HP 11807B Option 043
Lucent Autoplex® Series 1000
AMPS/TDMA Base Station Test Software

For the HP 8921A Cell Site Test Set

User's Guide

Software Revision: B.01.00 and above

For HP 8921A Test Set Firmware Revision: A.14.00 and above.

HP Part Number 11807-90016

Revision F

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In This Book

This book documents the use of the HP 11807B Option 043 Lucent AMPS/TDMA Base Station Test Software. The Software is used to test AMPS and TDMA base station equipment manufactured by Lucent Technologies.

Chapter 1, Product Description

General information on the Software plus hardware requirements for Software operation can be found in this chapter.

Chapter 2, Installation

Start at this chapter when using the Software for the first time. This chapter shows how to make connections, load and run the Software, and configure the Software to work with an external modem connected to the Test Set or an internal modem in a PC (using the BTS Laptop Utility program).

Chapter 3, Configuring the Cell Site for Tests

After you have the Software loaded and running, use this chapter to see steps for controlling the site via the Mobile Switching Center using a modem.

Chapter 4, Performing AMPS/TDMA Tests

Once the site has been configured for control, you can follow these steps to perform one of several AMPS/TDMA transmitter tests or utility tests.

Chapter 5, AMPS/TDMA Tests Software Reference

Descriptions of the Lucent AMPS/TDMA Base Station Test Software parameters and specifications, use of the Demo mode, creating frequency plans, and use of the Laptop Emulator utility.

Chapter 6, General Software Reference

This chapter discusses the use of the TESTS menus, memory cards, and how to print test results.

Chapter 7, Troubleshooting

This chapter offers suggestions to be used if you encounter errors while using the Software. Symptoms of potential problems are described and likely solutions are provided.

Conventions Used in this Guide

The following *terms* are used throughout this guide:

- Test Set - the HP 8921A Cell Site Test Set
- Cellular Adapter - HP 83204A TDMA Cellular Adapter
- Test System - the combination of the Test Set and an attached Cellular Adapter.
- Software - the Lucent AMPS/TDMA Base Station Test Software, described in this book.
- Select - means to move the cursor (using the cursor knob) to a specific control field and press the knob to choose it.

The Test Set's keys, softkeys, and selection choices in menu screens are shown as follows:

- A key on the Test Set's front panel: **TESTS**
- A selection choice or setting on the display: `Equipment Type`
- A USER Key: **k5** (**`Return`**). USER keys are labeled **k1** through **k5** on the front panel of the Test Set. As the Software is running, it assigns various operations to these keys.

  The convention used to indicate USER key operations implies that, in this case, you can either position the cursor in front of the control field labeled **`Return`** and press the knob to go to the previous menu, or just press the **k5** USER key to do the same thing.

Contents

1 Product Description

Review this chapter for general information on the Lucent AMPS/TDMA 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 AMPS/TDMA Base Station Test Software

The Software is an Instrument BASIC (IBASIC) application used to set up the Test Set for transmitter measurements on Lucent AMPS and TDMA base station equipment.

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-defined specification limits. These test results can be printed or stored to a memory card for archival purposes.

Four radio test routines are available, plus additional utilities for measuring cable, insertion, and return losses. Some routines contain a large number of test points. Other routines measure a specific parameter or access other Test Set functions.

Full Site Test (FCC)

The Full Site Test (FCC) is used to sequentially test several radios in the cell site by utilizing a frequency plan that you create. The frequency plan provides the needed information about each radio, and can be created using the Software or text editor on your PC. See "Frequency Plans" on page 116.

Single Radio Test

The Single Radio Test is used to test one radio at a time. Testing begins after you enter specific information about the radio under test.

TX Power Adjustment

This test provides a continually updated graphical representation of an analog power meter, as well as digital values, to measure transmitter power. Audible tones accompany the meter to allow you to adjust transmitter power without having to directly read the level. Testing begins after you enter specific information about the radio under test.

Spectrum Analyzer

This function accesses the Test Set's spectrum analyzer to view the signal being measured and the surrounding spectrum. Testing begins after you enter specific information about the radio under test.

Demo Mode

The Software provides a way to simulate testing without connecting the Test Set to a base station or modem. This “demonstration” mode of operation is very helpful in familiarizing yourself with Software operation. See “Demo (Demonstration) Mode” on page 113 for information on using this feature.

Who should use the Lucent AMPS/TDMA Base Station Test Software?

If you are installing, commissioning, or maintaining Lucent Technologies' AMPS or TDMA 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 043Software:

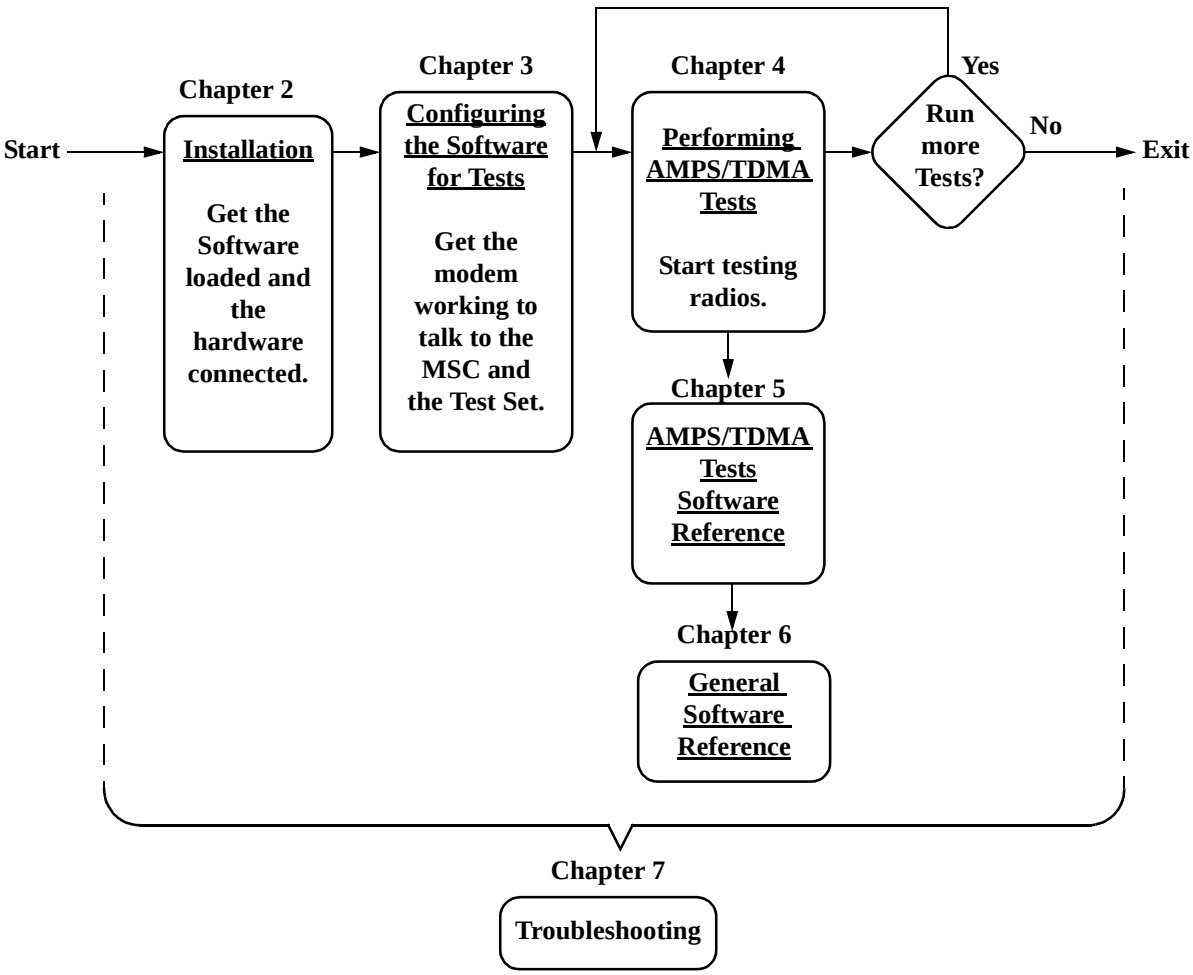
- ❏ PC Card (OTP) containing the Lucent AMPS/TDMA Base Station Test program (part number 11807-10016)
- ❏ Blank 256K byte RAM memory card - to save test procedures, save/recallregisters,testdata,configurationsettingsforexternalmodems (part number 0950-2209)
- ❏ 3.5 inch diskette containing the BTS Laptop Utilities program (part number E6385A Opt. K01)
- ❏ Lucent AMPS/TDMA Base Station Test Software manual - this manual (part number 11807-90016)
- ❏ Software License Agreement

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 AMPS/TDMA Tests,” on page 59, gives step-by-step instructions for each of the tests. If you have questions, further details can be found in Chapter 5, “AMPS/TDMA Tests Software Reference,” on page 105. If you encounter errors, Chapter 7, “Troubleshooting,” on page 205, can assist you.

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



Test System Hardware

Required Equipment

Test Equipment

The Software is written specifically to work with an HP 8921A Cell Site Test Set that has at least 928 KBytes of total installed RAM.

If you do not know how much memory your Test Set has, run the RAM_USAGE ROM program using the following procedure:

1. Press the **TESTS** button.
2. Set the **Select Procedure Location:** field to **ROM**.
3. Set the **Select Procedure Filename:** field to **RAM_USAGE**.
4. Press **k1** (**Run Test**). After a few seconds the Test Set displays the **Total RAM Installed** value.

If you have an older Test Set with 640 KBytes or less memory, contact your local HP Sales Engineer for information on purchasing a Memory Board upgrade for your Test Set.

HP 83204A (Option 001 or 003) TDMA Cellular Adapter

The cellular adapter provides the necessary modulation, demodulation, and signal processing for TDMA measurements. It is controlled entirely by the Test Set while the Software is running.

The cellular adapter is not needed for AMPS testing.

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.

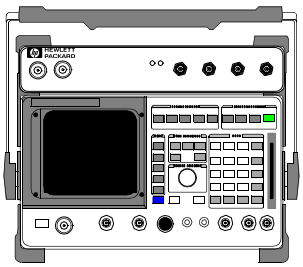
The Software also supports the use of external modems to control the cell site via the MSC, but may not always work well when negotiating through an OMP due to security procedures or differences in communications settings. See "Using an External Modem" on page 35.

Cables and Adapters

Several cables and adapters are required. See "Connector Kit" on page 112 for information on an optional cable kit that supplies the necessary cables and adapters to connect the Test Set to the base station and modem.

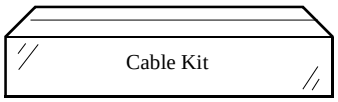
Figure 1-2 Required Equipment

Test Equipment required:



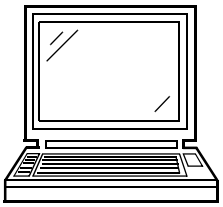
- AMPS Tests: HP 8921A

  TDMA Tests:
  HP 8921A Opt. 500 or 502
  (or an HP 8921A with an
  HP 83204A Option 001 or
  Option 003 Cellular Adapter)



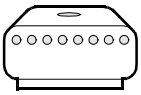
- HP 83202A
  Cable/Adapters Kit
  (or your own cables
  and adapters).

You must supply:

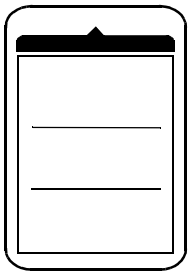


- Laptop PC to communicate with the switch. (Optional)

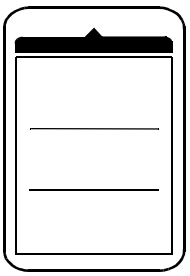
- External Modem (Optional)



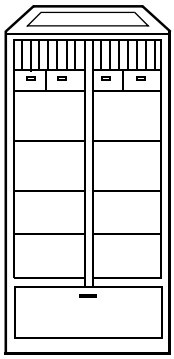
Supplied with the HP 11807B Option 043 Software:



HP 11807B Option 043 Lucent AMPS/TDMA Base Station Test Software



RAM Memory Card



- Lucent Series II Base Station.

Optional Equipment

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, serial, and HP-IB ports. The following printers are supported:

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

You may also collect the results using a PC on the serial port. This requires the BTS Laptop Utility, or a terminal emulator program, to be running on the PC.

Personal Computer (PC)

The Test Set and Software support using a PC to control the site via the MSC. The PC is connected to the Test Set via the serial port. Most PC's with an available serial port are compatible with the Test Set.

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

Getting Help, Software Upgrades, and Training

For instrument servicing, see the *HP 8921 Cell Site 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:

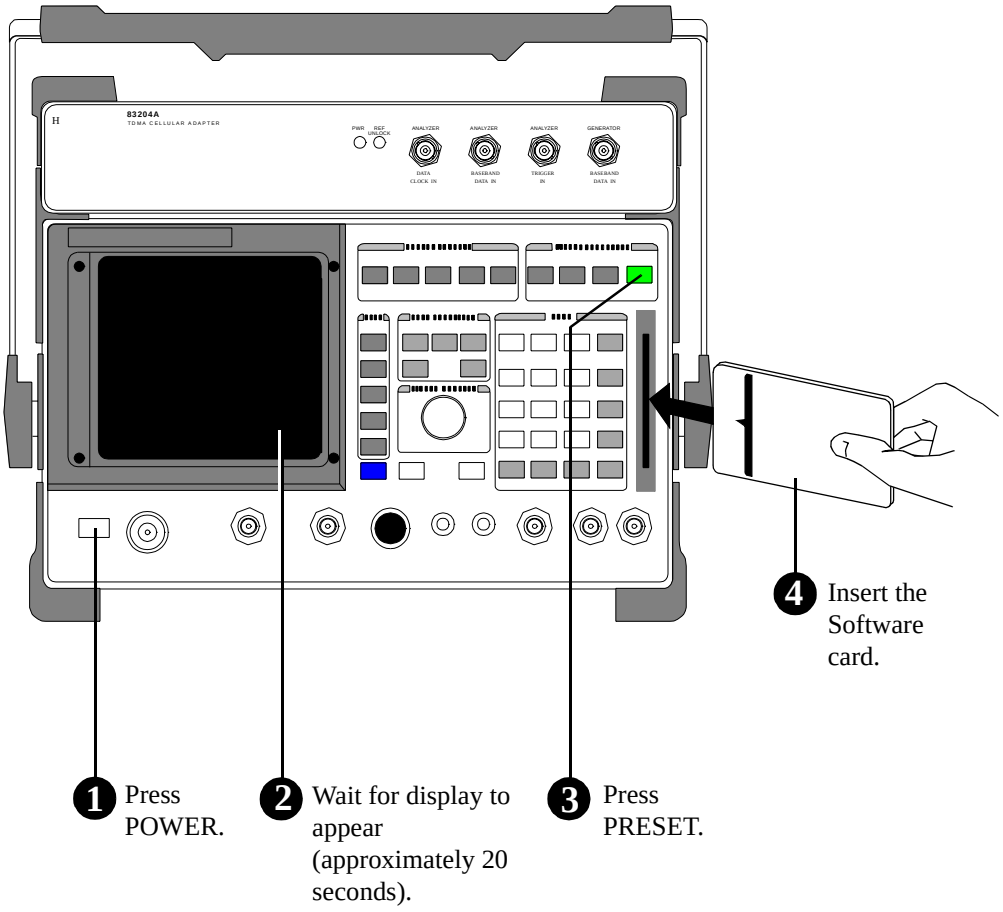
1. "Load and Run the Lucent AMPS/TDMA Base Station Test Software" on page 19.
2. "Connect the Test Set to the Site Equipment" on page 23.
3. "Connect the Modem to the Test Set" on page 28.

The last step, connecting a modem to the Test Set, is required for automated testing, and must be used to perform the Full Site Test (FCC). However, you do not need a modem to perform the rest of the tests if you have another way to manually control the base station.

Load and Run the Lucent AMPS/TDMA Base Station Test Software

Locate the memory card labeled “Lucent AMPS/TDMA Base Station Test Software” and follow the steps outlined in Figure 2-1 and Figure 2-2.

Figure 2-1 Loading the Software

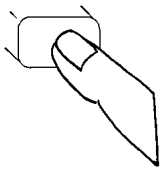


Continued on the following page

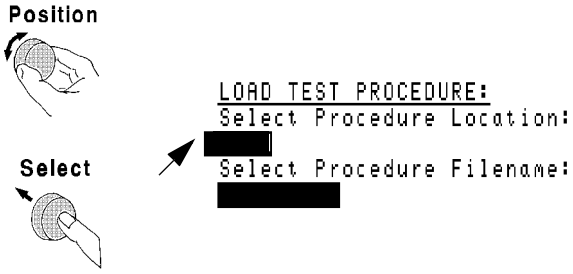
Figure 2-2 Loading the Software (continued)

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

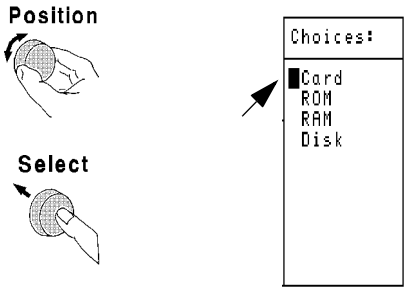
If you are in the IBASIC TESTs screen, press **PRESET** before pressing **TESTS**.



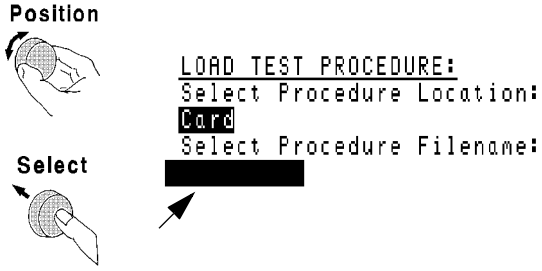
2 Position cursor at **Select Procedure Location:** and select it.



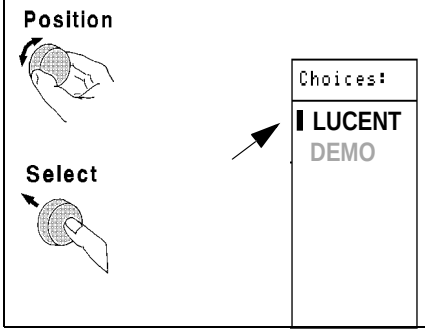
3 Position cursor at **Card** and select it.



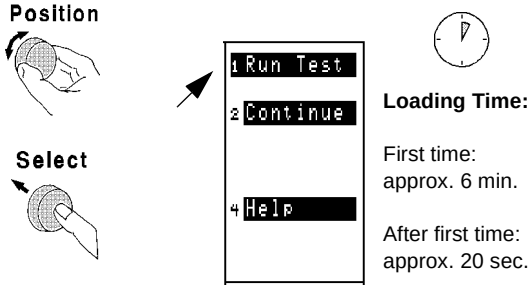
4 Position cursor at **Select Procedure Filename:** and select it.



5 Position cursor at **Choices:** and select **LUCENT**.



6 Position cursor at **Run Test** and select it. The Software starts loading.

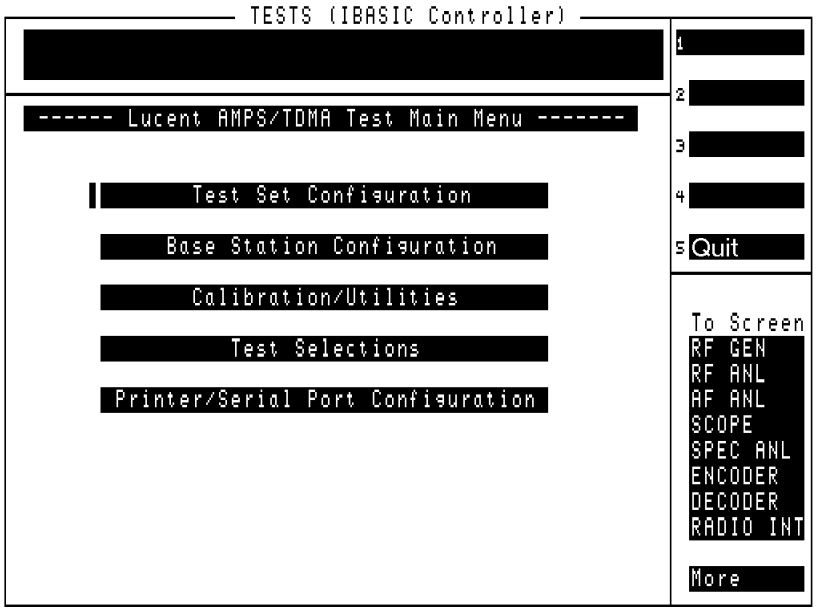


Navigation of the Lucent AMPS/TDMA Base Station Test Software

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 submenus. Turn and press the knob to access the desired submenu.

Figure 2-3 Lucent AMPS Test Software Main Menu



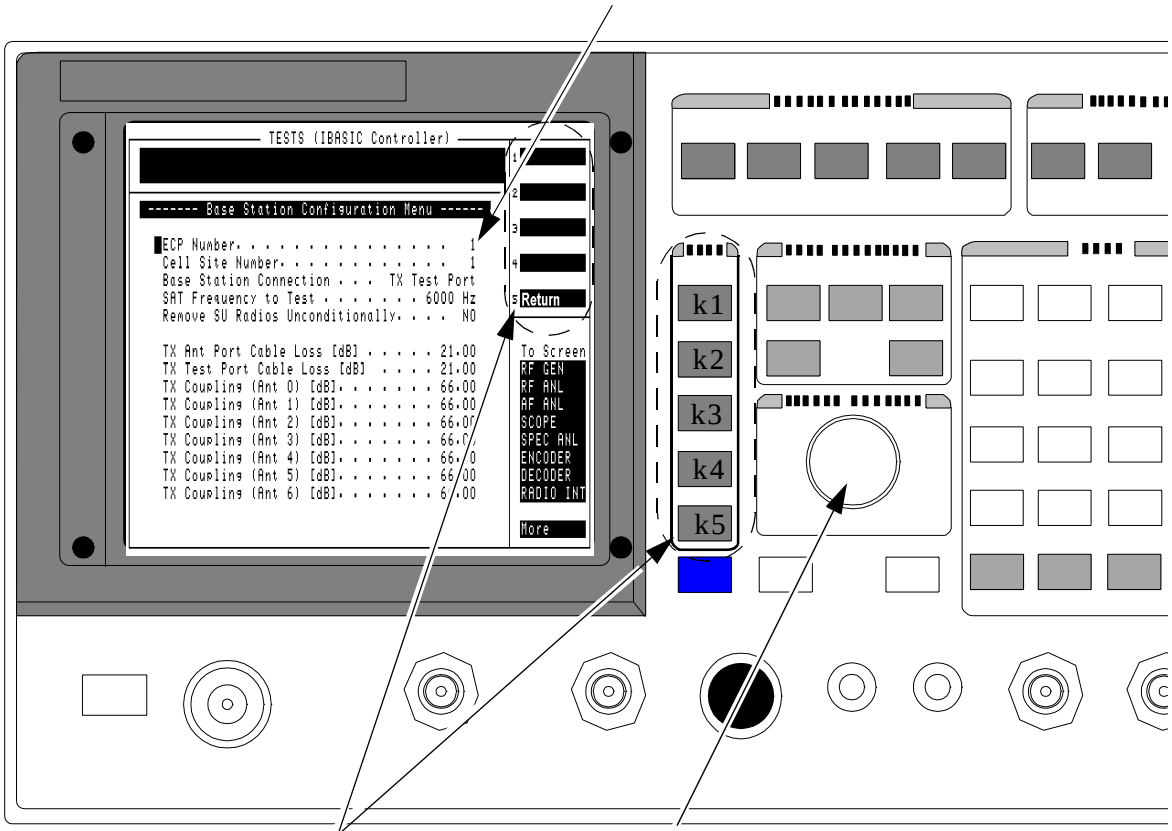
Main Menu Functions

- **Test Set Configuration** is where you define test information used by all tests; such as selecting the FCC Data Format for printouts and setting the speaker volume for the beeps that accompany prompts during operation.
- **Base Station Configuration** is where you enter the specific cell site and base station information the Software needs to configure itself and control your base station when communicating with the MSC during tests.
- **Calibration/Utilities** accesses procedures used to ensure optimal calibration of the Test Set and test cables. This menu is also used to access and edit the frequency plan, enter the laptop emulator mode to send commands directly to the MSC from a connected laptop PC, and to print an FCC Title Page for recording test information.
- **Test Selections** accesses AMPS and TDMA tests.

- **`Printer/Serial Port Configuration`** accesses routines used to enable printing of test results, enable data collection and data logging operations, configure a modem to talk to the MSC, and define the serial port communication settings. This is also where you tell the Software that you are going to use the BTS Laptop Utility.

Figure 2-4 Changing Settings and Using USER Keys

Entry Fields
Some Main Menu selections are entry fields. When these are selected, a highlighted area appears and you may key in a value with the DATA keys, or rotate the knob to change the value in the field. When the desired value is set, press the knob or the **ENTER** key.



USER Keys and their Fields
The USER Keys (**k1** - **k5**) correspond to fields 1-5 on the right side 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 back to the previous screen.

Knob
The knob controls the cursor position on the display and is sometimes used to make numeric entries. Pressing the knob has the same effect as pressing the **ENTER** key.

Connect the Test Set to the Site Equipment

The Test Set can be connected to the base station for either in-service or out-of-service testing for most tests. The Test Set and base station ports you use for testing depend on which type of testing you perform.

Which Test Set Port to Use

The maximum level into the RF IN/OUT port of the standard Test Set is 60 watts. This is the only port on the Test Set that you should connect directly to the base station's TX Antenna port.

The Test Set's ANT IN port is only used for very low signal levels ≤200 mW (23 dBm). Therefore, to prevent damage to the Test Set, *never connect this port directly to the TX Antenna port of the base station*. This Test Set port is typically connected to the base station's TX Test port.

Cellular Adapter Connections

The Cellular Adapter is used when making TDMA measurements. After it is installed on the Test Set and the two units are calibrated together, you connect your base station signals only to the Test Set during all measurements; no front-panel connectors on the Cellular Adapter are used.

Rear panel connections between the Test Set and Cellular Adapter are shown in Figure 5-1 on page 108.

NOTE If your Cellular Adapter has the CDPD option, you must disconnect the Type-N cable that is normally connected between the Test Set and Cellular Adapter's front panel RF IN/OUT ports for CDPD testing.

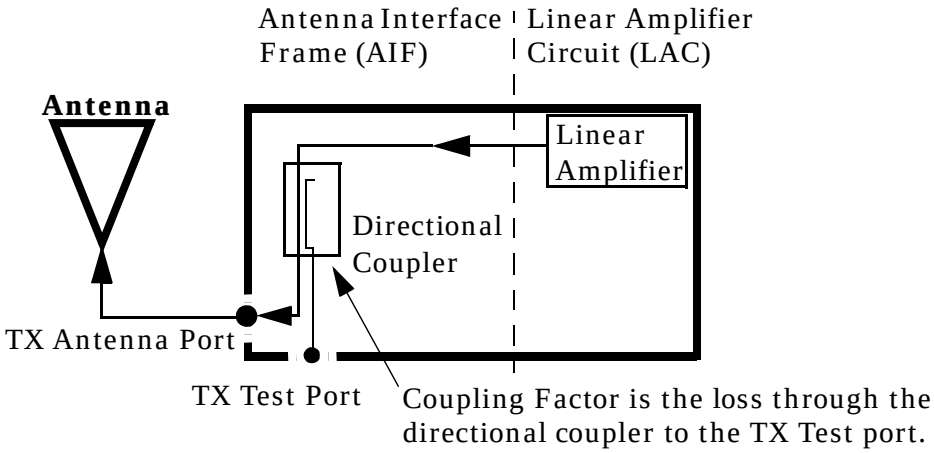
Which Base Station Port to Use - TX Test or TX Antenna?

See "Enter the Base Station Configuration Information" on page 47.

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 2-5). This coupled signal is routed to the J3 connector on the switch panel of the Antenna Interface Frame during software operation. 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 about 66 dB, but can vary.

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 Coupling Measurements" on page 94.

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.

After measuring the coupling factor, you should record the value for later use.

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 failing 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

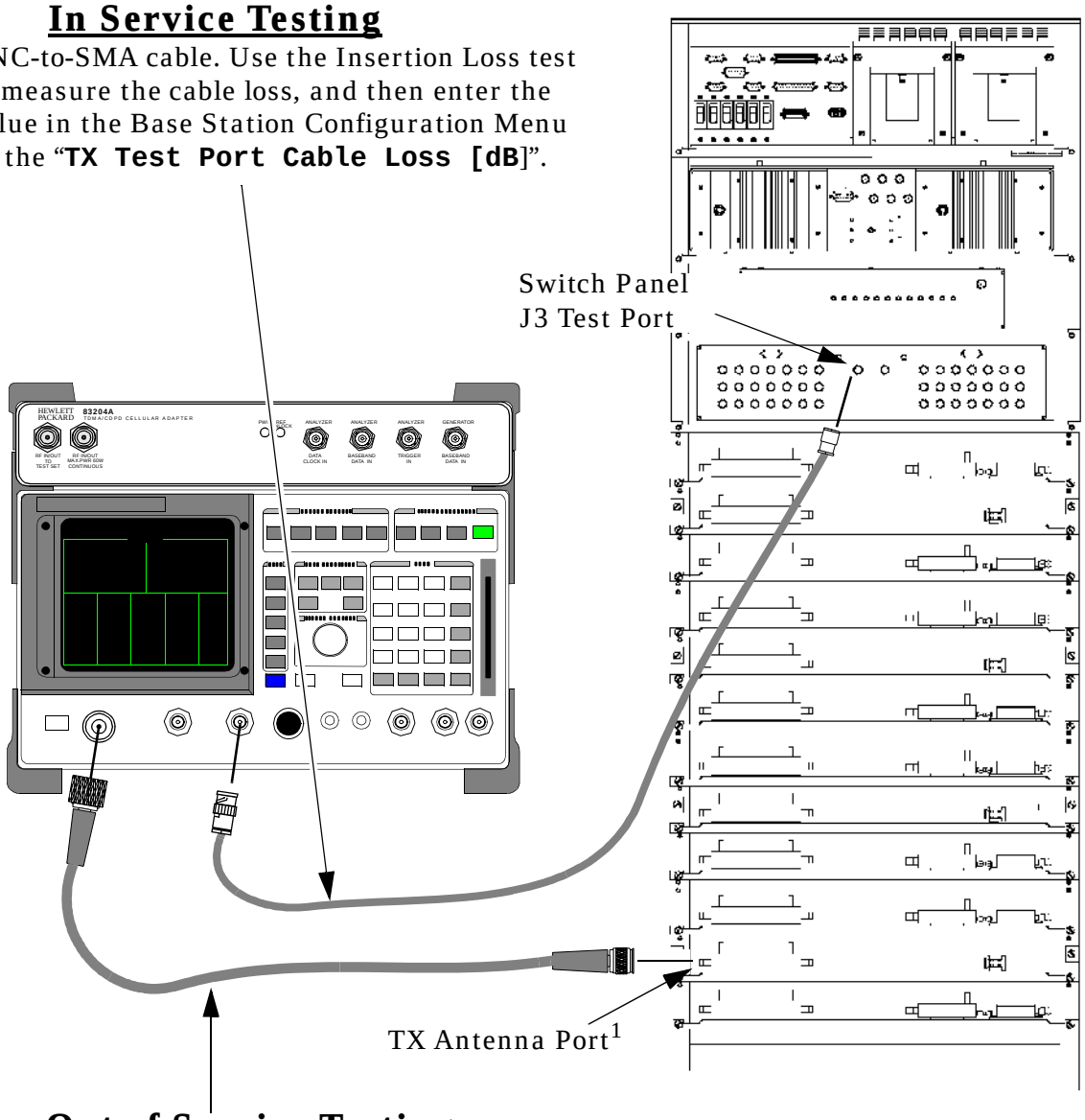
Disconnecting a TX Antenna feed line and connecting the Test Set to the TX Antenna port requires the associated base station to be taken out of service (disable call processing and turn off all transmissions to that TX Antenna port).

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, verifying the operation of the full transmission path inside the base station to the antenna port. It also provides an opportunity to perform transmission line and antenna testing while the antenna is disconnected from the base station.

Figure 2-6 Test Set to Series II Connections

In Service Testing

BNC-to-SMA cable. Use the Insertion Loss test to measure the cable loss, and then enter the value in the Base Station Configuration Menu as the "**TX Test Port Cable Loss [dB**]".



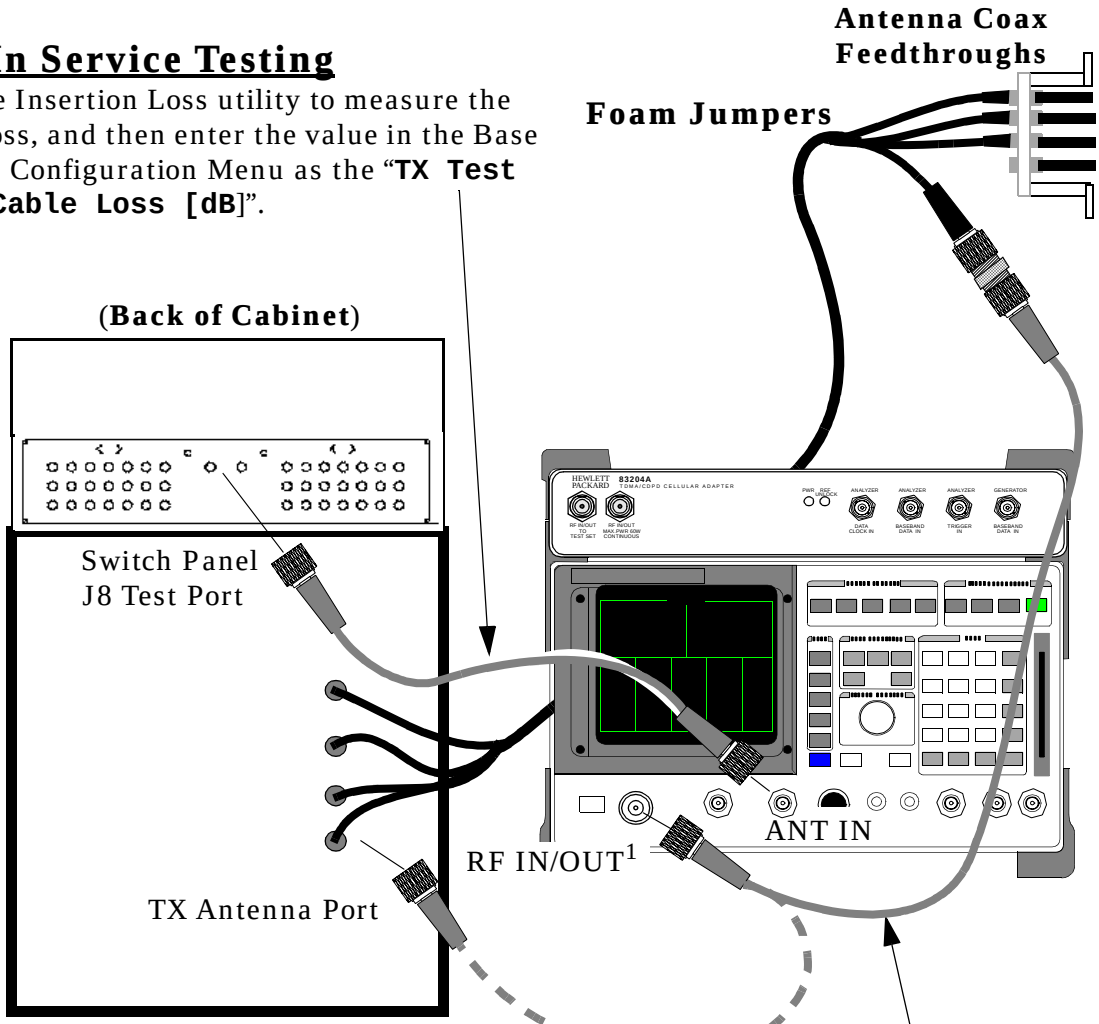
Out of Service Testing

Use the Insertion Loss utility to measure the cable loss, and then enter the value in the Base Station Configuration Menu as the "**TX Ant Port Cable Loss [dB**]".

You can make measurements at either the TX Antenna Port or at the end of the foam jumper. When making measurements at the antenna end of the foam jumper, be sure to add the foam jumper's cable loss to the TX Antenna Port Cable's loss when entering the "**TX Ant Port Cable Loss [dB**]" value.

[1]Connect to the antenna port indicated on the drawing displayed when running the test. (You specify the port in the Base Station Configuration Menu before testing.)

Figure 2-7 Test Set to Type M and MM Connections



In Service Testing

Use the Insertion Loss utility to measure the cable loss, and then enter the value in the Base Station Configuration Menu as the "**TX Test Port Cable Loss [dB]**".

[1]Connect to the antenna port indicated on the drawing displayed when running the test. (You specify the port in the Base Station Configuration Menu before testing.)

Out of Service Testing

Use the Insertion Loss utility to measure the cable loss, and then enter the value in the Base Station Configuration Menu as the "**TX Ant Port Cable Loss [dB]**".

You can make measurements at either the TX Antenna Port (on the back of the cabinet) or at the end of the foam jumper. When making measurements at the end of the foam jumper, be sure to add the foam jumper's cable loss to the TX Antenna Port Cable's loss when entering the "**TX Ant Port Cable Loss [dB]**" value.

Connect the Modem to the Test Set

Using a modem, the Software can take control of the cell site to perform tests in much less time than would be required under manual control. The software can work with an internal modem in your PC (preferred method) or an external modem.

When using an external modem, problems can occur when negotiating through an OMP due to security procedures or differences in communications settings. The use of the Laptop Utility and laptop PC with an internal modem does not typically encounter these restrictions.

NOTE If you are *not* using control of the site via a modem to the MSC, you may skip this section. However, the procedures in "Performing AMPS/TDMA Tests" on page 59 use a modem for site control.

Using an Internal Modem and the BTS Laptop Utility[1]

The BTS Laptop Utility is shipped with the Software on a separate 3.5 inch disk. This program sets up the internal modem and serial communications port of your laptop PC for automated testing with the Test Set. The utility 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 Utility provides the following functions:

- A Switch Terminal window that works with your internal modem to dial into the switch (MSC) and monitor replies sent back from the switch.
- An Other Data window to download frequency plans to the Test Set.
- 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. 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 (by pressing the **CANCEL** key) to print any of the TESTS screens used for automated testing.)

Need More Information? For additional information on using the BTS Laptop Utility after installation, refer to the online Help topics included with that program.

1. If you are using an external modem, see "Using an External Modem" on page 35.

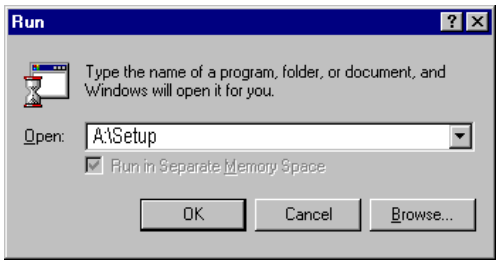
System Requirements for BTS Laptop Utility

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

BTS Laptop Utility Installation

Figure 2-8 Installing the BTS Laptop Utility Program



The BTS Laptop Utility 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.

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.

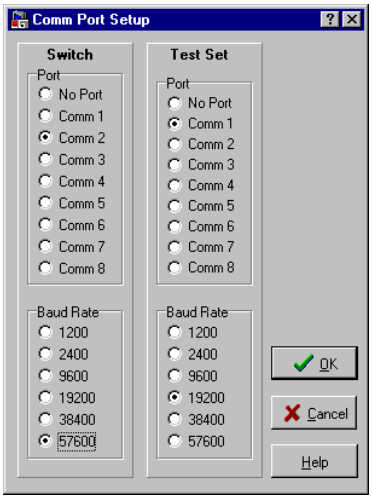
Configuring the Laptop's Serial Port.

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

Figure 2-9 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 PC and Test Set's serial ports).



- **Switch**: Port - This PC port is used to communicate with the laptop's Modem. The port number can be found in your laptop's Control Panel/Modems window. Simply click the Windows **Start** icon, **Settings**, **Control Panel**, and **Modems**. Select **Properties** to view the COM port (and default communication settings) for your modem.

If the modem's port is already in use when setting the Switch port, 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 memory card or internal modem. This is not the speed at which the modem communicates with the switch (MSC). 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. Settings of 9600 or 19200 are recommended.

- **Test Set**: Port - This is the serial port your laptop uses to communicate with the Test Set. This port setting can also be found in your laptop's Windows **Control Panel**. 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 Software's Serial Port Configuration Menu for **Serial Port 9 (Laptop/Printer)**. This value will not automatically adjust during the session. The recommended baud rate for the Test Set is 19200.

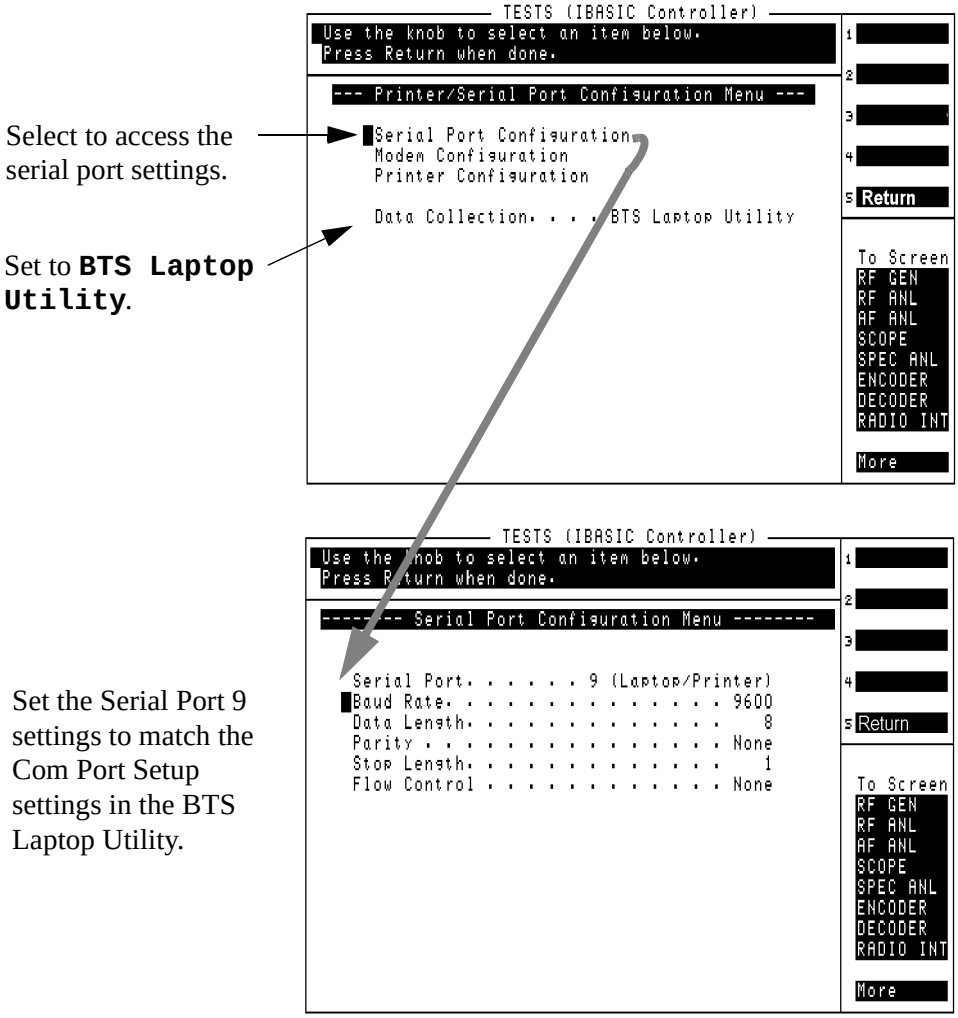
Configuring the Test Set Software to Work with the BTS Laptop Utility Software.

After installing BTS Laptop Utility on your laptop, you need to configure the Software to send data to the laptop. This is accomplished by setting the serial port 9 communication parameters and by telling the Software to use the BTS Laptop Utility.

- To configure serial port 9 and select BTS Laptop Utility operation.

  1. Load and run the Software (see "Load and Run the Lucent AMPS/TDMA Base Station Test Software" on page 19). The Software's Main Menu is displayed.
  2. Select **Printer/Serial Port Configuration** on the Main Menu.
  3. Select **Serial Port Configuration**.
  4. Set the Serial Port Configuration Menu settings to work with the BTS Laptop Utility (see figure 2-10 on page 32).
     - 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**.
     - Set **Flow Control** to **None**.
  5. Set the **Data Collection** field to **BTS Laptop Utility**.

Figure 2-10 Enabling BTS Laptop Operation and Changing the Test Set's Serial Port 9 Settings

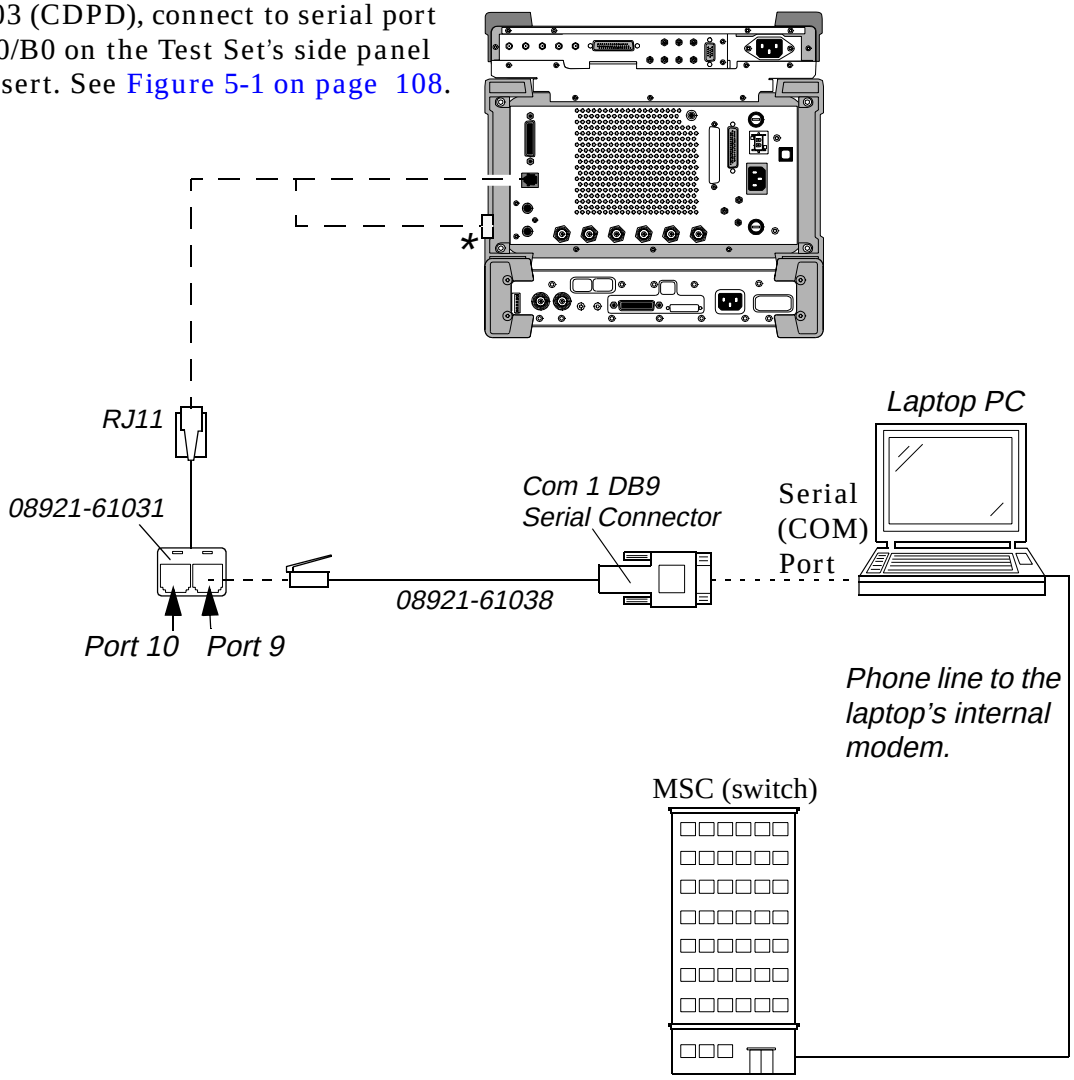


Test Set to Laptop Connections

Figure 2-11 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 a properly configured cellular capable modem will work.

Figure 2-11 Connections for Test Set and PC With Internal Modem

*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 108.



Test Your Connections and Configuration Settings

To test the settings you have selected, connect a cable from the Test Set's serial port 9 to the Com port of your laptop (as shown in Figure 2-11 on page 33) and try a screen capture.

If a program is running in the Test Set, press **CANCEL** to pause the program. With the cable connections complete, and BTS Laptop Utility running on your laptop, simply press the **SHIFT** key, then the **TESTS** key, on the Test Set. The currently-displayed screen should appear in the **Test Set Screen Capture** window of the BTS Utility.

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

Using an External Modem[1]

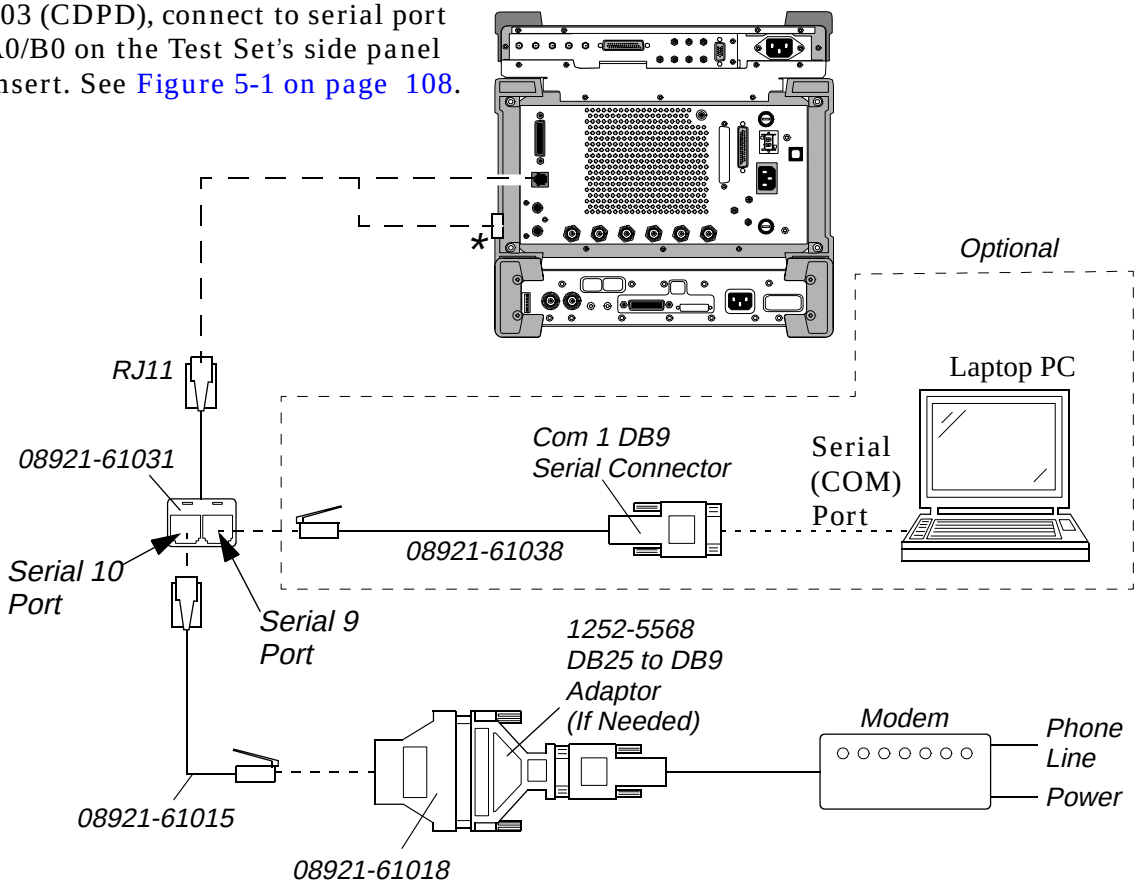
The Test Set's SERIAL PORT connector supports two serial communications channels: serial port 9 and serial port 10.

To control the radios at the cell site, the Test Set has the ability to send control commands to the switch via a modem connected to serial port 10. This section deals with setting up the external modem. Once you have set up and initialized the modem, you should not have to repeat these steps again unless the settings are cleared (or the modem is used for other purposes and is reconfigured).

A laptop PC can be connected to serial port 9 of the Test Set to allow you to interact manually with the switch. This addition of the PC is optional. Figure 2-12 shows the basic configuration of the Test Set, PC, and modem, and how they are connected to communicate to the switch.

Figure 2-12 Test Set, External Modem, and PC 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 108.



1. If you are using an internal modem, and have followed the instructions provided in "Using an Internal Modem and the BTS Laptop Utility" on page 28, skip this section and go to "Configuring the Software for Tests" on page 43.

Configure the Serial Port

The serial port information must be properly set for data communications between the Test Set, modem, MSC, and computer (if used). You need to set the Test System's parameters to match the communications requirements of the MSC, including the following items:

- ❏ Baud rate
- ❏ Data length
- ❏ Parity
- ❏ Stop length
- ❏ Flow Control

To configure serial port 10 for modem operation, perform the following steps:

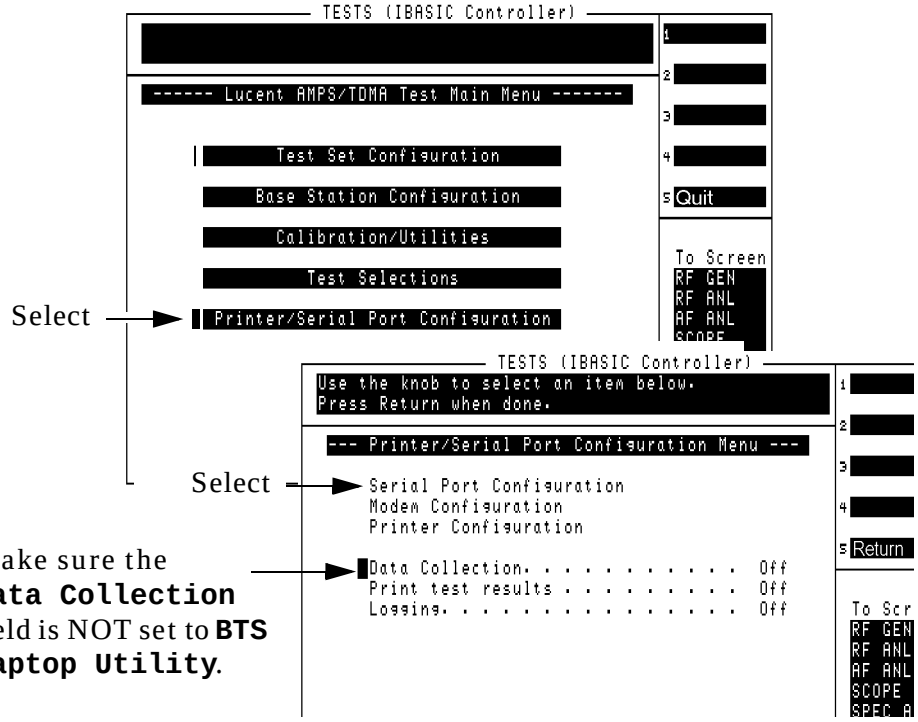
Step 1. Load and run the Software to display the Software Main Menu. (See page 19)

Step 2. Select **`Printer/Serial Port Configuration`**.

Step 3. Set the Data Collection field to any setting *except* **`BTS Laptop Utility`**.

Step 4. Select **`Serial Port Configuration`**.

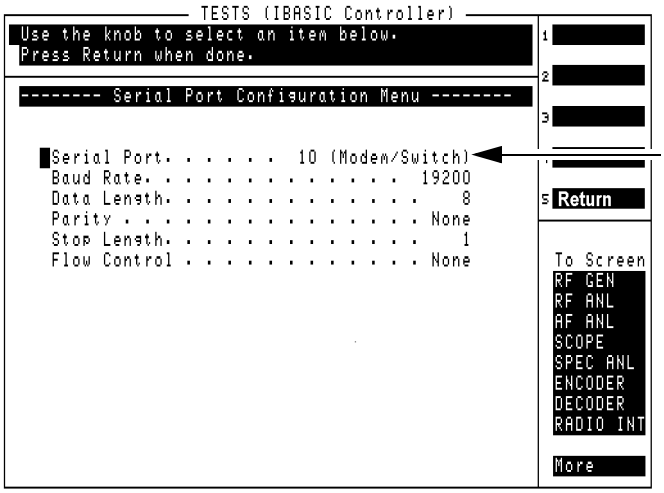
Figure 2-13 Selecting Serial Port Configuration



Step 5. Select **Serial Port** and set it to **10 (Modem/Switch)** (see Figure 2-14).

Step 6. Set the remaining communications parameters to match the serial communication settings of the MSC.

Figure 2-14 Modem Communications Parameters



Select **Serial Port** and set the serial port 10 settings to match the MSC's dial in communications settings.

If a PC is connected to serial port 9, change the serial port 9 settings to match the serial port 10 settings.

Step 7. If you have a computer connected to serial port 9 (as shown in figure 2-12 on page 35), select **Serial Port** again and select **9 (Laptop/Printer)**. Change these settings to match those set in Step 6.

Turn on the XON/XOFF pacing control on your *computer's* serial port (this may appear in your PC software as an item marked "Software Flow Control"; you will want to set this to "Yes" or "On"). Consult the documentation for the communications software package that is installed on your PC if you have questions on these or other settings.

Step 8. Select **Return** (k5) twice to return to the Software's Main Menu screen.

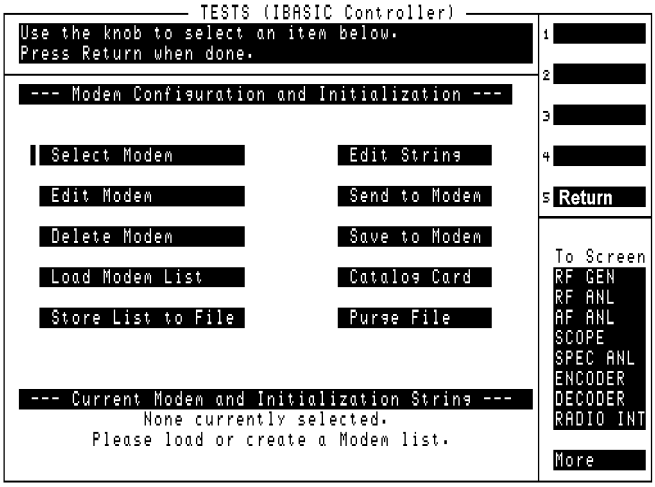
NOTE The settings you have made in the Serial Port Configuration Menu are saved in non-volatile memory and will be retained even if you turn the Test Set off. However, if you load another program or procedure, the settings will be lost. You can save your settings in a procedure file for later use. See "How to Save a Test Procedure" on page 175 for instructions on creating procedure files.

Configuring and Initializing the External Modem

After defining the serial port communication settings to the modem, you need to enter an identifying name for the modem you are using and its initialization string. You can then save this information to a file for later use.

See "Modem Configuration and Initialization Menu" on page 144 for more information on using this screen.

Figure 2-15 The Modem and Initialization Menu



Modem Configuration Procedure.

Use this procedure to enter the name and initialization string for the modem you are using.

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

Step 2. Select **Printer/Serial Port Configuration**.

Step 3. Select **Modem Configuration** to display the Modem Configuration and Initialization menu (figure 2-15).

Step 4. Select **Edit Modem**.

Step 5. Enter an identifying name for the modem, using the knob to scroll through and select characters from the **Choices** menu. Select **Done** when finished.

Step 6. Select **Edit String**.

Step 7. Enter the initialization string for the modem, using the knob to scroll through and select characters from the **Choices** menu. Select **Done** when finished.

The initialization string commands for your modem should be listed in the modem's documentation.

Step 8. Insert a RAM memory card into the Test Set, setting the card's write protect switch to allow writing to the card.

Step 9. Select **Store List to File** to save the modem configuration to a file on the memory card. The Software saves the file under the name "UMODEM".

If you select **Load Modem List**, then **Select Modem**, you see the modem name you just entered. This is how you load and retrieve stored modem files for later use.

Modem Initialization Procedure.
Use this procedure to send the initialization string to the modem to initialize it for use with the Software. In most cases, this string is all that is required to properly initialize your modem.

If you are unsuccessful in getting your modem to communicate with the switch, you may need to re-edit the initialization string using the **Edit String** function. See "Modem Configuration and Initialization Menu Functions" on page 146. Be sure to re-save the initialization string using **Store List to File** after getting the initialization string to work with the modem.

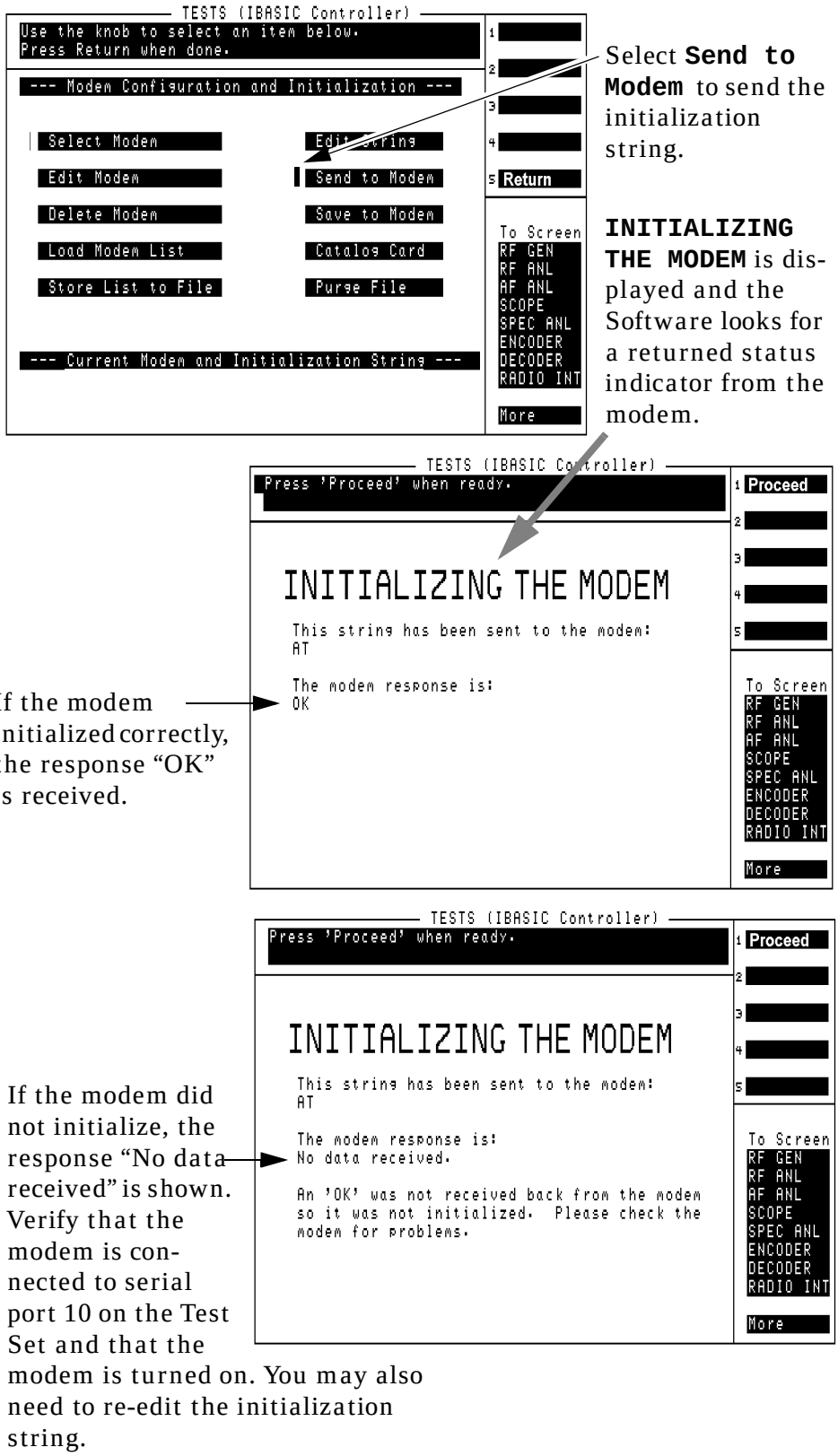
Step 1. If your modem is not already connected to the Test Set and phone line, make the connections now. If it is not turned on, turn it on now.

Step 2. Configure the Software to use your modem (as outlined on page 38).

Step 3. With the Modem Configuration and Initialization screen displayed, select **Send to Modem** (see Figure 2-16). The message "**INITIALIZING THE MODEM**" is displayed, along with the initialization string you entered.

If the modem initialized correctly, the response "OK" is displayed.

Figure 2-16 Initializing the Modem



NOTE If the modem still does not initialize, press **k1** (**Proceed**) and then **k5** (**Return**) to return to the Printer/Serial Port Configuration Menu. Verify that the **Data Collection** feature is *not* set to **BTS Laptop Utility**.

Step 4. If the modem accepts the command string, you should save the setting in the modem by selecting **Save to Modem**. This saves the string in the non-volatile memory of the modem so you don't have to re-initialize the modem the next time you connect it to the Test Set.

Step 5. After successfully initializing the modem, select **Return** (**k5**) twice to return to the Main Menu screen.

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 205 for help.

3 Configuring the Software for Tests

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

Configuring the Software results in the following conditions:

- Information about the Test Set and cell site have been entered, such as the ECP number and cell site number, and the base station port you will use for testing has been specified.
- For fully automated testing, communication has been established with the MSC (via the modem) and a command prompt is displayed on your laptop PC or on the Test Set. This indicates that the MSC is ready to receive commands from the Test Set.

Overview

For automated control of the cell site, you should have connected and configured the modem (and laptop if used) to work with the Test Set, as outlined in chapter 2. The modem is used to communicate with the MSC to set up cell sites for testing. In this chapter, you will use the modem to connect to the MSC and setup a 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 (see "Configuring the Laptop's Serial Port" on page 30).

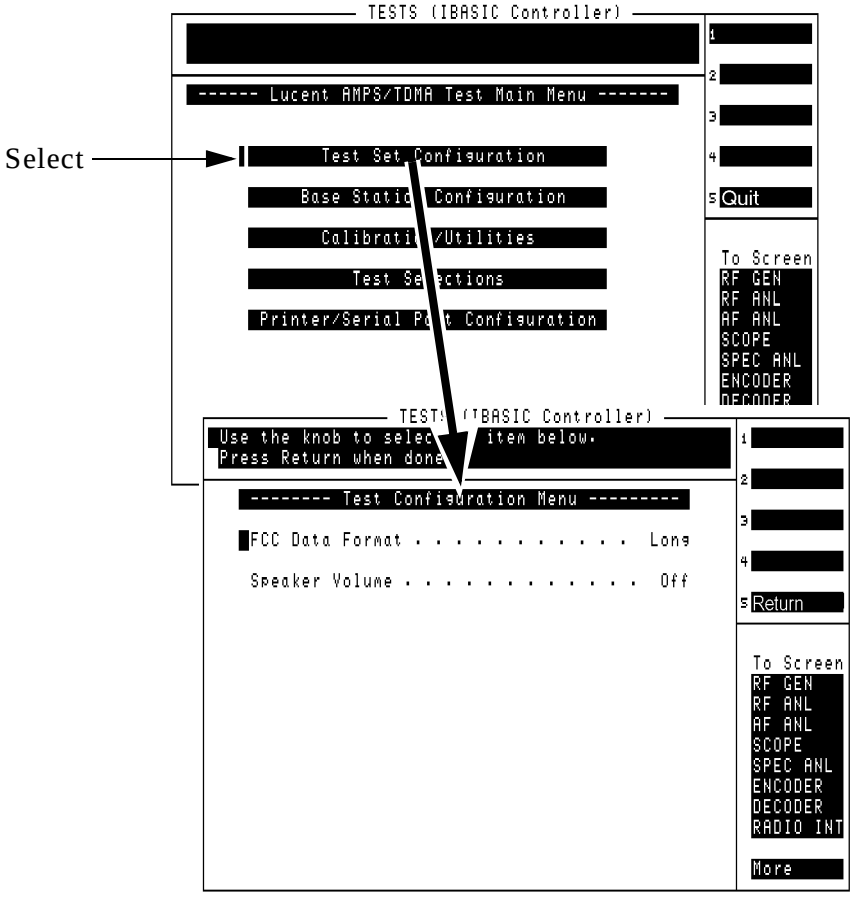
If you are not using a modem to provide fully automated control of the cell site, you still need to enter information in the Test Set Configuration and Base Station Configuration menus as outlined in this chapter.

Enter Test Set Configuration Information

Review the following information about the Test Configuration Menu and alter the settings as needed.

Step 1. Load and run the Software (see page 19). The Software's Main Menu is displayed.

Step 2. From the Software's Main Menu, select **`Test Set Configuration`**.

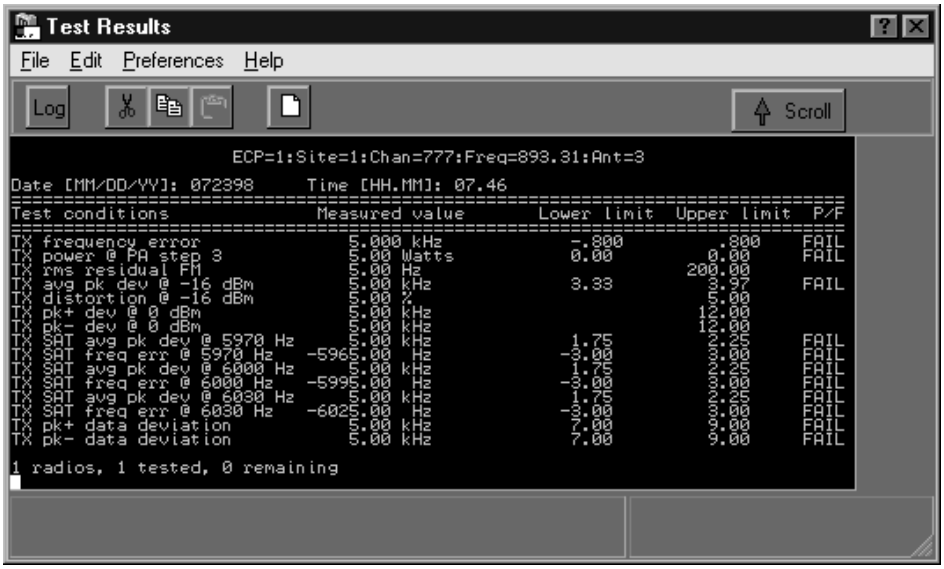


Step 3. **`FCC Data Format`** is used to select the format for printed results: **`Long`** or **`Short`**. If you are using the BTS Laptop Utility program on a PC, test results are printed both ways; displaying results in the short format in the **`Other Data`** window and the long format in the **`Test Results`** window.

Long and Short Data Format Using the BTS Laptop Utility

Short Format

Long Format



Step 4. Set the **Speaker Volume** to the desired level. This determines the volume of the beeps and tones issued by the Software during operation.

Step 5. Select **k5** (**Return**) to return to the Main Menu.

Enter the Base Station Configuration Information

The Base Station Configuration Menu is used to specify information needed to control the base station (for fully automated testing), configure the Software to use the correct test port and display the correct setup drawings, and to offset measured values to compensate for cable and test port coupler losses.

To ensure valid test results, modify the entries in this menu to match your testing situation each time you test a base station.

Base Station Configuration Procedure

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

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

Figure 3-1 Accessing the Base Station Configuration Information

Step 3. Select the **Base Station Type** to match the version of base station you are testing: **Series II**, **M**, or **MM**.

Step 4. Enter the **ECP Number** for the Executive Cellular Processor that controls the cell site you are testing.

Step 5. Enter the **Cell Site Number** for the cell site you are testing.

Step 6. Select the **Base Station Connection** you are going to use. See Figure 2-6 on page 26.

- **TX Antenna Port** - is used for out-of-service testing. You disconnect the antenna for the base station you are testing and connect the Test Set's RF IN/OUT port to the foam jumper from the Antenna Interface Frame.
- **TX Test Port** - is used for in-service testing. You connect the ANT IN port of the Test Set to the TX Test (coupled) port in the Antenna Interface Frame.

Step 7. Select the SAT Frequency to Test. You can select an individual SAT frequency, **5970 Hz**, **6000 Hz**, or **6030 Hz**, or **All** to test each frequency.

Step 8. If you are going to test one or more AMPS Setup radios, you can choose to unconditionally remove the radio, even if the MSC would prefer you didn't take the radio out of service. To do this, set the **Remove SU Radios Unconditionally** field to **YES**.

Step 9. Enter the **TX Ant Port Cable Loss [dB]**. This is the loss through the cable used to connect the Test Set's RF IN/OUT port to the antenna port of the Antenna Interface Frame during out-of-service testing. See Figure 2-6 on page 26.

Step 10. Enter the **TX Test Port Cable Loss [dB]**. This is the loss through the cable used to connect the Test Set's ANT IN port to the coupled test port in the Antenna Interface Frame during in-service testing. See Figure 2-6 on page 26.

Step 11. Enter the **TX Coupling** factor for each TX Test port in the Antenna Interface Frame that you will use during tests. If you do not know the coupling factor(s), you can run the TX Test Port Coupling Measurements utility to measure it. See "TX Test Port Coupling Measurements" on page 94.

Connect to the MSC Using a Laptop PC

You can connect to the MSC three ways:.

- Using a PC with an *internal modem* and the BTS Laptop Utilities connected to the Test Set. This is the preferred method, since it does not require connecting and configuring an external modem to communicate with the MSC. Connections are shown in figure 2-11 on page 33.
- Using a PC with a communications program and an *external modem* connected to the Test Set. This method uses the same communications package you normally use to dial up and login to the MSC, but requires you to use the Test Set and Laptop Emulator function in the Software as a communications link between the modem and the PC. Connections are shown in figure 2-12 on page 35.
- Using the Test Set's Laptop Emulator function and an *external modem* (no PC). This method requires you to send commands directly from the Test Set to the modem, using the Laptop Emulator function in the Software, to connect to the MSC. This method may not work well when negotiating through an OMP to login due to command response time requirements. Connections are shown in figure 2-12 on page 35.

MSC Dial-Up Procedure Using a PC and Internal Modem

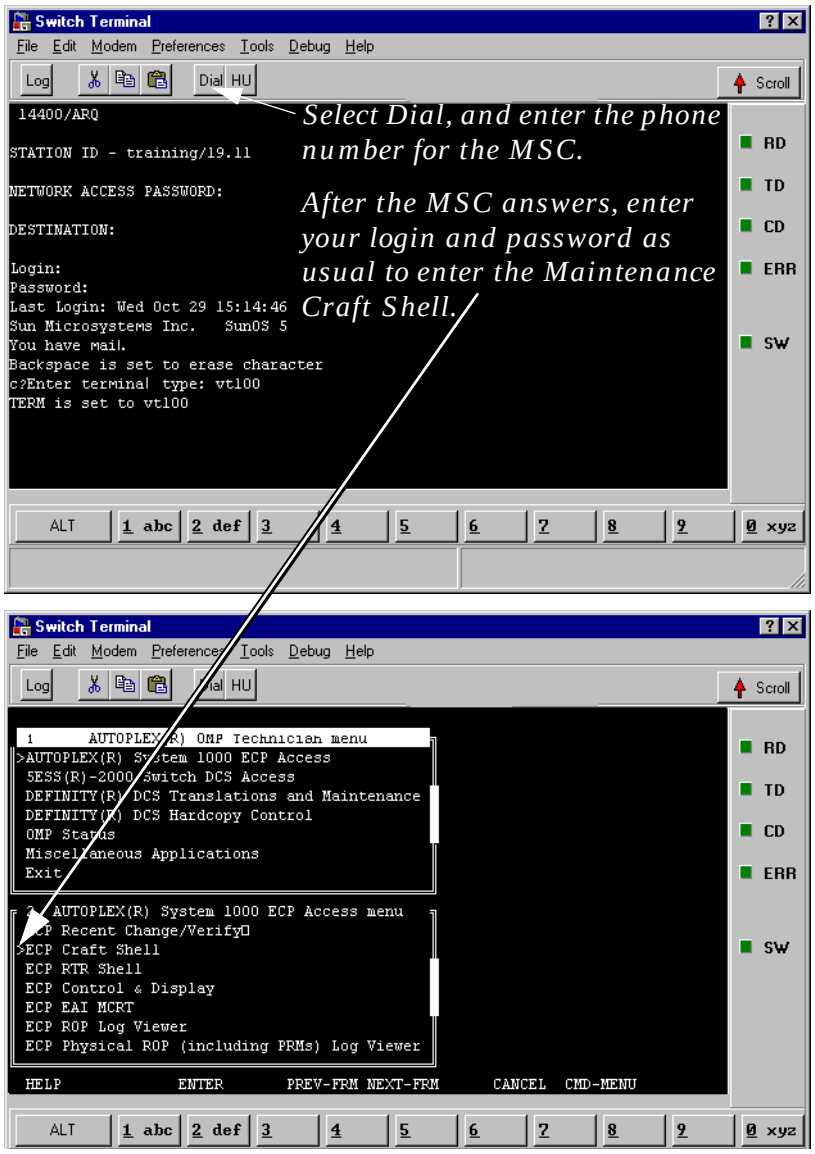
Step 1. Make sure your PC is connected to the Test Set (serial port 9) and the PC's internal modem is connected to a phone line.

Step 2. Install and configure the BTS Laptop Utility program in your PC. Refer to "Using an Internal Modem and the 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 Utility **`Switch Terminal`** window and select **`Dial`**. Enter the MSC's phone number when prompted, selecting **`OK`** to start dialing.

When prompted by the MSC, enter the same commands you would use in your regular communications program to login to the ECP and enter the maintenance craft shell. When done, a command prompt should be displayed, signalling 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 AMPS/TDMA Software running in the Test Set can now communicate with the MSC. See "Setup Site for Test" on page 57.

MSC Dial-Up Procedure Using a PC and External Modem

The connection sequence described in this section uses a PC connected to the Test Set and an external modem. The PC must have some type of communication software running (such as Procomm Plus®[1]) that can communicate to the MSC through the Test Set's serial port 10 (which is connected to the modem).

Step 1. Make sure that your modem is connected to the Test Set and a phone line, and both instruments are turned on.

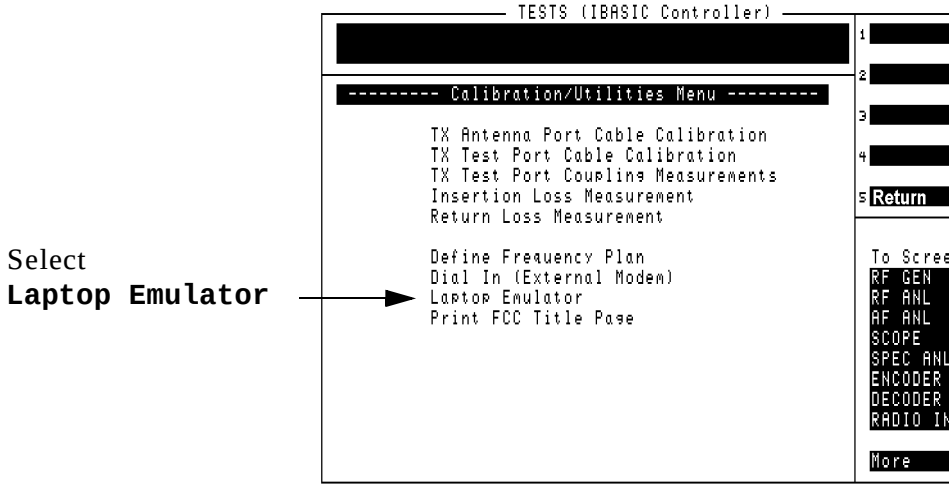
Step 2. Start the communications program in your PC.

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

Step 4. Select **Calibration/Utilities**. The Calibration/Utilities Menu is displayed. (See Figure 3-3).

Step 5. Select **Laptop Emulator**.

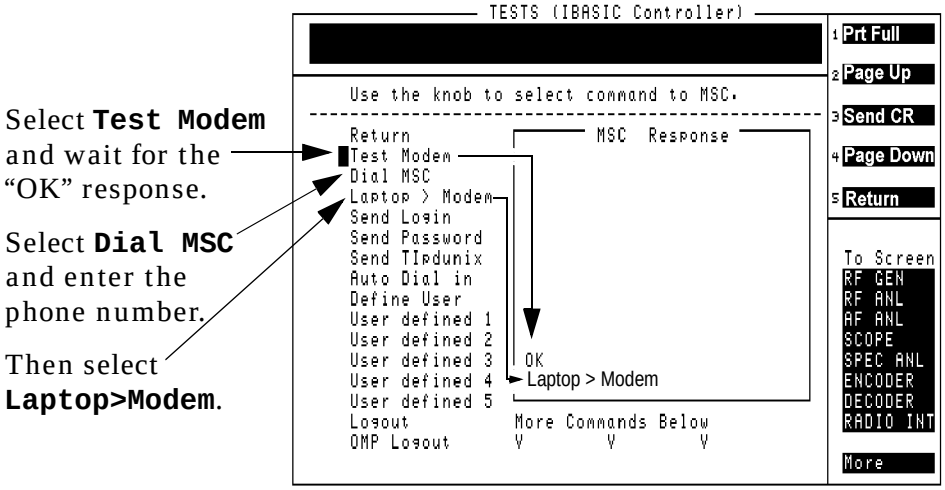
Figure 3-3 Accessing the Laptop Emulator Screen



1. Procomm is a product of DataStorm Technologies, Inc.

Step 6. Scroll down to **Test Modem** and press the knob to verify basic modem operation (see Figure 3-6 on page 54). The response "OK" should appear in the box. (Refer to "Configuring and Initializing the External Modem" on page 38 if the modem does not respond.)

Figure 3-4 Connecting to the MSC



Step 7. Select **Dial MSC** and enter the phone number for the MSC using the keypad and pressing **ENTER**. The modem then calls the switch.

Step 8. Select the **Laptop > Modem** mode. This causes characters typed on the connected PC to be passed on to the modem (and subsequently to the MSC). Likewise, communications from the MSC will be passed back to the PC.

Step 9. Login to the MSC using the PC. This typically involves:

1. Accessing the "AUTOPLEX® OMP Administrator menu".
2. Selecting "AUTOPLEX® Set 1000 ECP Access" from the list of menu items.
3. Selecting "ECP Craft Shell" from the next list of menu items.

Step 10. Once you have accessed the Craft Shell, and a command prompt is displayed indicating it is ready to receive commands, select **EXIT L>M** to exit the Laptop > Modem mode.

Step 11. Go to "Setup Site for Test" on page 57 and verify site control before proceeding to run tests.

Connect to the MSC Without a Laptop PC

If a laptop PC is not connected to your Test Set, use the Test Set's Laptop Emulator function to send the commands necessary to access the ECP. Rather than using a PC keyboard, you will use the Test Set's knob to select from lists of characters to login to the MSC and access the Craft Shell.

Once you have successfully used this method to login to the MSC, you can save the settings you used for later use to streamline the process. See "Using Automated Dial In" on page 141.

NOTE In some cases, you may need to use a PC with the modem to make the connection when negotiating through an OMP to access the Craft Shell. See "Connect to the MSC Using a Laptop PC" on page 49. For more information specific to the laptop emulator utility, see See "Laptop Emulator" on page 127.

MSC Dial-Up Procedure Without a Laptop PC

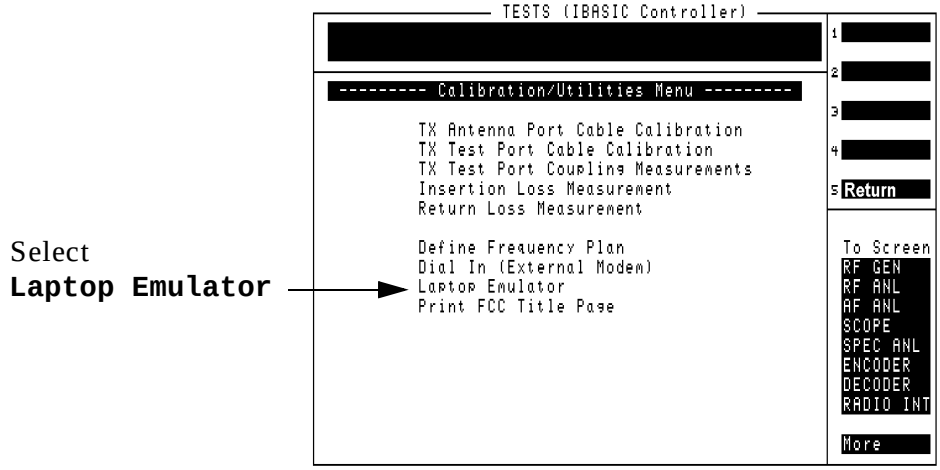
Step 1. Load and run the Software (see page 19). The Software's Main Menu is displayed (see Figure 2-3 on page 21).

Step 2. Make sure that your modem is connected to the Test Set and a phone line, and that both instruments are turned on.

Step 3. Select **Calibration/Utilities**. The Calibration/Utilities Menu is displayed. (See Figure 3-5).

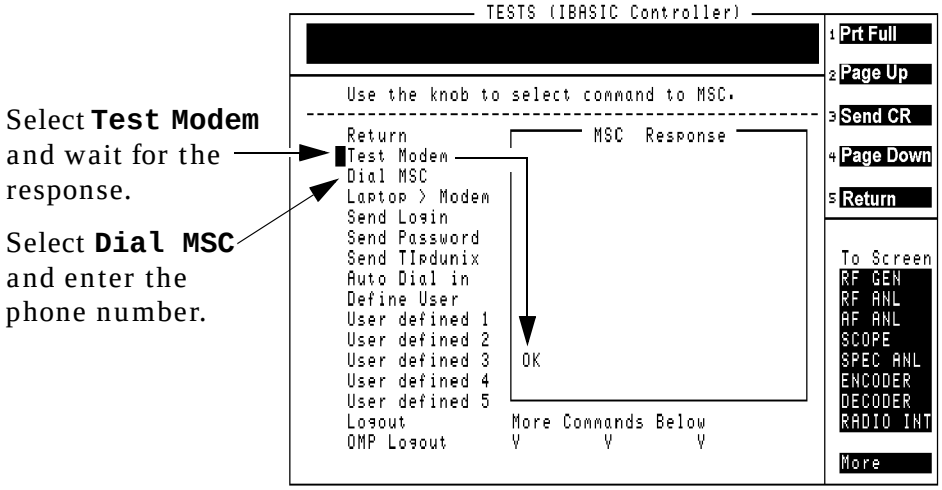
Step 4. Select **Laptop Emulator**.

Figure 3-5 Accessing the Laptop Emulator Screen



Step 5. Scroll down to **Test Modem** and press the knob to verify basic modem operation (see Figure 3-6). The response "OK" should appear in the box. (Refer to "Configuring and Initializing the External Modem" on page 38 if the modem does not respond.)

Figure 3-6 Connecting to the MSC



Step 6. Scroll down to **Dial MSC** and press the knob. When you are prompted to enter the phone number for the switch:

- If you have entered the number before, it will appear at the top of the screen and you can select **Done**.
- If you have not entered the number before, use the Test Set's keypad to enter the number and press **ENTER** to begin dialing.

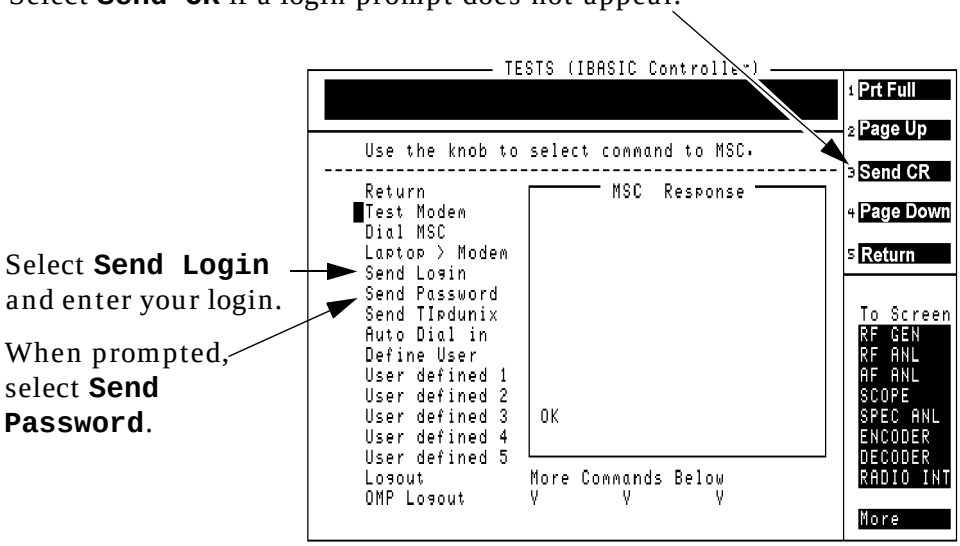
You should hear the modem activate and send the DTMF tones. You should then hear the ring at the MSC end, followed by the "connect sound." See "Laptop Emulator" on page 127 for details on dialing options.

Step 7. If a login prompt does not appear in the **MSC Response** box, select **Send CR** (k3) once or twice to get the login prompt to appear.

Step 8. When prompted by the MSC for a login, select **Send Login**.

- If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.
- If you have not entered your login before, use the knob to enter your login from the characters in the **Choices** menu, then select **Done**.

Figure 3-7 Logging in to the MSC



Step 9. When prompted by the MSC for a password, select **Send Password**.

- If you have entered your password previously, it will appear at the top of the screen and you can select **Done**
- If you have not entered your password before, use the knob to enter your password from the characters in the **Choices** menu and select **Done.**

Step 10. Wait for the prompt from the MSC (typically a “$” or “#” or a few characters of text) then select **Send TIpdunix** to enter the maintenance mode. You should receive a response of TERMINAL IN SERVICE. Figure 3-8 shows the typical appearance of the **MSC Response** box after a connection sequence.

Figure 3-8 Typical MSC Response Box Display After Connecting to the MSC

```
login: tech23
Password:

Welcome to the LUCENT Autoplex System 1000

Current ECP Generic: APX-1000 L8.0
Current IMS Generic: Release 4.1.3.D
Current 5E-DCS Generic: DCS 1 - 5E10
Current Definity DCS Generic: DCS 2 - 8.0

Current OMP Generic 8.0

Current Series I Cell Site Generic:  APXC04.12
Current Series II Cell Site Generic: APXB05.32
Current Series II/CDMA Cell Site Generic: b03Y07.10


You are logged into ECP-1

Good afternoon


Spokane, Wa.   APX-1000 APX8.0      ttyx     TTY 21
```

Step 11. Go to "Setup Site for Test" on page 57 and verify site control before proceeding to run tests.

Setup Site for Test

You can now verify that you can control the site via the MSC. This is done by accessing the Laptop Emulator and sending a command from the Test Set to the MSC and looking for a response.

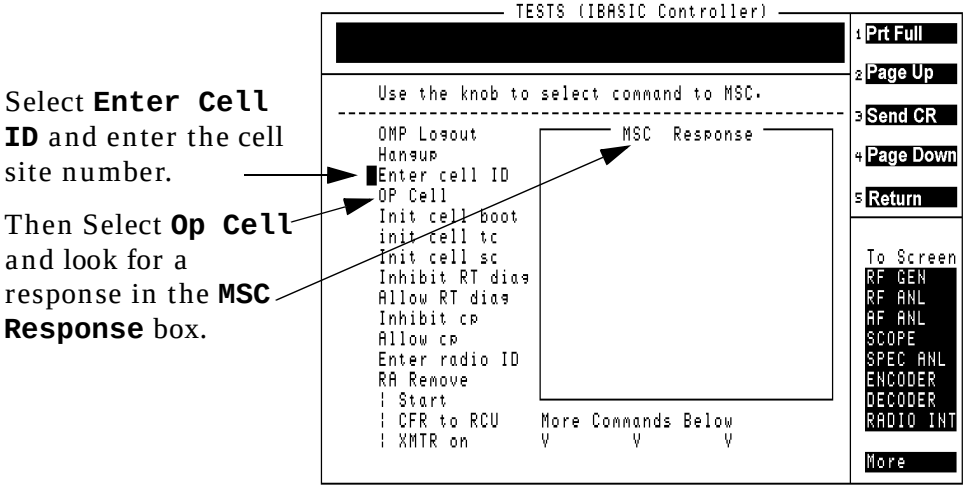
Step 1. If the Laptop Emulator screen is *not* already displayed -

1. Load and run the Software.
2. Select **Calibration/Utilities**.
3. Select **Laptop Emulator**.

Step 2. Press k4 (**Page Down**) then scroll to **Enter cell ID** and select it (see Figure 3-9). Enter the number for the cell site to be tested.

NOTE In the **Laptop Emulator** menu, using **Page Up** (k2) and **Page Down** (k4) can save time.

Figure 3-9 Verifying Site Control



Step 3. Select **OP Cell**. You should see a response to the Op Cell command in the **MSC Response** box on the display.

Step 4. The base station is now ready to receive the commands from the Test Set that are sent during testing. Exit the laptop emulator mode by selecting **Return** (k5).

Save Your Configuration Settings!

The Software comes with default settings for all parameters, pass/fail limits, and configuration settings. After configuring the software and changing these settings, the changes are held in the Test Set's memory as long as you do not run any other program on the Test Set or update the Test Set's firmware. If another program is run, or the firmware is updated, your configuration changes are erased. When you re-load and run the AMPS/TDMA Software, the Software's default settings are used.

To preserve all of your Software configuration changes, make all of the changes and then save them on a memory card as a custom procedure. See "How to Save a Test Procedure" on page 175.

If You Had Problems

If you were unable to load and run the software, make the required entries, or encountered error messages, refer to Chapter 7, “Troubleshooting,” on page 205 for help.

4 Performing AMPS/TDMA Tests

This chapter shows you how to run 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, or the **`Inhibit RT diag`** command in the Software's Laptop Emulator, to send a command to inhibit diagnostics from the switch before testing.

To send commands using the Laptop Emulator, see "Laptop Emulator" on page 127.

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 (internal PC or external) to communicate with the MSC (where applicable) and the Software will be set to send control commands.

Making Measurements

Before making AMPS/TDMA measurements, verify that you have performed the following steps in order:

Getting Ready to Test

Step 1. The Software is installed and configured.

- "Installation" on page 17.
- "Configuring the Software for Tests" on page 43.

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 158 for instructions on manual control of the site equipment.

Step 2. You have specified the required Test Set and Base Station configuration information.

- "Enter Test Set Configuration Information" on page 45.
- "Enter the Base Station Configuration Information" on page 47.

Step 3. 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 171 and “Specifications (Pass/Fail Limits) List and Descriptions” on page 154.

Step 4. To run the Full Site Test (FCC), you have entered a valid frequency plan. See "Frequency Plans" on page 116.

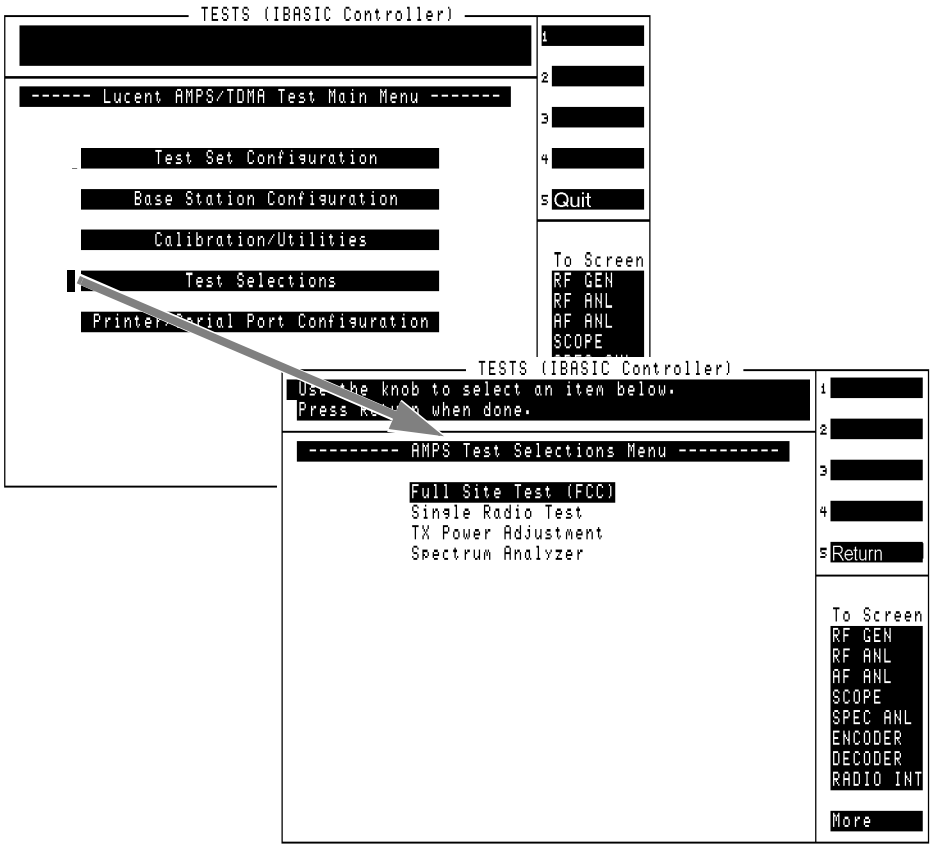
Step 5. You have inhibited cell site diagnostics using your PC or by using the Software’s Laptop Emulator to send the **`Inhibit RT diag`** command.

Start Testing

You are now ready to select and run AMPS/TDMA 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/Delete Procedures” on page 174.

Selecting Tests

Tests are selected by loading and running the software to display the Lucent AMPS/TDMA Test Main Menu (explained on page 19) and choosing **`Test Selections`**.

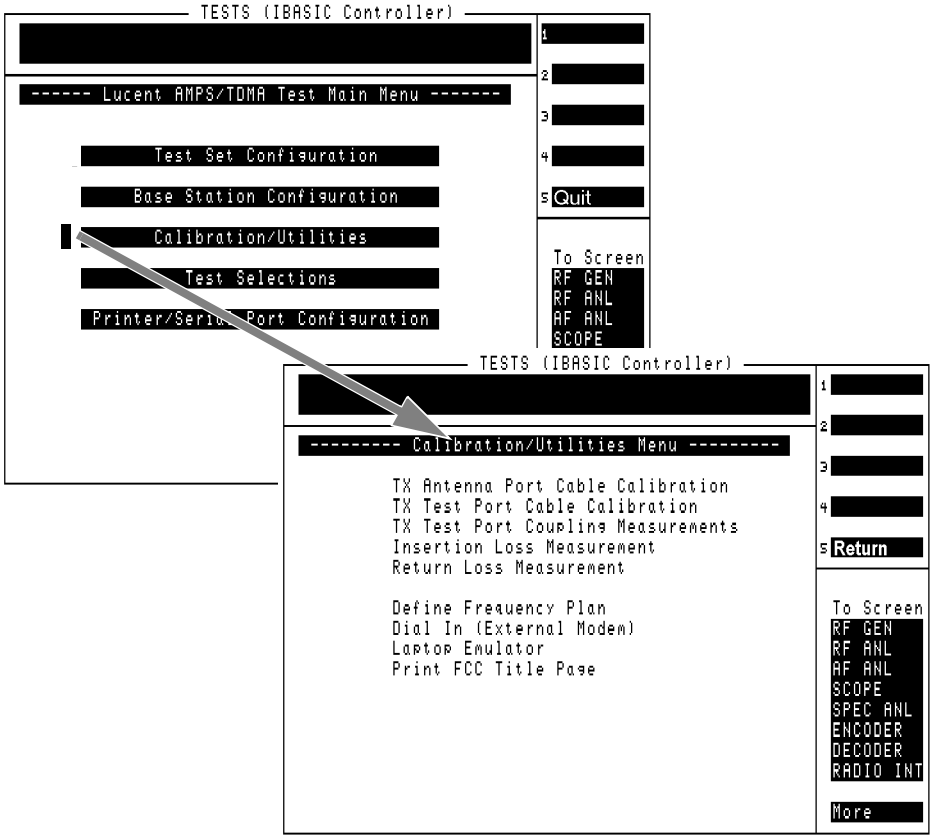


The tests are described on the following pages:

- “Full Site Test (FCC)” on page 65.
- "Single Radio Test" on page 70.
- "TX Power Adjustment" on page 78.
- "Spectrum Analyzer" on page 82.

Selecting Utilities

Calibration and support utilities, such as the Insertion Loss, Return Loss, and RX and TX Cable Loss measurements and Laptop Emulator, are selected by loading and running the software to display the Lucent AMPS/TDMA Test Main Menu (explained on page 19) and choosing **`Calibration/Utilities`**.



The calibration utilities are described on the following pages:

- “TX Antenna Port Cable Calibration” on page 86.
- "TX Test Port Cable Calibration" on page 90.
- "TX Test Port Coupling Measurements" on page 94.
- "Insertion Loss Measurement" on page 98.
- "Return Loss Measurement" on page 101.

The support utilities are described on the following pages:

- "Frequency Plans" on page 116.
- "Using Automated Dial In" on page 141.
- "Laptop Emulator" on page 127.
- "Printing the FCC Title Page" on page 159.

For More Information

For more details on the tests in this chapter:

- “Parameters List and Descriptions” on page 147.
- “Specifications (Pass/Fail Limits) List and Descriptions” on page 154.
- “Laptop Emulator” on page 127.

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

“Troubleshooting” on page 205.

Full Site Test (FCC)

This test measures several aspects of radio performance on one or more radios. Measurements can be made at the TX Test port, eliminating the need to take an entire antenna face down during testing, or at a TX Antenna port.

A TDMA cellular adapter must be connected to the Test Set to test TDMA radios.

NOTE Before the test can run, you need to create a frequency plan containing information about each radio you want to test. See "Frequency Plans" on page 116. Since the Software uses the frequency plan to automatically control all of the radios under test through the MSC, *you cannot perform this test using manual control of the base station*. If you must test a radio using manual control, use the "Single Radio Test" on page 70.

Measurements

AMPS & AMPS Setup Measurements

The measurements made on each radio depend on its type: AMPS or AMPS Setup. The radio type is specified in the frequency plan.

The following measurements are made on all radios:

- TX Frequency Error
- TX Power (at a specific power amplifier step)
- TX Peak (+) Data Deviation
- TX Peak (–) Data Deviation

The following additional measurements are only made on an AMPS radio (not AMPS Setup):

- TX RMS Residual FM
- TX Average Peak Deviation @ –16 dBm
- TX Distortion @ –16 dBm
- TX Peak (+) Deviation @ 0 dBm
- TX Peak (–) Deviation @ 0 dBm
- TX SAT Average Peak Deviation @ 5970 Hz, 6000 Hz, 6030 Hz
- TX SAT Frequency Error @ 5970 Hz, 6000 Hz, 6030 Hz

TDMA Measurements

The following measurements are made on TDMA radios:

- TX Power (at the specified VRAL setting)
- Frequency Error
- Origin Offset
- Error Vector Magnitude
- Lower Adjacent Channel Power
- Upper Adjacent Channel Power
- Lower First Alternate Channel Power
- Upper First Alternate Channel Power
- Lower Second Alternate Channel Power
- Upper Second Alternate Channel Power

Specifications and Parameters Used

Virtually all specifications and parameters are used in this test.

Some parameters are used for serial communications between the Test Set, Modem, PC, and MSC. Refer to "AMPS/TDMA Tests Software Reference" on page 105 for descriptions of all specifications and parameters.

Specifications (Pass/Fail Limits):

This test uses all specifications described in "Specifications (Pass/Fail Limits) List and Descriptions" on page 154.

Parameters:

- 1. Adjust TX Power [0=no 1=on fail 2=always]
- 2. GN Power Output [0=measured 1=specified]
- 3. GN Stop Test if results fail [0=no 1=yes]
- Since this test can ONLY be performed under MSC control, parameters 4 through 13 are used for communications between the MSC, laptop PC, and Test Set.
- 14. MSC Cell Site Number [222 Max] (This parameter can also be entered in the test menu at the start of this test.)
- 15. MSC ECP Number (This parameter can also be entered in the test menu at the start of this test.)
- 16. TDMA DCCH Equipped [0=No 1=yes]
- 17. TDMA Number of Averages for Readings
- 18. TX Antenna Port Cable Loss - when measuring at the antenna's foam jumper out of the Antenna Interface Frame.
- When measuring at the TX Test port in the Antenna Interface Frame, the TX Coupling factor for the associated antenna must be entered. This is done in parameters 19 through 25.
- 26. TX Output Power
- 27. TX Test Port Cable Loss - when measuring at the TX Test port in the Antenna Interface Frame.
- 28. ZZZZ Test Demo Mode [0=normal 1=demo]
- 30. GN MSC Command Speed [0=slow 1=fast][1]
- 32. MSC Require CP INH at Ant Port [1=Yes]

1. Set this parameter to **1** when using the BTS Laptop Utility; otherwise set it to **0**.

Select and Run the Test

Use these steps to select and run the Full Site Test (FCC):

Step 1. Create a frequency plan for the radios you want to test. See "Frequency Plans" on page 116.

Step 2. From the Main Menu, scroll to **`Test Selections`** and press the knob.

Step 3. Scroll to **`Full Site Test (FCC)`** and press the knob.

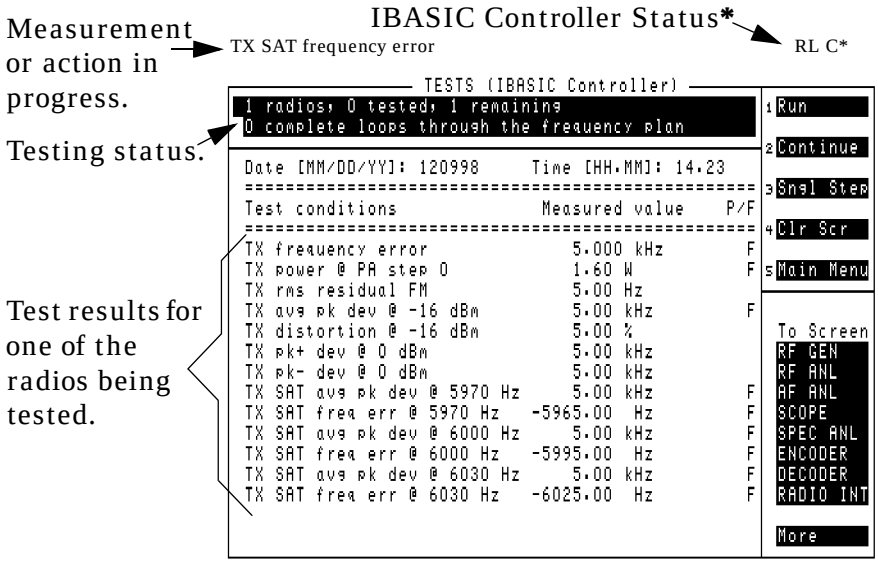
Step 4. Connect the Test Set's ANT IN port to the TX test port in the Antenna Interface Frame as shown on the Test Set's display.

Step 5. Select **k1** [**`Proceed`**].

Review the Results

The Software contacts the MSC to setup the radios as they are tested. Results for each radio are displayed as it is tested. Prompts are provided at the top of the display to indicate the measurement or action currently being performed. See Figure 4-1.

Figure 4-1 Full Site Test Results for One AMPS Radio



***The IBASIC status indicators reflect the current state of the Test Set's internal controller. An "**L**" means it is listening for a program command. A "**T**" means it is talking to the Test Set or other connected HP-IB (Hewlett-Packard Interface Bus: IEEE 488.2) device. A "**C**" means it is configured as the HP-IB controller to control external HP-IB devices. An asterisk (*****) means the Software is running. A hyphen (**-**) means the Software is paused. An "**R**" means the Test Set is being controlled remotely (in this case, by a program working through the internal HP-IB).

Single Radio Test

This test measures several aspects of a single radio. When the test is run, a setup screen is displayed to specify information about the radio you want to test.

The measurements made on each radio depends on its type: AMPS, AMPS Setup, or TDMA. The radio type is specified on the setup screen at the start of the test.

NOTE A TDMA cellular adapter must be connected to the Test Set to test TDMA radios.

In order to make measurements on a TDMA radio with a Digital Control Channel (DCCH), you must also set the value of parameter 16 to **1** before testing. See 16. TDMA DCCH Equipped [0=No 1=yes] on page 151.

This test can be performed with the base station 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 24 and "Enter the Base Station Configuration Information" on page 47.

Measurements

AMPS Radios

The following measurements can be made on AMPS radios.

NOTE The **TX Frequency Error** and **TX Power** measurements are always made.

To make any of the other measurements, you must have the **Send Commands to MSC** field set to **YES** at the start of the test. The Software must send configuration commands to the MSC to set up the radios using the necessary test conditions for those tests.

- TX Frequency Error
- TX Power (at a specific power amplifier step)
- TX RMS Residual FM
- TX Average Peak Deviation @ –16 dBm
- TX Distortion @ –16 dBm
- TX Peak (+) Deviation @ 0 dBm
- TX Peak (–) Deviation @ 0 dBm
- TX SAT Average Peak Deviation @ 5970 Hz
- TX SAT Frequency Error @ 5970 Hz
- TX SAT Average Peak Deviation @ 6000 Hz
- TX SAT Frequency Error @ 6000 Hz
- TX SAT Average Peak Deviation @ 6030 Hz
- TX SAT Frequency Error @ 6030 Hz
- TX Peak (+) Data Deviation
- TX Peak (-) Data Deviation

AMPS Setup Radios

The following measurements are made on all AMPS Setup radios. These are the only measurements made on AMPS Setup radios if the **Configuration Status** field is set to **Active**.

- SU TX Frequency Error
- SU TX Power (at a specific power amplifier step)
- SU Peak Data Deviation

TDMA Radios

The following measurements are made on TDMA radios:

- TX Power (at the specified VRAL setting)
- Frequency Error
- Origin Offset
- Error Vector Magnitude
- Lower Adjacent Channel Power
- Upper Adjacent Channel Power
- Lower First Alternate Channel Power
- Upper First Alternate Channel Power
- Lower Second Alternate Channel Power
- Upper Second Alternate Channel Power

Specifications and Parameters Used

The following specifications and parameters are *specific to running this test*.

Refer to "AMPS/TDMA Tests Software Reference" on page 105 for descriptions of all specifications and parameters.

Specifications (Pass/Fail Limits):

This test uses all specifications described in "Specifications (Pass/Fail Limits) List and Descriptions" on page 154.

Parameters:

- 1. Adjust TX Power [0=no 1=on fail 2=always]
- 2. GN Power Output [0=measured 1=specified]
- 3. GN Stop Test if results fail [0=no 1=yes]
- If the **Send Commands to MSC** field is set to **YES** at the start of testing, parameters 4 through 13 are used for communications between the MSC, laptop PC, and Test Set.
- 14. MSC Cell Site Number [222 Max] (This parameter can also be entered in the test menu at the start of this test.)
- 15. MSC ECP Number (This parameter can also be entered in the test menu at the start of this test.)
- 16. TDMA DCCH Equipped [0=No 1=yes]
- 17. TDMA Number of Averages for Readings
- 18. TX Antenna Port Cable Loss - when measuring at the antenna's foam jumper out of the Antenna Interface Frame.
- When measuring at the TX Test port in the Antenna Interface Frame, the TX Coupling factor for the associated antenna must be entered. This is done in parameters 19 through 25.
- 26. TX Output Power (This parameter can also be entered in the test menu at the start of this test.)
- 27. TX Test Port Cable Loss - when measuring at the TX Test port in the Antenna Interface Frame.
- 28. ZZZZ Test Demo Mode [0=normal 1=demo]
- 30. GN MSC Command Speed [0=slow 1=fast][1]
- 32. MSC Require CP INH at Ant Port [1=Yes]

1. Set this parameter to **1** when using the BTS Laptop Utility; otherwise set it to **0**.

Select and Run the Test

Use these steps to select and run the Single Radio Test (FCC):

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

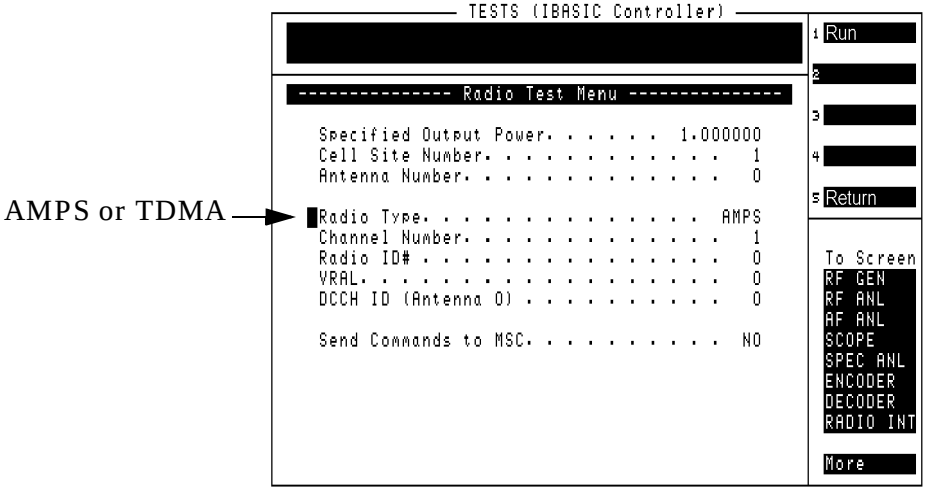
Step 2. Scroll to **`Single Radio Test`** and press the knob.

Step 3. Enter information about your radio in the Radio Test Menu. The information you enter is dependent on the Radio Type you select.

For All Radio Types

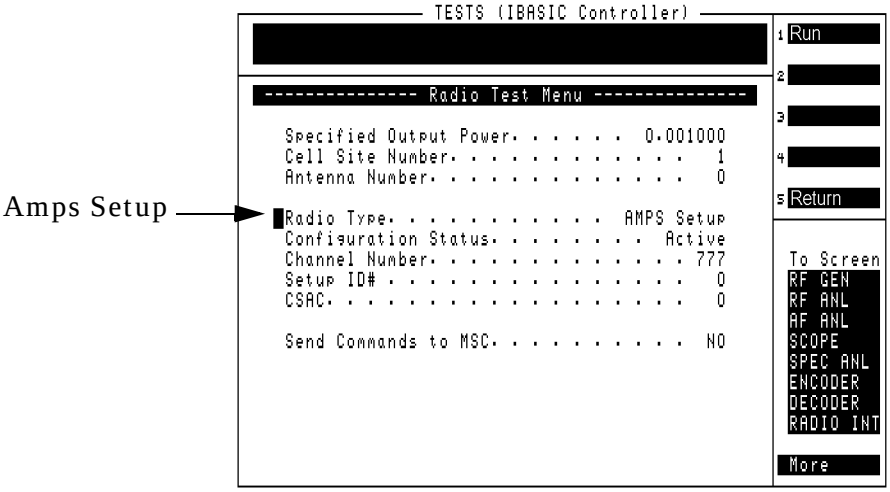
- Enter the **`Specified Output Power`** (in Watts) for the radio you are testing. This is the level that should be present at the output of the Antenna Interface Frame (that would normally connect to the transmit antenna feed line).
- Enter the **`Cell Site Number`** for the site you are testing at.
- Enter the **`Antenna Number`** for the antenna connected to the radio you are testing.
- Select the **`Radio Type`**: AMPS, AMPS Setup, TDMA Voice, TDMA with DCCH.

For AMPS or TDMA Radios



- Enter the **Channel Number** for the radio under test.
- Enter the **Radio ID#** (number) for the radio under test.
- Enter the VRAL (Voice RAdio Level) for the radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For AMPS Setup Radios



- Set the **Configuration Status** to **Active** to test a radio while it is in service, or select **Configured** to take the radio out of service for testing.
- Enter the **Channel Number** for the setup radio under test.
- Enter the **Setup ID#** (number) for the setup radio under test.
- Enter the **CSAC** (Control Setup Attenuation Code) for the setup radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For All Radio Types

Step 4. Select K1 [**Run**] to begin the test.

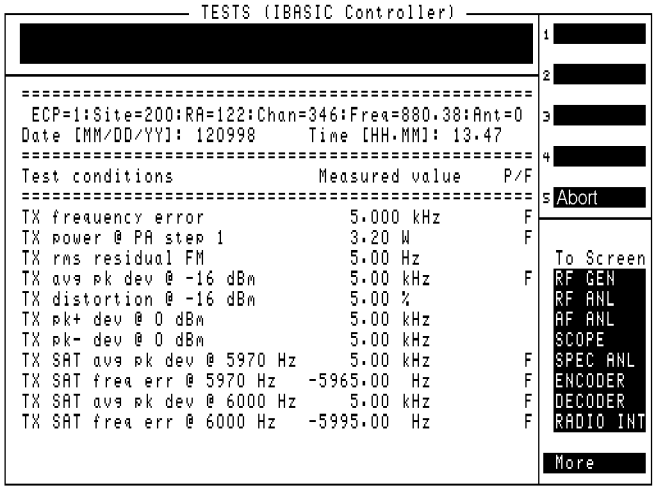
Step 5. Follow the displayed instructions and setup diagram as prompted to complete the testing.

Review the Results

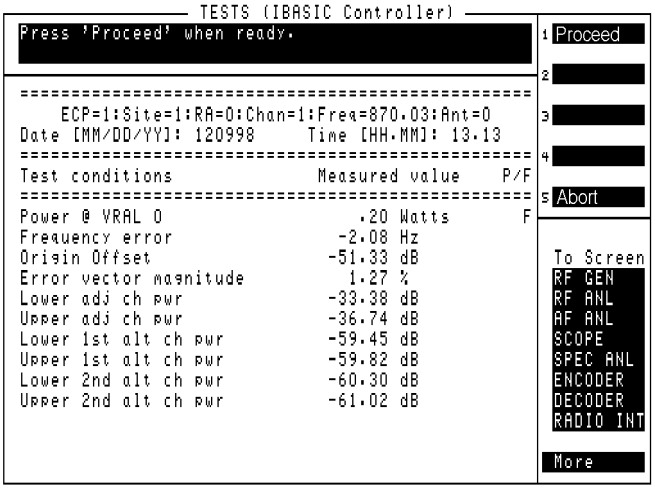
The Software displays test results for the radio as it tests. Prompts are provided at the top of the display to indicate the measurement or action currently being performed.

Figure 4-2 Example Single Radio Test Results

AMPS Radio



TDMA Radio



TX Power Adjustment

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

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 choose between measurement units of dBm or Watts.

This test can be performed with the base station 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 24 and "Enter the Base Station Configuration Information" on page 47.

Specifications and Parameters Used

The following specifications and parameters are *specific to running this test*.

Many other parameters are used during this test (and all other tests) for serial communications between the Test Set, Modem, PC, and MSC. Refer to "AMPS/TDMA Tests Software Reference" on page 105 for descriptions of all specifications and parameters.

Specifications (Pass/Fail Limits):

- 9. `Output Power Adjustment Error`. The upper and lower limits are indicated by the longer tick marks on the power meter display (see Figure 4-3 on page 81).

Parameters:

- 18. `TX Antenna Port Cable Loss` - when measuring at the antenna's foam jumper out of the Antenna Interface Frame.
- 27. `TX Test Port Cable Loss` - when measuring at the TX Test port in the Antenna Interface Frame.
- When measuring at the TX Test port in the Antenna Interface Frame, the TX Coupling factor for the associated antenna must be entered. This is done in parameters 19 through 25.

Select and Run the Test

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

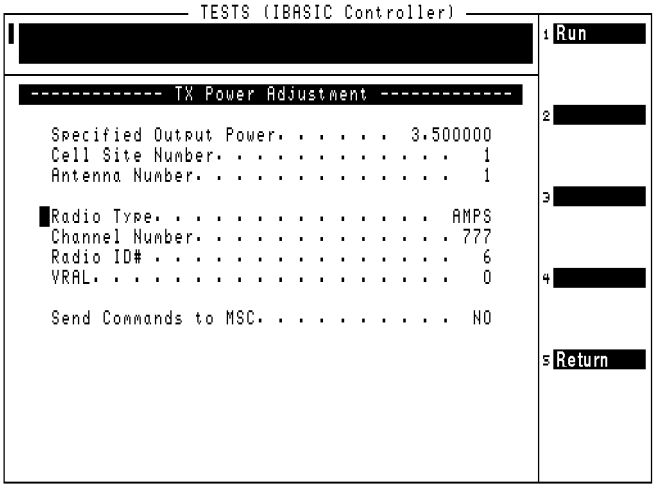
Step 1. From the Main Menu, scroll to **Test Selections** and press the knob.

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

Step 3. Enter information about your radio in the TX Power Adjustment menu.

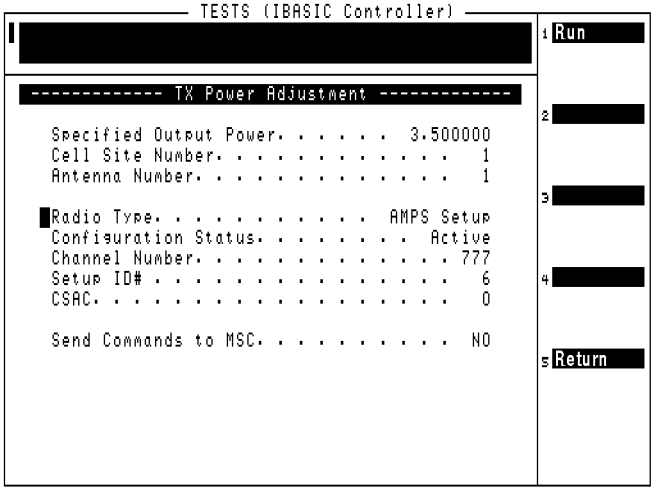
- Enter the **Specified Output Power** for the radio you are testing. This is the level that should be present at the output of the Antenna Interface Frame (that would normally connect to the transmit antenna feed line).
- Enter the **Cell Site Number** for the site you are testing at.
- Enter the **Antenna Number** for the antenna connected to the radio you are testing.
- Select the **Radio Type**: AMPS, AMPS Setup, TDMA Voice, or TDMA with DCCH.

For AMPS or TDMA Radios



- Enter the **Channel Number** for the radio under test.
- Enter the **Radio ID#** (number) for the radio under test.
- Enter the VRAL (Voice RAdio Level) for the radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For AMPS Setup Radios



- Set the **Configuration Status** to **Active** to test a radio while it is in service, or select **Configured** to take the radio out of service for testing.
- Enter the **Channel Number** for the setup radio under test.
- Enter the **Setup ID#** (number) for the setup radio under test.
- Enter the **CSAC** (Control Setup Attenuation Code) for the setup radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For All Radios

Step 4. Select k1 [**Run**] to begin the test.

Step 5. Follow the displayed instructions and setup diagram as prompted to complete the testing.

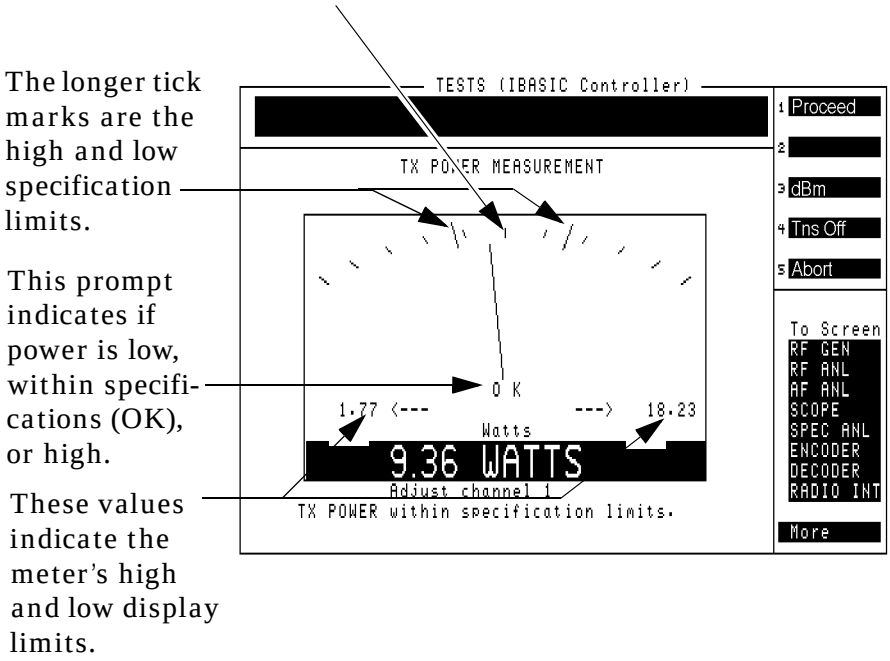
Review the Results

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 **k3** (**dBm**). 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 **k4** (**Tns off, Tns quiet, Tns loud**).

   Figure 4-3 Power Meter Display

   The center tick mark on the meter display is the Specified Output Power level you entered at the start of the test.



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 signal or look for sources of interference.

This test can be performed in-service or out-of-service. See "Which Base Station Port to Use - TX Test or TX Antenna?" on page 24.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

- None used for this test

Parameters:

- 18. `TX Antenna Port Cable Loss` - when measuring at the antenna's foam jumper out of the Antenna Interface Frame.
- 27. `TX Test Port Cable Loss` - when measuring at the TX Test port in the Antenna Interface Frame.
- When measuring at the TX Test port in the Antenna Interface Frame, the TX Coupling factor for the associated antenna must be entered. This is done in parameters 19 through 25.

Select and Run the Test

Use these steps to select and run the Spectrum Analyzer test:

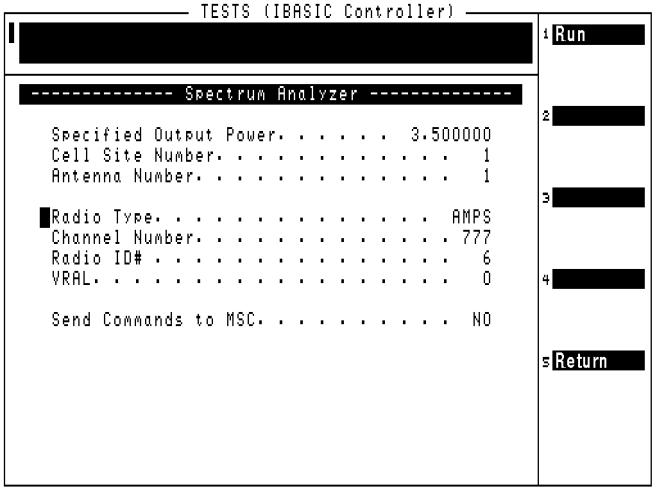
Step 1. From the Main Menu, scroll to **`Test Selections`** and press the knob.

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

Step 3. Enter information about your radio in the Spectrum Analyzer menu.

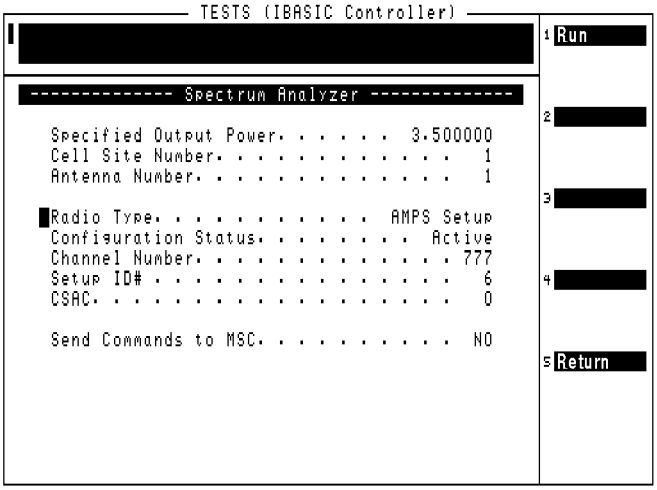
- Enter the **`Specified Output Power`** for the radio you are testing. This is the level that should be present at the output of the Antenna Interface Frame (that would normally connect to the transmit antenna feed line).
- Enter the **`Cell Site Number`** for the site you are testing at.
- Enter the **`Antenna Number`** for the antenna connected to the radio you are testing.
- Select the **`Radio Type`**: AMPS, AMPS Setup, TDMA Voice, or TDMA with DCCH.

For AMPS or TDMA Radios



- Enter the **Channel Number** for the radio under test.
- Enter the **Radio ID#** (number) for the radio under test.
- Enter the VRAL (Voice RAdio Level) for the radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For AMPS Setup Radios



- Set the **Configuration Status** to **Active** to test a radio while it is in service, or select **Configured** to take the radio out of service for testing.
- Enter the **Channel Number** for the setup radio under test.
- Enter the **Setup ID#** (number) for the setup radio under test.
- Enter the **CSAC** (Control Setup Attenuation Code) for the setup radio under test.
- Set the **Send Commands to MSC** field to **YES** for automated testing using a modem, or **NO** to control the base station using another method.

For All Radios

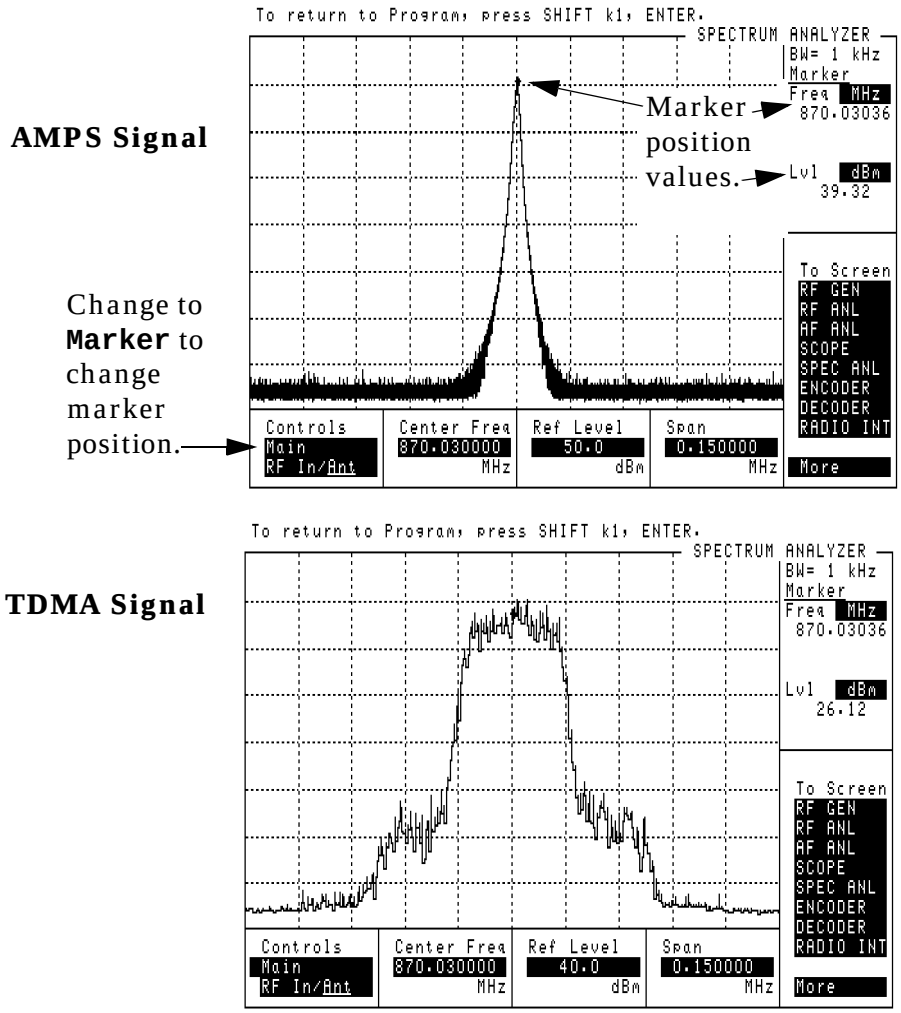
Step 4. Select K1 [**Run**] to begin the test.

Step 5. Follow the displayed instructions and setup diagram as prompted to view the signal on the spectrum analyzer.

Review the Results

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

Figure 4-4 The Spectrum Analyzer Display



2. Use the **Ref Level** and **Span** fields to give you the best view of the transmitted signal.

   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.

NOTE Do not make changes to the **Center Freq** field.

If you would like to view another channel/frequency, press **SHIFT**, **k1**, **ENTER**, and change the **Channel Number**, then press **k1**(**Run**) to re-run the test.

3. When you are finished using the spectrum analyzer, press **SHIFT**, **k1**, then **ENTER**. The Software will return to the Spectrum Analyzer menu. Press **k5**(**Return**) to access other menus and tests.

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 on the antenna interface frame. This loss must be known when making power measurements at this port. Once this value is measured, you should label the cable indicating the loss through it for future use.

See "Which Test Set Port to Use" on page 23 for more information on using this port.

After measuring the cable loss, the Software displays the loss value and the frequency used for the test. You are then asked if you want to store the value.

- If you select **Yes**, the Software automatically enters the value in the Base Station Configuration Menu. The value is then used in any tests where this cable is indicated on the setup diagrams at the start of testing. Unless you believe that the indicated loss is incorrect, you should select **Yes**.

NOTE If you load a different software package into the Test Set after making this measurement, or update the Test Set's firmware, the parameter value is reset to the factory default the next time you load the Software from the factory memory card.

To preserve the measured calibration value after testing, save your test setup as a new procedure on the SRAM card supplied with the Software (see "How to Save/Delete Procedures" on page 174). You can then use that procedure, which includes the measured parameter value, when reloading the Software into the Test Set in the future.

- If you select **No**, you are asked if you want to **Remeasure** the loss or **Return** to the Calibration/Utilities Menu.

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; you must provide them.

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

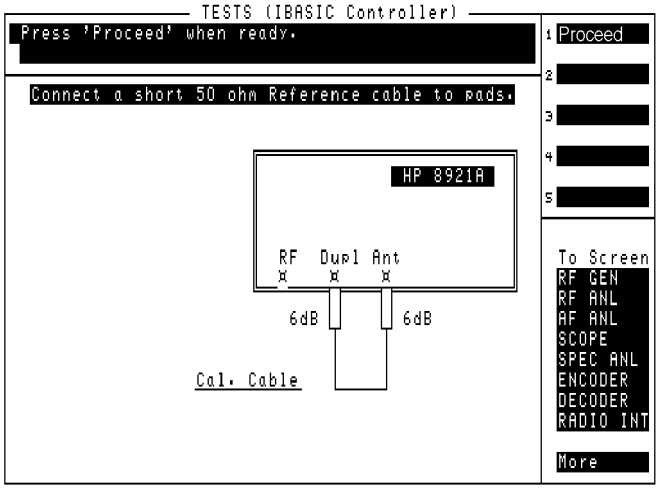
Select and Run the Utility

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

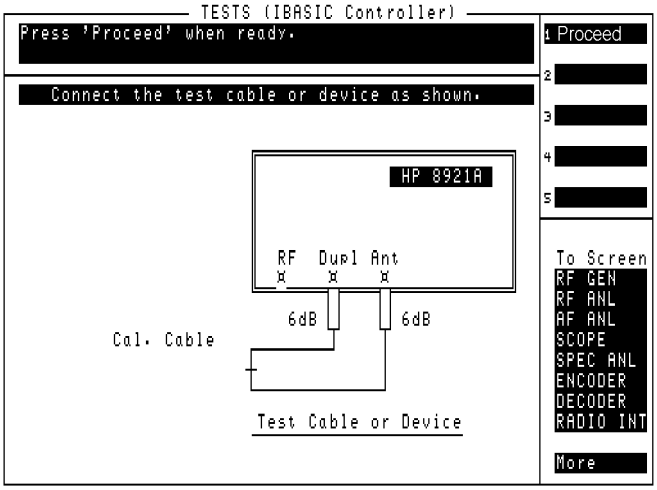
Step 1. From the Main Menu, scroll the cursor to **`Calibration/Utilities`** and press the knob.

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.



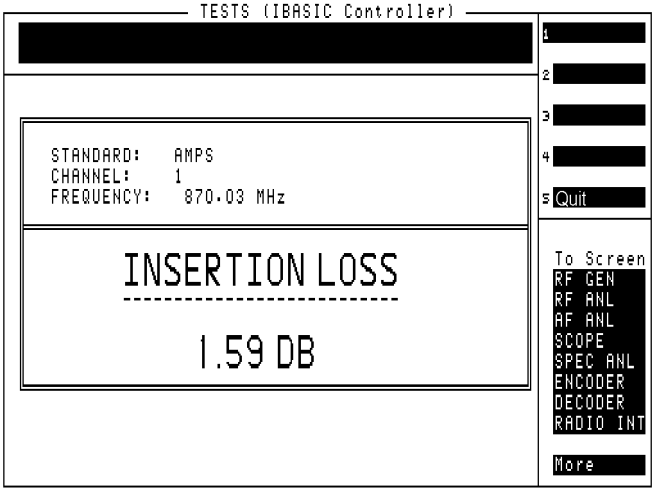
Step 4. Follow the displayed instructions to connect the test cable in series with the calibration cable and pads. Select **`Proceed`** (k1) to continue making the measurement.



Review the Results

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

Figure 4-5 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. Turn and press the knob to select **Yes** or **No**.

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 transmitter output through a directional coupler in the Antenna Interface Frame. This loss must be known when making power measurements at this port. Once this value is measured, you should label the cable indicating the loss through it for future use.

See "Which Test Set Port to Use" on page 23 for more information on using this port.

After measuring the cable loss, the Software displays the loss value and the frequency used for the test. You are then asked if you want to store the value.

- If you select **Yes**, the Software automatically enters the value in the Base Station Configuration Menu. Unless you believe that the indicated loss is incorrect, you should select **Yes**.

NOTE If you load a different software package into the Test Set after making this measurement, or update the Test Set's firmware, the parameter value is reset to the factory default the next time you load the Software from the factory memory card.

To preserve the measured calibration value after testing, save your test setup as a new procedure on the SRAM card supplied with the Software (see "How to Save/Delete Procedures" on page 174). You can then use that procedure, which includes the measured parameter value, when reloading the Software into the Test Set in the future.

- If you select **No**, you are asked if you want to **Remeasure** the loss or **Return** to the Calibration/Utilities Menu.

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.

This test sends no control commands to the MSC.

Specifications and Parameters Used

Specifications (Pass/Fail Limits):

None used for this test.

Parameters:

- 27. TX Test Port Cable Loss

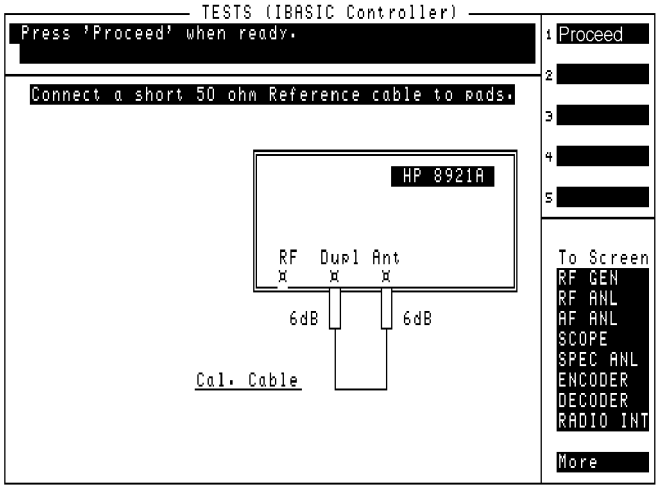
Select and Run the Utility

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

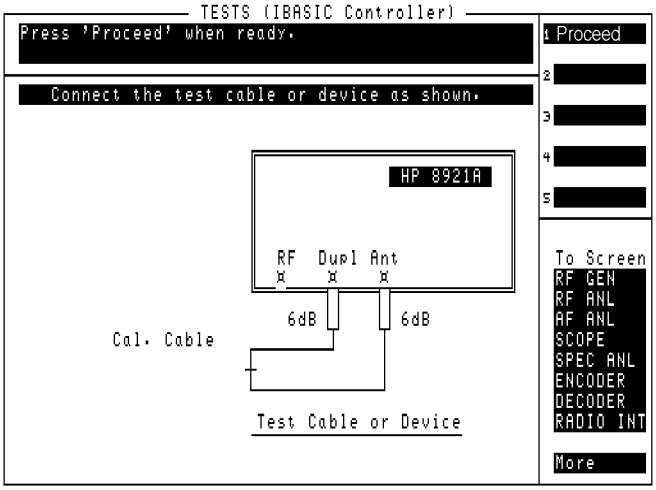
Step 1. From the Main Menu, scroll to **Calibration/Utilities** and press the knob.

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.



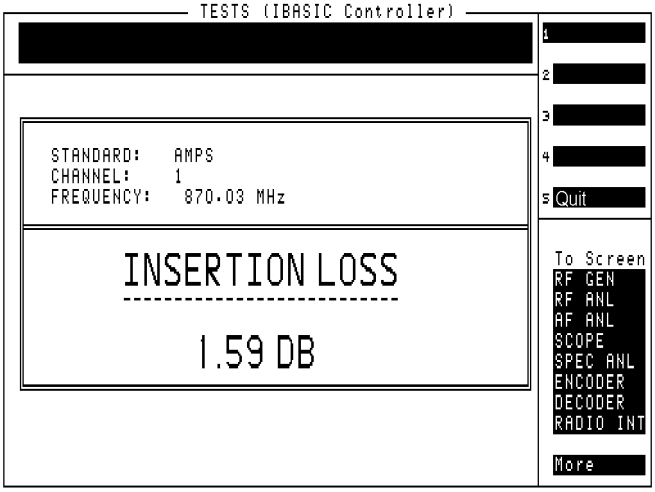
Step 4. Follow the displayed instructions to connect the test cable in series with the calibration cable and pads. Select **Proceed** (k1) to continue making the measurement.



Review the Results

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

Figure 4-6 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. Turn and press the knob to select **Yes** or **No**.

TX Test Port Coupling Measurements

The TX Test Port Coupling Measurements utility measures the loss associated with testing from a TX Test port. This gives the Test Set a coupling factor to use when making measurements at that port. Repeat this measurement for each test port you will use at the cell site.

See "Which Test Set Port to Use" on page 23 for more information on using this port.

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

- **Full** calibration first measures the level of a transmitting radio 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. 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.

- **Partial** calibration uses a Reference Power Level (that you specify) to determine the coupling factor. This is the level out of the Antenna Interface Frame that feeds the foam jumper to the transmit antenna. If the correct 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 Reference Power Level you enter 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
- 27. TX Test Port Cable Loss

Select and Run the Test

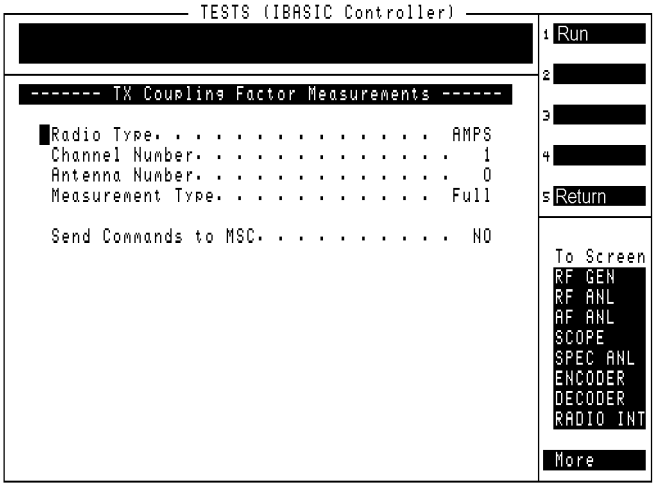
Use these steps to select and run the TX Test Port Calibration utility:

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 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 Coupling Measurements`** and press the knob.

Step 3. Enter the needed testing information in the TX Coupling Factor Measurements menu.



- Select the **`Radio Type`**: AMPS, AMPS Setup, TDMA Voice, or TDMA with DCCH.
- Enter the **`Channel Number`** of one of the radios you will be testing at this port.
- Enter the **`Antenna Number`** for the TX test port.
- Select the **`Measure Type`**: Full or Partial. (See page 94.)

  If **`Partial`** is selected, enter the level that should be present at the TX antenna port in the **`Reference Power Level`** field.

- Set the **Send Commands to MSC** field to YES or NO.
  - If YES is selected, you also need to enter the **Radio ID** number and the **VRAL** for the radio.

    The Software will automatically take the radio out of service before testing, bring up the radio to transmit during the measurement, shut down the radio after testing (to re-connect cables), and then put the radio back into service at the end of testing.
  - If No is selected, you will be prompted to take the radio(s) for the selected antenna out of service and turn them on and off as needed during the tests.

Step 4. Press k1 (**Run**).

Step 5. Connect the Test Set to the base station as indicated and perform any other operations as prompted. 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.

• Partial 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 entered into the Base Station Configuration Menu for the antenna you specified at the start of the test. To see this value, press k5(**Return**) twice to return to the Main Menu, then select **Base Station Configuration**. You should write the coupling factor next to the TX Test port for future reference.

   Select **Return** (k5) 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. These parts are not standard equipment with the Test Set.

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.

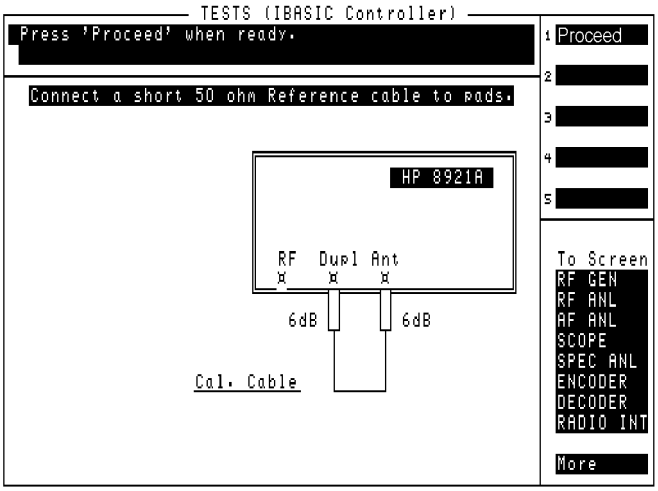
Step 2. Scroll to **Insertion Loss Measurement** and press the knob.

Step 3. Select the **Loss Measurement Type**:

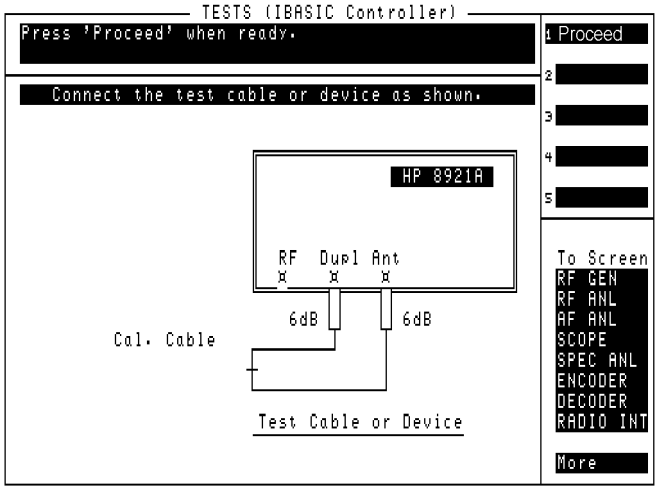
- **Swept** measures the loss over the frequency range you specify in the **Start Frequency** and **Stop Frequency** settings.
  - ❑ The **Maximum Expected Loss** for the device you are testing is used to adjust the scale on the results plot. Use a value slightly greater than expected for the best display 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 4. Press **k1** (**Run**).

Step 5. Follow the displayed instructions to connect the 6 dB pads and calibration cable. Select **k1**(**Proceed**) to continue.



Step 6. Follow the displayed instructions to connect the test cable, or other RF device, in series with the calibration cable and pads. Select **k1** (**Proceed**) to continue making the measurement.



Review the Results

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

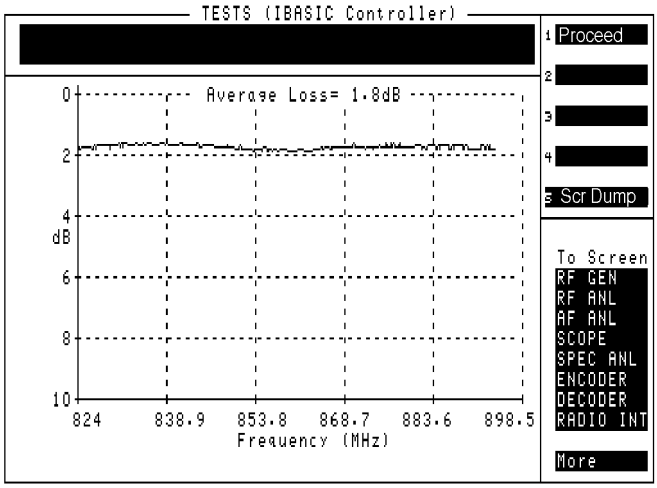
   When making a swept measurement, the loss is displayed on the screen (in units of dB) and as a plot of loss versus frequency. (See Figure 4-7.)

   - Selecting k5 **Scr Dump** causes the Test Set to pause automated operation to print a copy of the plot. Press the **SHIFT** key, then the **TESTS**(PRINT) key to send the plot to a printer (or PC running the BTS Laptop Utility) connected to serial port 9 on the Test Set. After the plot has printed, select k2 (**Continue**).

     Printer selection and settings are accessed by selecting **Printer/Serial Port Configuration** on the Software's Main Menu.

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

Figure 4-7 Swept 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. 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 SWR bridge, and then the return loss is measured with the cable or antenna-under-test connected. 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.

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.

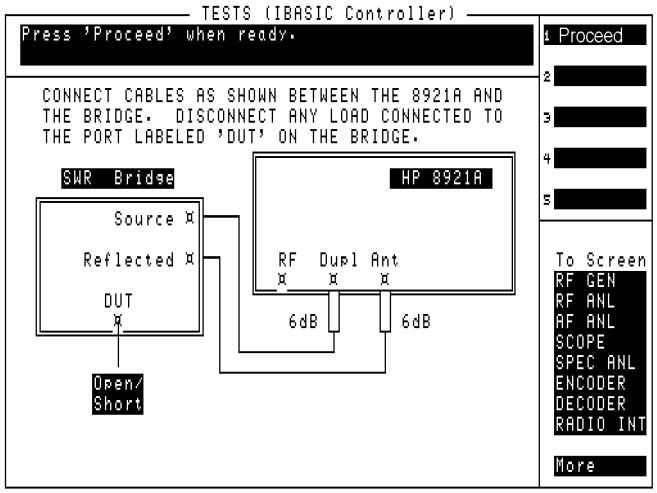
Step 2. Scroll to **Return Loss Measurement** and press the knob.

Step 3. Select the **Loss Measurement Type**:

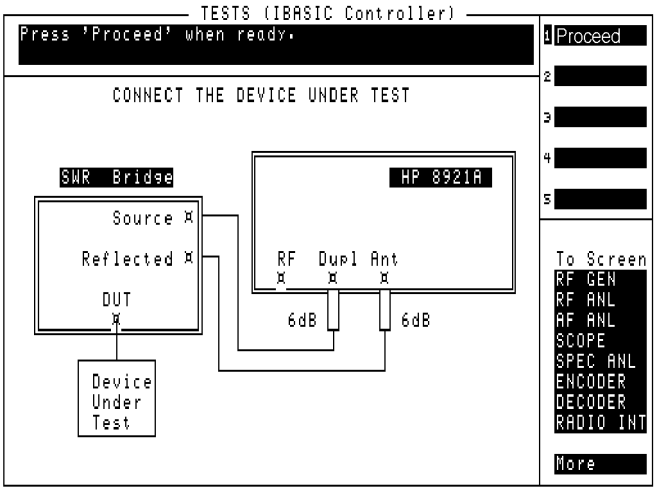
- **Swept** measures the loss over the frequency range you specify in the **Start Frequency** and **Stop Frequency** settings.
  - ❑ The **Maximum Expected Loss** for the device you are testing is used to adjust the scale on the results plot. Use a value slightly greater than expected for the best display 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 4. Select k1 (**Run**) to start the test.

Step 5. At the start of the test sequence, you see a connection diagram. You are prompted to make connections between the Test Set's DUPLEX OUT and ANT IN ports and the SWR bridge. Select k1 (**Proceed**) when the connections have been made.



Step 6. 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.

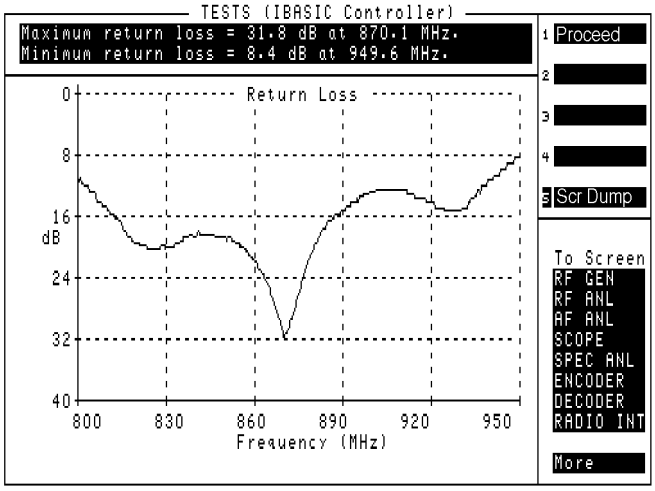
  When making a swept measurement, the loss is displayed on the screen (in units of dB) and as a plot of loss versus frequency. (See Figure 4-8.)

  - Selecting k5 (**Scr Dump**) 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 k2 (**Continue**).

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

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

Figure 4-8 Return Loss Test Results Example (For a Mobile Radio Antenna)



5 AMPS/TDMA Tests Software Reference

This chapter describes detailed operation of the Software that was not covered in "Performing AMPS/TDMA Tests " in chapter 4. 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 AMPS/TDMA tests.

Overview

Reference Information Topics

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

Connections

Refer to the following sections for details on making connections:

- "Cellular Adapter Connections and Calibration" on page 108.
- For Test Set to base station connections, see "Test Set to Series II Connections" on page 26.
- "External Modem Connections" on page 109.
- "Printer Connections" on page 111.
- "Connector Kit" on page 112.

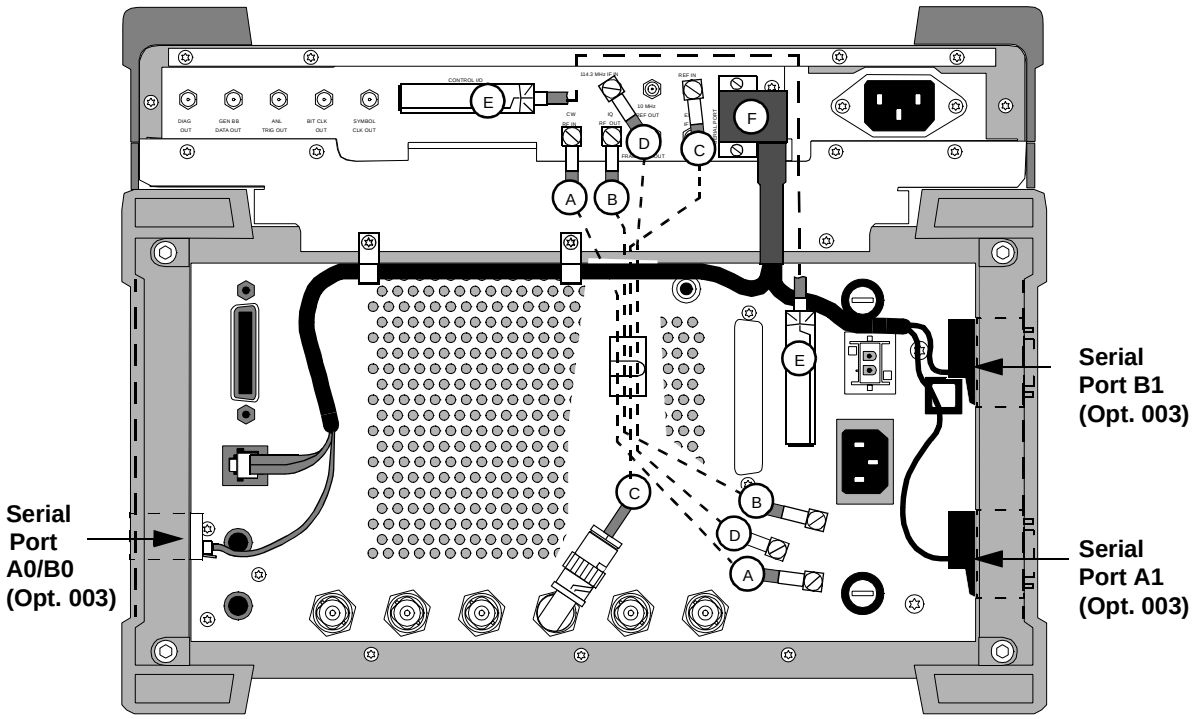
Cellular Adapter Connections and Calibration

The Cellular Adapter has several rear-panel connections that route the control, timing, and transmitter signals between the Test Set and the adapter. *These connections must be made before making any measurements with the adapter.*

When the Cellular Adapter is installed, you must also run an internal calibration program to prepare it for use with the Test Set. Instructions for calibrating the Cellular Adapter using the **PER_CALD** program in the Test Set's ROM are included in the *Installation* section of the *HP 83204A User's Guide.*

NOTE Mains power is supplied to the Test Set and Cellular Adapter using individual power cables. However, the Cellular Adapter does not have an external power switch, and can only be powered on when it is connected to a Test Set that is also powered on.

Figure 5-1 Connecting the Cellular Adapter to the Test Set



Cellular Adapter	Wire No.	Test Set
CW RF IN	A	CW RF OUT
IQ RF OUT	B	IQ RF IN
REF IN	C	10 MHz REF OUT
114.3 MHz IF IN	D	114.3 MHz IF OUT
CONTROL I/O	E	CONTROL I/O
SERIAL PORT EXPANSION	F	SERIAL PORTS (Opt. 003 only)

External Modem Connections

Figure 5-2 illustrates the connections used when adding an external modem to the Test Set and (optionally) how to add a personal computer to the second serial port.

Figure 5-2 Connections for the HP 8921A, Modem, 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 108.

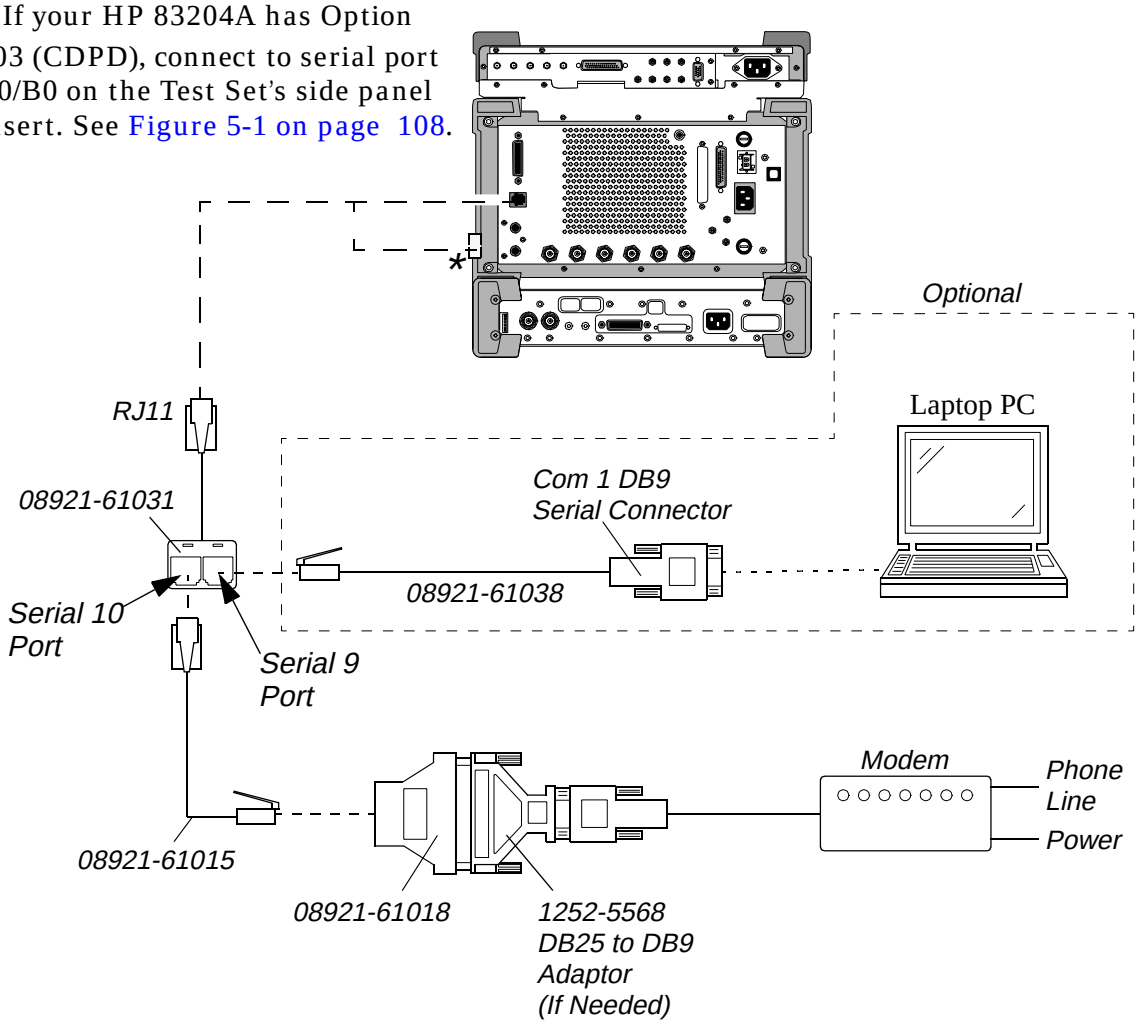
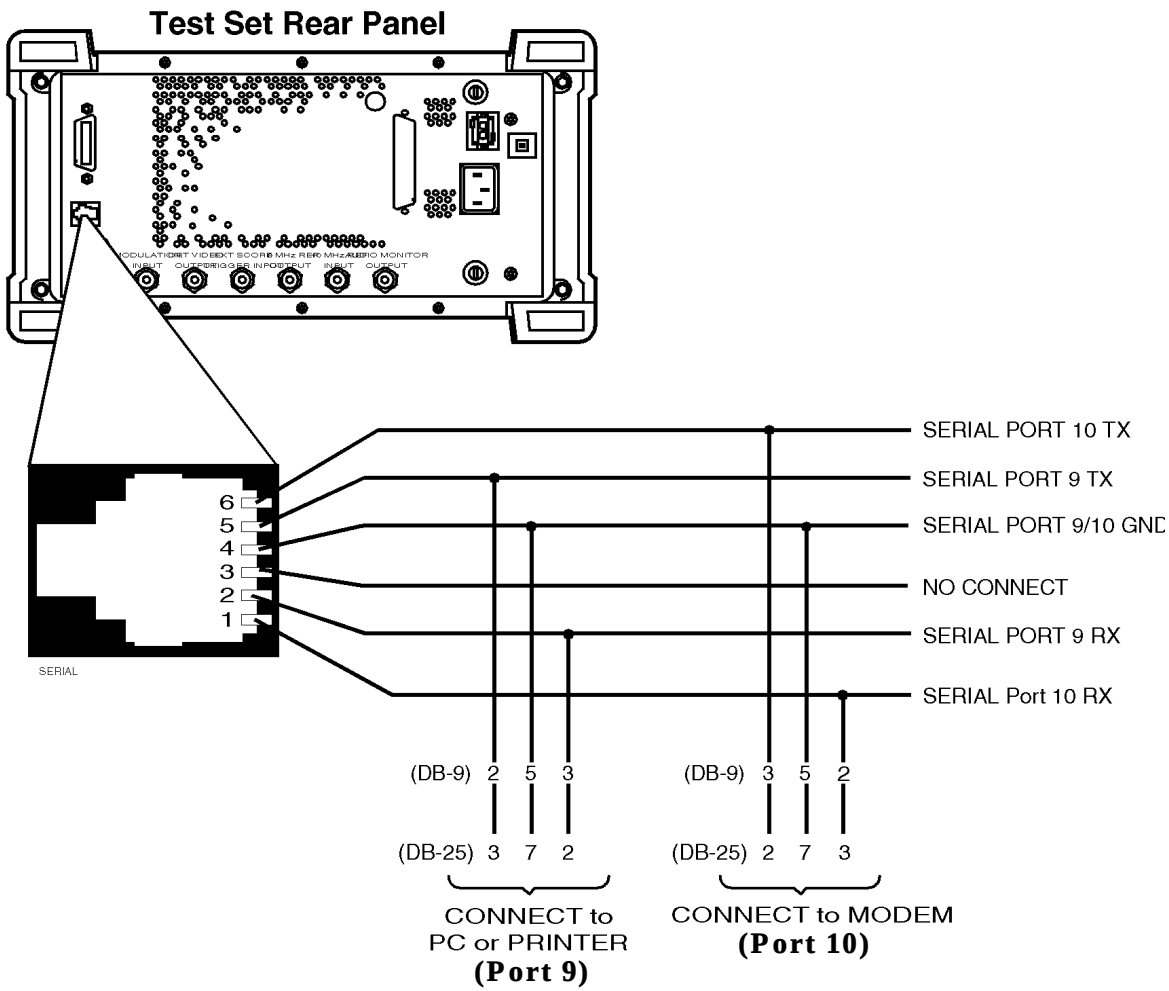


Figure 5-3 Serial Port Connector Description



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 serial port 9, parallel port, or the HP-IB port. When using serial port 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. The printer is connected and configured the same way you would configure it to collect data. See "Data Collection" on page 179.
- Using the data collection function, you can print test results as tests are run. See "Data Collection" on page 179.
- Using data logging, you can print commands and responses between the MSC and Test Set. See "Logging" on page 195.

Connector Kit

A connector and cable kit is available to supply the required parts to connect the Test Set to the base station equipment for both AMPS and TDMA testing. The HP 83202A Option 043 connection kit supplies serial cables, various cable adapters, and RF cables needed to connect the Test Set for testing. Refer to **table 5-1** for a list of parts included in the kit.

Table 5-1 HP 83202A Option 043 AT&T Base Station Connection Kit

Description	Purpose	Quantity	HP Part Number
RJ-11(m) to Dual RJ-11(f) cable/adapter, 6-wire	test set serial port splitter	1	08921-61031
RJ-11(m) to RJ11(m) cable, 25 ft.	modem to phone line	2	08921-61015
RJ-11(f) to DB-25(m) adapter	RJ-11 to DB-25 modem connection	1	08921-61018
DB-25(f) to DB-9(m) adapter	test set Serial port to PC adapter	1	1252-5568
DB-9(f) to RJ-11(m) 4-wire cable	PC interface for data collection or printer	1	08921-61038
N(m) to BNC(f) adaptor	Adaptor for Test Set RF IN/OUT connector	1	1250-0780
SMA(m) to BNC(f) adaptor	Series II test port J3 to test set ANT IN	1	1250-1200
6-dB Pad, BNC(f) to BNC(m)	Series II test port J3 to test set matching	1	0955-0698
BNC(m) to BNC(m) cable, 10 ft.	Test cables for J3 test and RFTOOLS measurements	2	08921-61011
DB-25(m) to RJ-11(m) 4-wire cable	modem to phone line	1	08921-61039

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

NOTE Future Software revisions include a “DEMO” procedure that will be selectable from the Software memory card (as an alternate to selecting the normal LUCENT test procedure). Running this procedure causes the Test Set to operate in demonstration mode; eliminating the need for the following procedure.

The switch used to turn the demo mode on and off is a parameter in the TESTS (Test Parameters) menu. To turn on the demo mode:

Step 1. If the Software is running, press **SHIFT** then **CANCEL** to stop program operation.

Step 2. Press the **TESTS** key to display the SOFTWARE 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 28. ZZZZ Test Demo Mode [0=normal 1=demo] and press the knob.

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 keys, press **1** then **Enter**. The parameter’s value is now **1.000000**.

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 **TESTS** key and then select **k1** (**Run Test**). You will return to the Software’s 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 **SHIFT** then **CANCEL** to stop program operation.

Step 2. Press the **TESTS** key to display the SOFTWARE 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 28. ZZZZ Test Demo Mode [0=normal 1=demo] and press the knob.

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 keys, press **0** (zero) then **Enter**. The parameter's value is now **0.000000**.

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 **TESTS** key and then select **k1** (**Run Test**). You will return to the Software's Main Menu in the normal test mode.

Frequency Plans

When running the Full Cell Site Test (see "Full Site Test (FCC)" on page 65), you must provide the Test Set with information on the radios in the site that are being tested. This is done using frequency plans. Frequency plans are defined on a per site basis; you need one plan for each site that you plan to test.

Once defined, you can store your plans to a memory card and you can modify them at a later date.

The Software supports two methods of entering the information into a frequency plan. The first method uses an editor that is part of the Software; all plan entry is done on the Test Set. The second method uses an external PC as the editor; the plan is defined and is then downloaded to the Test Set for storage.

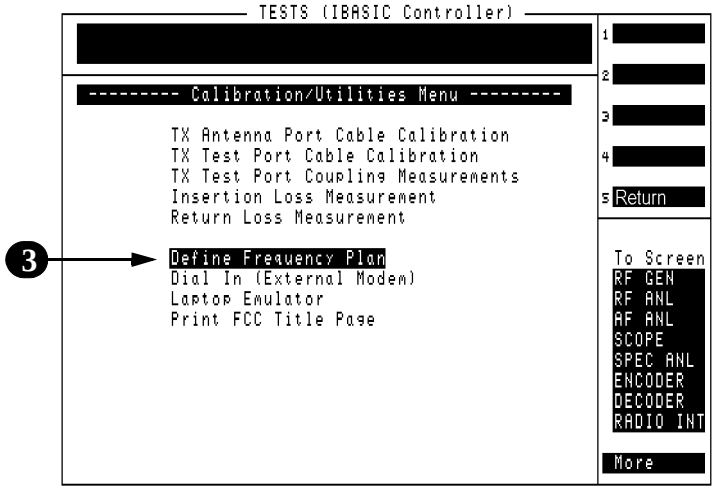
Defining a Frequency Plan Using the Software's Editor

Step 1. One of the steps in defining frequency plans is to save the information on a memory card. Before beginning the plan definition, make sure that you have an initialized SRAM card for file storage.

Step 2. From the Software's Main Menu, select **`Calibration/Utilities`**.

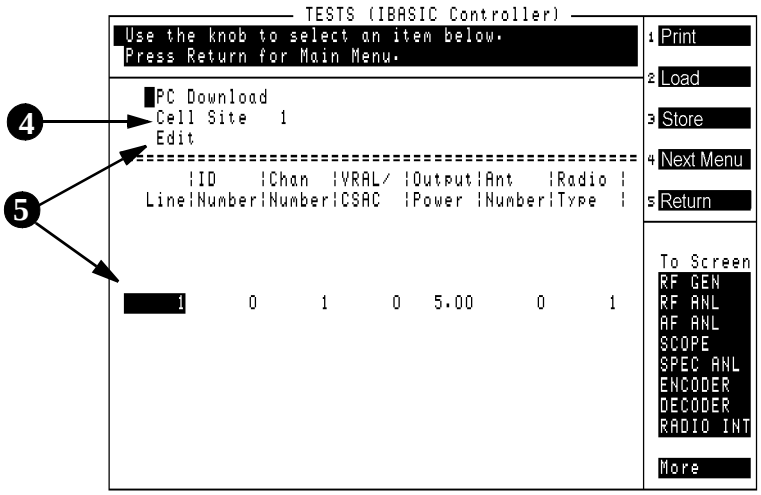
Step 3. Select **`Define Frequency Plan`**.

Figure 5-4 Accessing the Frequency Plan Menu



Step 4. You will see the frequency plan menu shown in Figure 5-5. The display is split into two parts: the top of the screen is used to perform file functions and the lower part is used to edit the data. Scroll down to **Cell Site** and press the knob. Using the DATA keys, enter the number of the site that you will be defining the frequency plan for. Press the knob again to enter the value.

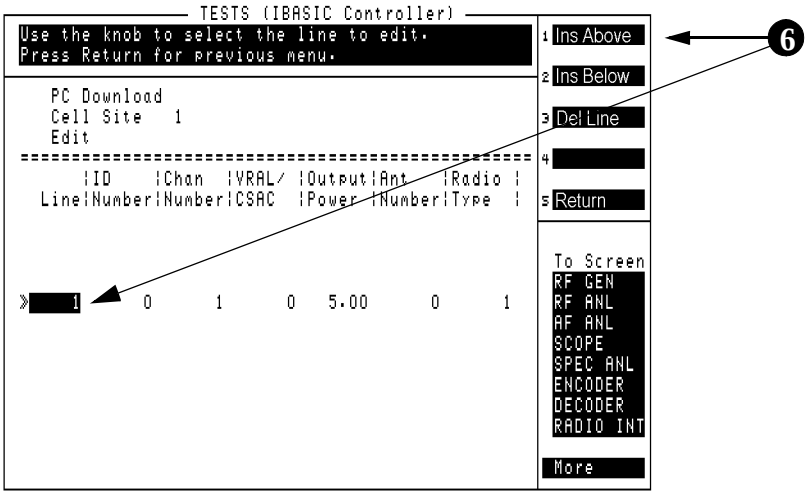
Figure 5-5 Selecting the Frequency Plan



Step 5. Scroll down to **Edit** and press the knob. The lower part of the screen is now active for editing and the first line will show a highlighted one (1). The USER key assignments on the right side of the screen also change to allow you to insert or delete lines of frequency plan information.

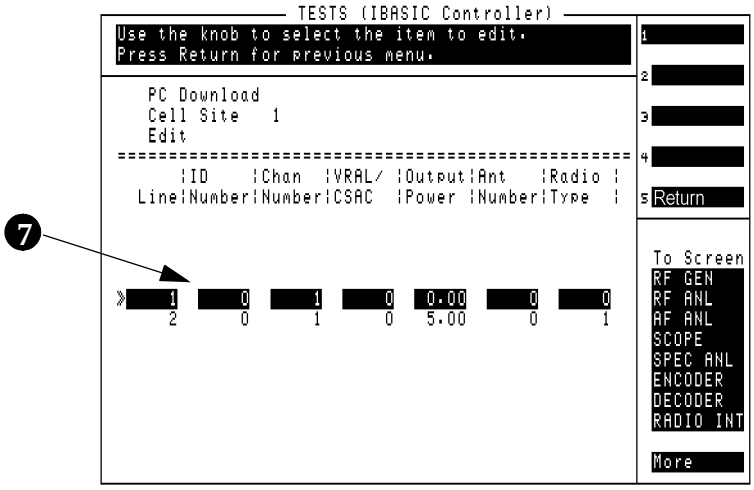
Step 6. Press K1 (**Ins Above**) to add lines to the list. See **Figure 5-6** and **Figure 5-7**. Each line of the plan corresponds to one radio in the site.

Figure 5-6 Adding Lines to the Frequency Plan



Step 7. Press the knob to highlight the seven entries for that line in the plan. You can now modify the entries for that line by moving the cursor in front of each entry, pressing the knob, and changing the value using the DATA keys or the knob. After changing an entry, press and turn the knob again to move to the next entry.

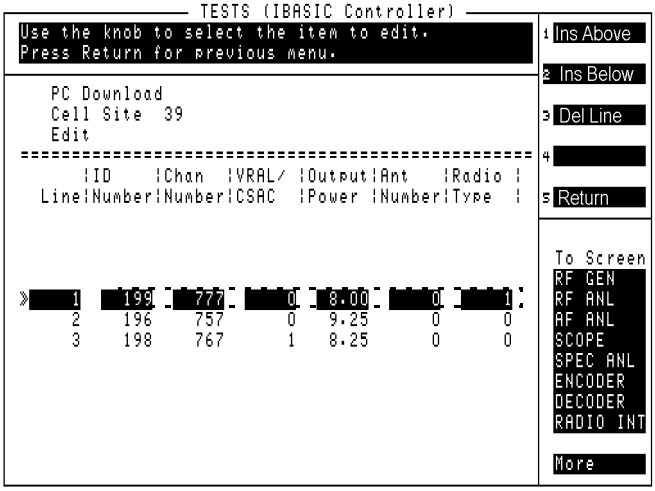
Figure 5-7 Changing Entries in the Frequency Plan



Step 8. Use the **Line** field to select each line in the plan (which corresponds to individual radios in the site) and then enter these values for each line:

- **ID Number** — the Radio ID number (0 to 199)
- **Chan Number** — the radio's channel number (1 to 1023)
- **VRAL/CSAC** — the Voice RAdio Level (VRAL) for an AMPS or TDMA radio, or the Control Setup Attenuation Code (CSAC) for an AMPS Setup radio. Range is 0 to 7.
- **Output Power** — the power at the TX antenna output from the Antenna Interface Frame.
- **Ant Number** — the antenna number for that radio (0 to 6) (see Table 5-2 on page 122).
- **Radio Type** — 0=AMPS radio, 1=AMPS Setup radio, 2=TDMA voice only, 3=TDMA with DCCH.

Figure 5-8 An Example Frequency Plan



Step 9. This completes the steps needed to define the frequency plan for one site. Press **k5** (**Return**) to exit the editing mode.

Step 10. To store your frequency plan, press **k3** (**Store**). You must have an initialized SRAM card in the slot to store your data. The plan is stored using the **Cell Site** number entry.

Step 11. If you want to define plans for other sites, repeat these steps starting with **step 4**. Otherwise, press **k5** (**Return**) to get back to the Calibration/Utilities Menu.

Defining a Frequency Plan Using a PC

You can create frequency plans with a personal computer and then download the plans to the Test Set. These plans can then be saved, reused, and updated as needed.

Requirements

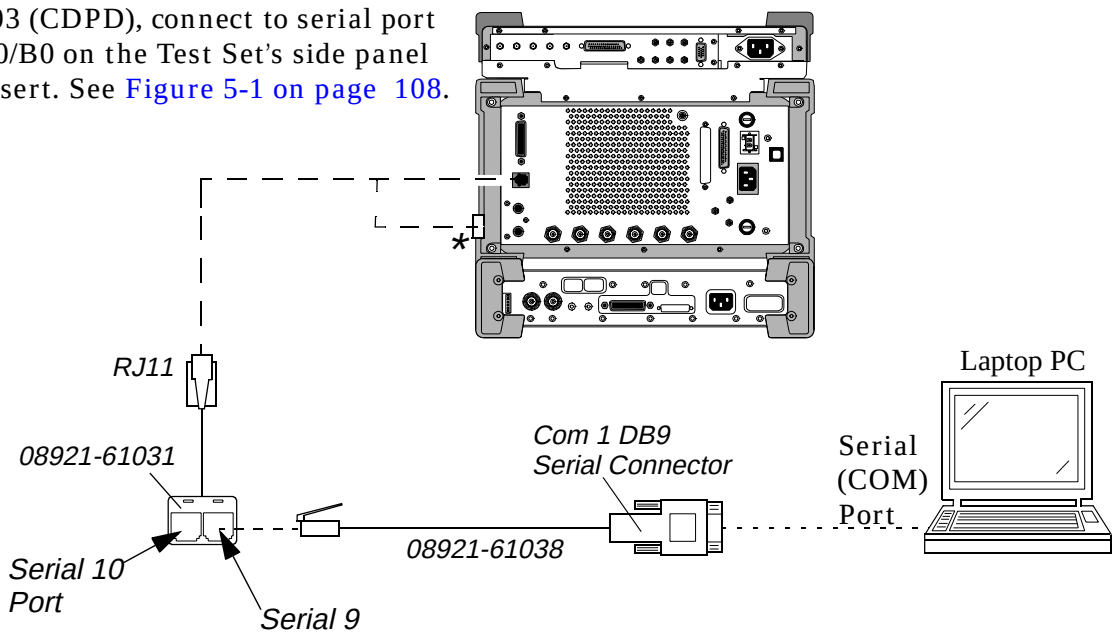
- ❏ A personal computer (PC) with an available serial communications port.
- ❏ PC Software programs for text editing and serial communications; such as Windows®[1] Notepad, and the BTS Laptop Utilities program.
- ❏ Null modem cable for connecting the Test Set to the PC.
- ❏ An initialized SRAM memory card for storing the frequency plans once defined.

Connect the Test Set to your PC

The serial connection for frequency plan transfer is the same as that used for testing the radio with a connected PC. See **Figure 5-9**.

Figure 5-9 Serial Connections for the Test Set 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 108.



1. Windows and Notepad are U.S. registered trademarks of Microsoft Corporation.

Create the Frequency Plan File on the PC

Frequency plan files created on a PC are simple. You can use any text editor that allows you to save a file in an ASCII format to create a frequency plan. Use the following steps and guidelines to create a text file to download to the Test Set:

NOTE You may need to refer to the documentation for your PC's application software for details on opening new files, entering data, and storing the file.

1. Start your PC's text editor program (such as Notepad®[1]).
2. Open a new file to begin editing.
3. Create a plan for one site, using the following guidelines:
   - The data should be entered in a tabular format. A carriage return or line feed must be at the end of each line.
   - At least *two* non-numeric characters must be used to separate (delimit) numeric values. These characters can be spaces, commas, periods, tabs, or another non-numeric character.
   - You can use text anywhere in the file to help you keep track of the numbers in the file. When downloading the file to the Test Set, all non-numeric text is ignored (with the exception of the carriage return and alpha character to indicate the end of the plan during the transfer).
   - The first number in the file should be the Cell Site Number.
   - The next line must contain values that match the Define Frequency Plan screen fields (Line, ID Number, Chan Number, VRAL/CSAC, Output Power, Ant Number (see Table 5-2), and Radio Type (0=AMPS, 1=AMPS Setup, 2=TDMA voice only, 3=TDMA with DCCH). See Figure 5-10 for an example of a frequency plan definition (again, the text is optional and you can use other text or none at all).
   - Increment the Line field by one for each additional line you use.
   - Add additional lines for each additional radio, again making sure that data for each field is entered.
   - A carriage return (Line feed, Return/Enter, and so forth) and at least one alpha character should be entered after the last number in the last line in the plan to define the end point of the plan.

1. Notepad is a registered trademark of Microsoft Corporation.

Figure 5-10 An Example Frequency Plan on the PC

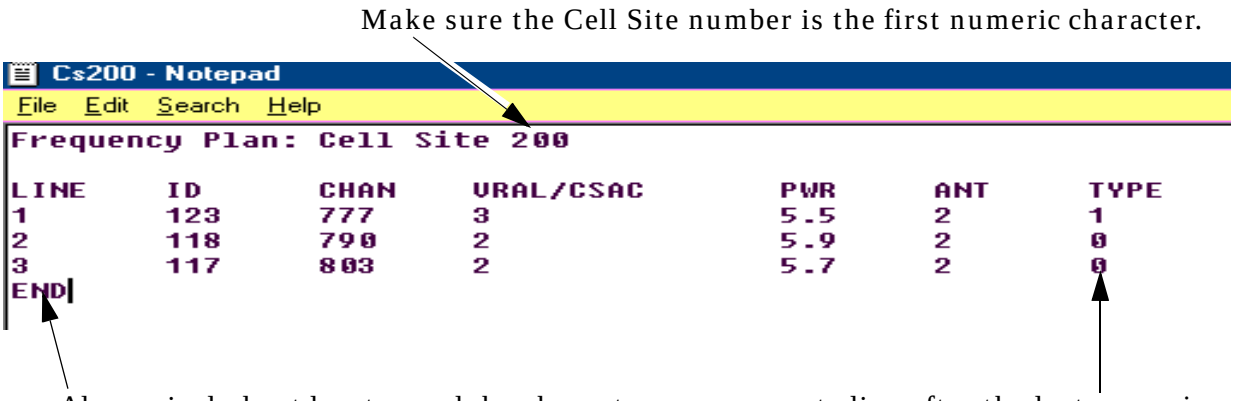


Table 5-2 Antenna Numbers and Equivalents

Ant # Entry	Antenna Equivalent (typical)
0	Omni antenna
1	Alpha face of a sectored site
2	Beta face of a sectored site
3	Gamma face of a sectored site
4	Delta face of a six-sectored site
5	Epsilon face of a six-sectored site
6	Zeta face of a six-sectored site

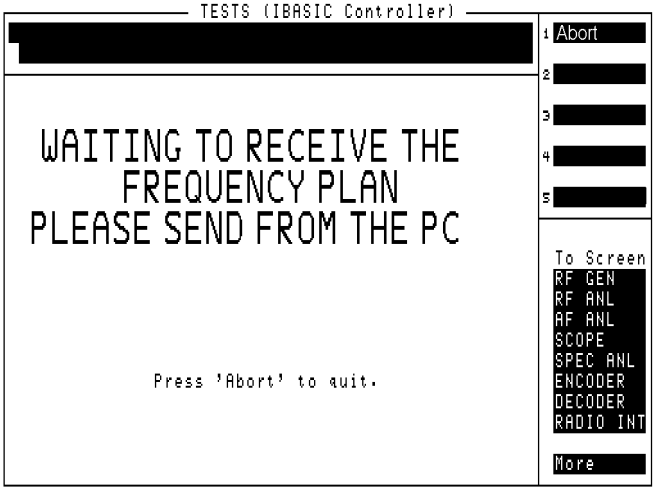
4. Once your entries match the site configuration, save the file in an ASCII format using the extension.TXT. For example: CS200.TXT
5. If you need to define plans for more than one site, repeat **step 2** through **step 4** until plans for all sites have been created and saved.
6. Exit the editing program.

Send the Plan to the Test Set:

Once you have connected the Test Set to the PC via the serial port and defined and saved a frequency plan, you are ready to send the plan to the Test Set. The following steps use the BTS Laptop Utility program (shipped with the Lucent Software) to perform this function.

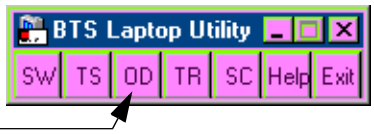
NOTE If you are not using the BTS Laptop Utility, you may need to refer to the documentation for your PC's application software for details on setting up serial communications, opening files, and transferring data.

1. From the Software's Main Menu, scroll to and select **Calibration/Utilities**.
2. Scroll to and select **Define Frequency Plan**.
3. Scroll to and select **PC Download**. When the screen below is displayed, the Software is ready to receive the frequency plan.

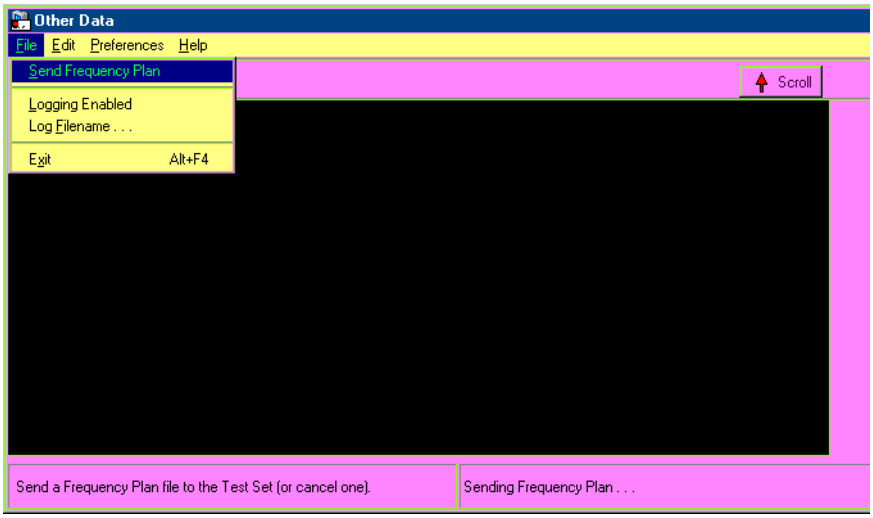


4. Load and run the BTS Laptop Utility as explained in "BTS Laptop Utility Installation" on page 29. When completed, the BTS Laptop Utility control bar is displayed, and you have set the Test Set Comm Port settings to match the serial communication settings for the serial port 9 of the Test Set.
5. Open the Other Data Window by selecting the **OD** button on the title bar.

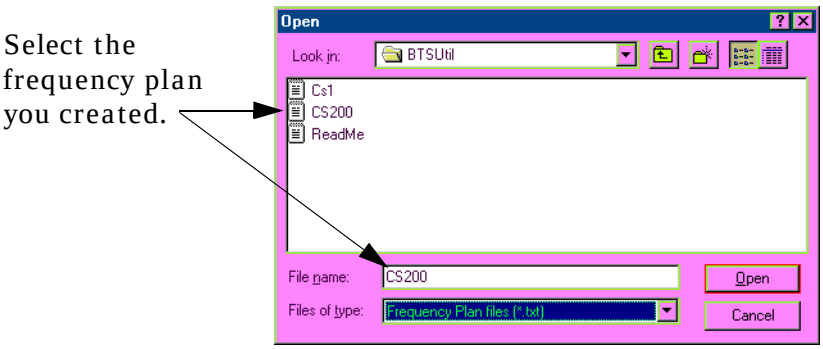
Select OD to view the Other Data window.



6. Select **File**, then **Send Frequency Plan**.



7. Select the frequency plan file you saved. After double-clicking on the file name, or selecting the file name and selecting Open, the frequency plan is downloaded into the software.



8. If all is set up correctly, you should see transmitted characters scrolling on the Test Set's screen. After a pause, the Software returns to the **Define Frequency Plan** menu and the transferred plan is displayed.

9. With the correct **Cell Site** number and frequency plan data displayed, insert an initialized SRAM card into the Test Set and press **k3** (**Store**). The new frequency plan will be store for that cell site number.

NOTE If you change the cell site number before storing, *the data will be lost.*

10. If you have additional files to transfer for defining other sites, repeat **step 3** through **step 9** until all files have been sent to the Test Set and stored to the card.

11. To exit the **Define Frequency Plan** menu, press **k5** (**Return**).

Loading a Frequency Plan from a Memory Card

Loading of frequency plans is automatic. All you have to do is enter a number into the **Cell Site** field while in the **Define Frequency Plan** menu and, if the card has a plan for that site, the data will be loaded.

NOTE If you edit a saved plan on the Test Set and then decide *not* to make the changes, press the **k2** (**Load**) key and the on-screen data will be overwritten with numbers from the memory card.

Purging (Deleting) a Frequency Plan File

Frequency plans can be maintained by editing existing files. If you have plans you no longer use, however, you can purge (delete) the files from the memory card using these steps:

1. Insert the SRAM memory card with the frequency plan you want to purge.
2. From the Software's Main Menu, select **Calibration/Utilities**.
3. Scroll to and select **Define Frequency Plan**.
4. Scroll to **Cell Site**, press the knob, and enter the number of the site that corresponds to the file you want to delete.
5. Press **k4** (**Next Menu**) to access additional file operations.
6. Press **k2** (**Purge**).
7. You will be asked to verify the purge operation for the cell site number entered. Press **k1** (**Yes**) to purge the file.
8. Press **k5** (**Return**) twice to return to the Software's Main Menu.

Printing a Frequency Plan

If you have a printer connected to your Test Set you can print your frequency plans. This can be useful for record-keeping. The following steps are used for printing frequency plans:

1. If you have not printed with the Test Set, make sure that it is configured for printing test results (see "Data Collection to a Printer" on page 192). If you have already printed results, make sure the printer is on and is loaded with paper.
2. From the Software's Main Menu level, scroll to and select **Calibration/Utilities**.
3. Select **Define Frequency Plan**.
4. If the frequency plan you want to print out is not currently loaded, insert the SRAM card containing the frequency plan and select the plan by scrolling to **Cell Site**, pressing the knob, and entering the site number that corresponds to the plan you would like to print.
5. Press **k1** (**Print**) to send the frequency plan values to your printer.
6. If you would like to print other plans, change the **Cell Site** number and repeat **step 5**
7. When finished, press **k5** (**Return**) twice to go back to the Software's Main Menu.

Laptop Emulator

Overview

The Test Set has the ability to send control commands to the MSC (switch), via an external modem, to control the radios at the cell site. This significantly reduces test time over manual operation. The Software function for site control via the MSC is called the Laptop Emulator.

The Laptop Emulator uses the Test Set's internal IBASIC controller and serial I/O capabilities to emulate a terminal device for communications to the MSC. The Laptop Emulator can be used instead of (or in conjunction with) a separate laptop PC.

NOTE The Laptop Emulator function cannot be used if you are using the BTS Laptop Utility program running on a connected PC with an internal modem. See "Connect to the MSC Using a Laptop PC" on page 49.

Setting Up and Using the Laptop Emulator

This section outlines the steps required to setup the Test Set to use the Laptop Emulator for automated testing.

The following steps are used to configure the Laptop Emulator (only steps 2 and 3 are covered in this chapter; see "Installation" on page 17 for modem setup steps 1a to 1c):

1. Set up the modem for communication to the MSC.
   a. Make the serial communications connections.
   b. Configure the serial ports.
   c. Initialize the modem.
2. Dial and log on to the MSC.
3. Send commands to the MSC.

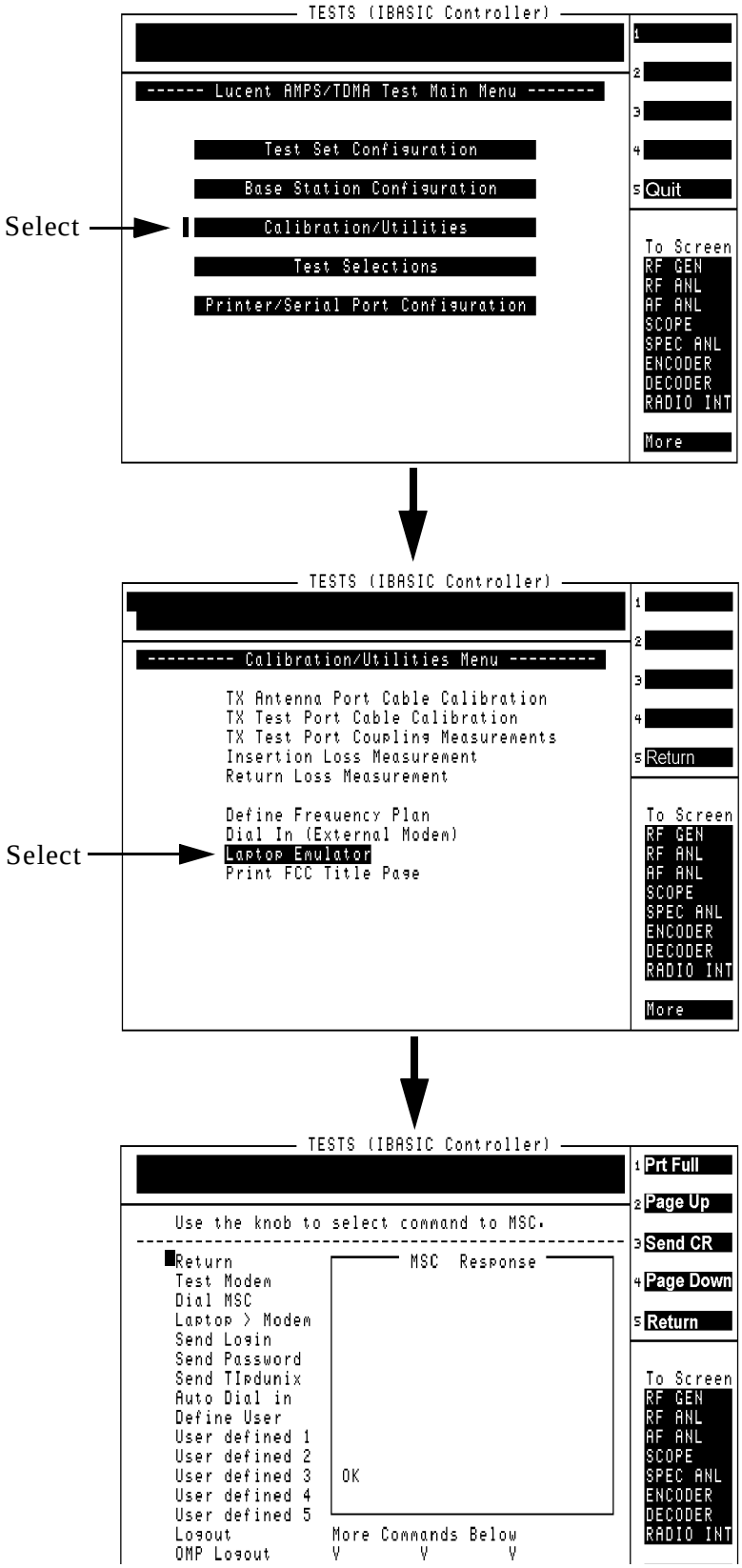
Dialing and Logging on to the MSC

Once the modem is connected and configured, you should be able to dial up the MSC and log on to perform maintenance. See Figure 5-11 on page 129.

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

Step 2. Scroll to **`Laptop Emulator`** and press the knob.

Figure 5-11 Selecting the Laptop Emulator



Step 3. Make sure that your modem is connected and turned on. You should have already performed the steps to set the modem up for use with the Test Set. If not, return to "Installation" on page 17 and follow the steps outlined in that chapter.

Step 4. Scroll to **Test Modem** and press the knob to check basic modem operation. The response OK should appear in the MSC Response box.

If the correct response is not returned, use the **Edit String** feature on the Modem Configuration and Initialization menu to edit the initialization string (see "Modem Configuration and Initialization Menu Functions" on page 146).

Step 5. To dial up the MSC, scroll to **Dial MSC** and press the knob.

- If you have entered the number before, it will appear at the top of the screen and you can simply select **Done**.
- If you have not previously entered the number, you are prompted to enter the phone number for the switch (MSC). Enter the number using the DATA keys and press the knob (**Done**)

You should hear the modem activate and send the DTMF tones. You should then hear the ring at the MSC end, followed by the connect sound.

Step 6. You now need to get to the login prompt. This may require that you send a few carriage returns (CR). Select the **k3** (**Send CR**) once or twice to get the login prompt to appear in the **MSC Response** box.

NOTE If you use passcodes to access the MSC or must negotiate an OMP, you may have to use the Laptop > Modem mode to log on. See "Using the Laptop > Modem Mode" on page 133.

Step 7. When prompted by the MSC for a login, select **Send Login**.

- If you have entered your login previously, it will appear at the top of the screen and you can simply select **Done**.
- If you have not previously entered your login, use the knob to enter your login from the characters in the **Choices** menu, then select **Done**.

Step 8. When prompted by the MSC for a password, select **Send Password**.

- If you have entered your password previously, it will appear at the top of the screen and you can simply select **Done**.
- If you have not previously entered your password, use the knob to enter your password from the characters in the **Choices** menu and select **Done**.

Step 9. Wait for the prompt from the MSC (typically a "$" or "#" or a few characters of text) then select `Send TIpdunix` to enter the maintenance mode. You should receive a response of TERMINAL IN SERVICE. **Figure 5-12** shows the typical appearance of the `MSC Response` box after a connection sequence.

Figure 5-12 Typical Laptop Emulator Display After the Connection to the MSC

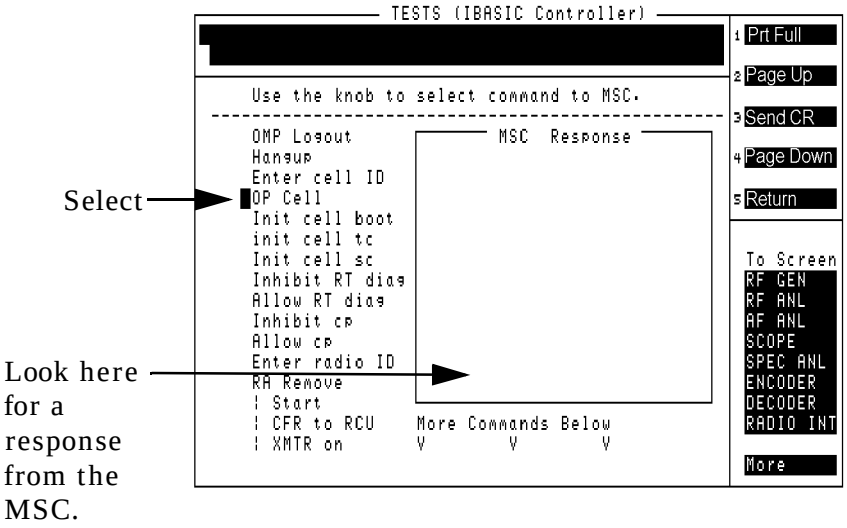
```
login: tech23
Password:

Welcome to the LUCENT Autoplex System 1000

Current ECP Generic: APX-1000 L8.0
Current IMS Generic: Release 4.1.3.D
Current 5E-DCS Generic: DCS 1 - 5E10
Current Definity DCS Generic: DCS 2 - 8.0

Current OMP Generic 8.0

Current Series I Cell Site Generic:  APXC04.12
Current Series II Cell Site Generic: APXB05.32
Current Series II/CDMA Cell Site Generic: b03Y07.10


You are logged into ECP-1

Good afternoon


Spokane, Wa.   APX-1000 APX8.0      ttyx     TTY 21
```

Step 10. You can now verify that you can control the site via the MSC. Select k2 (**Page Down**) and scroll to and select **Enter cell ID**. Enter the number for the cell site to be tested.

NOTE In the **Laptop Emulator** , the use of the **Page Up** (k2) and **Page Down** (k4) USER keys can be a time-saver.

Step 11. Scroll to and select **OP Cell** (see figure 5-13). You should see a response to the Op Cell command in the MSC Response box on the display.

Figure 5-13 Verifying Site Control



Step 12. The site should now be ready to receive the commands from the Test Set that will be sent during testing. Scroll to the command you want to use next and press the knob to select. Commands that require entry will present the Choices menu for you to spell out the entries. Exit the Laptop Emulator mode by pressing **Return** (k5).

Using the Laptop > Modem Mode

If you have connected a PC to serial port 9 of the Test Set (see "Connections for the HP 8921A, Modem, and PC" on page 109) you can use the **Laptop > Modem** mode to bypass Test Set communications to the MSC during login. The Test Set merely routes the commands back and forth between the MSC and the laptop PC without sending any commands of its own.

This may be necessary when you are negotiating an OMP in logging on to the MSC. It also gives you more freedom in sending site control commands; you can send any type-in command from the keyboard. You are not limited to the built-in commands of the Laptop Emulator menu.

These are the steps to accessing and using the Laptop > Modem mode:

Step 1. First, make sure that you have connected the modem and PC to the serial ports as shown in figure 5-2 on page 109.

Step 2. Prepare your PC for use by starting a communications software application. This is usually the same software you normally use during maintenance to communicate with the MSC.

Step 3. From the Software's Main Menu, scroll to **Calibration/Utilities** and press the knob.

Step 4. Scroll to **Laptop Emulator** and press the knob.

Step 5. Scroll to **Laptop > Modem** and press the knob.

Step 6. You can now type commands on the PC using your terminal/communications program. The commands are passed, via the Test Set, to the modem and then the MSC. Responses from the modem and MSC will appear on your PC's display, not the Test Set's display.

NOTE While using the Laptop > Modem mode, you can no longer choose and send commands from the Laptop Emulator menu. You must first exit the Laptop > Modem mode by pressing **EXIT L>M** (k3).

Step 7. When finished using the PC to communicate, select **EXIT L > M** (k3) to return to the Laptop Emulator menu.

Step 8. To return to the Calibration/Utilities Menu, select **Return** (k5). Selecting **Return** (k5) a second time returns the Software to the Main Menu.

Creating User-Defined Commands

Why use the user-defined commands?

The Laptop Emulator provides most common commands needed to control the site and the radios. In some cases, however, you may want to use commands that are not available in the Laptop Emulator menu.

For one-time use, you can use the **`Enter Command`** selection in the menu and type in the command directly. If you need to use the command more than once, it is probably best to define a user command file and add it to the Laptop Emulator list. Use the steps in this section to create, store, and use custom commands.

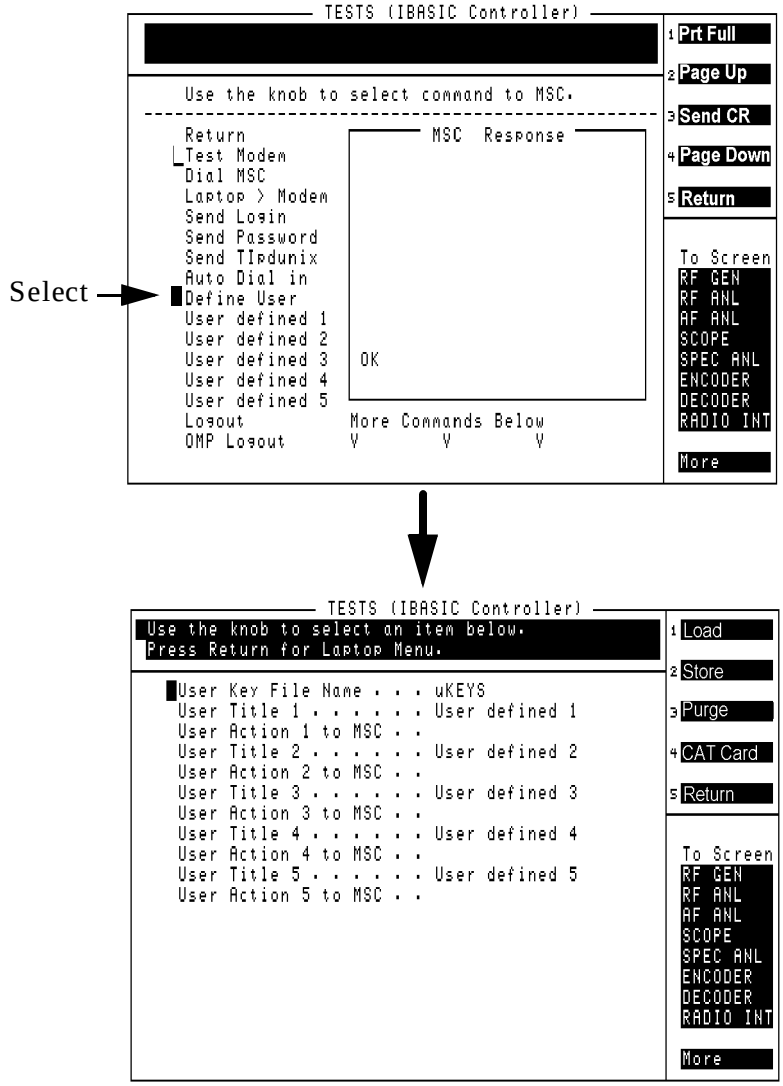
Defining your command set:

Step 1. Insert an SRAM memory card into the Test Set's front-panel memory card slot. Make sure that the card is *not* write-protected.

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

Step 3. Scroll to **`Laptop Emulator`** and press the knob.

Step 4. Scroll to **Define User** and select it by pressing the knob.



Step 5. Select **User Key File Name**. There are five file names available for storage of commands: **uKEYS**, **uKEYS2**, **uKEYS3**, **uKEYS4** and **uKEYS5**.

Step 6. Select the file name by pressing a USER key (**k1** through **k5**).

Step 7. Scroll to **User Title 1** and press the knob.

Step 8. The title you enter will be displayed on the Laptop Emulator menu as one of the choices. Use the knob to select from the characters in the **Choices** menu to create a title for your command. When done spelling the name, scroll to **Done** and press the knob.

Step 9. Scroll to **User Action 1 to MSC** and press the knob.

Step 10. Now enter the corresponding command string to be sent to the MSC exactly as it would appear if you were using your PC to send the command. Again, you will use the **Choices** menu to select the characters. You will need to scroll to the end of the list if you need characters such as colons, commas, and semicolons. When finished with the entry, scroll to **Done** and press the knob. Your text will appear next to **User Action 1 to MSC**.

Step 11. If you have other commands to define, repeat **step 7** through **step 10** for User Actions and User Titles 2 through 5.

Step 12. Once the commands have been entered, store the entries by selecting **Store** (k2).

Step 13. Return to the Laptop Emulator menu by selecting **Return** (k5). User titles that you entered will appear immediately after the **Define User** selection. Position the cursor in front of the title to display the associated user defined action at the top of the screen.

Step 14. To exit the Laptop Emulator mode, select **Return** (k5).

Loading and Using your User-Defined Commands:

Step 1. Insert the SRAM card you stored your commands on into the Test Set's front-panel memory card slot.

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

Step 3. Scroll to **Laptop Emulator** and press the knob.

Step 4. If your commands do not appear on the list available in the Laptop Emulator screen:

a. Scroll to **Define User** and press the knob.

b. Position the cursor in front of **User Key File Name** and press the knob.

c. Press the USER key (**k1** through **k5**) associated with the file name you saved your user-defined commands under.

d. Select **Load** (**k1**).

e. The definitions for your user-defined commands should appear in the list on the display. Select **Return** (**k5**) to go back to the Laptop Emulator.

Step 5. Scroll to the user-defined command area (follows the **Define User** choice in the Laptop Emulator) to the command you want to use. With the cursor in front of the command, and **before** pressing the knob, you can see the command characters to be sent at the top of the display.

Step 6. Press the knob to send the command to the MSC.

Step 7. Select and send other commands, as needed, in the Laptop Emulator.

Step 8. To exit the Laptop Emulator, select **Return** (**k5**).

Purging User-Defined Command Files:

If you find that you have user-defined command files on a memory card that you no longer use and would like to remove them, follow these steps:

Step 1. Insert the SRAM card you stored your commands on into the Test Set's front-panel memory card slot.

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

Step 3. Scroll to **Laptop Emulator** and press the knob.

Step 4. Scroll to **Define User** and press the knob.

Step 5. Scroll to **User Key Filename** and press the knob.

Step 6. Press a USER key (**k1** through **k5**) corresponding to the file that you plan to delete.

Step 7. Select **k3** (**Purge**). A prompt appears asking if you are sure you want to purge the selected file.

- Select **k1** (**Yes**) to remove the file.
- Select **k2** (**No**) to keep the file on the card.

Step 8. Select **k5** (**Return**) to leave the user-defined command screen.

Step 9. Select **k5** (**Return**) again to return to the Calibration/Utilities Menu.

Command Summary

Table 5-3 lists the commands available in the laptop emulator mode and the command syntax that is sent to the MSC. The commands to the MSC are the same as those sent if you are using a laptop PC to control the site.

NOTE In the table, CELL *x* indicates the current Cell Site number and BBA *y* the current BBA number.

Table 5-3 Laptop Emulator Commands

Command	Command Syntax Sent to MSC
Return	*exits the Laptop Emulator menu*
Test Modem	AT
Dial MSC	ATDT *phone number entered*
Laptop>Modem	permits communication with the MSC through the Test Set (See "Using the Laptop > Modem Mode" on page 133)
Send Login	sends *login*
Send Password	sends *password*
Send TIpdunix	TIpdunix
Auto Dial in	sends user defined login information and responses to prompts
Define User	*allows user to customize command* (see "Creating User-Defined Commands" on page 134)
User Defined 1	*sends user defined command 1*
User Defined 2	*sends user defined command 2*
User Defined 3	*sends user defined command 3*
User Defined 4	*sends user defined command 4*
User Defined 5	*sends user defined command 5*
Logout	Two Control - D's
OMP Logout	forces OMP to close connection. This command is dependent on the base station's code revision number.
Hang-up	+ + +
Enter Cell ID	*stores cell ID information for recall later*
Op Cell	OP:CELL *x*

Command	Command Syntax Sent to MSC
Init Cell Boot	INIT:CELL *x*:BOOT
Init cell tc	INIT:CELL *x*:TC
Init cell sc	INIT:CELL *x*:SC
Inhibit RT diag	INH:CELL *x*,RTDIAG
Allow RT diag	ALW:CELL *x*,RTDIAG
Inhibit cp	INH:CELL *x*,CP
Allow cp	ALW:CELL *x*,CP
Enter # of CEs	*displays the number of CEs to test at the top of the display*
Enter BBA ID	*stores radio ID information for recall later*
|RST UCL	RST:CELL *x*,BBA *y*;UCL
|Multi Start	CFR:CELL *x*,MULTI;START
|Multi Config	CFR:CELL *x*, MULTI BBA *y*;CONFIG 150
|Multi TX On	CFR:CELL *x*, MULTI BBA *y*;XMITC 300
|Multi Full Pwr	CFR:CELL *x*, MULTI BBA *y*;CDMAPC 715
||Multi Add CEs	CFR:CELL *x*, MULTI BBA *y*;ADDCE
||Multi Del CEs	CFR:CELL *x*, MULTI BBA *y*;DELCE
|Multi TX Off	CFR:CELL *x*, MULTI BBA *y*;XMITC 301
|Multi Stop	*x*CFR:CELL ,MULTI;MSTOP
Enter Command	*allows user to enter command (use quotes around the command if a comma is used)*

Using Automated Dial In

Once you have become familiar with the steps to dial the MSC and log on, you can use the dial in mode to save time on subsequent connections.

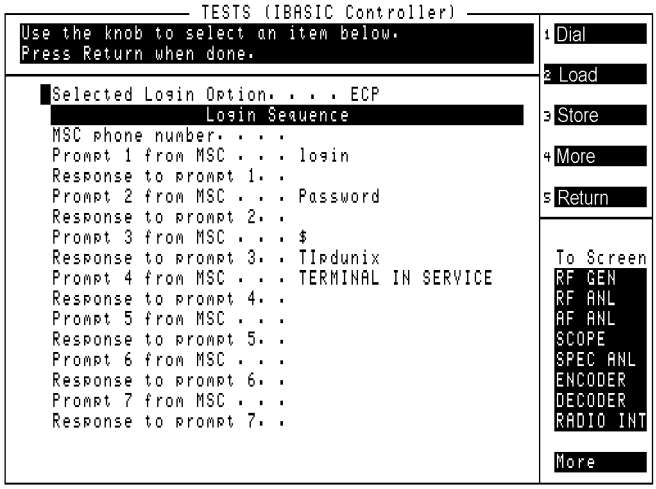
Dial in is set up by entering the commands to be sent to the MSC during the logon sequence. You will also enter the responses that should come back from the MSC so the Test Set knows when to send the next commands.

Defining and Storing the Dial In File:

Use these steps to make the entries needed to use the dial-in feature to connect to the MSC and prepare a cell site for maintenance:

1. From the Software's main menu, select **`Calibration/Utilities`**.
2. Select **`Dial In (External Modem)`**. The dial in screen is then displayed (see Figure 5-14).

Figure 5-14 Entering the Dial in Information for Automated Dial In



3. To specify the method to use when logging in, choose **Selected Login Option**.
   - ECP - enter through the Executive Cellular Processor.
   - ECP/CODE - enter through the Executive Cellular Processor and prepare to create and send a coded response.
   - OMP - enter through the Operations Maintenance Platform
   - OMP/CODE - enter through the Operations Maintenance Platform and prepare to create and send a coded response.
   - DK/OMP - use Data Kit to enter through the OMP
   - DK/ECP - use Data Kit to enter through the ECP
4. Scroll to **MSC phone number** and press the knob. Using the DATA keys, enter the phone number for the MSC to be dialed. Press **Enter** when the complete number has been entered.
5. Scroll to **Prompt 1 from MSC** and press the knob. This defines the initial response text that will be looked for from the MSC. In many cases this will be "login." Use the **Choices** menu to enter the response from your MSC. Scroll up and select **Done** when the entry has been made.
6. Scroll to **Response to prompt 1** and press the knob. Now enter the response that you would send to the MSC prompt defined in the previous step. In most cases, this would be your login name.
7. Repeat these steps to enter the MSC responses and commands to send from the Test Set. Typically, you can include the commands up to and including sending the TIpdunix command to put the site into the maintenance mode.
8. When finished with the command-response entries, press **k5** (**Return**).
9. If you made changes, you will be asked if you would like to save them to the SRAM memory card. Press **k1** (**Yes**). After the file is saved, you will be returned to the main menu.

NOTE The dial-in information is automatically saved to a file named aSIGN. You cannot use another file name, nor can you have more than one dial-in file on an SRAM card.

Running the Dial In Sequence:

Use the following steps to initiate the dial-in sequence (after it has been defined) in order to connect to the MSC and set up for maintenance:

1. Make sure that the serial connections to the modem have been made, that the modem is powered on, and that it is connected to the phone line. If you have already used the Laptop Emulator to connect to the MSC manually, you should not need to make any changes to the equipment setup.
2. From the Software's Main Menu, select **Calibration/Utilities**.
3. Select **Dial In (External Modem)**.
4. Send the dial-in sequence to the MSC.

- If the currently displayed entries are correct for dialing in to the MSC, press k1 (**Dial**) to dial in and login.
- To use Dial in settings saved on an SRAM memory card, insert the card and press k2 (**Load**). Press k1 (**Dial**) to dial in and login.

Once logged on to the MSC and in the maintenance mode, you can use the Laptop Emulator to send further commands to the MSC or exit the Laptop Emulator and begin automated testing using the Test Set.

To Logout Using the Terminal Emulator

After using the Terminal Emulator to dial in and login to the MSC to test, you should use the Terminal Emulator again to logout after testing.

1. Make sure that the serial connections to the modem have been made, that the modem is powered on, and that it is connected to the phone line.
2. From the Software's Main Menu, select **Calibration/Utilities**.
3. Select **Laptop Emulator**.
4. Select **Logout** or **OMP Logout** (if logged in through the OMP).
5. Press k5 (**Return**) to return to the Calibration/Utilities Menu.

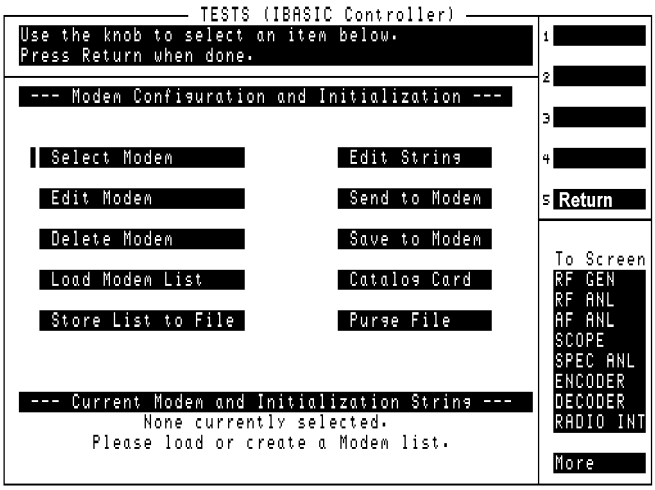
Modem Configuration and Initialization Menu

The Modem Configuration and Initialization menu is where you load, store, edit, delete, or create modem initialization files. This menu is accessed from the Main Menu by selecting **Printer/Serial Port Configuration**, and then selecting **Modem Configuration**.

After the modem initialization string is entered, it is sent to the modem to initialize it for communication with the MSC. Once the modem is initialized, you use the Laptop Emulator utility to send commands to the MSC to enter the OMP Craft Shell. After a command prompt is displayed for the Craft Shell, you can exit the laptop emulator and start automated testing.

Once the initialization string has proven to work correctly with your modem, you should store the initialization string to a file on an SRAM memory card (supplied with the Software) for later use. The **Store List to File** feature stores the modem in a file called “UMODEM”.

Figure 5-15 Modem Configuration and Initialization Screen



Getting Started With a New Modem

When you first start using the Software with a modem, you need to get the modem working and then save the modem's information for later use. This procedure is discussed in "Configuring and Initializing the External Modem" on page 38. The general steps are as follows:

1. Connect your modem to the Test Set. See "Connect the Modem to the Test Set" on page 28.
2. Access the Modem Configuration and Initialization menu.
3. Enter a modem name using the **Edit Modem** function.
4. Enter the modem's initialization string using the **Edit String** function.
5. Verify that the initialization string works correctly with the modem using the **Send to Modem** function. If no message is displayed after attempting initialization, the modem initialized properly.
   - If the modem initialized correctly, save the name and string to a file using the **Store List to File** function.
   - If the message **"Problem, modem not initialized"** is displayed, use the **Edit Modem** function to modify the initialization string. Select **Send to Modem** to test the new string. After getting the modem to accept the initialization string (the error message is not displayed after sending the string), save the name and string to a file using the **Store List to File** function.
6. Save the initialization string in the *modem* using the **Save to Modem** function. This eliminates the need to re-initialized the modem later.

Modem Configuration and Initialization Menu Functions

- **Select Modem** is used to select the modem you are using from a list of modems that you have stored. The modem name and initialization string are then listed at the bottom of the screen.
- **Edit Modem** is used to edit the name of the selected modem. Use this function whenever you need to create a new modem configuration.

  When you create a new modem configuration, save the configuration to a memory card using the **Store List to File** function. If not saved, the new configuration will be lost if a new program is loaded into the Test Set.
- **Delete Modem** is used to remove the current modem's settings from the Test Set's memory. Subsequent use of the **Select Modem** function shows that the modem you deleted is no longer shown on the modem list. A modem may be deleted from the list if you need to enter a name and initialization settings for an unlisted modem.

  If you removed a modem from the list in error, reload the modem list using the **Load Modem List** function.
- **Load Modem List** is used to load a list of modems from a memory card. You must first create the modem list and store it on an SRAM memory card (using the **Store List to File** function).
- **Store List to File** is used to store the list of modems currently loaded into the Test Set's memory onto a RAM memory card. The software automatically assigns the name "UMODEM" to the list.

  After a list has been created, the message **"Duplicate file name"** is displayed any time you try to re-save information to an existing modem configuration. The message warns you that you will overwrite the previous information. If you are editing the initialization string, select **Yes** (**k1**) to save the new information.
- **Edit String** is used to alter the initialization string for the currently selected modem.
- **Send to Modem** sends the initialization string to the modem. Serial communication settings to the modem must have already been configured (see "Configure the Serial Port" on page 36).
- **Save to Modem** stores the initialization string in the modem for future use.
- **Catalog Card** lists all of the files contained on the inserted memory card.
- **Purge File** removes the currently selected modem list from the inserted memory card (if the card is not write-protected).

Parameters List and Descriptions

The Software uses your entries in the Test Parameters screen to customize testing, specify serial communications settings, and configure an external modem.

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 113.

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 TX Power [0=no 1=on fail 2=always]
  - 3. GN Stop Test if results fail [0=no 1=yes]
  - 16. TDMA DCCH Equipped [0=No 1=yes]
  - 17. TDMA Number of Averages for Readings
  - 28. ZZZZ Test Demo Mode [0=normal 1=demo]
  - 29. TX Use 230 kHz BW on Data Dev [1=yes]
  - 30. GN MSC Command Speed [0=slow 1=fast]

- By loading the Software and selecting **`Parm Test Parameters`** on the main SOFTWARE MENU screen, you can change the settings 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 169 and "How to Save a Test Procedure" on page 175.

Parameter Names and Use

1. **Adjust TX 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 adjustment 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 155 and "Output Power Error" on page 155.

2. **GN Power Output [0=measured 1=specified]**

   This setting affects how output power test results are displayed.

   - If set to **0**, the measured output power is entered in the FCC short form when the Full Site Test (FCC) test or Single Radio Test is run. Also, when the TX Power Adjustment test is run, the center scale value on the meter is determined by the pass/fail limits.
   - If set to **1**, the value you specify for the radio in the frequency plan, or at the start of the Single Radio Test, is printed in the Output Power column of the FCC short form - not the measured value. The measured value is still printed in the long form. Also, when the TX Power Adjustment test is run, the center scale value is set to the value you enter for the **Specified Output Power** at the start of the test.

3. **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.

4. **LAP Baud Rate [valid test set range]**

   Enter the baud rate to use for communications between the laptop PC and the Test Set's serial port 9. 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.

5. **LAP 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 port 9. This number can be entered using the DATA keys. This setting must match the setting used by your laptop's communication software.

6. **LAP Flow Control [1=None 2=Xon**

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

   - **1** provides no flow control.
   - **2** uses Xon/Xoff flow control.

7. **LAP 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 Port 9. Enter the number value to indicate your desired setting as indicated below:

   Table 5-4Parity 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

8. **LAP 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 port 9.

9. **MDM Baud Rate [valid test set range]**

   Enter the baud rate used by your switch when communicating via a modem connected to the Test Set's SERIAL 10 port. Typical entries for this parameter are 2400 and 9600 baud. This number can be entered using the DATA keys.

10. **MDM Data Length [7 or 8]**

    Select either 7 or 8 bits for your serial communication data link to the MSC via modem from the Test Set's SERIAL 10 port. This number can be entered using the DATA keys.

11. **MDM Flow Control [1=None 2=Xon**

    Enter the type of data flow control for your serial communication data link between the modem and the Test Set's SERIAL 10 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.

12. **MDM Parity [0=0 1=1 2=none 3=even 4=odd]**

    Set to match your communication link to the MSC from the Test Set's SERIAL 10 port. Enter the number value to indicate your desired setting as indicated below:

    Table 5-5 Parity Settings for Modem to MSC Communication

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

13. **MDM Stop Length [1 or 2]**

    Enter the number of stop bits that matches your communication link with the MSC from the Test Set's SERIAL 10 port. You can choose 1 or 2 stop bits. Enter these values using the DATA keys.

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

    Enter the cell site number where you are testing.

15. **MSC ECP Number**

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

16. **TDMA DCCH Equipped [0=No 1=yes]**

Enter **0** if you are *not* testing a TDMA radio that uses a Digital Control CHannel (DCCH). Enter **1** if a DCCH is used.

NOTE This parameter must be set to **1** (one) to be able to specify the DCCH ID number for the specified antenna associated with the TDMA Digital Control Channel. See "Single Radio Test" on page 70.

17. **TDMA Number of Averages for Readings**

This parameter determines how many measurement samples are used when calculating the average value of TDMA measurements. Averaging is helpful when measurements fluctuate during a short period of time, causing an intermittent test point failure.

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 86.

19. **TX Coupling Factor [ANT 0]**

Enter the coupling factor for the TX Test port for this antenna.

20. **TX Coupling Factor [ANT 1]**

Enter the coupling factor for the TX Test port for this antenna.

21. **TX Coupling Factor [ANT 2]**

Enter the coupling factor for the TX Test port for this antenna.

22. **TX Coupling Factor [ANT 3]**

Enter the coupling factor for the TX Test port for this antenna.

23. **TX Coupling Factor [ANT 4]**

    Enter the coupling factor for the TX Test port for this antenna.

24. **TX Coupling Factor [ANT 5]**

    Enter the coupling factor for the TX Test port for this antenna.

25. **TX Coupling Factor [ANT 6]**

    Enter the coupling factor for the TX Test port for this antenna.

26. **TX Output Power**

    Enter the power level (in Watts) that should be transmitting at the TX Antenna port/foam jumper.

27. **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 90.

28. **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 113.

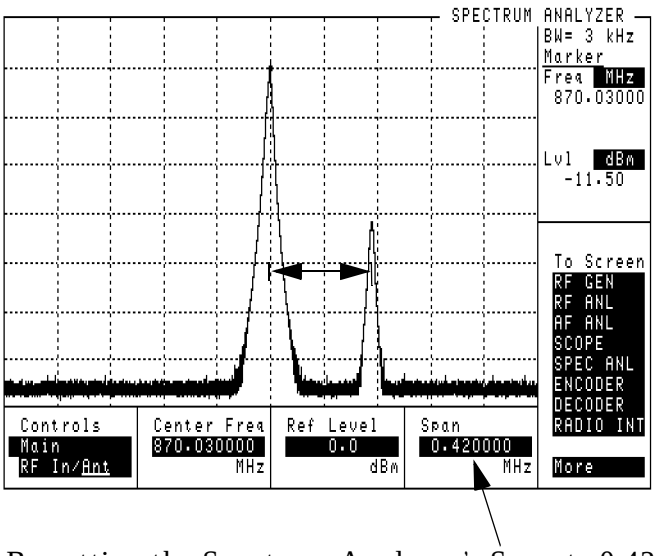
29. **TX Use 230 kHz BW on Data Dev [1=yes]**

    The Data Deviation test point in the Single Radio Test or Full Site Test can use either of the Test Set's IF filters: 30 kHz or 230 kHz. Setting the value to **1** (yes) causes the 230 kHz filter to be used; this is the default setting.

    When using the 230 kHz IF filter, the base station must not be transmitting another signal within seven channel spacings (210 kHz) above or below the signal being measured; otherwise the measurement will be in error. Figure 5-16 uses the Test Set's Spectrum Analyzer and delta marker functions to demonstrate how another signal may interfere with the measurement. (See the Test Set's *Reference Guide* for information on using the Spectrum Analyzer).

    It is preferable to use the 230 kHz filter when possible. However, if you cannot turn off a transmitter that is within 210 kHz of the signal you are measuring, set the value of this parameter to **0** to use the narrow (30 kHz) filter.

Figure 5-16Determining the Best IF Filter Setting



By setting the Spectrum Analyzer's Span to 0.420 MHz, you can see if any interfering signals exist on either side of the measured signal. If another signal is present, turn off the second signal or set parameter 29 to 0.

30. **GN MSC Command Speed [0=slow 1=fast]**

    This setting determines the speed that commands are sent from the Test Set to the MSC during automated testing.

    When using a laptop PC running the BTS Laptop Utility and an internal modem, set this value to **1** (fast) for quickest operation. When using an external modem connected to the Test Set, set this value to **0** (slow) for reliable operation.

31. **MSC BTS Type [1=Series II 2=M 3=MM**]

    Enter **1**, **2**, or **3** to specify the version of base station you are using: Series II, M, or MM (respectively).

32. **MSC Require CP INH at Ant Port [1=Yes]**

    Enter **1** to inhibit all call processing and take the entire cell site out of service. Enter **0** to only take the sector out of service that is associated with the specified antenna port you are testing at.

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 171 and "How to Save a Test Procedure" on page 175.

1. **AMPS Data Peak Deviation**

   The 1004 Hz test signal in the base station is sent to the data modulator in the radio and the resulting peak deviation is measured. Enter the upper and lower deviation limits in kHz.

2. **AMPS Deviation at -16 dBm Audio Level**

   The 1004 Hz test signal in the base station is set to a level of –16 dBm, and is then sent to the analog modulator in the radio. The resulting deviation is then measured. Enter the upper and lower deviation limits for this input signal level in kHz.

3. **AMPS Deviation at 0 dBm Audio Level**

   The 1004 Hz test signal in the base station is set to a level of 0 dBm, and is then sent to the analog modulator in the radio. The resulting deviation is then measured. Enter the upper deviation limit for this input signal level in kHz.

4. **AMPS Distortion at -16 dBm Audio Level**

   The 1004 Hz test signal in the base station is set to a level of –16 dBm, and is then sent to the analog modulator in the radio. The resulting distortion is then measured. Enter the upper distortion limit for this input signal level in percent (%).

5. **AMPS Frequency Error**

   The Test Set measures the transmitter’s center frequency and compares it to the ideal AMPS channel 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.

   Enter the upper and lower limits in Hz.

6. **AMPS Residual FM [15 Hz - 15 kHz]**

   With all modulation turned off, the Test Set measures the amount of FM present in the radio's carrier. Enter the upper and lower limits in Hz.

7. **AMPS SAT Frequency Error**

   This is the difference between the measured SAT frequency and the SAT frequency specified in the Base Station Configuration Menu.

   When testing *all* SAT frequencies, the Software changes the SAT frequency to measure each frequency in sequence, using the same frequency error limits for all measurements.

   Enter the upper and lower limits in Hz.

8. **AMPS SAT Peak Deviation**

   The peak deviation for the SAT is measured with all other modulation turned off. Enter the upper and lower limits in Hz.

9. **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.

   Enter both limits in dB.

10. **Output Power Error**

    The previous limit setting (**Output Power Adjustment Error**) controlled the adjustment diagram in power meter use. These values (Output Power Error) determine whether or not the power measurement made in automated testing meets specifications. If you set **Output Power Error** limits of ±2 dB, these 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.

Enter both limits in dB.

11. **TDMA Adjacent Channel Power**

    This is the maximum amount of power that gets inadvertently transmitted one channel spacing above and one channel spacing below the intended transmitted channel.

    For example, if the transmitter is supposed to be transmitting at 850.030 MHz, and the channels are 30 kHz apart, the levels at 850 MHz and 850.060 MHz are measured and compared to the level of the intended channel. The limit is entered in dB, relative the to level of the intended transmitted channel's signal.

    Enter the upper limit only.

12. **TDMA Error Vector Magnitude**

    Enter the maximum allowed error vector magnitude. This value typically indicates the quality, or balance, of the IQ modulator in the transmitter.

    Enter the upper limit only.

13. **TDMA First Alternate Channel Power**

    This is the maximum amount of power that gets inadvertently transmitted two channel spacings above and two channel spacings below the intended transmitted channel. The limit is entered in dB, relative the to level of the intended transmitted channel's signal. See specification 11 - TDMA Adjacent Channel Power.

    Enter the upper limit only (in dB).

14. **TDMA Frequency Error**

    The Test Set measures the transmitter's center frequency and compares it to the ideal TDMA channel 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.

    Enter the upper and lower limits in Hz.

15. **TDMA Origin Offset**

    This is a measure of how close the measured IQ modulation origin point is relative an ideal reference origin. Excessive origin offset may indicate an unbalanced IQ modulator in the transmitter.

    Enter the upper limit only (in dB).

16. **TDMA Second Alternate Absolute Power**

This is the amount of power measured three channel spacings above and three channel spacings below the intended transmitted channel. Unlike the adjacent channel power measurements where the power is measured *relative* to the transmitted power (in dB), this measurement measures the *absolute* power (in dBm) at frequencies 90 kHz above and below the transmitted signal.

Enter the upper limit only (in dBm).

17. **TDMA Second Alternate Channel Power**

This is the maximum amount of power that gets inadvertently transmitted three channel spacings (90 kHz) above and three channel spacings below the intended transmitted channel. The limit is entered in dB, relative the to level of the intended transmitted channel's signal. See specification 11 - TDMA Adjacent Channel Power.

Enter the upper limit only (in dB).

Testing without MSC Control

Chapter 4, "Performing AMPS/TDMA Tests," on page 59, lists the steps for fully automated testing, using the Software to control the base station. The steps of that chapter use an internal modem in a PC, or an external modem connected to the Test Set, to control the cell site via the MSC.

If you *have no modem connection to the MSC*, the following considerations apply:

- The Full Site Test (FCC) cannot be run. This test only works when a modem is connected to control the cell site.
- The **Send Control Commands to MSC** field is listed with other fields at the start of the Single Radio Test, TX Power Adjustment test, and Spectrum Analyzer test. Make sure this field is set to **NO** to prevent the Test Set from trying to send control commands to the MSC.
- At the start of each test sequence, prompts will appear above the connection diagram telling you verify transmitter operation. You must control the transmitter signal manually when prompted (you will probably need an assistant at the MSC to control the site and remove the radio being tested from service).

Printing the FCC Title Page

After entering the information on the Base Station Configuration screen, you can print a title page that indicates the testing conditions used. This provides a record for later use when comparing test results and conditions for each cell site.

To print the title page:

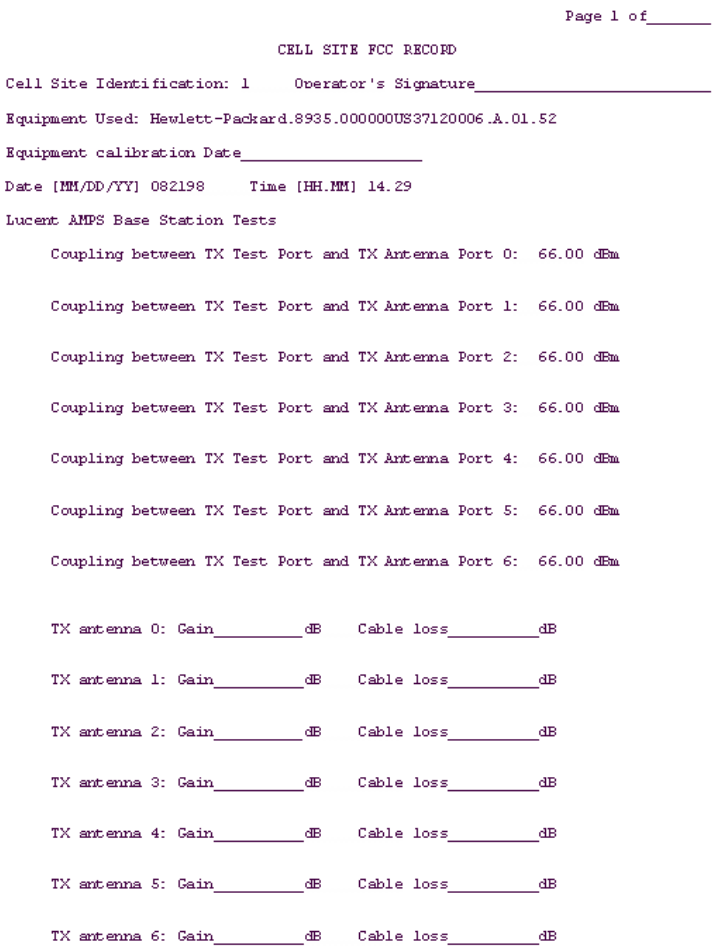
Step 1. Load and run the Software.

Step 2. Connect a printer to the Test Set and configure the Software to print to that printer. See "Data Collection to a Printer" on page 192.

Step 3. From the Software's Main Menu, select **`Calibration/Utilities`**.

Step 4. Select **`Print FCC Title Page`**.

Figure 5-17 FCC Title Page Printout



Page 1 of_____

CELL SITE FCC RECORD

Cell Site Identification: 1 Operator's Signature_____

Equipment Used: Hewlett-Packard.8935.000000US37120006.A.01.52

Equipment calibration Date_____

Date [MM/DD/YY] 082198 Time [HH.MM] 14.29

Lucent AMPS Base Station Tests

Coupling between TX Test Port and TX Antenna Port 0: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 1: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 2: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 3: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 4: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 5: 66.00 dBm

Coupling between TX Test Port and TX Antenna Port 6: 66.00 dBm

TX antenna 0: Gain_____dB Cable loss_____dB

TX antenna 1: Gain_____dB Cable loss_____dB

TX antenna 2: Gain_____dB Cable loss_____dB

TX antenna 3: Gain_____dB Cable loss_____dB

TX antenna 4: Gain_____dB Cable loss_____dB

TX antenna 5: Gain_____dB Cable loss_____dB

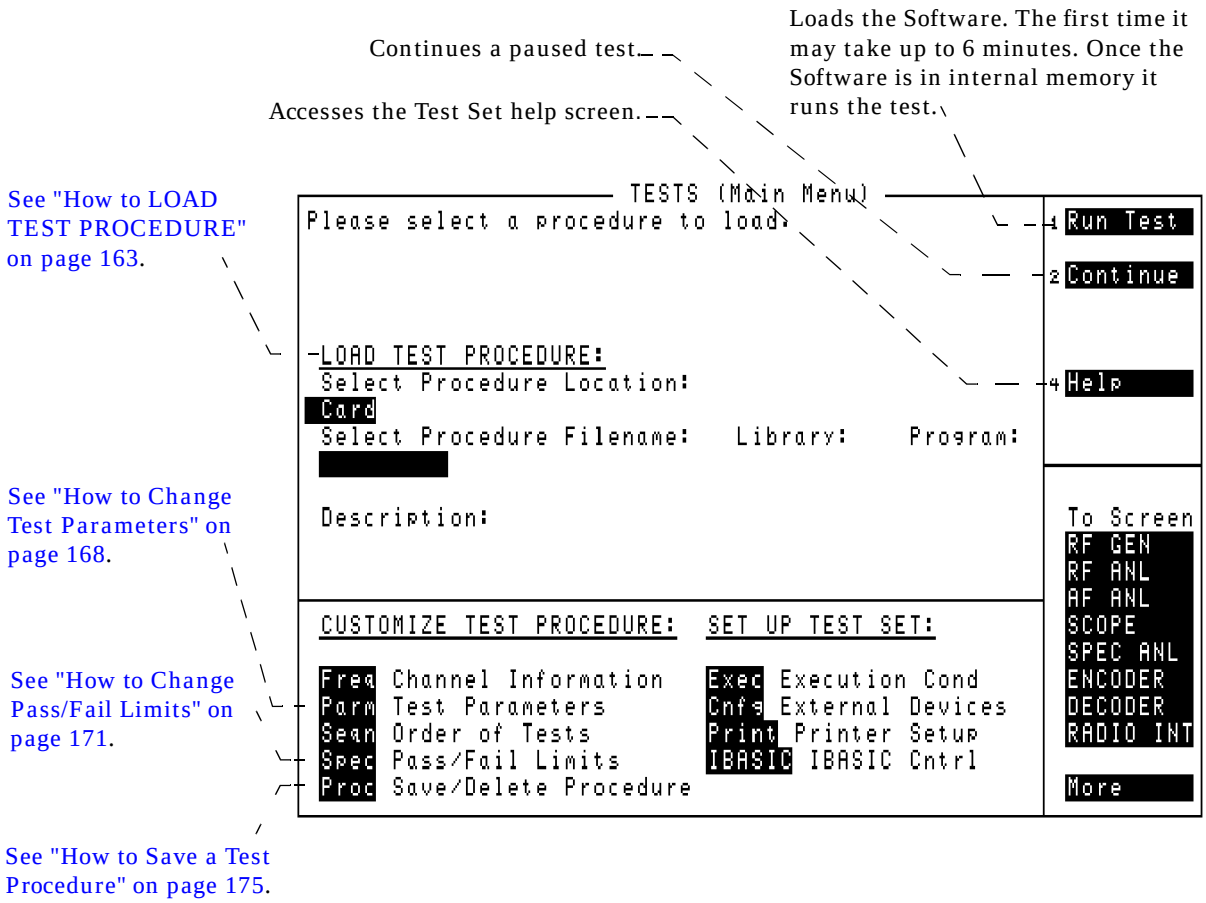
TX antenna 6: Gain_____dB Cable loss_____dB

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

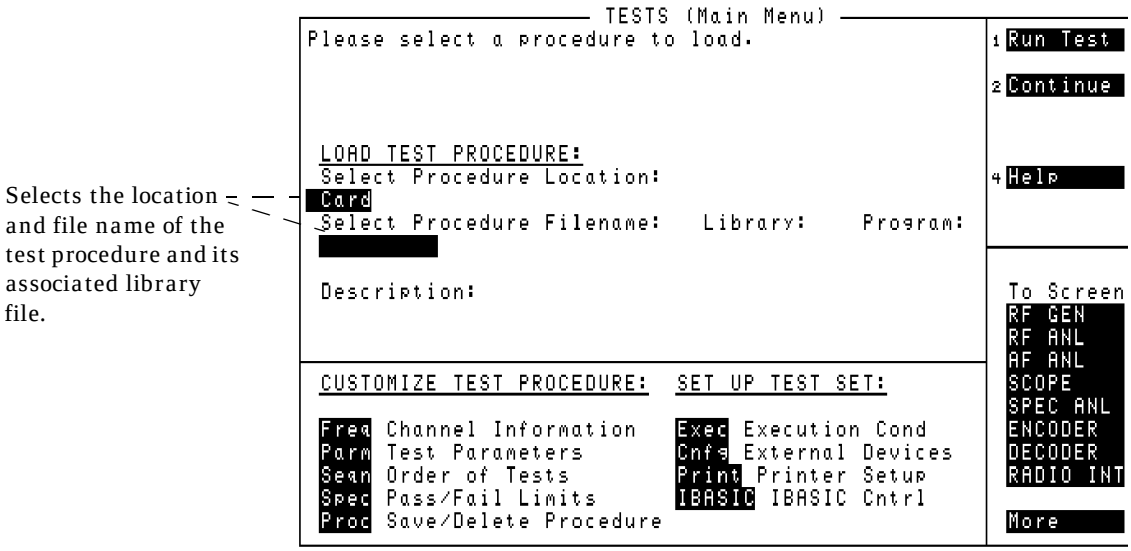
Figure 6-1 Test Subsystem



Pressing the front panel **TESTS** key will display the TESTS (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

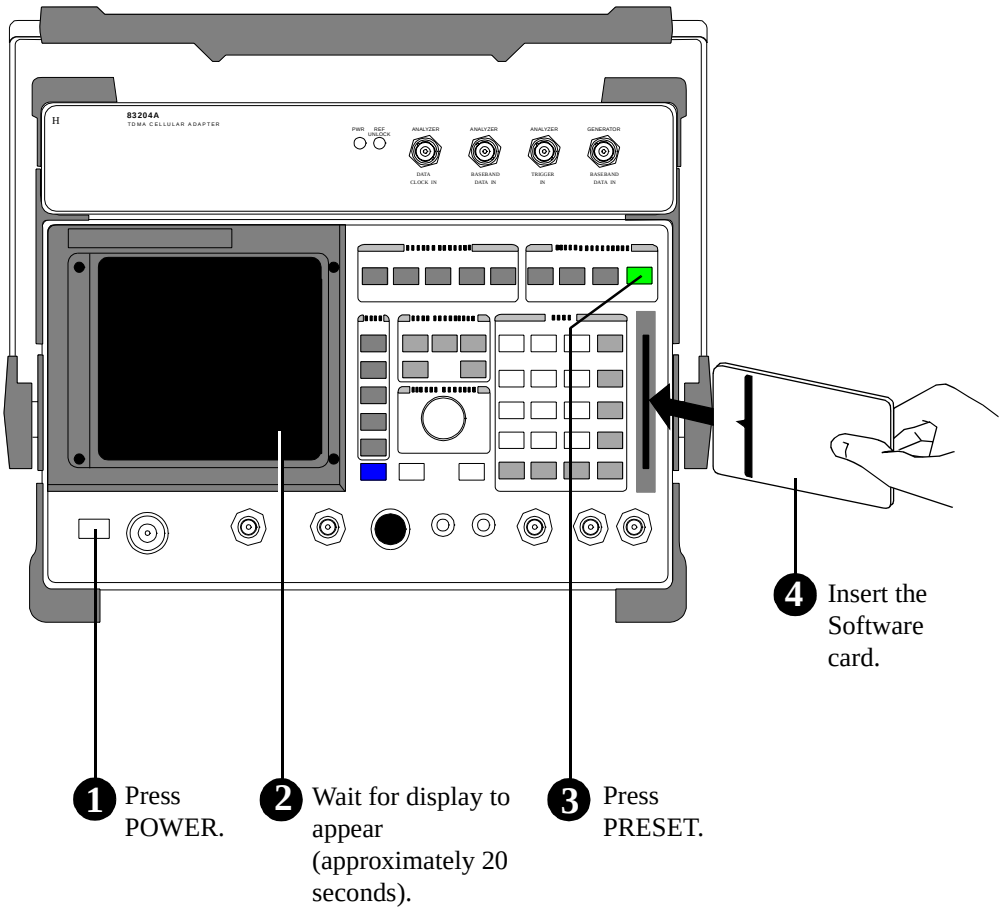
See "Troubleshooting the Software Installation" on page 166 for some hints to help debug any problems you may have during the installation of the Software.

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

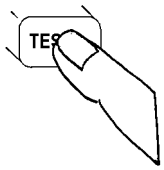
Figure 6-3 Loading the Software Card



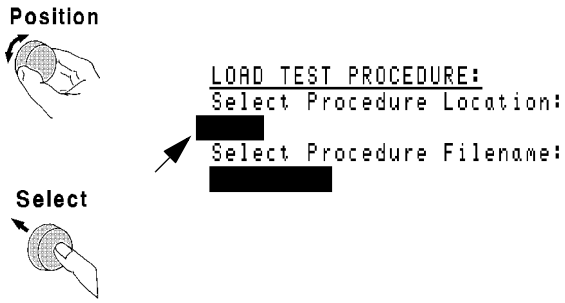
Continued on the following page

Figure 6-4 Selecting a Procedure

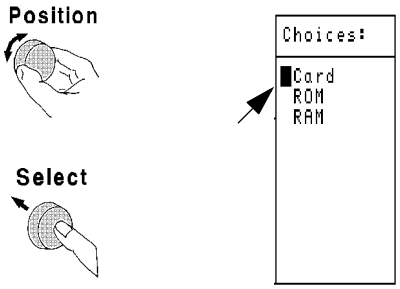
5 Press the **TESTS** key to display the **TESTS (Main Menu)** screen.



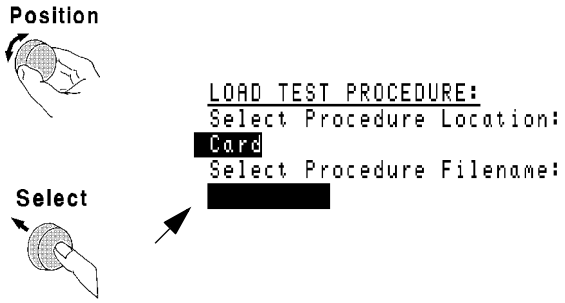
6 Position the cursor at **Select Procedure Location:** and select it.



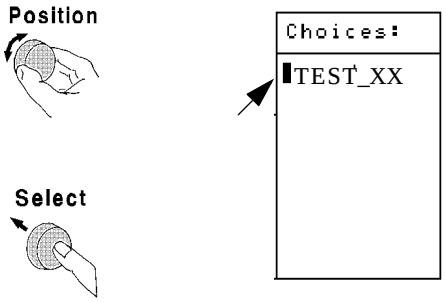
7 Position the cursor at **Card** and select it.



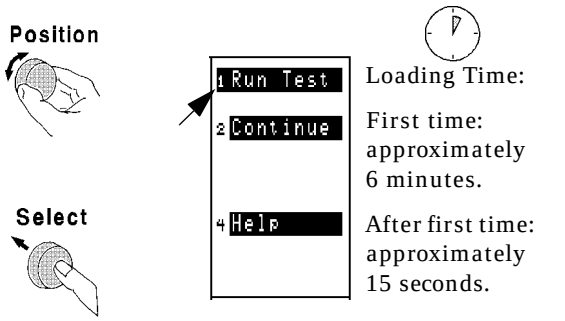
8 Position the cursor at **Select Procedure Filename:** and select it.



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:

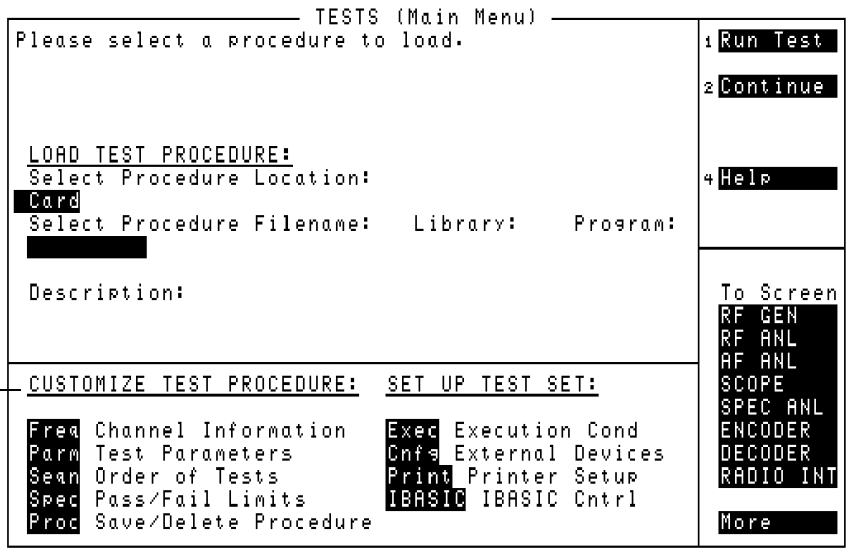
- Is the power on?
- Is the memory card inserted in the right direction?
- Is the memory card firmly seated in the slot? It should slide in loosely, then must be firmly pushed in to make proper contact.
- Did you get to the TESTS (Main Menu) screen? Pressing **Preset** should take you to the TX TEST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



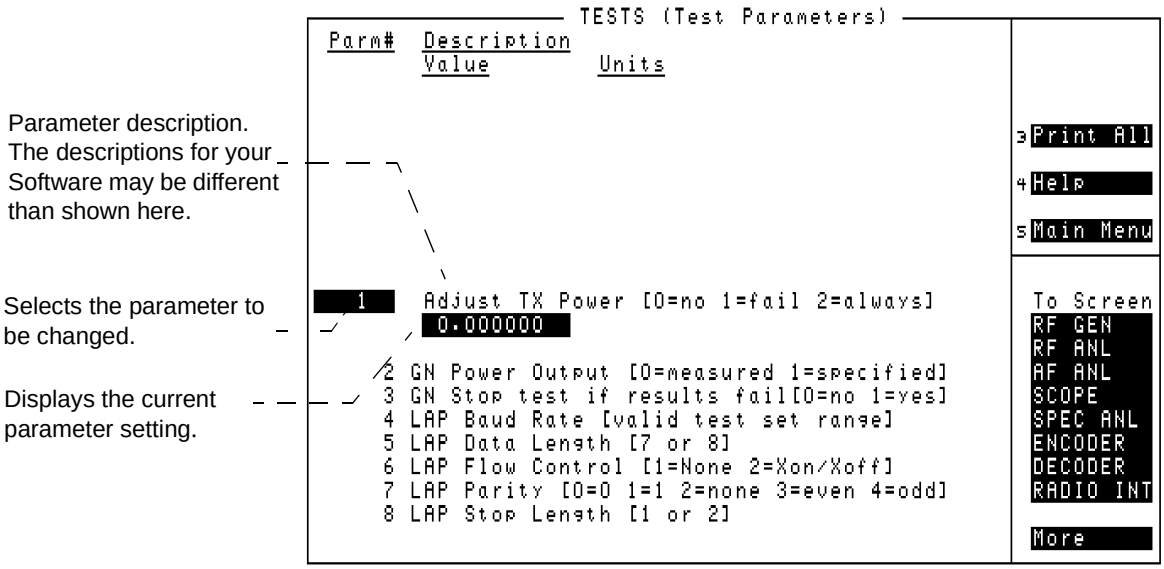
The fields listed under CUSTOMIZE TEST PROCEDURE are used to customize the software for various testing needs.

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 174.

How to Change Test Parameters

Figure 6-6 TESTS (Test Parameters) screen



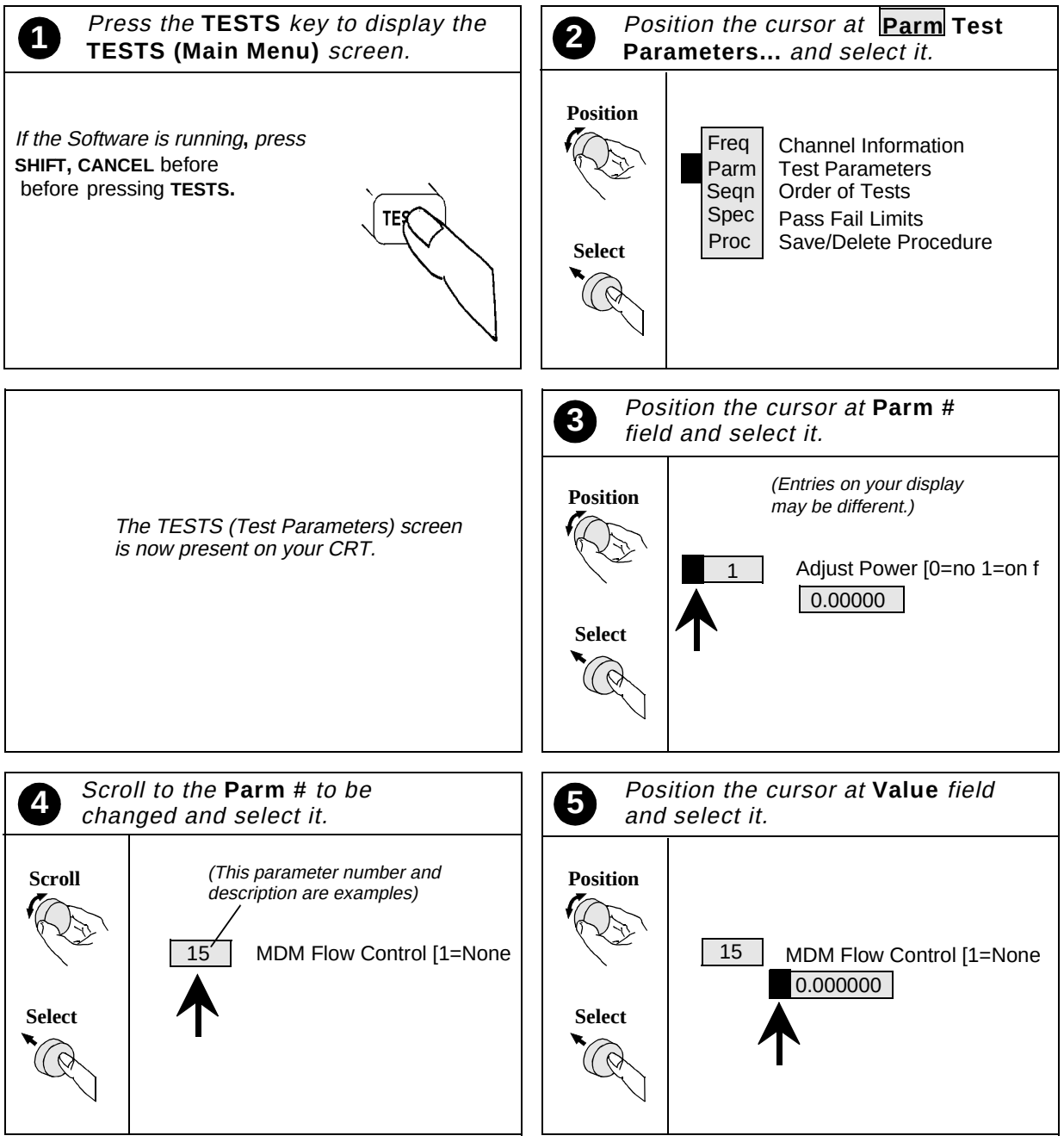
NOTE The TESTS (Test Parameters) screen may not be used in your particular Software package or some fields may not be present depending on the Software application. The message “Access to secure test information denied” is displayed if the screen is not supported in your current Software package.

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 174.

How to Change the Test Parameters and Conditions

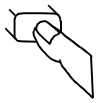
Figure 6-7 Procedure for Changing Parameters



Continue on next page

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

Select

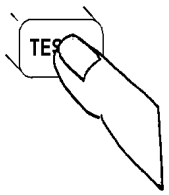


Select

15 MDM Flow Control [1=None

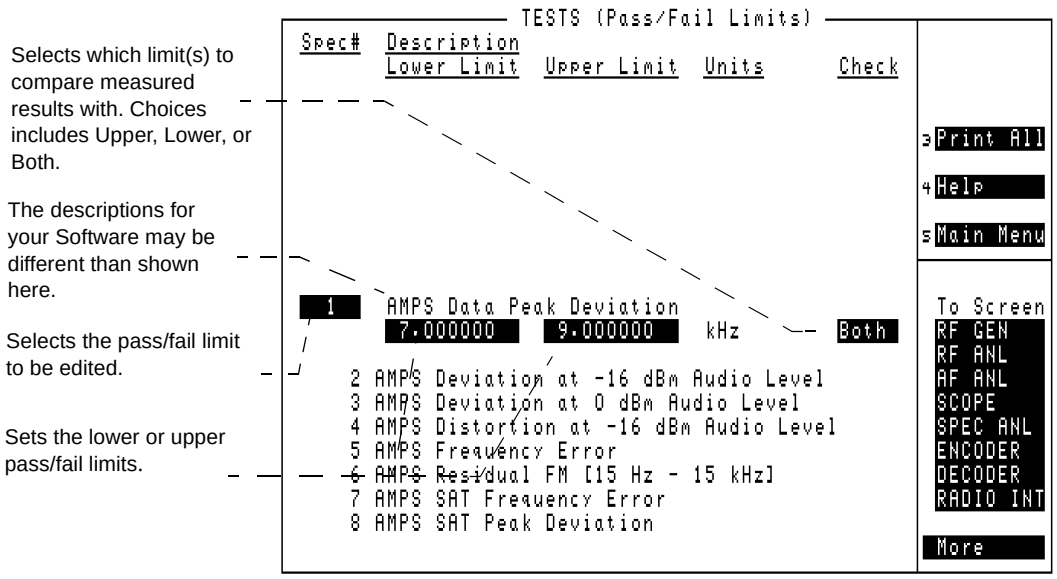
1.000000

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 174 to save your new pass/fail limits.

How to Change Spec Pass/Fail Limits

Figure 6-9 Procedure for Setting Pass/Fail Limits

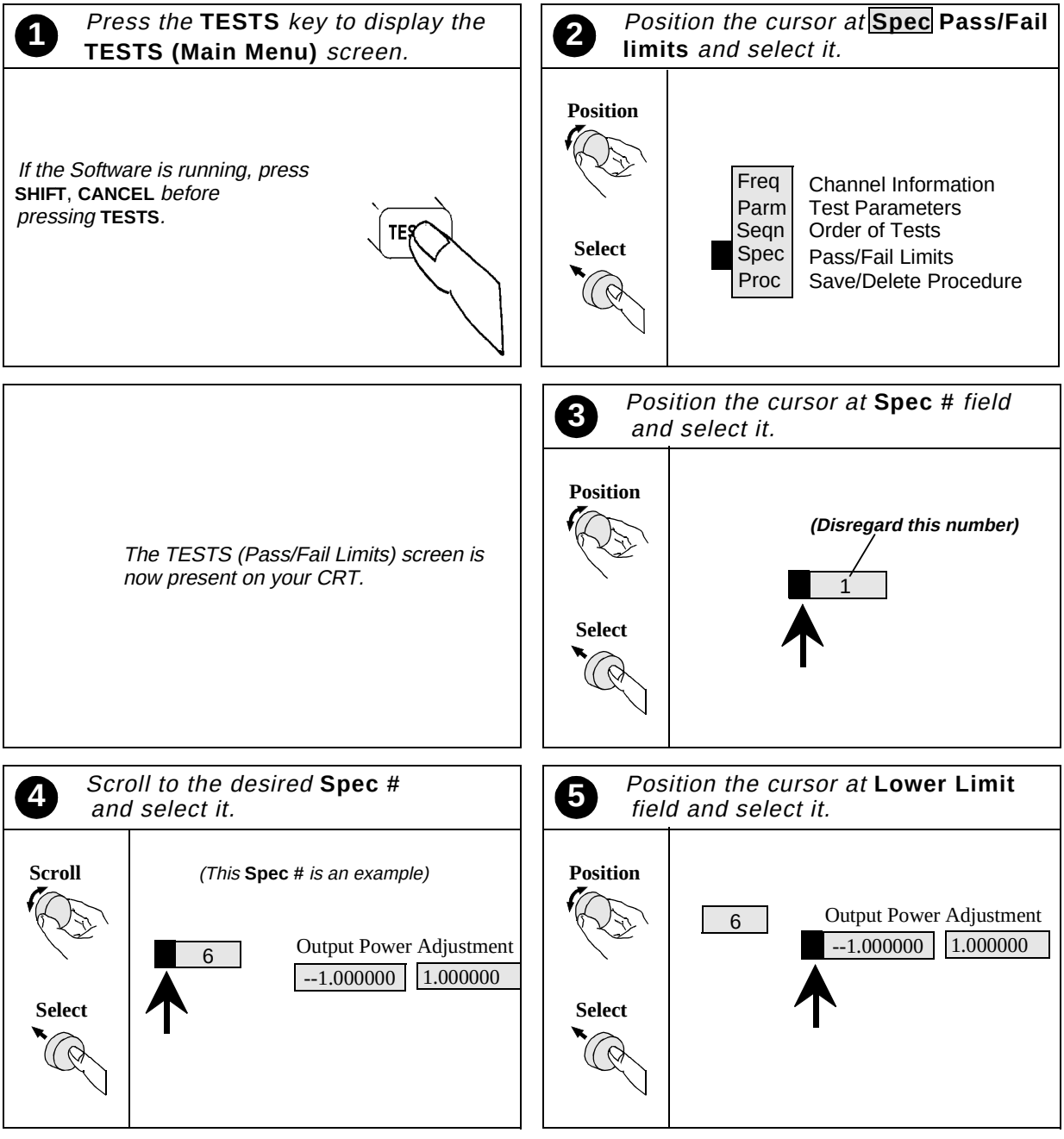


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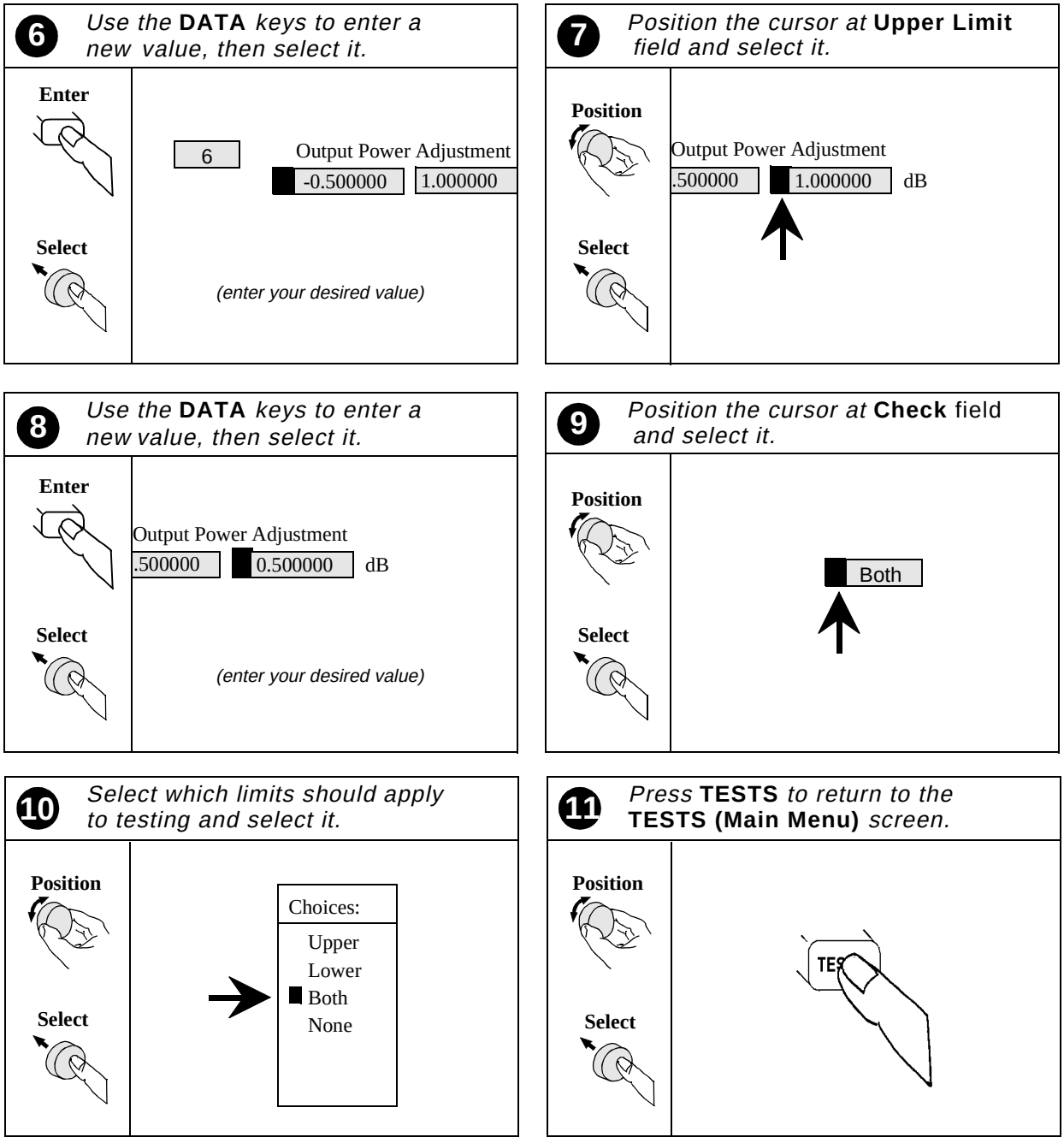
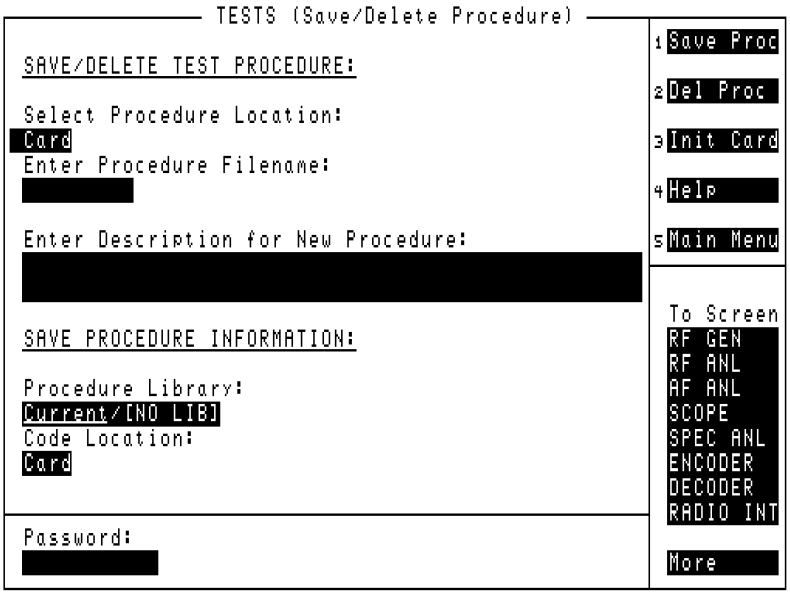
Figure 6-10 Procedure for setting pass/fail limits



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.

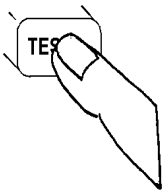
How to Save a Test Procedure

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.*

Position

Select

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

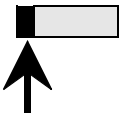
The TESTS (Save/Delete Procedure) screen is now on your Test Set display.

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

Position

Select

Select Procedure Location:



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

Position

Select

Choices:
- Card
- RAM
- Disk

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

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

For detailed memory card initialization instructions
See "Initializing a memory card" on page 202

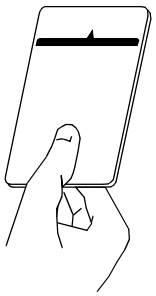


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Figure 6-13 How to Save a Test Procedure

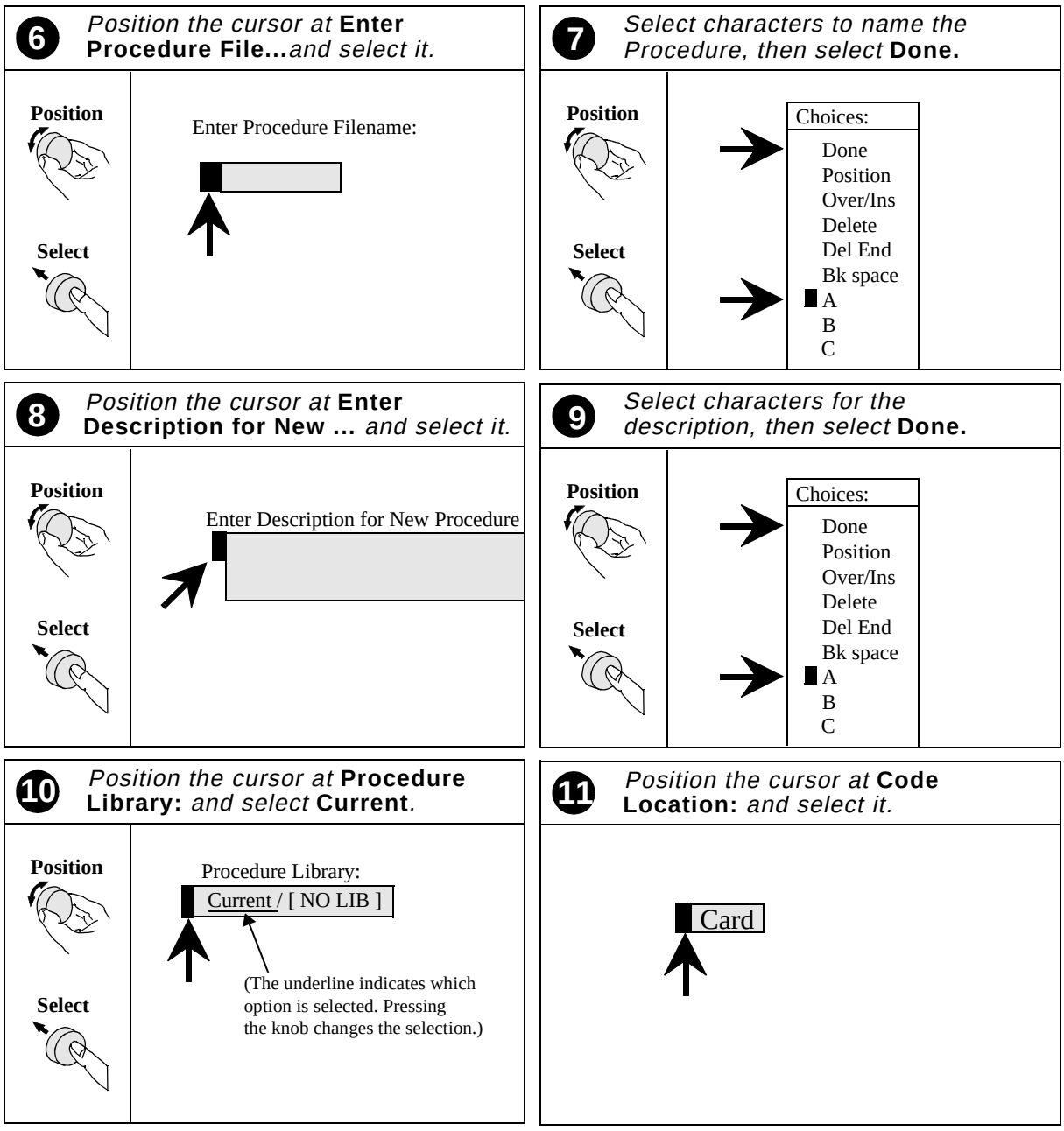

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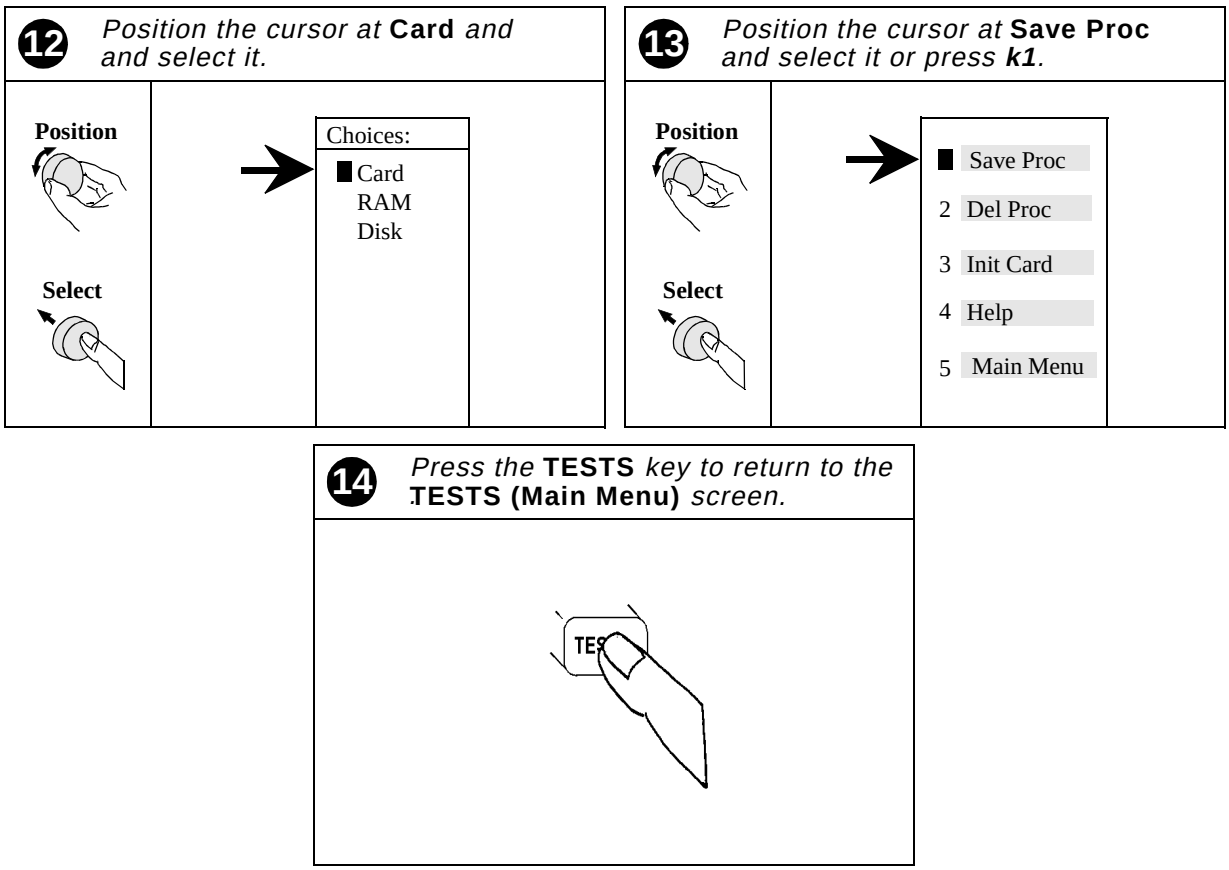
Figure 6-14 How to Save a Test Procedure



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 and logging.

To find out more on this subject see:

- Data Collection
  - See "Data Collection to a PC (Not Using the BTS Laptop Utilities)" on page 181.
  - See "Configuring Data Collection to a memory card" on page 186.
  - See "Transferring Data to a Printer via the Serial Port:" on page 187.
  - See "Transferring Data to a PC via the Serial Port:" on page 189.
  - See “Data Collection to a Printer” on page 192.
- Logging
  - See “Logging to a PC” on page 195.
  - See “Logging to a Printer” on page 200.

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 181 or "Configuring Data Collection to a memory card" on page 186.

NOTE **BTS Laptop Utilities and Data Collection**

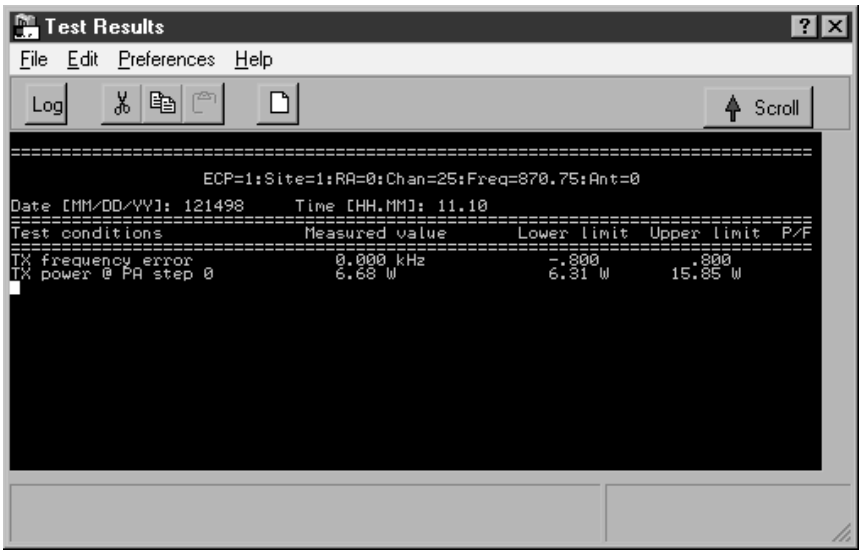
If you enable the use of the BTS Laptop Utilities on the Printer/Serial Port Configuration Menu, data collection and printing from the Test Set are disabled. To collect test data, use the Test Results window logging feature in the laptop utilities. To print the collected data, connect a serial printer 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 "Using an Internal Modem and the 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]

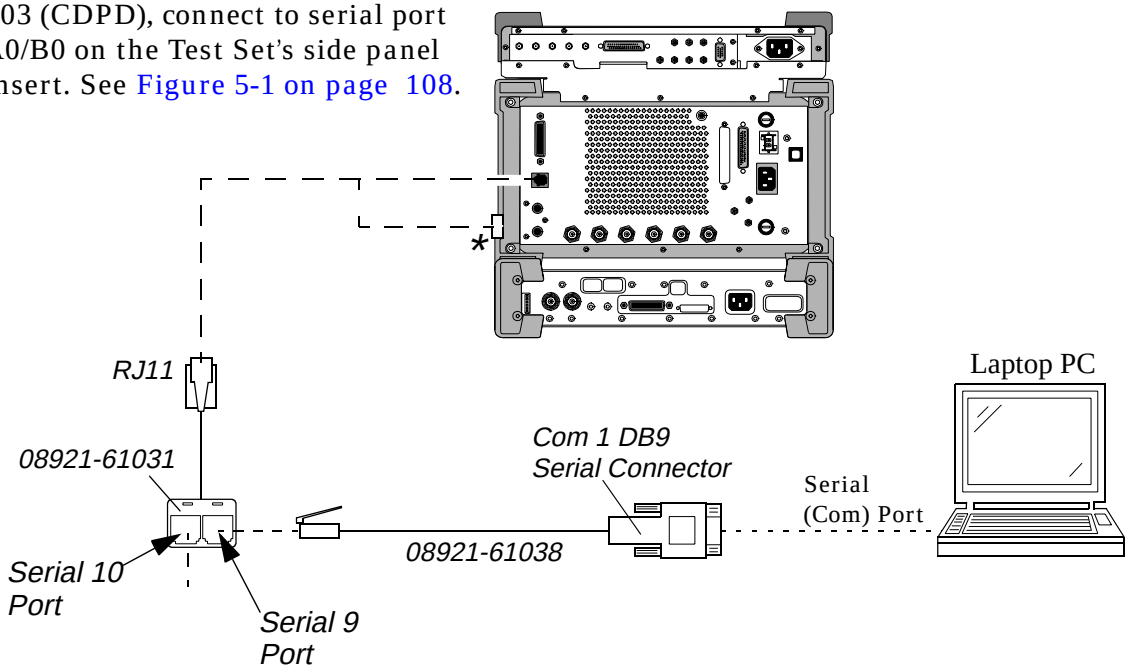
To collect data to a PC you must meet the requirements listed below.

- 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.

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 108.



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.

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.

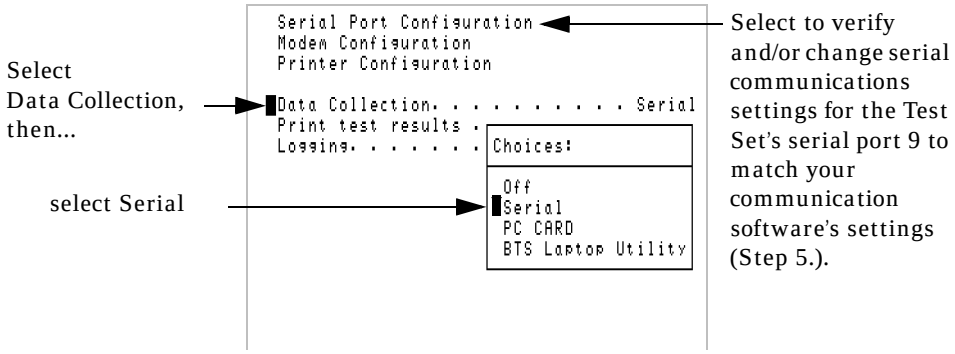
Step 2. Press **k1** (**Run Test**) to start the Software.

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 163 for details.

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

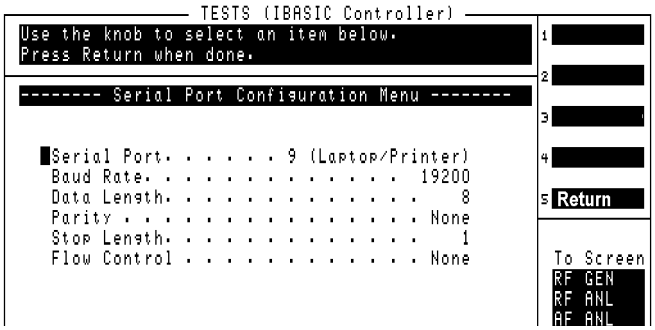
Step 4. Select **Data Collection**, then select **Serial** from the **Choices:** displayed.

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.

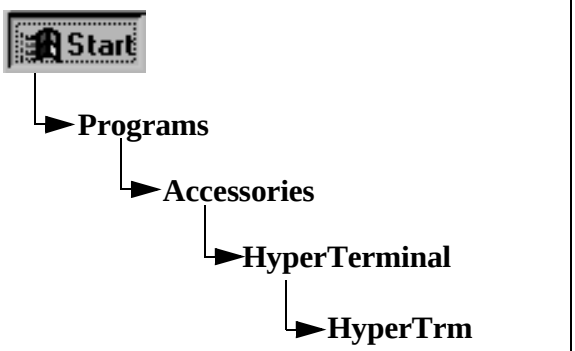
NOTE The following instructions apply to both Windows 95 and Windows NT. However, different versions of Windows may implement the HyperTerminal program differently.

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.

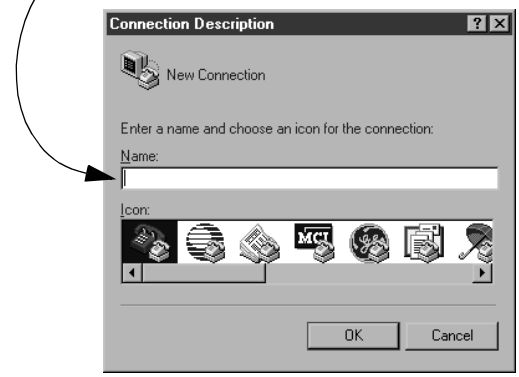
1. Microsoft is a U.S. registered trademark of Microsoft Corp.
2. Windows is a U.S. registered trademark of Microsoft Corp.
3. Copyright Hilgraeve, Inc. USA

Figure 6-19 Configuring the HyperTerminal Program for Data Collection

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

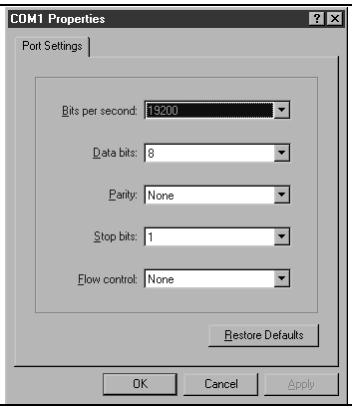


2 Enter a name for the terminal setup to use to capture test results.

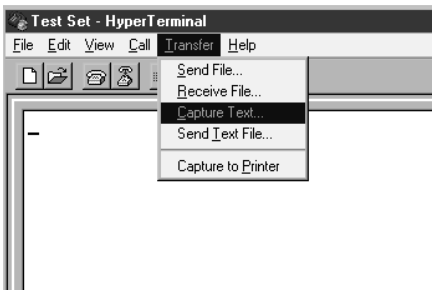


3 Select the serial port the PC will use to communicate with the Test Set.

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.

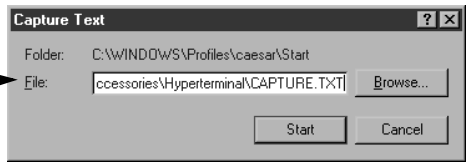
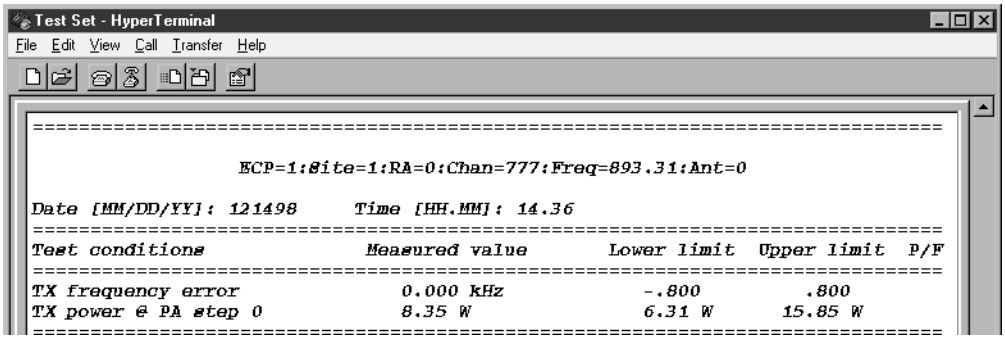


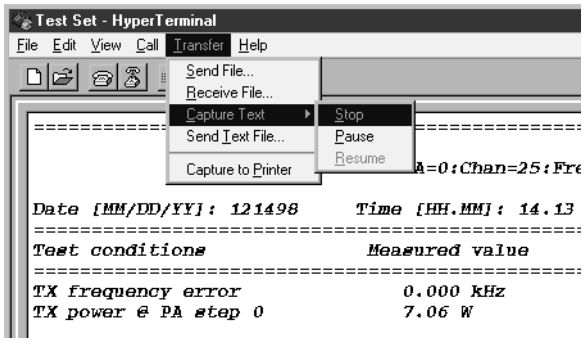
Figure 6-20 Configuring the HyperTerminal Program for Data Collection (continued)

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 187 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.

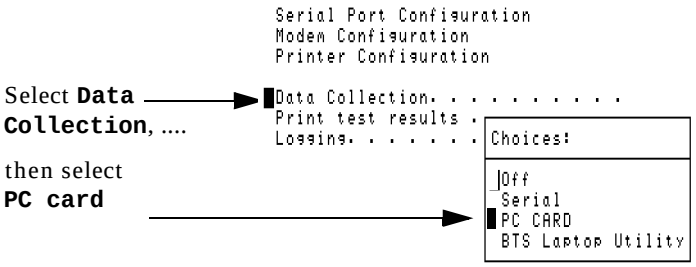
The Software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 163 for details.

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 202

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 192.)

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 k1(**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 163.

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 181.)

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 183.)

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 163.

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.

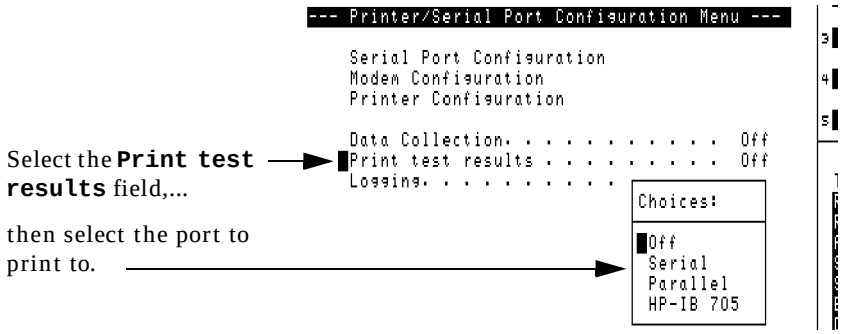
The software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 163 for details.

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** and **Logging** fields are 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 108.

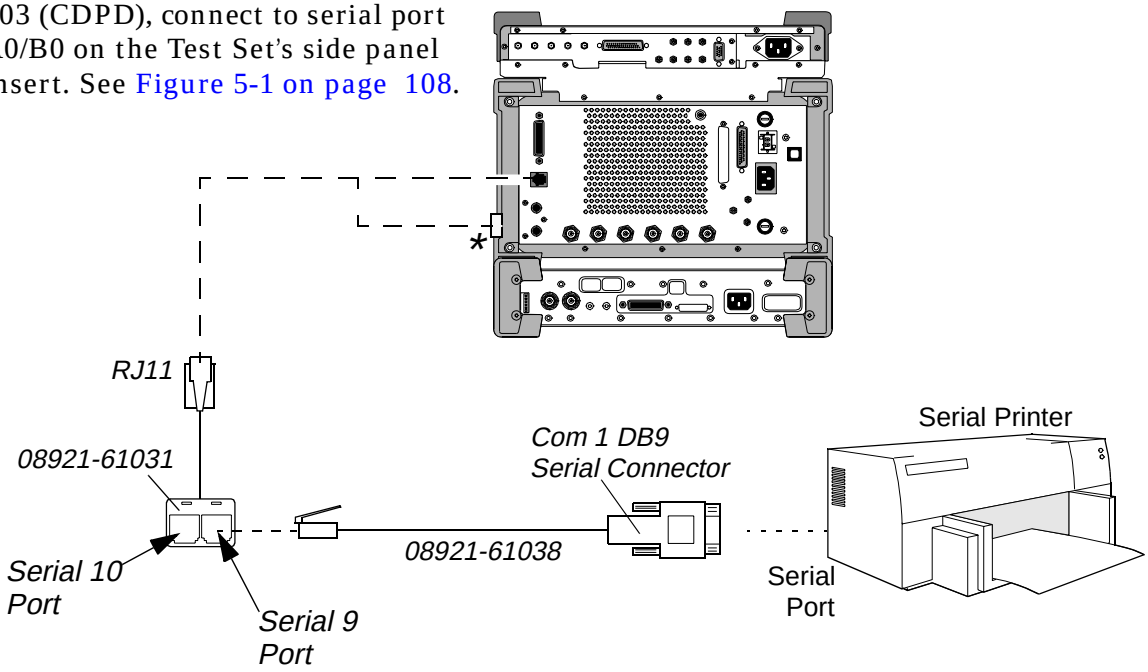


Figure 6-24 Parallel Printer Connections

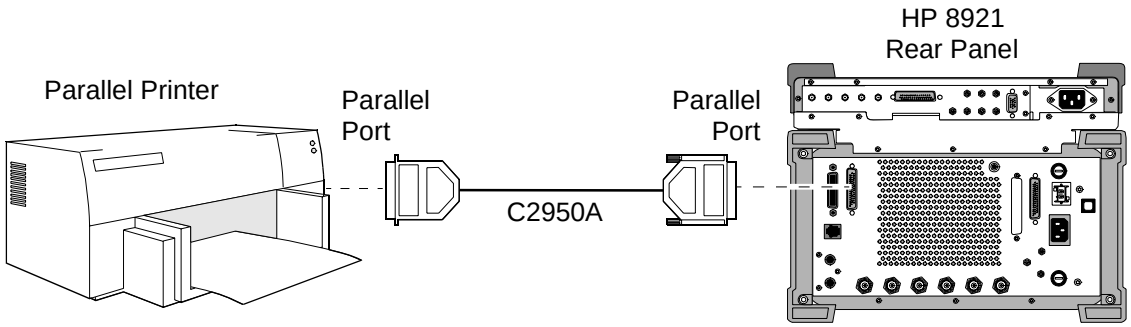
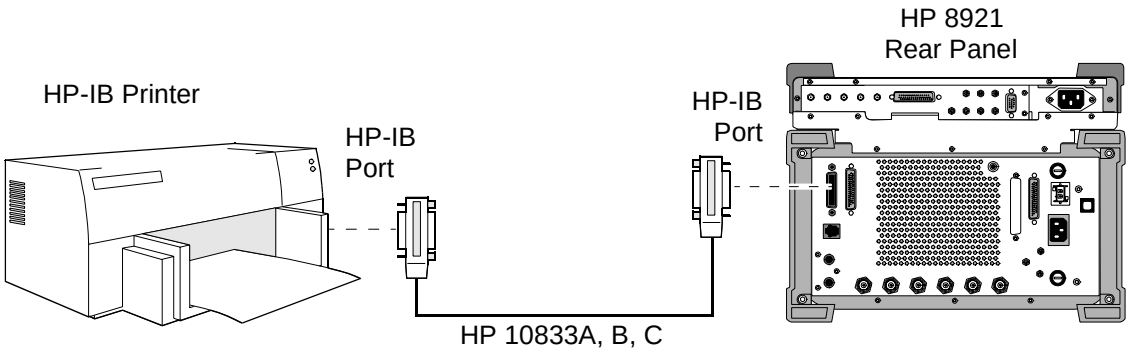


Figure 6-25 HP-IB Printer Connections



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.

Logging

The Software has a logging mode that will display the commands being sent between the Test Set and the base station or MSC. This mode can be useful if you suspect communications problems between the Test Set and the base station. Once enabled, the logging mode will display commands from the Test Set along with the corresponding responses from the base station.

Commands can be printed on a serial, parallel, or HP-IB printer, or sent to the Test Set's serial port 9 and recorded on a PC using a communications software package. You can also use the BTS Laptop Utilities to display and save the commands in a file using the Switch Terminal window.

NOTE To use the BTS Laptop Utilities to log commands between the MSC and the Test Set, the **`Data Collection`** field on the Printer/Serial Port Configuration Menu must be set to **`BTS Laptop Utility`**.

Doing this disables printing directly from the Test Set for logging or data collection.

Logging to a PC

A variety of devices can log commands directly to a PC communications program through the Test Set's serial port 9. A terminal emulator can display the commands or they can be written directly to a file. An HP Palmtop computer, PC, laptop, or terminal can be used. Examples of terminal emulator programs are Microsoft Windows Terminal, or ProComm.

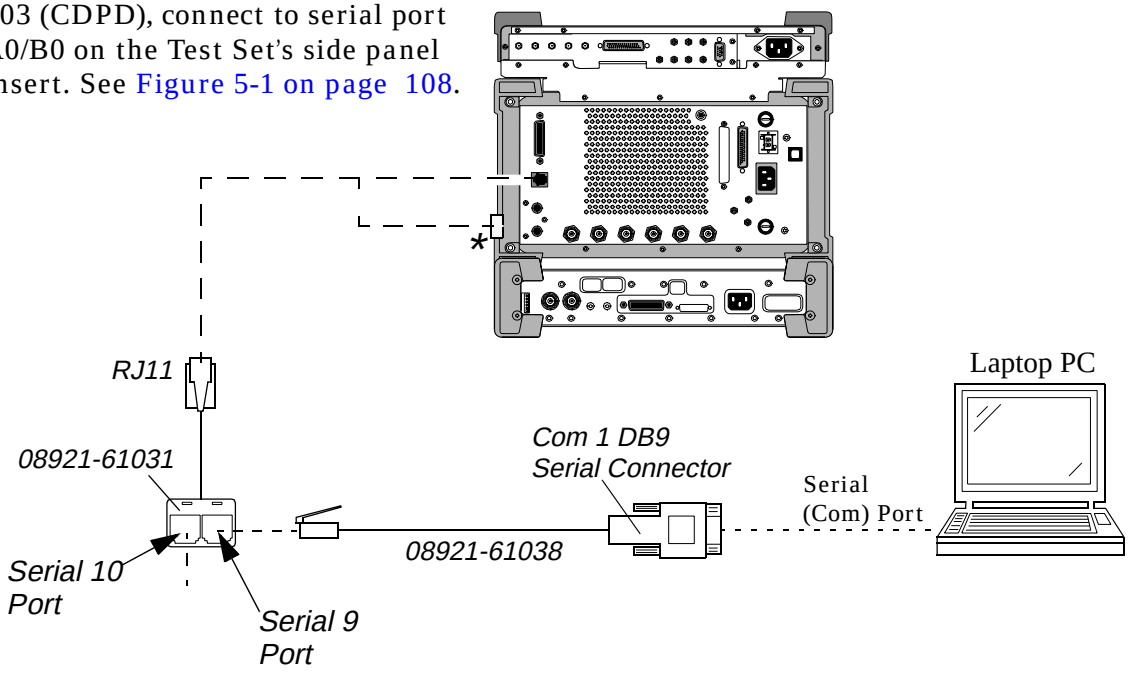
To log to a PC you must meet the requirements listed:

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

Test Set Connections to a PC

Figure 6-26 Serial Port 9 Connection From the Test Set to a 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 108.



Set up the Test Set for Logging to a PC

To log communications to a PC, you will need to turn on logging within 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.

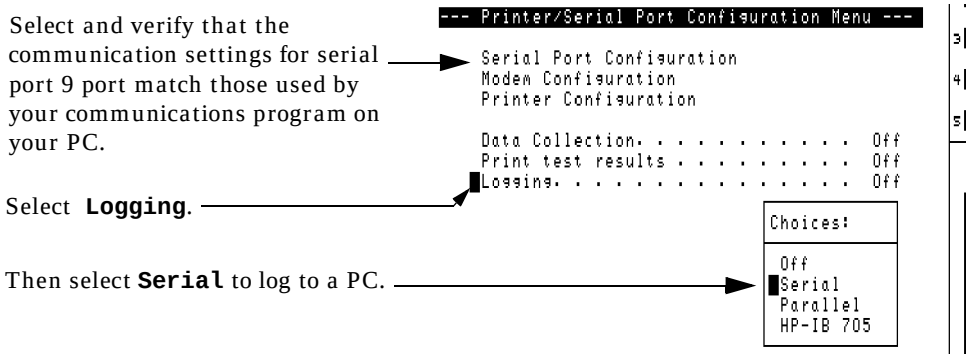
The Software's Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 163 for details.

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

Step 4. Select the **Logging** field, then select **Serial** from the **Choices:** displayed.

NOTE If the **Print test results** and **Logging** fields are 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 6-27 Logging to a PC



Step 5. Start your PC terminal program. See Setting Up Your PC for Logging.

Step 6. Select **Serial Port Configuration**.

Check that the communications parameters match those of the terminal program you are running.

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

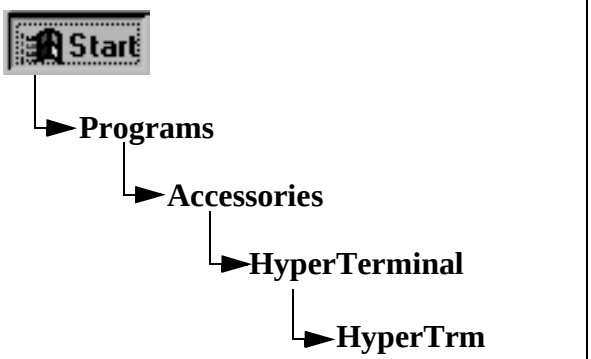
The Test Set will now log communications between the MSC and the Test Set to a PC until you turn off logging.

Setting Up Your PC for Logging

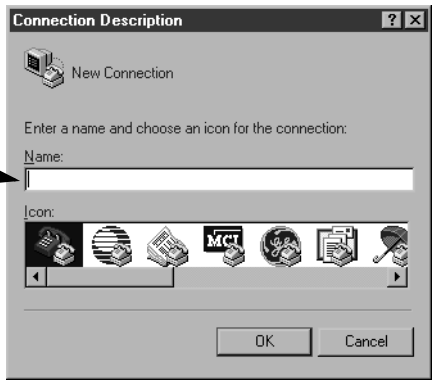
Figure 6-28 and Figure 6-29 describe how to set Windows Hyperterminal software for logging. You may need to refer to your software manuals to perform this task with other terminal/communications programs.

Figure 6-28 Configuring the HyperTerminal Program for Logging

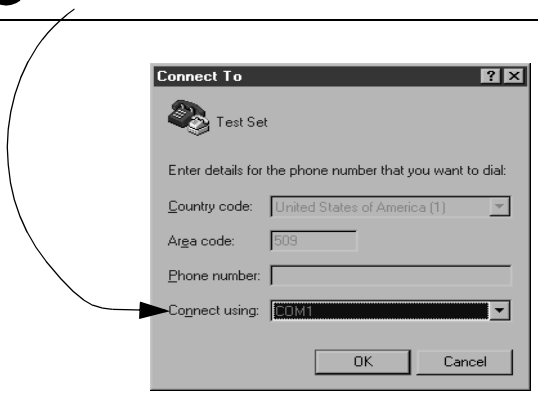
1 Start the HyperTerminal program in Windows 95 (or Windows NT).



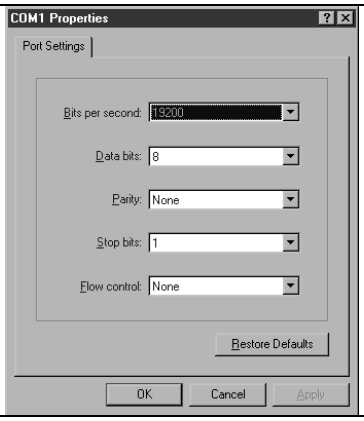
2 Enter a name for the terminal setup used for logging (or data collection).



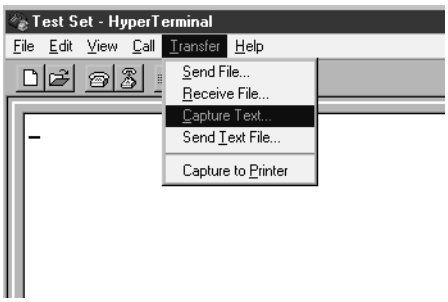
3 Select the serial port the PC will use to communicate with the Test Set.



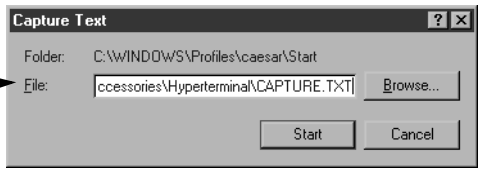
4 Set the terminal COM port settings to match the Test Set's port 9 settings.



5 To save logged commands, select **`Transfer`**, then select **`Capture Text...`** If you just want to view commands (without saving them) go to **`step 7`**.



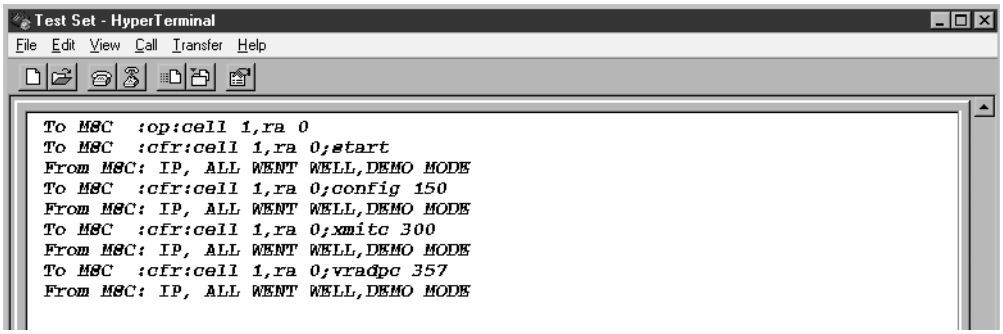
6 Enter a filename to use to save the test results to.



Continue on next page

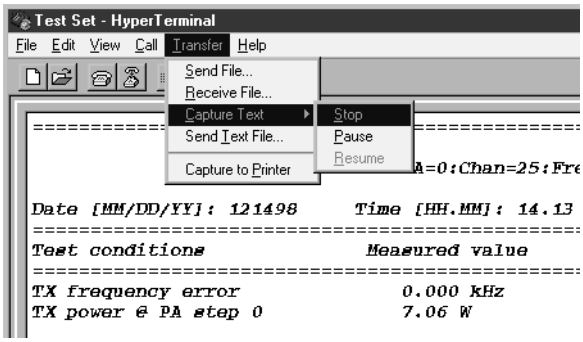
Figure 6-29 Configuring the HyperTerminal Program for Logging (continued)

7 Start testing your radio. The test results appear in the terminal window. The example below was created with the Software in demo mode.



8 If you are saving logged commands, and you want to temporarily stop saving them, select **Transfer**, **Capture Text**, **Pause.** Select **Transfer**, **Capture Text**, **Resume** to continue collecting test data.

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



Using HyperTerminal for logging in the future-

The next time you want to log commands, 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.

Logging to a Printer

A printer can be used to create a hard copy of the commands being sent between the Test Set and the MSC.

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

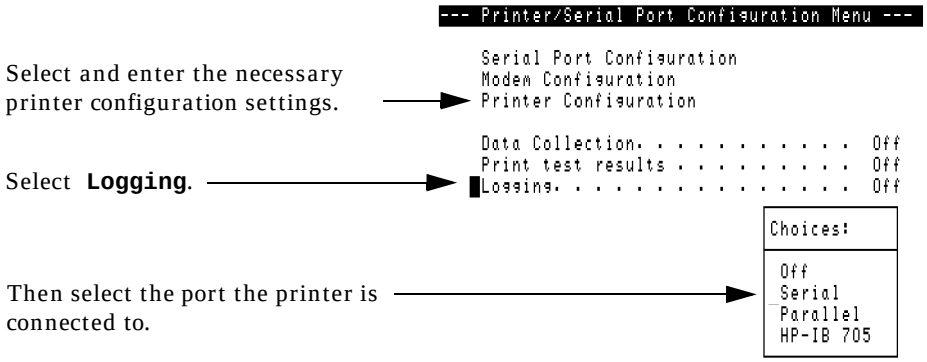
Step 2. Select **k1** (**Run Test**) to start the Software.

The Software Main Menu is displayed. If the Software is not loaded in the Test Set, see "How to LOAD TEST PROCEDURE" on page 163 for details.

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

Step 4. Select the **Logging** field, then select the desired printer port from the **Choices:** displayed.

Figure 6-30 Logging to a printer



Step 5. Connect the printer to the Test Set. See Figure 6-23 on page 193, Figure 6-24 on page 194, and Figure 6-25 on page 194.

Step 6. 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 Heading

You are now ready to log to a printer.

Turning the Logging Mode Off

To turn the Logging mode 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 Software Main Menu is displayed.

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

Step 4. Select the **Logging** field, then select **Off** from the **Choices:** displayed.

The logging mode is now off.

Using a memory card

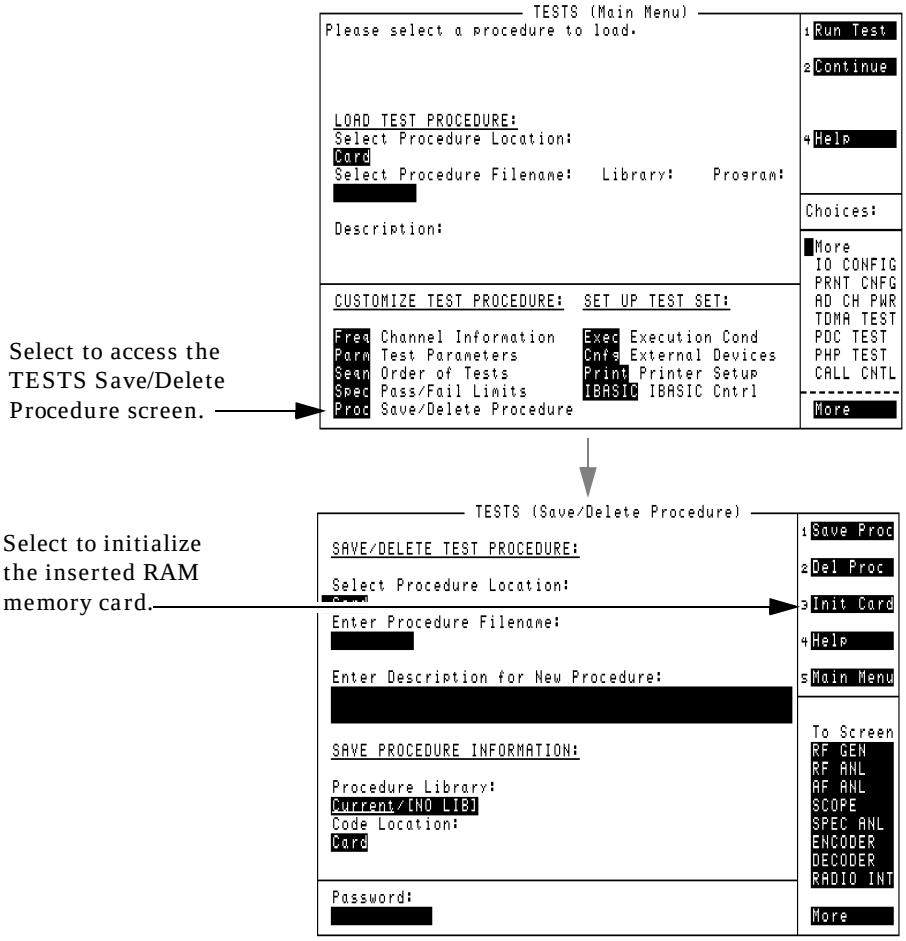
Initializing a memory card

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:

"Errors When Loading and Running the Software" on page 207

"Errors When First Setting Up or Connecting to MSC" on page 209

"Communications Errors During Testing" on page 210

"Errors While Attempting Measurements" on page 213

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:

"Troubleshooting Checks for Communications Problems" on page 210

"Troubleshooting Tools for Communications Problems" on page 212

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

- You do not have enough RAM (Random Access Memory) installed in your Test Set.

  This program will not run on older Test Set's with 640kB of RAM. If you have one of these older Test Set's, contact your local Hewlett-Packard Sales Engineer to purchase a memory upgrade kit (HP 8921ART R40).

- The amount of useable RAM (Random Access Memory) space has been reduced below the amount needed, due to other data stored in memory.

  The 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*.

The risters can be saved to a RAM memory card, as well. To do this, recall the Save/Recall register you want to save, insert an initialized SRAM memory card into the Test Set, and then change the `Save/Recall` field on the IO CONFIGURE screen to `Card`. Press **SHIFT**, then press **RECALL**(SAVE) and enter the register's name. Refer to the *HP 8921A User's Guide* for more information on saving and recalling registers.

To delete a single register:

Step 1. Press the **RECALL** key.

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

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

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

Step 4. All save registers are now cleared.

Communications Errors

Errors When First Setting Up or Connecting to MSC

- Messages:

  MSC, TEST SET, AND LAPTOP BAUD RATES MUST BE SET TO THE SAME VALUE.

  CHECK TEST PARAMETERS FOR MSC DATA LENGTH AND PARITY FOR ERRORS.

  These messages may be displayed if the configuration of the Test Set and modem do not match the communication requirements of the MSC. To correct this, follow the steps to set up the Test Set parameters for serial communication via the modem. See "Using an External Modem" on page 35.

- Message: Base station did not answer command: <command name> with a response of: <command response> in three tries. Use the Laptop Emulator to correct problem. 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 210 for a list of items to check when you have received this error.

- Message: Improper communication with MSC. Use the Laptop Emulator to correct problem. Press 'Abort' to return to main menu.

  If commands are misunderstood at the MSC end, this error message can occur. Use the laptop emulator to send commands and view responses to identify the problem command. You may also use the logging capability of the Software to display the commands between the MSC and the Test System to help you locate the problem area. See "Logging" on page 195.

- The unit-under-test is unavailable. Use the Laptop Emulator to correct problem. Press 'Abort' to return to main menu.

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

Communications Errors During Testing

Message: Lost the modem carrier. Use the Laptop Emulator to correct problem. 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 Laptop Emulator menu 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, modem, and phone line:

  Make sure that you have made the proper connections between the Test Set's serial port, the modem, the phone line, and the PC (if used).

  A list of cables and their part numbers is provided in "Connector Kit" on page 112.

- ❏ External Modem operation:

  Verify that you have supplied power to the external modem and that the power indicator light (if it has one) is on. Most modems also have indicators to show when they have gone off hook and TX/RX lights to show data transfers.

  Make sure that you have followed the steps to configure the modem. These steps make all required modem settings to match the communication setup of the modem to the Test Set and MSC. See "Configuring and Initializing the External Modem" on page 38.

- 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 Laptop Emulator screen (see "Laptop Emulator" on page 127) and in a custom file in the Define Auto menu (see "Creating User-Defined Commands" on page 134).

- Modem autobaud being set to on:

  If you have made changes to the system baud rate since applying power to the modem, you might need to turn it off and back on in order to clear the autobaud setting. Some modems autobaud to the incoming data rate and will not change thereafter until the power is removed.

- 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:

- Laptop Emulator:

  The Laptop Emulator can be a useful tool when checking communications between the Test System and the MSC.

  Use the `Test Modem` command to check basic communication between the Test System and the modem. If the modem does not respond with OK you need to check:

  - Check serial connections between the Test Set's SERIAL 10 port and the external modem.
  - Check power to the modem and that the power switch is on.
  - Check settings in the TESTS (Edit Parameters) menu for serial communications (baud rate, parity, stop bits, and so forth). See "Parameters List and Descriptions" on page 147.
  - Verify external modem configuration. Follow the steps in "Configuring and Initializing the External Modem" on page 38.

  Use the Laptop > Modem mode and a PC to perform the connection and to send custom commands once connected. See "Laptop Emulator" on page 127.

- Logging Data Communications:

  The BTS Laptop Utility software has a Test Set Terminal window that monitors commands sent between the MSC and the Test Set. If you have this program loaded in your connected laptop PC, select this window and look for command responses from the MSC.

  If you are not using the BTS Laptop Utility on a connected PC, 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 "Logging" on page 195 for more information.

Errors While Attempting Measurements

The following problems may occur after beginning AMPS measurements:

- Full Site Test (FCC) is selected but does not run.

  The Full Site Test uses a frequency plan to provide the needed cell site and radio information. If the Software cannot find a frequency plan, it exits the test. See "Frequency Plans" on page 116 for information on frequency plan contents and how to create them.

- The indicated TX Power level is very low or very high.

  Assuming your radio is transmitting at the proper level, this problem is usually caused by incorrect parameter entries dealing with test cable and test port losses.

  If testing at the TX Test port

  - Verify that the `Base Station Connection` setting on the Base Station Configuration Menu is set to `TX Test Port`.
  - Verify that you connected the base station's TX test port to the Test Set's ANT IN port (as shown in the setup drawing that appears at the start of the test).
  - Measure the coupling factor for the test port you are testing at and make sure the value is entered in the Base Station Configuration menu. See "TX Test Port Coupling Measurements" on page 94.
  - Measure the TX Test Port Cable Loss and enter it on the Base Station Configuration Menu. See "TX Test Port Cable Calibration" on page 90.
  - Verify that you have entered the correct VRAL/CSAC setting for the selected radio at the start of the test.

If testing at the TX Antenna port (or foam jumper)

- Verify that you connected the base station's TX Antenna port to the Test Set's RF IN/OUT port (as shown in the setup drawing that appears at the start of the test).
- Verify that the `Base Station Connection` setting on the Base Station Configuration Menu is set to `TX Antenna Port`.
- Measure the TX Antenna Port Cable Loss and enter it on the Base Station Configuration Menu. See "TX Antenna Port Cable Calibration" on page 86.
- Verify that you have entered the correct VRAL/CSAC setting for the selected radio at the start of the test.
- The Data Deviation measurement fails in the Full Site or Single Radio test.

  This measurement is performed by applying a 10 kHz signal to the transmitter's wideband data modulator and measuring the maximum (peak) deviation. The measurement uses the Test Set's 30 kHz IF filter or 230 kHz IF filter. The 230 kHz filter is the default. See "TX Use 230 kHz BW on Data Dev [1=yes]" on page 152.

  If more than one signal is present within the span of the IF filter, the measurement will be a composite of the two (or more) signals. Therefore, when measuring a specific radio, you must make sure that only that radio is transmitting within the IF filter's bandwidth.

  When using the 230 kHz filter, you cannot have another transmitter turned on that is less than 7 channels (210 kHz) away from the transmitter you want to measure. If you cannot turn off transmitters that are too close to the one you want to measure, change the IF filter to 30 kHz to filter out those other radios by changing parameter 29.

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