HP 11807B Option 093
Lucent PCS TDMA Base Station Test Software
User's Guide

Software Revision: B.01.00 and above

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Revision B

In this Book   This book documents the use of the HP 11807B Option 093 Software. The Software is used to test PCS TDMA base station equipment manufactured by Lucent Technologies.

Chapter 1, Product Description

This chapter provides general information on the Software and hardware requirements for Software operation.

Chapter 2, Installation

Start here when using the Software for the first time. This chapter shows the steps necessary to load and run the Software and to configure the Test System.

Chapter 3, Test Tutorials

After you have the Software loaded and running, use this chapter to see detailed steps for running one of the five available test modes.

Chapter 4, Reference

More detail than is provided in the Test Tutorials chapter can be found here. Use this chapter if you need more information than the tutorials provide.

Chapter 5, Troubleshooting

This chapter offers reference material to be used if you encounter errors while using the Software. Symptoms of potential problems are described and likely solutions 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 - the HP 83201A or 83204A TDMA Cellular Adapter.
- PCS Interface - the HP 83236A,B; used to translate signals into the range of the Test Set.
- Software - the Lucent PCS TDMA Base Station Test Software, described in this book.
- Test System - the combination of a Test Set, a Cellular Adapter, and a PCS Interface.

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 USER Key: **Prev Menu** (k5)
- A selection choice or setting on the CRT display: **Equipment Type**

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1

Product Description

Review this chapter for general information on the Lucent PCS TDMA Base Station Test Software. Included here is a list of required equipment to complete the Test System plus a look at the basic Software "flow".

Introduction

Who should use the Lucent PCS TDMA BS Test Software

If you are installing, commissioning, or maintaining Personal Communication Services (PCS) sites using Lucent Technologies' TDMA cell site equipment, this software will assist you in performing key tests of transmitter performance.

Product Description

The HP 11807B Option 093 Lucent PCS TDMA BS Test Software is an Instrument BASIC (IBASIC) application used to set up the Test System for transmitter measurements on TDMA base station equipment. The software runs on the Test Set's internal IBASIC controller to allow you to perform the following tests:

- Full Cell Site Test
- Radio Test
- TX Power Meter
- Spectrum Analyzer
- Insertion Loss Test

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 your time spent at the site and to greatly improve the repeatability of measurements.

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

What is Included with the Software

Included with the HP 11807B Option 093 Software is a memory card containing the program and related files, an SRAM card for storing new files, and this manual.

Optional Equipment

See **"HP 83202A Option 093 Cable Accessory Kit Contents." on page 139** for information on a cable kit that supplies required cables and adapters for connection of the Test System to the base station and modem.

Related Documents

If you would like more details on the operation of the individual instruments in the Test System, refer to the following documents:

❏ HP 8921A Cell Site Test Set User's Guide (part number 08921-90022)
❏ HP 83201A or HP 83204A TDMA Cellular Adapter User's Guide (part number 83201-90033 and part number 83204-90009)
❏ HP 83236A,B PCS Interface Operating Manual (part number 83236-90001 and 83236-90100)

Software Operation in Brief

Figure 1 illustrates the basic steps for Software operation. After the completion of the steps in **"Installation" on page 21**, you will then select from five available tests depending on your site testing needs. The **"Test Tutorials" on page 35** give step-by-step instructions for each of the five tests. After running, a test can be repeated or you can select a different test.

If you have questions, further details can be found in the **"Software Reference" on page 113**.

If you encounter errors, **"Troubleshooting" on page 219** can assist you.
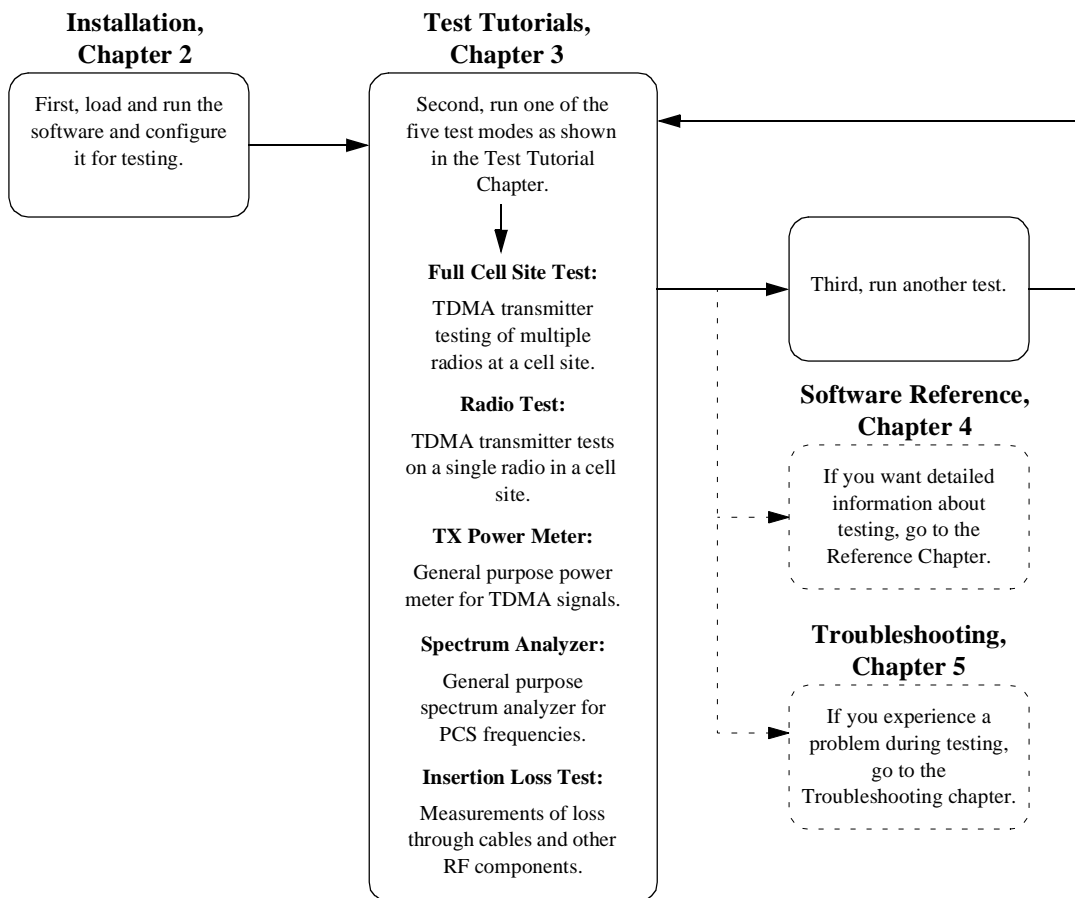
Figure 1   **Basic steps in Software operation.**

Supported Hardware

Test System

The Lucent PCS TDMA Software supports the following Test System configurations:

- HP 8921A Option 501 (includes the HP 8921A Cell Site Test Set, HP 83204A TDMA Cellular Adapter, and HP 83236B PCS Interface).
- HP 8921A Options 500 and 503 plus the HP 83236A,B PCS Interface.
- HP 8921A plus either the HP 83201A or HP 83204A TDMA Cellular Adapter plus the HP 83236A,B PCS Interface.

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

Modems

The Software will operate with most Hayes-compatible external modems capable of operating at up to 9600 baud. It does *not* support internal PC modems.

Printers

The Test System supports printing via the parallel and HP-IB ports. The following printers are supported:

❒ HP DeskJet printer models
❒ HP LaserJet printer models
❒ HP ThinkJet printers
❒ HP QuietJet printers
❒ Epson FX-80 and LQ-850

You may also collect the results using a PC on the serial port.

Required Equipment

Test Equipment required:

● HP 8921A Opt. 500, 501, 503
or an HP 8921A with an
HP 83201A or 83204A
Cellular Adapter.

● HP 83236A,B PCS
Interface

Cable Kit

● HP 83236A,B Cable Kit
(Supplied with the
HP 83236A,B)

Supplied with the HP 11807B Option 093 Software:

● PCS TDMA
Base Station Test
Software on OTP card

● RAM Card with
battery.

● This Manual

HP 11807B Option 093 Lucent
PCS TDMA Base Station Test
Software

You must supply:

● Laptop PC to communicate with
the switch.

● Modem

● Lucent PCS TDMA Base Station.

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

Figure 2

2

Installation

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

Chapter Overview

This chapter shows you how to set up the Test System and Software to begin testing. The basic steps in this chapter are:

• Make the connections on the Test System and any peripheral equipment.

NOTE: The connections between the Test System and the base station will be discussed in **"Test Tutorials" in chapter 3**.

• Load and run the Software.
• Do basic configuration in Software screens.
• Initialize the modem.
• Go on to make measurements (**see "Test Tutorials" on page 35**).

Step 1: Make Connections

Make the connections between the elements of the Test System as shown in
figure 3. The cables shown in the figure are included with the HP 83236A,B PCS
Interface.

NOTE: This figure does not illustrate all rear-panel connections between the Cellular Adapter and Test
Set. Refer to the *Cellular Adapter User's Guide* to verify these connections.
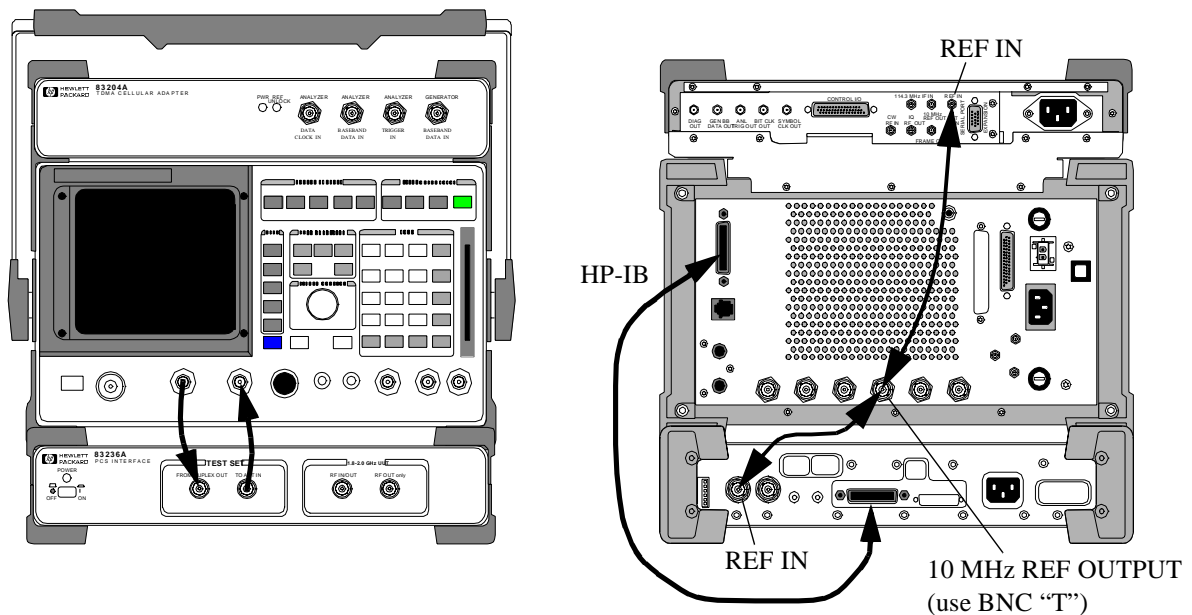
Figure 3   **Test System Connections.**

Next, make the serial connections shown in **figure 4**.

NOTE: If you are *not* using control of the site via a modem to the MSC, you may skip these connections. The tutorials in **chapter 3, "Test Tutorials"** assume that a modem *is* used for site control.
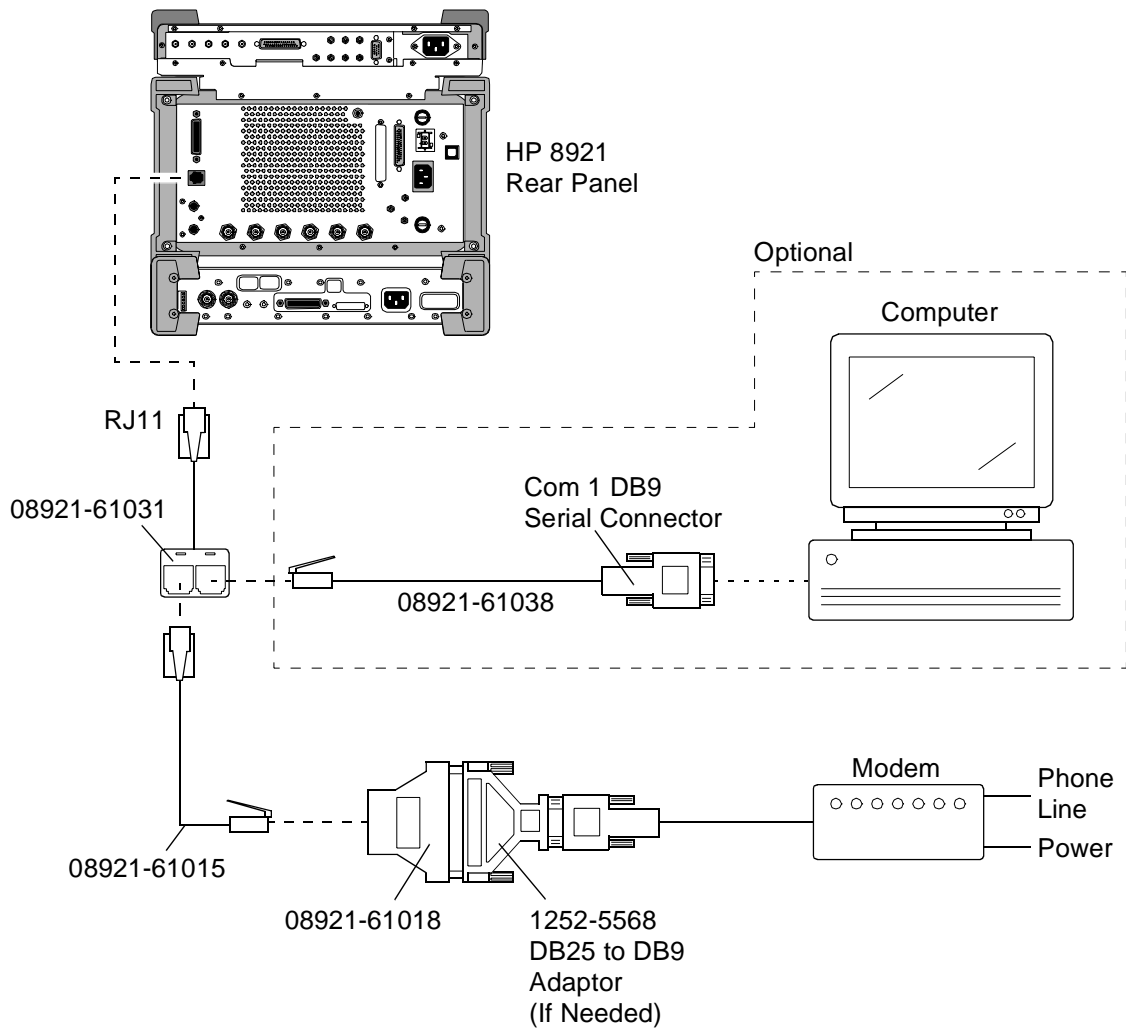
Figure 4   **Serial Connections for the HP 8921A, Modem and PC**

Step 2: Load and Run the Lucent PCS TDMA BS Test Software

The next step is to get the Lucent PCS TDMA BS Test Software loaded into the Test Set and running on the IBASIC controller. Locate the HP 11807B Option 093 memory card and follow the steps outlined in **figure 5** and **figure 6**.

④ Insert the Software card.

① Press POWER.

② Wait for display to appear (approximately 20 seconds).

③ Press PRESET.

Figure 5

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

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

Position

Select

```
LOAD TEST PROCEDURE:
Select Procedure Location:
████
Select Procedure Filename:
██████
```

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

Position

```
Choices:
█Card
 ROM
 RAM
 Disk
```

Select

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

Position

```
LOAD TEST PROCEDURE:
Select Procedure Location:
Card
Select Procedure Filename:
██████
```

Select

9 Position the cursor at **Choices:** and select PCSTDMA.

Position

```
Choices:
█PCSTDMA
 XXXXXX
 YYYYYY
```

Select

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

Position

```
1 Run Test
2 Continue
4 Help
```

Loading Time:
First time:
approximately
three minutes.

After first time:
approximately
15 seconds.

Select

Figure 6

Navigation of the Lucent PCS TDMA BS Test Software

After the Software has loaded, you should see the Lucent PCS TDMA BS Test Software's Main Menu screen on the display of the Test Set (see **figure 7**). Important features of this screen are indicated in the figure with notes on their use.

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

Entry Fields
Some Main Menu selections are entry fields. When these are selected, a highlighted area appears and you may enter 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.
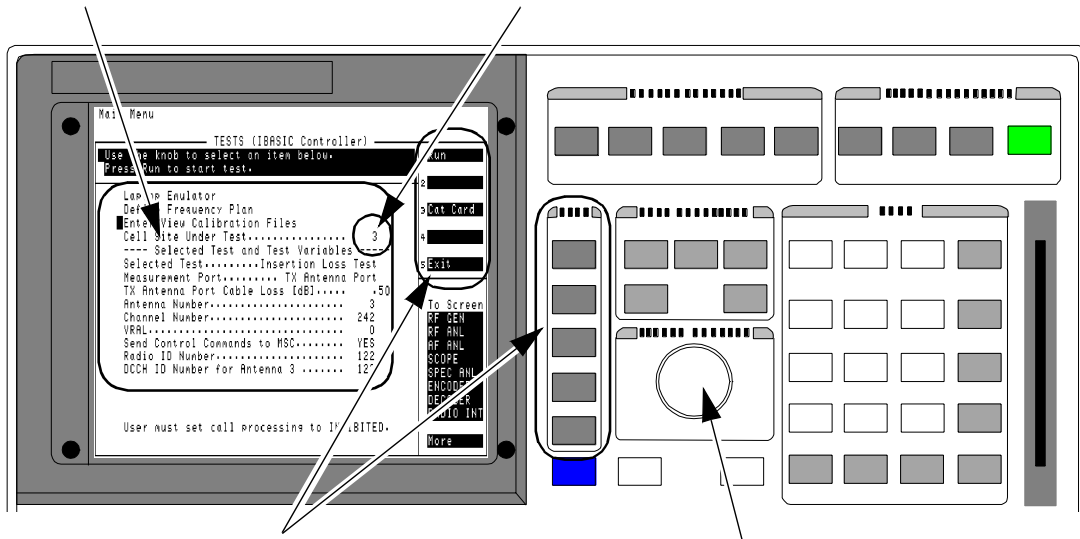
USER Keys and their Fields
The USER Keys (k1 - k5) correspond to fields 1-5 at the top right corner of the test screen. They are used for navigation through menus and for making selections. In many lower-level menus, a "Return" key is provided to take you up one menu level.

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

Figure 7   **The Lucent PCS TDMA BS Test Software's Main Menu features.**

Step 3: Set up the Modem for Communication to the MSC

NOTE: This method of site control is optional. If you have other means of controlling the site equipment, you may skip this section covering modem setup and go right to making tests (**see "Test Tutorials" in chapter 3**).

Overview

The Test Set has the ability to send control commands to the switch, via a modem, to control the radios at the cell site. This enables the Test System to perform tests in the shortest amount of time and with little operator intervention. This section deals with setting up the 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).

In addition to the modem, a laptop PC can be connected to the second serial port of the Test Set to allow you to interact manually with the switch (this addition of the PC is optional). It also allows you to do data collection directly to your PC for archival or later printing. **Figure 8** shows the basic configuration of the Test System and modem and how it is used to communicate to the switch.
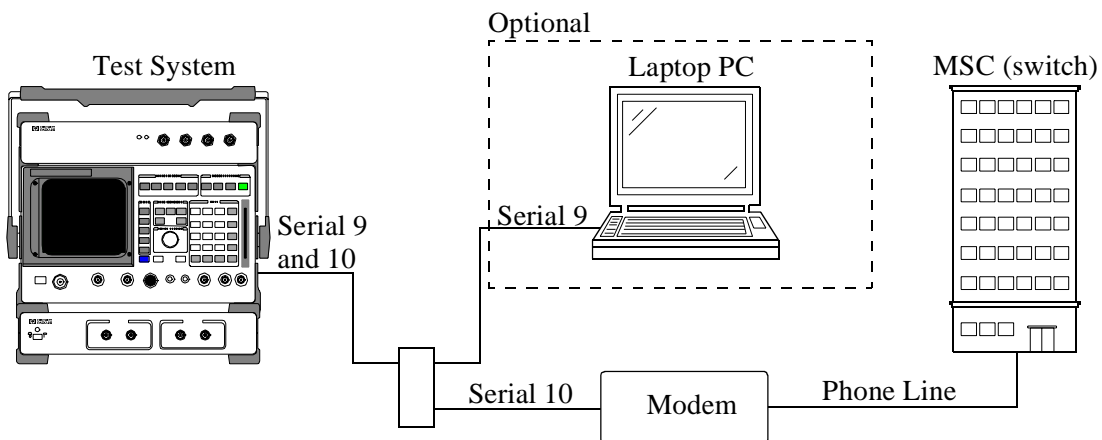
Figure 8   **Test Set communication to the MSC.**

Configure the Serial Ports

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

❒ Baud rate
❒ Data length
❒ Parity
❒ Stop length

To configure the serial ports, you will have to temporarily exit the Software environment. These steps will show you how to exit the Software, make the settings, then return to Software control:

1. From the Software's Main Menu, press **Exit** (k5). The Software will be paused.
2. Press the TESTS key.
3. Scroll to and select **Parm:Test Parameters** near the bottom of the screen.
4. Using the knob to select the **Parm #** and modifying the **Value** fields, change *parameters 6, 7, 8, 9, and 10* to match the serial port settings of the MSC (see **figure 9**).

```
                    ┌─ TESTS (Test Parameters) ─┐
  Parm#   Description                               │
          Value        Units                        │
                                                    │
                                                    │
       1 Adj TX Power [0=no 1=fail 2=always]    3│Print All│
       2 Alarm Clock Start [0=no 1=yes]         │
       3 Short Form Printout [0=no 1=yes]       4│Help     │
       4 Print Power [0=spec 1=Foam 2=ERP]      │
       5 Exit Power Meter[0=no x=times in spec] 5│Main Menu│
       6 MSC Baud Rate [valid test set range]   │
                                                    │
  ▐ 7 ▌    MSC Data Length [7 or 8]             │ To Screen
        ▐ 8.000000 ▌  bits                      │RF GEN
                                                    │RF ANL
       8 MSC Parity [0=0 1=1 2=none 3=even 4=odd]│AF ANL
       9 MSC Stop Length [1 or 2]               │SCOPE
      10 MSC Transmit Lower Case [0=normal 1=lwc]│SPEC ANL
      11 TDMA Number of Averages for Readings   │ENCODER
      12 TX Antenna Port Cable Loss             │DECODER
      13 ZZZZ Test Demo Mode [0=normal 1=demo]  │RADIO INT
                                                    │
                                                    │More
```

Figure 9   **Parameter screen, showing modem setup parameters.**

5. To return to Software control, press the TESTS key followed by **`Run Test`** (k1).
6. If you have connected a computer as shown in **figure 8**, set up your PC terminal program for a serial port connection with the same settings made earlier in the TESTS:Test Parameters screen. 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.

NOTE: The settings you have made in the Test Parameters screen are saved in non-volatile memory and will be retained even if you turn the Test Set off. However, if you load another program the settings will be lost. To prevent this, you can save your settings in a "procedure file" for later use after running other programs. **See "Procedure Files" on page 203** for instructions on creating procedure files.

Initialize the Modem

In these steps, you will send pre-defined strings to the modem that will initialize it for use with the Software. In most cases, these pre-defined strings will properly initialize your modem. If you are unsuccessful in getting your modem to communicate with the switch, you may need to customize the strings. The steps for creating custom strings and a summary of the pre-defined strings are given in **"Creating User-Defined Commands" on page 186**.

1. From the Software's Main Menu, scroll to and select **Laptop Emulator** (see **figure 10**).

```
Main Menu

            ┌─────────────── TESTS (IBASIC Controller) ───────────────┐  ┌───────────┐
            │ Use the knob to select an item below.                   │  │1 Run      │
            │ Press Run to start test.                                │  ├───────────┤
            │                                                         │  │2          │
            │  ■Laptop Emulator                                       │  ├───────────┤
            │   Define Frequency Plan                                 │  │3 Cat Card │
            │   Enter/View Calibration Files                          │  ├───────────┤
            │   Cell Site Under Test.................    3            │  │4          │
            │   ---- Selected Test and Test Variables -----           │  ├───────────┤
            │   Selected Test......... Full Cell Site Test            │  │5 Exit     │
            │   Measurement Port.......... TX Antenna Port            │  ├───────────┤
            │   TX Antenna Port Cable Loss [dB].....    .50           │  │           │
            │   Test with power set to.............. VRAL             │  │ To Screen │
            │                                                         │  │ RF GEN    │
            │                                                         │  │ RF ANL    │
            │                                                         │  │ AF ANL    │
            │                                                         │  │ SCOPE     │
            │                                                         │  │ SPEC ANL  │
            │                                                         │  │ ENCODER   │
            │                                                         │  │ DECODER   │
            │                                                         │  │ RADIO INT │
            │   User must set call processing to INHIBITED.           │  ├───────────┤
            │                                                         │  │ More      │
            └─────────────────────────────────────────────────────────┘  └───────────┘
                                                                                    main_2
```

Figure 10   **Selecting the Laptop Emulator.**

2. If your modem is not already turned on, turn it on now.

3. Position the cursor at **Test Modem** and press the knob. In the **MSC Response** window the modem should respond "OK". This confirms that the Test Set can communicate with the modem via the serial port.

```
Cell= 3 :RA ID= 122
```

```
                    ┌──── TESTS (IBASIC Controller) ────┐   ┌──────────┐
                    │Use the knob to select an item below.│   │1 Prt Full│
                    │Press Return for Main Menu           │   └──────────┘
                    │                                     │   ┌──────────┐
                    │   Use the knob to select command to MSC.│   │2 Page Up │
                    │ -----------------------------------------│   └──────────┘
                    │ Return          ┌─── MSC  Response ───┐  │3 Send CR │
                    │■Test Modem      │                     │  └──────────┘
                    │ Dial MSC        │                     │  ┌──────────┐
                    │ Laptop > Modem  │                     │  │4 Page Down│
                    │ Send Login      │                     │  └──────────┘
                    │ Send Password   │                     │  ┌──────────┐
                    │ Send TIpdunix   │                     │  │5 Return  │
                    │ Define Auto     │                     │  └──────────┘
                    │ Auto Login      │                     │
                    │ Define User     │                     │   To Screen
                    │ User defined 1  │                     │   RF  GEN
                    │ User defined 2  │                     │   RF  ANL
                    │ User defined 3  │ OK                  │   AF  ANL
                    │ User defined 4  │                     │   SCOPE
                    │ User defined 5  └─────────────────────┘   SPEC ANL
                    │ Logout          │                         ENCODER
                    └─────────────────┘                         DECODER
                                                                RADIO INT
                                                                ┌──────────┐
                                                                │More      │
                                                                └──────────┘
```

Figure 11   **The Laptop Emulator screen.**

4. Scroll down to **Define User** and select it by pressing the knob.
5. To load a set of available modem commands, press the **File Name** (k1) user key (this screen is not shown).

6. You will use the pre-defined set for modem use, so press the **Modem** (k5) user key. You should see modem setup strings appear in the menu under the lines marked **User Action x to MSC** (screen not shown).

7. You should not need to make any changes to these strings, so press the **Return** (k5) user key. You should now have choices of **Modem Init 1**, **Modem Init 2**, and **Modem Save** in the Laptop Emulator menu (see **figure 12**).

```
Cell= 3 :RA ID= 122
                      ┌──── TESTS (IBASIC Controller) ────┐      ┌───────────┐
                      │ Use the knob to select an item below. │      │1│Prt Full │
                      │ Press Return for Main Menu            │      └───────────┘
                      │                                       │      ┌───────────┐
                      │   Use the knob to select command to MSC. │    │2│Page Up  │
                      │ -------------------------------------- │      └───────────┘
                      │   Return              ┌── MSC  Response ──┐    │3│Send CR  │
                      │   Test Modem          │                  │    └───────────┘
                      │   Dial MSC            │                  │    │4│Page Down│
                      │   Laptop > Modem      │                  │    └───────────┘
                      │   Send Login          │                  │    │5│Return   │
                      │   Send Password       │                  │    └───────────┘
                      │   Send TIpdunix       │                  │
                      │   Define Auto         │                  │      To Screen
                      │   Auto Login          │                  │    │RF GEN   │
                      │   Define User         │                  │    │RF ANL   │
                      │  ▌Modem Init 1        │                  │    │AF ANL   │
                      │   Modem Init 2        │                  │    │SCOPE    │
                      │   Modem Save          │                  │    │SPEC ANL │
                      │   User defined 4      │                  │    │ENCODER  │
                      │   User defined 5      └──────────────────┘    │DECODER  │
                      │   Logout                                      │RADIO INT│
                      │                                               │More     │
                      └───────────────────────────────────────┘
```
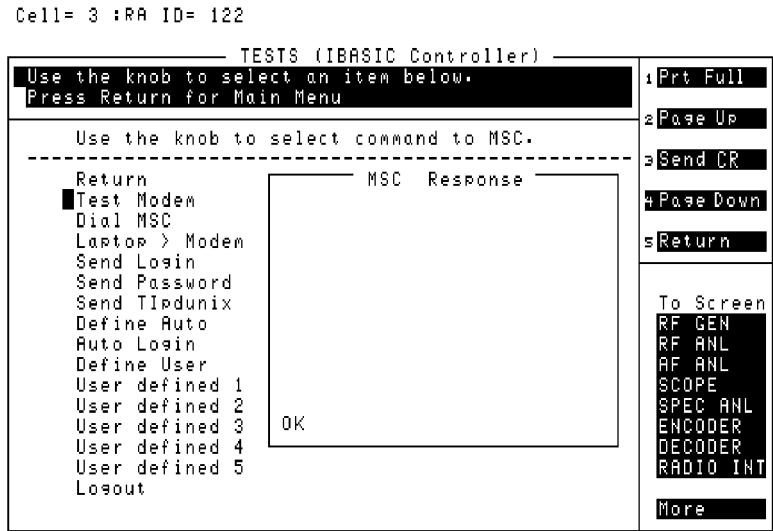
Figure 12   **Laptop Emulator screen after selecting the Modem user definition.**

8. The modem for MSC communication can now be initialized.
   a. Position the cursor on **Modem Init 1**. The top of the display will show the command string that will be sent to the modem. Press the knob to send the command and wait for the "OK" response in the MSC Response window.
   b. Position the cursor on **Modem Init 2** and select it. This sends the second command string.
   c. If the modem accepted the two command strings, you will probably want to save the settings in the modem. Scroll to **Modem Save** and press the knob. This will save the settings in the non-volatile memory of the modem so you can skip these steps in the future.

9. To exit the Laptop Emulator mode, press **Return** (k5).

Step 4: Perform Tests

Now that you have successfully run the Software and initialized the modem, you can go on to perform tests. Refer to **"Test Tutorials" on page 35** to see detailed steps for performing tests.

If You Had Problems

If you were unable to load and run the Software or make the required entries, or you encountered error messages, refer to **"Troubleshooting" on page 219** for help.

3

Test Tutorials

This chapter shows detailed steps used in running each of the Software's five test modes. Highlights are given for each step and cover setting up through getting test results. Before starting the tests, you should have completed the steps outlined in **Chapter 2, "Installation"**.

Introduction

Important: System Configuration Used for these Test Tutorials

These tutorial procedures are designed to take you from setting up a test to getting final test results. To simplify the procedures, the following settings are used to configure the Software for testing:

- *These steps are presented as they would occur using control of the site equipment via the MSC using a modem.* The Software also allows you to control the equipment manually, but these steps are not included in these tutorials. **See "Testing without MSC Control" on page 218** for instructions on manual control of the site equipment.
- *These steps are presented as they would occur with connections to the TX Antenna Ports for testing.* The Software also supports testing at the TX Test Port as well, but you will need to refer to **"Testing with Connections to the TX Test Port" on page 217** for more information.

Test Tutorial Starting Pages

Once you have decided which test you want to run, use **table 1** to locate the start of the tutorial section for that test.

Table 1

Test Modes and Description	Start of Tutorial
Full Cell Site Test - complete TDMA transmitter testing of multiple radios at a cell site.	**See "Full Cell Site Test" on page 38**
Radio Test - TDMA transmitter testing of a single radio in a cell site.	**See "Radio Test" on page 56**
TX Power Meter - a general-purpose power meter for measuring TDMA transmitters.	**See "TX Power Meter" on page 70**
Spectrum Analyzer - a general-purpose spectrum analyzer for viewing signals in the PCS frequency band.	**See "Spectrum Analyzer" on page 84**
Insertion Loss Test - tests of loss through cables and other RF components.	**See "Insertion Loss Test" on page 98**

Full Cell Site Test

Overview

The Full Cell Site Test mode allows you to test the TDMA performance of an entire cell site. You will define, in advance of testing, a "frequency plan" that is used for radio setup throughout the site. Using a modem link, the Test System will communicate to the mobile switching center (MSC) to set the radios up, one at a time, until all have been tested.

If you would prefer to test only one radio, rather than all radios in the site, you should use the Radio Test mode (**see "Radio Test" on page 56**).

The basic steps in Full Cell Site Test are:

1. Define a Frequency Plan for the site (if one does not already exist).
2. Use the Laptop Emulator screen to connect to the MSC and prepare the site for maintenance.
3. Define the required calibration information for the site (if it does not already exist).
4. Select the Full Cell Site Test mode and provide the required information.
5. Run the test and review the test results.

Prerequisites

You must have completed the steps outlined in **"Installation" on page 21**. This tutorial starts with the test equipment connected and the modem initialized.

You must know the following about your system, site, and radio:

❏ Phone number, login, and password for the switch (MSC)
❏ Cell Site information, including:
  - Cell Site number
  - Radio ID numbers for all radios at the site
  - Channel number for each radio
  - VRAL setting for each radio
  - Antenna number used for each radio
  - DCCH status for each radio
  - DCCH Radio ID number for each antenna
  - Power output at the foam jumper
  - Foam jumper loss (in dB)
❏ TX Antenna Port Cable Loss (in dB)

Step 1: Define a Frequency Plan for the Site

Before running a Full Cell Site Test sequence, you must create a file that defines the site configuration. This file is called a frequency plan. The frequency plan contains information about each radio in the cell site, including Radio ID, Channel number, VRAL setting, and Antenna number. Once you have defined the frequency plan, you may save it to a memory card to speed up subsequent testing.

NOTE: In this section, you will be shown the steps used in defining a frequency plan using the Test Set's screens. You can also define plans on a PC using a software package for editing. To see detailed steps on using the PC to define a plan and the method of sending the plan to the Test Set, **see "Method 2: Defining a Frequency Plan Using a PC" on page 166**.

Requirements:

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.

a. From the Software's Main Menu, choose **`Define Frequency Plan`** (see **figure 13**).
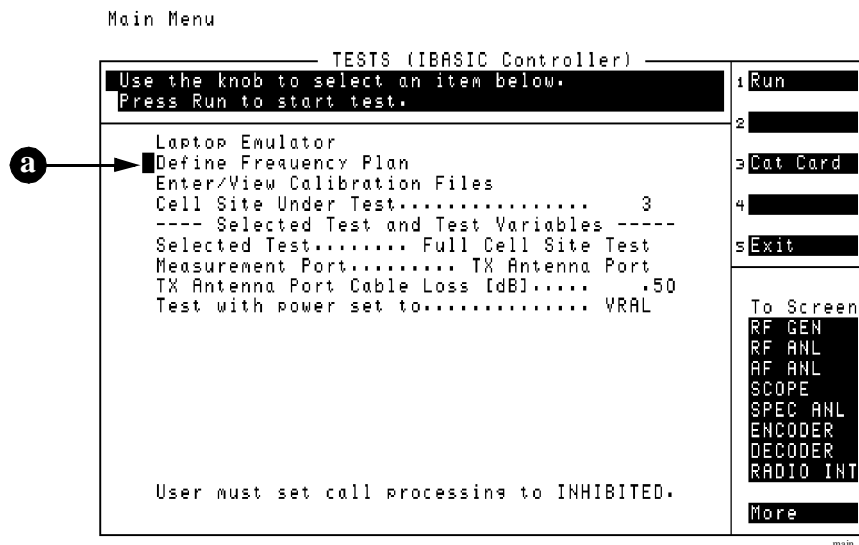
Figure 13   **Selecting the Define Frequency Plan Menu.**

b. You will see the frequency plan menu shown in **figure 14**. 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.
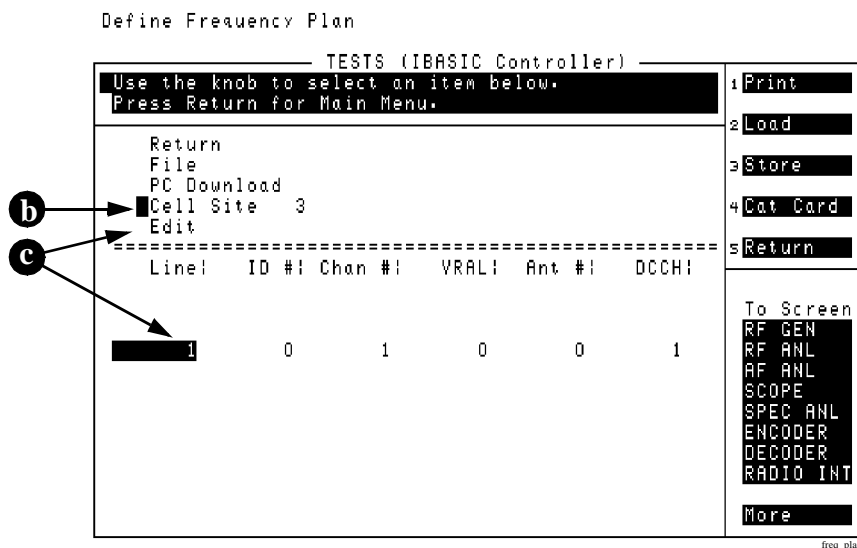
Figure 14   **Entering the frequency plan.**

c. 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).

    d. Press the **Ins Line** (k3) key several times to add lines to the list (see **figure 15**). Each line of the plan corresponds to one radio in the site.

    e. Press the knob and the highlight will be removed from the **Line** field. You can now scroll across to the five entry fields for that line number.

    f. Use the **Line** fields to select the different radios in the site and then enter these values:

        1. ID # − the Radio ID number (0 to 199)

        2. Chan # − the PCS-TDMA channel number (2 to 1998)

        3. VRAL − Voice RAdio Level setting for that radio (0 to 7)

        4. Ant # − the antenna number for that radio (0 to 6) (**see "Antenna numbers and equivalents" on page 168**)

        5. DCCH − set to 1 if the radio is used as a DCCH, else set to 0 (zero)

NOTE: You must have at least one DCCH radio configured for each antenna number in the frequency plan.
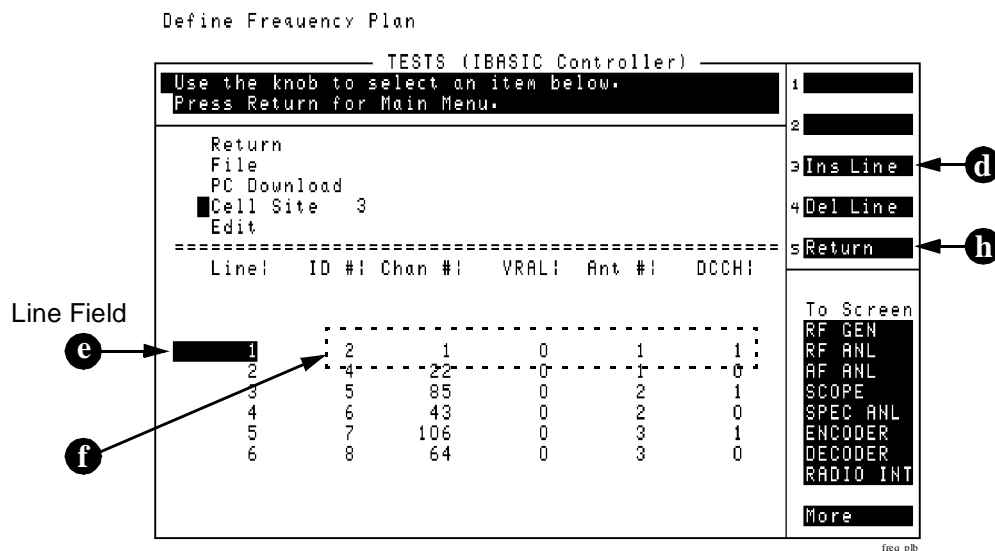
Figure 15   **An example frequency plan.**

    g. To get to the next line and enter data for another radio, scroll the cursor back to the **Line** field and press the knob. You can now scroll down to the next line or back up to a previous line. When on the next blank line, press the knob again to begin filling in the data. Repeat **step e.** and **step f.** to enter all the data for a particular site. Once you have filled in a few lines, the display will look similar to **figure 15**.

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

    i. To store your frequency plan, press `Store` (k3). You must have an initialized SRAM card in the slot to store your data. The plan is stored using the `Cell Site` number entry (**see "Frequency Plans" on page 161** for more information on frequency plan file storage).

    j. If you want to define plans for other sites, repeat these steps starting with **step b.** Otherwise, press `Return` (k5) to get back to the Software's Main Menu.
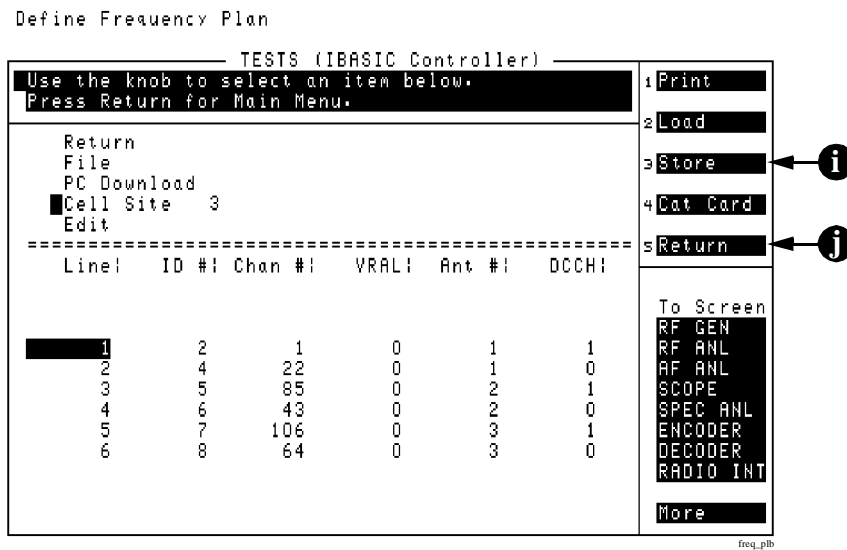
Figure 16   **Storing the frequency plan.**

Step 2: Connect to MSC

Next, you will use the Test System to dial up the MSC controlling the site you are planning to test. You will then log on and enter the maintenance craft shell (TIpdunix). From there, the Test System will send commands to the site when an action is required during testing.

NOTE: When testing at the TX Antenna Ports *and* using the modem to control the MSC, it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is a reminder; if unsure, you can verify the CP status by using the OP Cell command of the Laptop Emulator.

NOTE: The steps in this section describe the use of the Test Set and the Software screens to communicate to the MSC via the modem. In some cases, you may need to use a PC with the modem to make the connection (such as when negotiating through an OMP). This process is described at the end of this section (**"Use of a PC to accomplish the connection to the MSC (Laptop>Modem):" on page 46**) and in more detail in **"Laptop Emulator" on page 174**.

    a. From the Software's Main Menu, scroll to `Laptop Emulator` and press the knob (see **figure 17**).
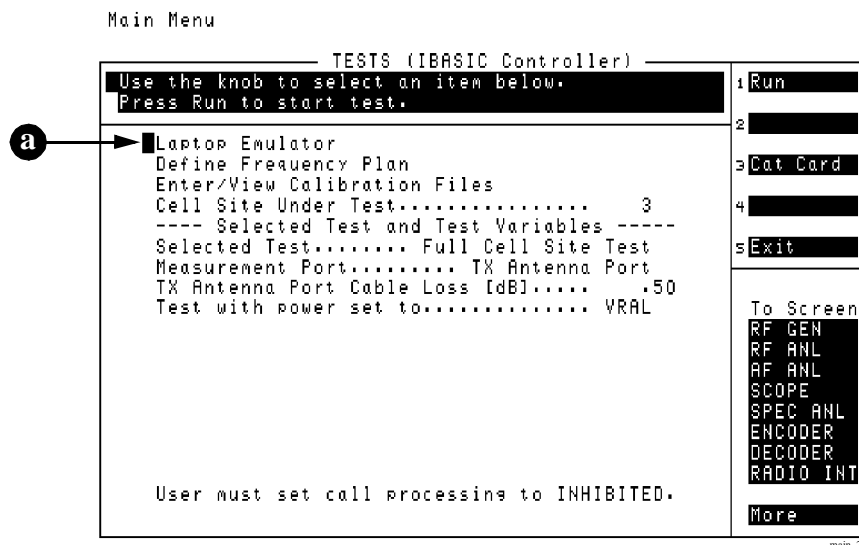
Figure 17   **Selecting the Laptop Emulator.**

    b. Make sure that your modem is connected and turned on.

c. Scroll down to **Test Modem** and press the knob to verify basic modem operation (see **figure 18**). The response "OK" should appear in the **MSC Response** box.
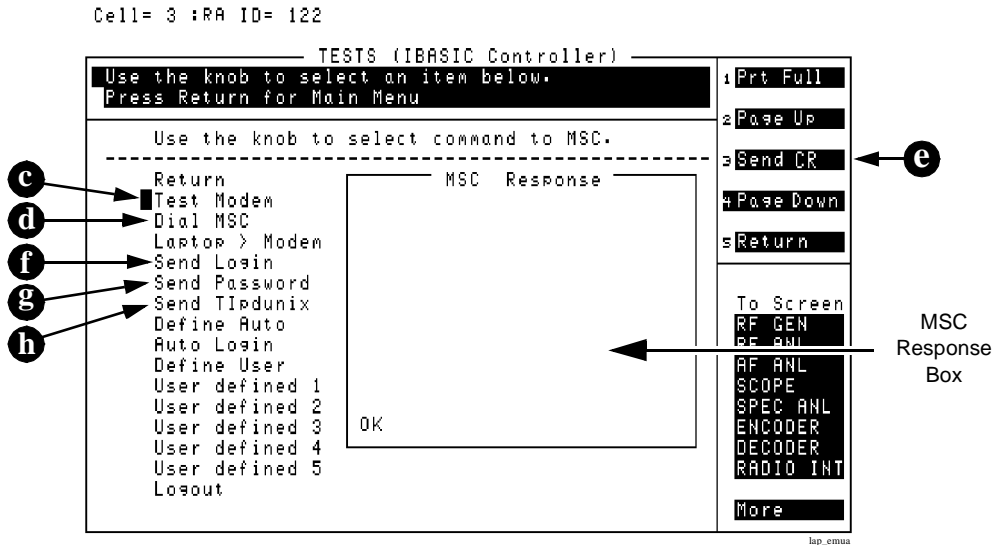
Figure 18   **Connecting to the MSC.**

d. Now, dial up the MSC: Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it using the DATA keys and press the knob (**Done**). If you have entered the number before, it will appear at the top of the screen and you can select **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." **See "Laptop Emulator" on page 174** for details on dialling options.

e. If a login prompt does not appear in the **MSC Response** box, press the **Send CR** (k3) USER key once or twice to get the login prompt to appear.

f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.

g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the characters in the **Choices** menu and select **Done** If you have entered your password previously, it will appear at the top of the screen and you can select **Done**.

h. 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 19** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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

```

Figure 19   **Typical MSC Response box display after the connection to the MSC.**

i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 20**). Select it and enter the number for the cell site to be tested.

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

j. Scroll to and select **OP Cell**. You should see a response to the Op Cell command in the **MSC Response** box on the display.
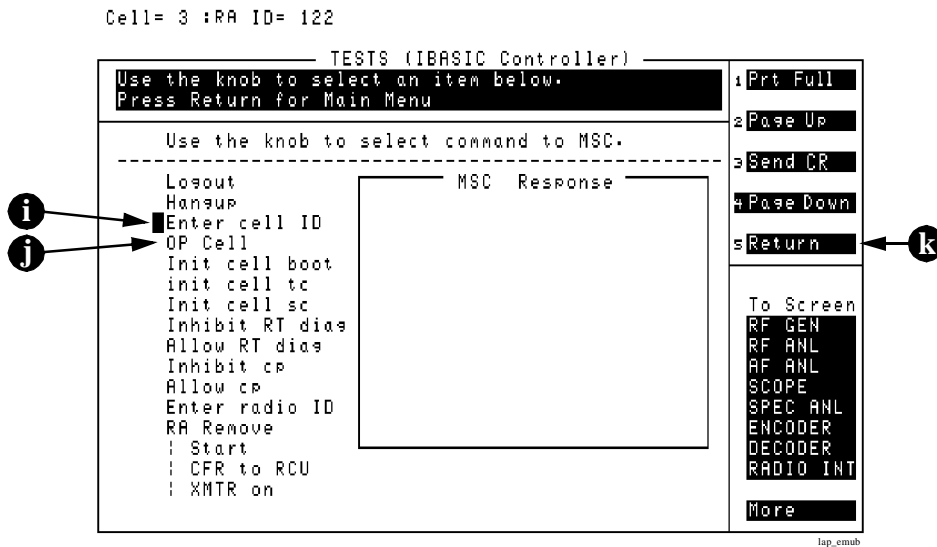
Figure 20 **Verifying site control.**

k. The radio is now ready to receive the commands from the Test System that will be sent during testing. Exit the Laptop Emulator mode by pressing **Return** (k5).

Use of a PC to accomplish the connection to the MSC (Laptop>Modem):

You may also perform the connection sequence described in this section using a PC connected to the Test System rather than the Laptop Emulator menu. This may be necessary when negotiating an OMP or when passcodes are used. The basic steps are:

1. Go to the Laptop Emulator menu.
2. Select the Laptop > Modem mode.
3. Perform connection to MSC using the PC via the modem.
4. Once connected, exit the Laptop > Modem mode and the Laptop Emulator menu.

For more information, **see "Laptop Emulator" on page 174**.

Step 3: Enter Site Calibration Constants

The next step is to enter values for calibration constants. These constants, defined per antenna per site, are used by the Software to make corrections for cable losses and Test System gains. Once you have defined the calibration constants, you may save them to a memory card to speed up subsequent testing.

    a. From the Software's Main Menu, choose `Enter/View Calibration Files` (see **figure 21**).

```
Main Menu
                  ┌──────── TESTS (IBASIC Controller) ────────┐ ┌──────────┐
                  │█Use the knob to select an item below.     │ │1 Run     │
                  │█Press Run to start test.                  │ └──────────┘
                  │                                           │ ┌──────────┐
                  │  Laptop Emulator                          │ │2         │
                  │  Define Frequency Plan                    │ └──────────┘
   ●a ───────────────▶█Enter/View Calibration Files           │ │3 Cat Card│
                  │  Cell Site Under Test................   3 │ └──────────┘
                  │  ---- Selected Test and Test Variables --- │ │4         │
                  │  Selected Test........ Full Cell Site Test│ └──────────┘
                  │  Measurement Port......... TX Antenna Port│ │5 Exit    │
                  │  TX Antenna Port Cable Loss [dB].....   .50│ └──────────┘
                  │  Test with power set to............. VRAL  │  To Screen
                  │                                           │  RF GEN
                  │                                           │  RF ANL
                  │                                           │  AF ANL
                  │                                           │  SCOPE
                  │                                           │  SPEC ANL
                  │                                           │  ENCODER
                  │                                           │  DECODER
                  │                                           │  RADIO INT
                  │  User must set call processing to INHIBITED.│ ┌──────────┐
                  └──────────────────────────────────────────┘ │ More     │
                                                    main_3      └──────────┘
```

Figure 21   **Selecting the Enter/View Calibration Files Menu.**

b. You will see the main calibration constant menu as shown in **figure 22**. Enter the correct values for `Cell Site Number` and `Antenna Number` at the top of the list in the `Enter/View Calibration Files` menu.
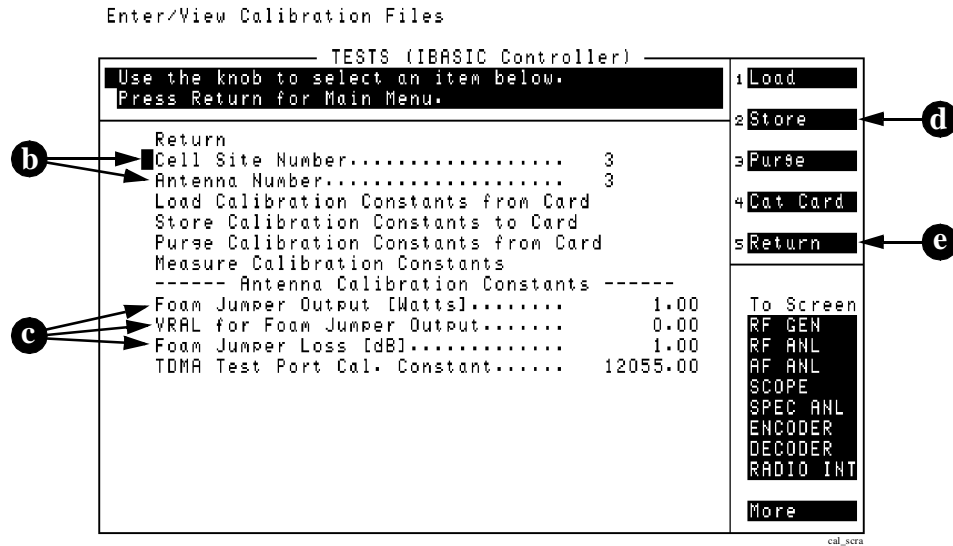
Figure 22   **Entering the calibration constants.**

c. Enter values for the following:
   1. `Foam Jumper Output [Watts]`
   2. `VRAL for Foam Jumper Output`
   3. `Foam Jumper Loss [dB]`

NOTE: If you are measuring the power at the *output* of the foam jumper, set the `Foam Jumper Loss [dB]` field to zero (0). If measuring at the *input* to the foam jumper, you need to enter the RF loss of the foam jumper itself.

NOTE: A value for the TDMA Test Port Cal. Constant is *not required* when testing at the TX Antenna Ports, as has been assumed for these tutorials. If you plan to test using connections to the TX Test Port, **see "Testing with Connections to the TX Test Port" on page 217**.

d. Once the values have been entered, press `Store` (k2) to save them on a memory card. This completes the steps needed to define the calibration constants for a given antenna. If the site you are to test has multiple antennas, repeat these steps starting at **step b.** using a new `Antenna Number` entry.

e. When finished with entries for all antennas, press `Return` (k5) to go back to the Software's Main Menu.

Step 4: Select the Full Cell Site Test Mode

a. From the Software's Main Menu, choose `Selected Test` and scroll to `Full Cell Site Test` and press the knob (see **figure 23**). Note that with the selection of a new test, different entry fields appear below the `Selected Test` field.

Figure 23   **Selecting the Full Cell Site Test mode.**

b. If `Measurement Port` is not set to `TX Antenna Port`, scroll to the `Measurement Port` field and press the knob once to change it (see **figure 24**).


```
Main Menu
                 ┌── TESTS (IBASIC Controller) ──┐
                 │ Use the knob to select an item below.   │ 1│Run    │
                 │ Press Run to start test.                │ 2│       │
                 │                                         │
                 │ Laptop Emulator                         │ 3│Cat Card│
                 │ Define Frequency Plan                   │
                 │ Enter/View Calibration Files            │ 4│       │
                 │ Cell Site Under Test...............   3 │
                 │ ---- Selected Test and Test Variables --│ 5│Exit   │
 b ────────────→ │ Selected Test........ Full Cell Site Test│
 c ────────────→ │ Measurement Port......... TX Antenna Port│  To Screen
 d ────────────→ │ TX Antenna Port Cable Loss [dB].....  .50│  RF GEN
                 │ Test with power set to............. VRAL │  RF ANL
                 │                                         │  AF ANL
                 │                                         │  SCOPE
                 │                                         │  SPEC ANL
                 │                                         │  ENCODER
                 │                                         │  DECODER
                 │                                         │  RADIO INT
                 │ User must set call processing to INHIBITED.│
                 │                                         │  More
                 └─────────────────────────────────────────┘
                                                      main_fca
```
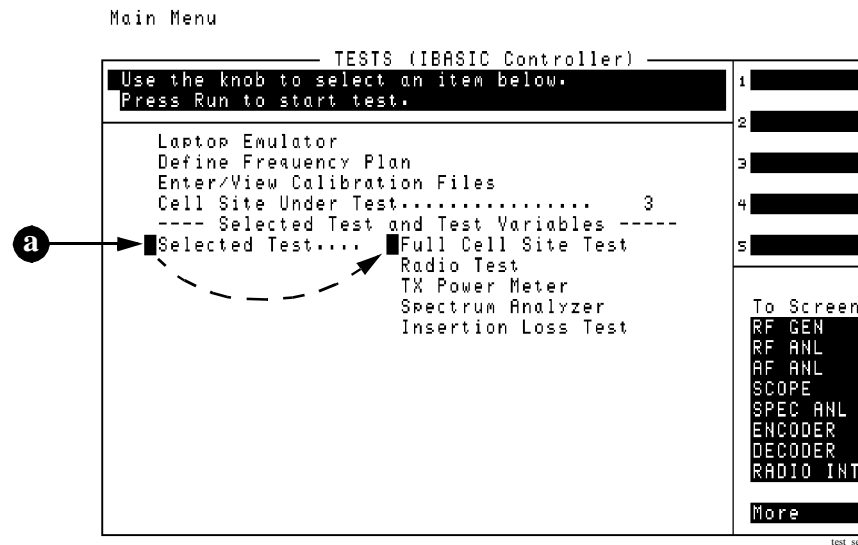
Figure 24   **Entering test information.**

c. Enter the loss (in dB) through the cable used to connect the Test System's RF IN/OUT port to the base station's TX Antenna Port. If you do not know the exact loss, you may use an approximate value. However, error in this value will affect power measurement accuracy. To *measure* the loss through the cable, **see "Insertion Loss Test" on page 98**.

d. Set `Test with power set to` to `VRAL` or `Full Power`. If you choose `VRAL`, the testing will be done with the radio set to the VRAL value you entered into your frequency plan. If you choose `Full Power`, testing is done at maximum power output, no matter what VRAL entry you have made in the frequency plan for the radio.

WARNING: **Maximum input power to the RF IN/OUT port of the PCS Interface is 1W (+30 dBm) for a CDMA base station transmitter. Before proceeding with testing, make sure that the test signal will not exceed this level. Damage to the Test System could result if the input is overdriven.**

Step 5: Run the Test and Review the Results

At this time you are ready to start the Full Cell Site Test sequence.

NOTE: When testing at the TX Antenna Ports *and* using the modem control of the MSC it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is only a reminder; it does not mean that any action is required.

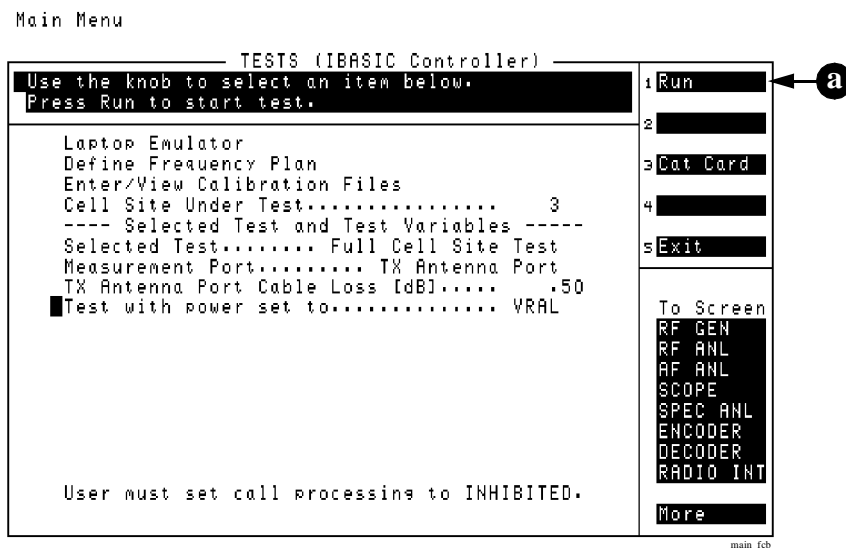a. From the Software's Main Menu, press the `Run` (k1) USER key (see **figure 25**).

```
Main Menu
            ┌──────── TESTS (IBASIC Controller) ────────┐
            │ Use the knob to select an item below.      │ 1│Run    │ ◄── a
            │ Press Run to start test.                   │ 2│       │
            │                                            │
            │    Laptop Emulator                         │ 3│Cat Card│
            │    Define Frequency Plan                   │
            │    Enter/View Calibration Files            │ 4│       │
            │    Cell Site Under Test...............  3  │
            │    ---- Selected Test and Test Variables --│ 5│Exit   │
            │    Selected Test........ Full Cell Site Test│
            │    Measurement Port......... TX Antenna Port│     To Screen
            │    TX Antenna Port Cable Loss [dB].....  .50│     RF GEN
            │ ■Test with power set to............. VRAL   │     RF ANL
            │                                            │     AF ANL
            │                                            │     SCOPE
            │                                            │     SPEC ANL
            │                                            │     ENCODER
            │                                            │     DECODER
            │                                            │     RADIO INT
            │    User must set call processing to INHIBITED.│   More
            └────────────────────────────────────────────┘
                                                       main_fcb
```

Figure 25 **Running the Full Cell Site Test.**

    b. At the start of testing, a connection diagram will be displayed (see **figure 26**). Make the connections between the base station and the Test System as shown. If you need to stop testing at this point, press **Abort** (k5).
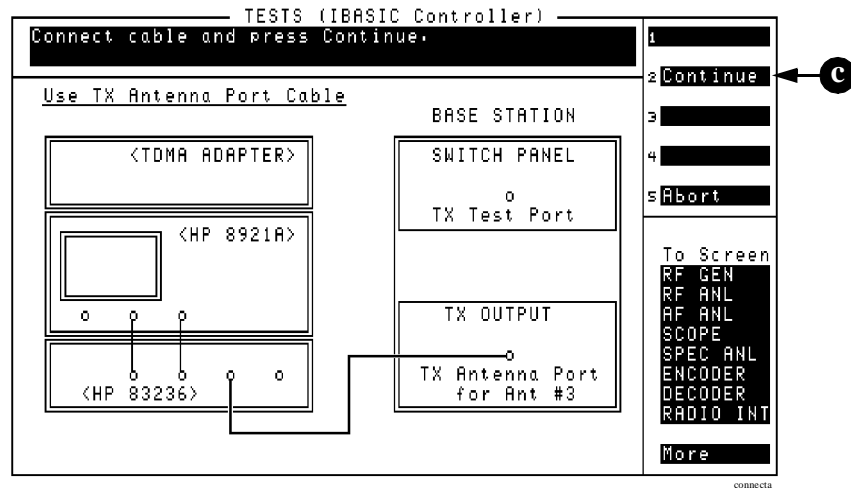

Figure 26   **Connection diagram at start of testing.**

    c. After the connections are made, press **Continue** (k2) and the test sequence will resume.

d. After testing has started, the measured results will scroll on the display of the Test Set. If you are using a printer, the TDMA test names will be followed by the measured values, the specification limits, and a fail indicator if the measured value is outside the pass/fail limits (see **figure 27**).

An updated count of total radios to test, radios already tested, and remaining radios to test will be displayed at the top of the screen during testing. If you have set up your frequency plan to test radios on more than one antenna port, connection diagrams will prompt you to connect to the appropriate port.

If you need to end the testing before the Test System has finished, press the **Abort** (k5) USER key. You may receive a message to use the Laptop Emulator to reconfigure the radios at the site.

```
Date [MM/DD/YY] 120396     Time [HH.MM] 10.04
================================================================================
Test conditions             Measured value     Lower limit  Upper limit  P/F
================================================================================
_____Site=8:Ant=1:Chan=232:RA=45:Freq=1936.98 MHz_____
Power @ VRAL 2                   .21 Watts           .10          .25
Frequency error                4.25 Hz          -217.00       217.00
Origin offset                -46.50 dB                         -30.00
Magnitude error                 .28 %                           12.50
Phase error                     .40 deg                          7.00
     .                           .                                .
     .                           .                                .


_____Site=8:Ant=2:Chan=253:RA=46:Freq=1937.61 MHz_____
Power @ VRAL 2                   .27 Watts           .10          .25        F
Frequency error               -6.80 Hz          -217.00       217.00
Origin offset                -48.75 dB                         -30.00
Magnitude error                 .35 %                           12.50
     .                           .                                .
     .                           .                                .


_____Site=8:Ant=3:Chan=274:RA=47:Freq=1938.24 MHz_____
Power @ VRAL 2                   .18 Watts           .10          .25
Frequency error                5.13 Hz          -217.00       217.00
Origin offset                -51.65 dB                         -30.00
Magnitude error                 .32 %                           12.50
Phase error                     .38 deg                          7.00
     .                           .                                .
     .                           .                                .



3 radios, 3 tested, 0 remaining
```

Figure 27   **Example printed results from the Full Cell Site Test mode.**

NOTE: Due to the communications between the MSC and the Test System, you may have to wait up to 30 seconds before being returned to the Software's Main Menu after having pressed the `Abort` (k5) key.

When testing is complete, you will be prompted to re-connect all of the foam jumpers to their antenna ports. Press `Continue` (k2) after having done that, and you will be returned to the Software's Main Menu.

For More Information

For details on the steps used in Full Cell Site Test see the following descriptions:

"Frequency Plans" on page 161
"Calibration Files" on page 120
"Laptop Emulator" on page 174
"Test Descriptions" on page 208
"Printing and Report Generation" on page 198

If you had problems or received error messages:

See **"Troubleshooting" on page 219**

Radio Test

Overview

The Radio Test mode allows you to measure the TDMA performance of a single radio at a cell site. By defining the radio number and antenna number, you can control and test one radio at a time. A complete suite of transmitter tests will be run automatically, with the Test System controlling the radio via the MSC (if using modem control).

If you prefer to test *all* radios at a site, rather than a one radio at a time, you should use the Full Cell Site Test mode (**see "Full Cell Site Test" on page 38**).

This tutorial section details the following steps:

1. Using the Laptop Emulator screen to connect to the MSC and prepare for maintenance.
2. Defining the calibration information for the Radio Test.
3. Selecting the Radio Test mode and providing required information.
4. Running the test and seeing test results as the measurements are performed.

Prerequisites

You must have completed the steps outlined in **"Installation" on page 21**. This tutorial starts with the test equipment connected and the modem initialized.

You must know the following about your system, site, and radio:

❐ Phone number, login, and password for the switch (MSC)
❐ Cell Site information, including:
   • Cell Site number
   • Radio ID number for the radio being tested
   • Channel number for the radio
   • VRAL setting for the foam jumper output power
   • Antenna number of the radio being tested
   • DCCH status for the radio
   • DCCH Radio ID number for each antenna
   • Foam jumper output power
   • Foam jumper loss (in dB)
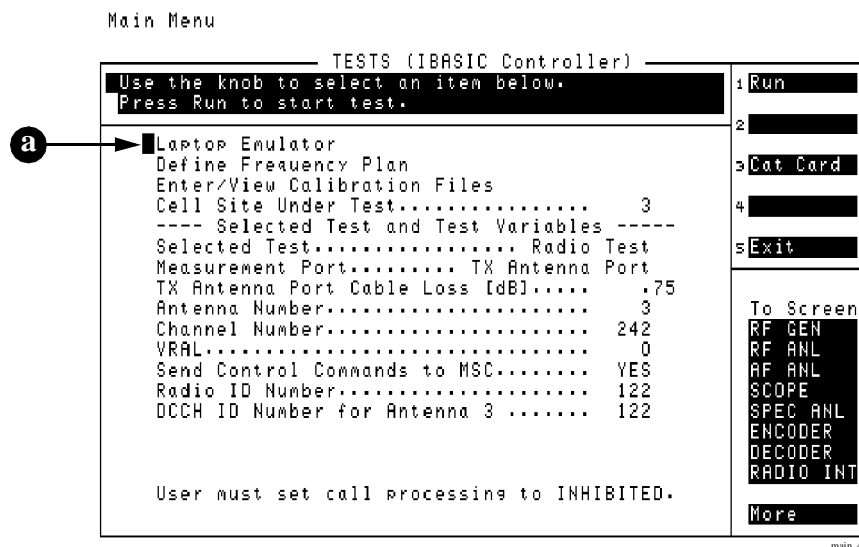❐ TX Antenna Port Cable Loss (in dB)

Step 1: Connect to MSC

First, you will use the Test System to dial up the MSC controlling the site you are planning to test. You will then log on and enter the maintenance craft shell (TIpdunix). From there, the Test System will send commands to the site when an action is required during testing.

NOTE: When testing at the TX Antenna Ports *and* using the modem to control the MSC, it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is a reminder; if unsure, you can verify the CP status by using the OP Cell command of the Laptop Emulator.

NOTE: The steps in this section describe the use of the Test Set and the Software screens to communicate to the MSC via the modem. In some cases, you may need to use a PC with the modem to make the connection (such as when negotiating through an OMP). This process is described at the end of this section (**"Use of a PC to accomplish the connection to the MSC (Laptop>Modem):" on page 60**) and in more detail in **"Laptop Emulator" on page 174**.

a. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob to enter the Laptop Emulator Menu (see **figure 28**).

```
Main Menu

          ━━━━━━━━ TESTS (IBASIC Controller) ━━━━━━━━    ┌─────────┐
         │ Use the knob to select an item below.    │  1│Run      │
         │ Press Run to start test.                 │   └─────────┘
          ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━    2┌─────────┐
       ▶ ■Laptop Emulator                                └─────────┘
         Define Frequency Plan                          3┌─────────┐
         Enter/View Calibration Files                    │Cat Card │
         Cell Site Under Test................   3         └─────────┘
         ---- Selected Test and Test Variables -----    4┌─────────┐
         Selected Test................. Radio Test       └─────────┘
         Measurement Port......... TX Antenna Port      5┌─────────┐
         TX Antenna Port Cable Loss [dB].....   .75      │Exit     │
         Antenna Number.....................   3         └─────────┘
         Channel Number.....................  242
         VRAL...............................    0        ┌─────────┐
         Send Control Commands to MSC........  YES       │To Screen│
         Radio ID Number....................  122        │RF GEN   │
         DCCH ID Number for Antenna 3 .......  122       │RF ANL   │
                                                         │AF ANL   │
                                                         │SCOPE    │
                                                         │SPEC ANL │
                                                         │ENCODER  │
         User must set call processing to INHIBITED.     │DECODER  │
                                                         │RADIO INT│
          ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━    │More     │
                                                         └─────────┘
                                                          main_4
```

Figure 28   **Selecting the Laptop Emulator.**

b. Make sure that your modem is connected and turned on.

    c. Scroll down to **Test Modem** and press the knob to verify basic modem operation (see **figure 29**). The response "OK" should appear in the **MSC Response** box.
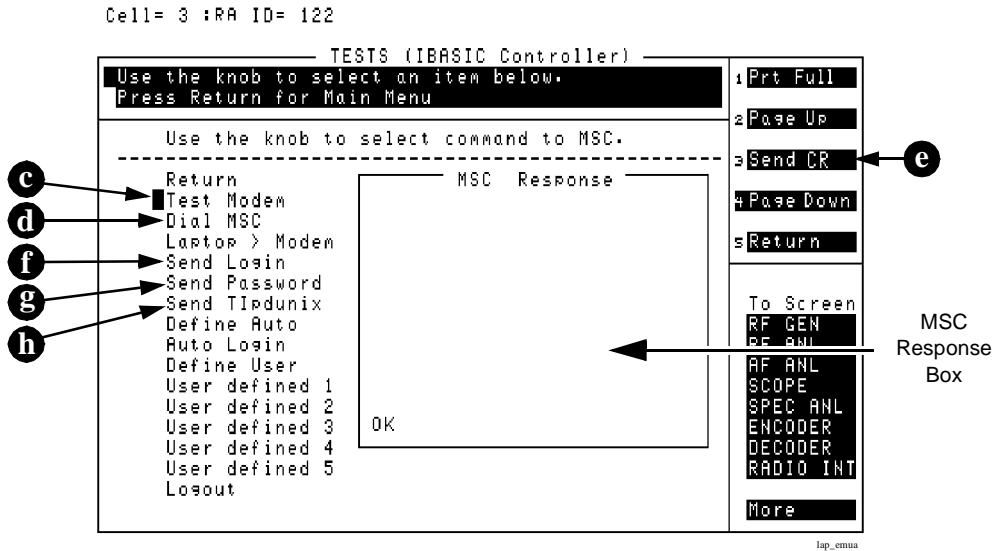

Figure 29   **Connecting to the MSC.**

    d. Now, dial up the MSC: Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it using the DATA keys and press the knob (**Done**). If you have entered the number before, it will appear at the top of the screen and you can select **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." **See "Laptop Emulator" on page 174** for details on dialling options.

    e. If a login prompt does not appear in the **MSC Response** box, press the **Send CR** (k3) USER key once or twice to get the login prompt to appear.

    f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.

    g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the characters in the **Choices** menu and select **Done** when finished. If you have entered your password previously, it will appear at the top of the screen and you can select **Done**.

h. Wait for the prompt from the MSC (typically a "$" or "#" or a few characters of text) then scroll to and select **Send TIpdunix** to enter the maintenance mode. You should receive a response of TERMINAL IN SERVICE. **Figure 30** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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
```

Figure 30   **Typical MSC Response box display after the connection to the MSC.**

i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 31**). Select it and enter the number for the cell site to be tested.

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

j. Scroll to and select **OP Cell**. You should see a response from the MSC in the **MSC Response** window.

lap_emub
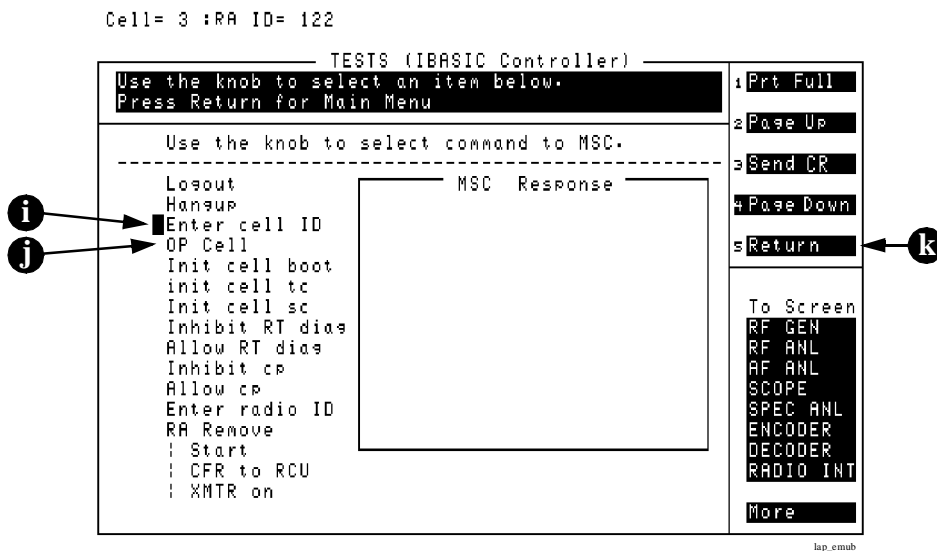
Figure 31 **Verifying site control.**

k. The radio should now be ready to receive the commands from the Test System that will be sent during testing. Exit the Laptop Emulator mode by pressing **Return** (k5).

Use of a PC to accomplish the connection to the MSC (Laptop>Modem):

You may also perform the connection sequence described in this section using a PC connected to the Test System rather than the Laptop Emulator menu. This may be necessary when negotiating an OMP or when passcodes are used. The basic steps are:

1. Go to the Laptop Emulator menu.
2. Select the Laptop > Modem mode.
3. Perform connection to MSC using the PC via the modem.
4. Once connected, exit the Laptop > Modem mode and the Laptop Emulator menu.

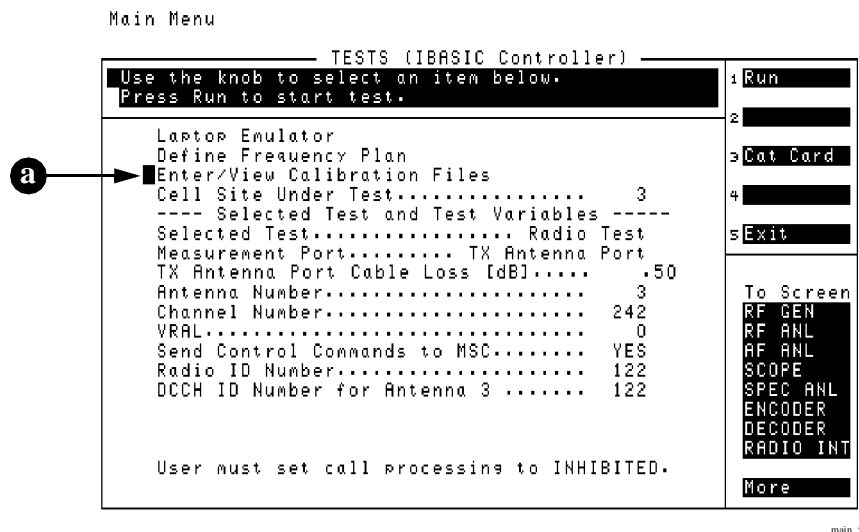For more information, **see "Laptop Emulator" on page 174**.

Step 2: Enter Site Calibration Constants

The next step is to enter values for calibration constants. These constants, defined per antenna per site, are used by the Software to make corrections for cable losses and Test System gains. Once you have defined the calibration constants, you may save them to a memory card to increase the speed of subsequent testing.

NOTE: The Software provides three ways to fill in calibration constants: 1) enter them directly, 2) measure them, or 3) load them from a file on a memory card. This procedure uses direct entry. For details on loading from a file and measuring the constants, refer to **"Calibration Files" on page 120**.

a. From the Software's Main Menu, choose **Enter/View Calibration Files** (see **figure 32**).

Main Menu

```
━━━━━━━━━ TESTS (IBASIC Controller) ━━━━━━━━━   ┌─┬─────────┐
┌────────────────────────────────────────────┐  │1│Run      │
│Use the knob to select an item below.        │  └─┴─────────┘
│Press Run to start test.                     │  ┌─┬─────────┐
└────────────────────────────────────────────┘  │2│         │
                                                 └─┴─────────┘
    Laptop Emulator                              ┌─┬─────────┐
    Define Frequency Plan                        │3│Cat Card │
 ▶▪ Enter/View Calibration Files                 └─┴─────────┘
    Cell Site Under Test................  3       ┌─┬─────────┐
    ---- Selected Test and Test Variables -----   │4│         │
    Selected Test................. Radio Test     └─┴─────────┘
    Measurement Port......... TX Antenna Port     ┌─┬─────────┐
    TX Antenna Port Cable Loss [dB].....   .50    │5│Exit     │
    Antenna Number.....................     3     └─┴─────────┘
    Channel Number.....................   242
    VRAL...............................     0      To Screen
    Send Control Commands to MSC........  YES     RF GEN
    Radio ID Number....................   122     RF ANL
    DCCH ID Number for Antenna 3 .......  122     AF ANL
                                                  SCOPE
                                                  SPEC ANL
                                                  ENCODER
                                                  DECODER
    User must set call processing to INHIBITED.   RADIO INT

                                                  ┌─────────┐
                                                  │More     │
                                                  └─────────┘
```

main_5

Figure 32   **Selecting the Enter/View Calibration Files Menu.**

b. You will see the main calibration constant menu shown in **figure 33**. Enter the correct values for `Cell Site Number` and `Antenna Number` at the top of the list in the `Enter/View Calibration Files` menu.

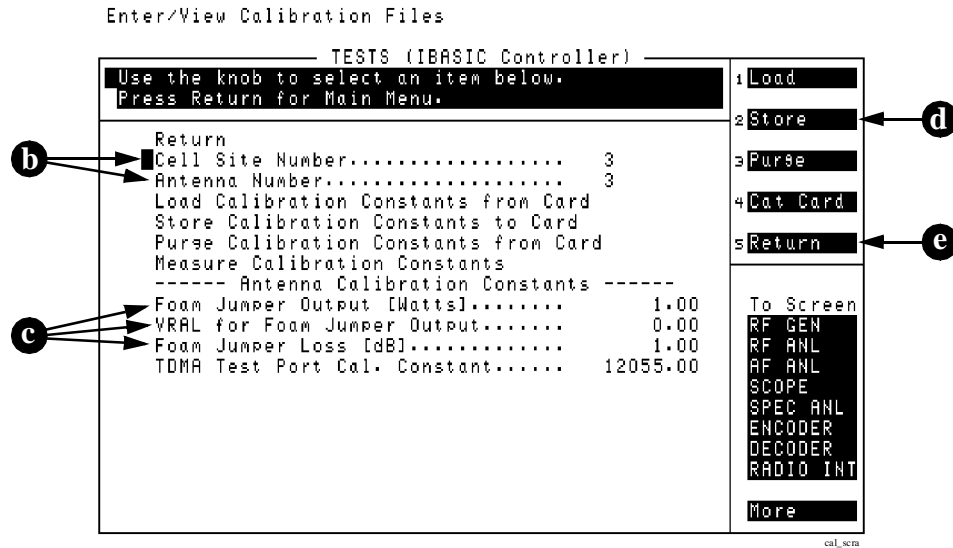**Figure 33**　　　　**Entering the calibration constants.**

c. Enter values for the following:
   1. `Foam Jumper Output [Watts]`
   2. `VRAL for Foam Jumper Output`
   3. `Foam Jumper Loss [dB]`

NOTE: If you are measuring the power at the *output* of the foam jumper, set the `Foam Jumper Loss [dB]` field to zero (0). If measuring at the *input* to the foam jumper, you need to enter the RF loss of the foam jumper itself.

NOTE: A value for the TDMA Test Port Cal. Constant is *not required* when testing at the TX Antenna Ports, as has been assumed for these tutorials. If you plan to test using connections to the TX Test Port, **see "Testing with Connections to the TX Test Port" on page 217**.

d. Once the values have been entered, press `Store` (k2) to save them on a memory card. This completes the steps needed to define the calibration constants for a given antenna. If the site you are to test has multiple antennas, repeat these steps starting at **step b.** using a new `Antenna Number` entry.

e. When finished with entries for all antennas, press `Return` (k5) to go back to the Software's Main Menu.

Step 3: Select the Radio Test Mode

a. From the Software's Main Menu, choose `Selected Test` and scroll to `Radio Test` and press the knob (see **figure 34**). Note that with the selection of a new test, different entry fields appear below the `Selected Test` field.
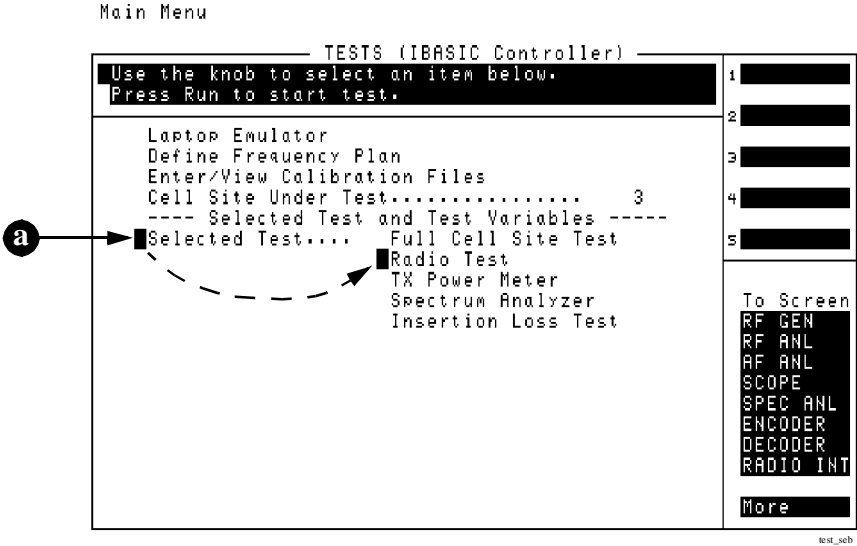
Figure 34 **Selecting the Radio Test mode.**

b. If the **Measurement Port** field is not set to **TX Antenna Port**, scroll to the field and press the knob to set it to **TX Antenna Port** (see **figure 35**).
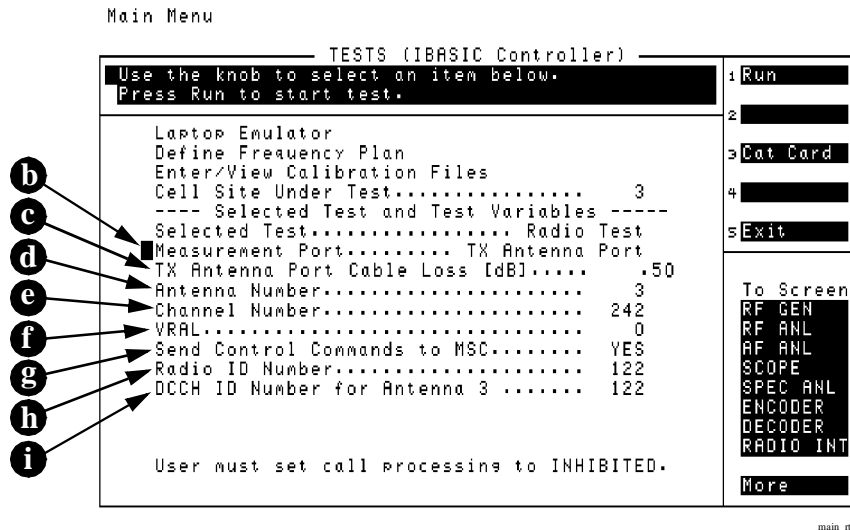
```
Main Menu
                     ┌──────── TESTS (IBASIC Controller) ────────┐
                     ┃ Use the knob to select an item below.    ┃ 1 Run
                     ┃ Press Run to start test.                 ┃
                     ┃                                          ┃ 2
                     ┃ Laptop Emulator                          ┃
                     ┃ Define Frequency Plan                    ┃ 3 Cat Card
                     ┃ Enter/View Calibration Files             ┃
 ⓑ                  ┃ Cell Site Under Test............... 3    ┃ 4
 ⓒ                  ┃ ---- Selected Test and Test Variables --- ┃
 ⓓ                  ┃ Selected Test............... Radio Test   ┃ 5 Exit
 ⓔ                  ┃ Measurement Port.......... TX Antenna Port ┃
 ⓕ                  ┃ TX Antenna Port Cable Loss [dB].....  .50 ┃
 ⓖ                  ┃ Antenna Number....................... 3   ┃   To Screen
                     ┃ Channel Number...................... 242  ┃ RF GEN
 ⓗ                  ┃ VRAL................................   0  ┃ RF ANL
 ⓘ                  ┃ Send Control Commands to MSC....... YES    ┃ AF ANL
                     ┃ Radio ID Number.................... 122   ┃ SCOPE
                     ┃ DCCH ID Number for Antenna 3 ...... 122   ┃ SPEC ANL
                     ┃                                          ┃ ENCODER
                     ┃                                          ┃ DECODER
                     ┃                                          ┃ RADIO INT
                     ┃ User must set call processing to INHIBITED. ┃
                     └──────────────────────────────────────────┘ More
                                                          main_rta
```

Figure 35   **Entering the Test Variables for Radio Tests**

c. Enter the loss (in dB) through the cable used to connect the Test System's RF IN/OUT port to the base station's TX Antenna Port. If you do not know the exact loss, you may use an approximate value. However, error in this value will affect power measurement accuracy. To *measure* the loss through the cable, **see "Insertion Loss Test" on page 98**.

d. Enter the **Antenna Number** for the radio being tested.

e. Enter the channel number in the **Channel Number** field.

f. Enter the radio's attenuation value in the **VRAL** field.

WARNING: **Maximum input power to the RF IN/OUT port of the PCS Interface is 1W (+30 dBm) for a CDMA base station transmitter. Before proceeding with testing, make sure that the test signal will not exceed this level. Damage to the Test System could result if the input is overdriven.**

g. Scroll to **Send Control Commands to MSC** and press the knob to set the field to **YES**.

NOTE: If you set the **Send Control Commands to MSC** field to **YES** and you have selected **TX Antenna Port** as the **Measurement Port**, you will need to make sure that the site call processing is inhibited. *This requires taking the entire site off-line.* You can use the Laptop Emulator to set call processing to inhibited (**see "Laptop Emulator" on page 174**).

    h. Enter the **Radio ID Number**.

    i. Enter the **DCCH ID Number for Antenna x** value.

NOTE: If the radio being tested includes the DCCH, the **DCCH ID Number** will be the same as the **Radio ID Number**. If the DCCH for antenna x is found on a different radio, enter the ID Number for the radio which includes the DCCH.

Step 4: Run the Test and Review the Results

At this time you are ready to start the Radio Test sequence.

a. From the Software's Main Menu, press the **Run** (k1) USER key (see **figure 36**).

main_rtb
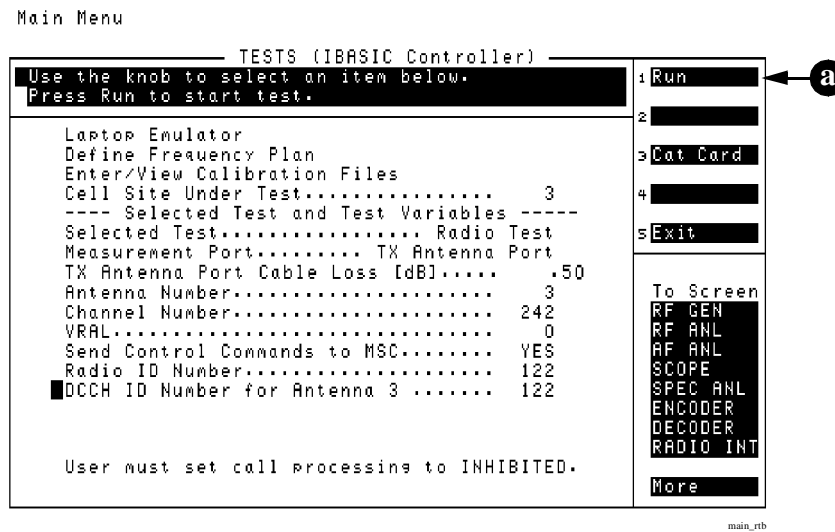
Figure 36   **Running the Radio Test.**

    b. At the start of testing, a connection diagram will be displayed (see **figure 37**). Follow the connection instructions listed on the display. If you need to stop testing at this point, press **Abort** (k5).

NOTE: This tutorial uses control via the MSC. If you are *not*, you will also see prompts here to turn the transmitter on and off. **See "Testing without MSC Control" on page 218**.
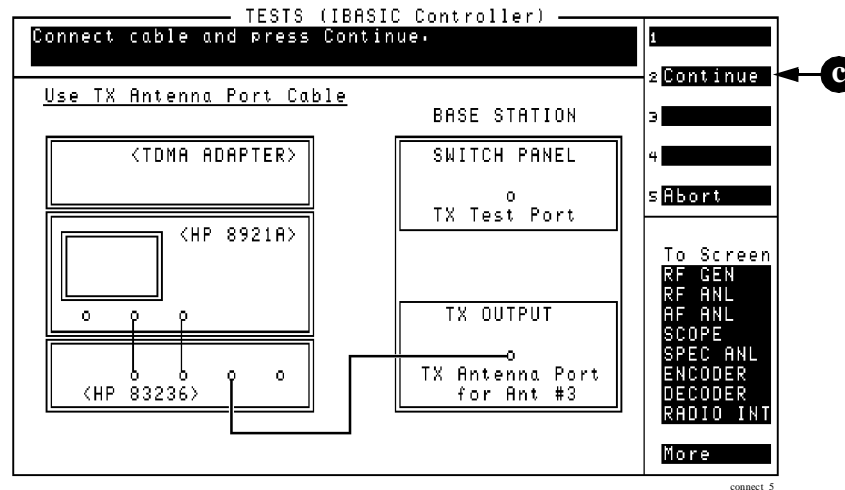
Figure 37   **Connection diagram at start of Radio Test.**

    c. After making the connections, press **Continue** (k2) and the test sequence will resume.

    d. After testing has started, the measured results will scroll on the display of the Test Set (see **figure 38**). The TDMA test names will be followed by the measured values. If you are using a printer, the specification limits will also appear.

```
==============================================================================
Test conditions            Measured value      Lower limit  Upper limit  P/F
==============================================================================
_____Site=4:Ant=1:Chan=232:RA=182:Freq=1936.98 MHz_____
Power @ VRAL 7                 0.02 Watts            .01          .02
Frequency error                1.07 Hz          -217.00       217.00
Origin offset                -81.99 dB                        -30.00
Magnitude error                 .09 %                          12.50
Phase error                    4.00 deg                         7.00
Error vector magnitude          .48 %                          12.50
Lower adj ch pwr             -55.62 dB                        -26.00
Upper adj ch pwr             -61.83 dB                        -26.00
Lower 1st alt ch pwr         -67.92 dB                        -45.00
Upper 1st alt ch pwr         -67.48 dB                        -45.00
```

Figure 38   **Example printout results from the Radio Test.**

If you need to end the testing before the Test System has finished, press the **Abort** (k5) USER key. You may receive a message to use the Laptop Emulator to reconfigure the radios at the site.

NOTE: Due to the communications between the MSC and the Test System, you may have to wait up to 30 seconds before being returned to the Software's Main Menu after having pressed the **Abort** (k5) key.

When testing is complete, press **Continue** (k2) to return to the Software's Main Menu.

For More Information

Testing another radio:

If you would like to perform the same tests on another radio (channel), update the following fields in the Software's Main Menu and repeat **"Step 4: Run the Test and Review the Results" on page 66**.

- **Antenna Number**
- **VRAL**
- **Channel Number**
- **Radio ID Number**
- **DCCH ID Number for Antenna x**

For details on the functions used in this step see the following descriptions:

If you had problems or received error messages:

TX Power Meter

Overview

The TX Power Meter mode configures the Test System to act as a power meter for average power measurements on transmitter signals in the PCS band.

This tutorial section details the following steps:

1. Using the Laptop Emulator to connect to the MSC and prepare for maintenance.
2. Defining calibration information for the TX Power Meter.
3. Selecting the TX Power Meter mode and providing required information.
4. Running the test and using the power meter display.

Prerequisites

You must have completed the steps outlined in **"Installation" on page 21**. This tutorial starts with the test equipment connected and the modem initialized.

You must know the following about your system, site, and radio:

❒ Phone number, login, and password for the switch (MSC)
❒ Cell Site information, including:
   • Cell Site number
   • Radio ID Number for the radio being tested
   • Channel number for the radio
   • VRAL setting for the Foam Jumper Output power
   • Antenna number used for the radio
   • DCCH status for the radio
   • DCCH Radio ID number for each antenna
   • Power output at the foam jumper
   • Foam jumper loss (in dB)
❒ TX Antenna Port Cable Loss (in dB)

Step 1: Connect to MSC

First, you will use the Test System to dial up the MSC controlling the site you are planning to test. You will then log on and enter the maintenance craft shell (TIpdunix). From there, the Test System will send commands to the site when an action is required during testing.

NOTE: When testing at the TX Antenna Ports *and* using the modem to control the MSC, it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is a reminder; if unsure, you can verify the CP status by using the OP Cell command of the Laptop Emulator.

NOTE: The steps in this section describe the use of the Test Set and the Software screens to communicate to the MSC via the modem. In some cases, you may need to use a PC with the modem to make the connection (such as when negotiating through an OMP). This process is described at the end of this section (**"Use of a PC to accomplish the connection to the MSC (Laptop>Modem):" on page 74**) and in more detail in **"Laptop Emulator" on page 174**.

a. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob (see **figure 39**).
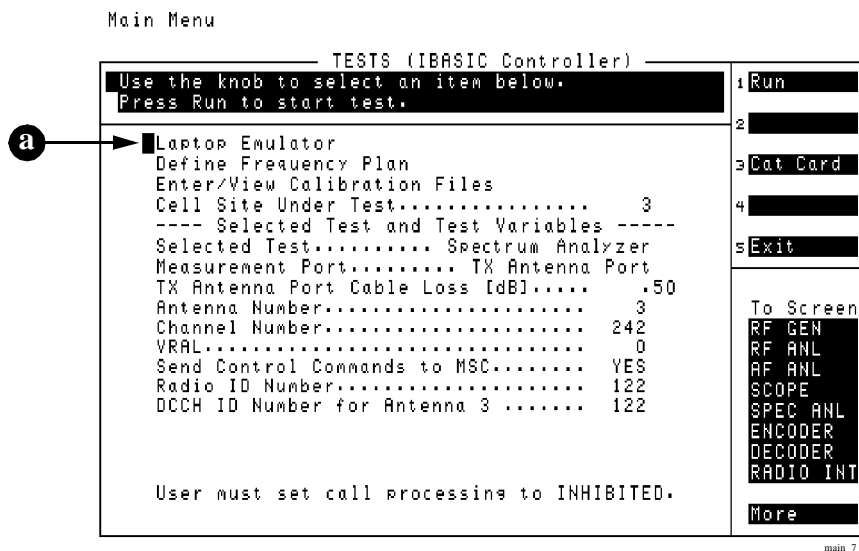
Figure 39   **Selecting the Laptop Emulator.**

b. Make sure that your modem is connected and turned on.

c. Scroll down to **Test Modem** and select it to verify basic modem operation (see **figure 40**). The response "OK" should appear in the **MSC Response** box.


```
Cell= 3 :RA ID= 122

                    ┌──── TESTS (IBASIC Controller) ────┐   ┌─────────┐
  ┌─────────────────────────────────────────────────┐     │1 Prt Full│
  │Use the knob to select an item below.            │     └─────────┘
  │Press Return for Main Menu                       │     ┌─────────┐
  └─────────────────────────────────────────────────┘     │2 Page Up │
                                                           └─────────┘
        Use the knob to select command to MSC.             ┌─────────┐
     --------------------------------------------          │3 Send CR │ ◄── e
  c   Return                    ┌──── MSC  Response ──┐     └─────────┘
      Test Modem                │                     │     ┌─────────┐
  d   Dial MSC                  │                     │     │4 Page Down│
      Laptop > Modem            │                     │     └─────────┘
  f   Send Login                │                     │     ┌─────────┐
      Send Password             │                     │     │5 Return  │
  g   Send TIpdunix             │                     │     └─────────┘
      Define Auto               │                     │
  h   Auto Login                │                     │      To Screen
      Define User               │                     │     ┌─────────┐
      User defined 1            │                     │     │RF GEN   │
      User defined 2            │                     │     │RF ANL   │
      User defined 3            │ OK                  │     │AF ANL   │
      User defined 4            │                     │     │SCOPE    │
      User defined 5            └─────────────────────┘     │SPEC ANL │
      Logout                                                │ENCODER  │
  └─────────────────────────────────────────────────       │DECODER  │
                                                            │RADIO INT│
                                                            └─────────┘
                                                            │More     │
                                                            cal_emua
```

MSC
Response
Box

Figure 40   **Connecting to the MSC.**

d. Now, dial up the MSC: Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it and press the knob (**Done**) If you have entered the number before, it will appear at the top of the screen and you can select **Done**. You should hear the modem activate and send the DTMF tones. You should then be able to hear the ring at the MSC end, followed by the "connect sound." **See "Laptop Emulator" on page 174** for details on dialling options.

e. If a login prompt does not appear in the MSC Response box, press the **Send CR** (k3) USER key once or twice to get the login prompt to appear.

f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the list of characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.

g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the list of characters in the **Choices** menu and select **Done** If you have entered your password previously, it will appear at the top of the screen and you can select **Done**.

h. 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 41** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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
```

Figure 41 **Typical MSC Response box display after the connection to the MSC.**

i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 42**). Select it and enter the number for the cell site to be tested. Then scroll to and select **OP Cell**.

NOTE: In the **Laptop Emulator** menu, using the **Page Up** (k2) and **Page Down** (k4) USER keys can save time.
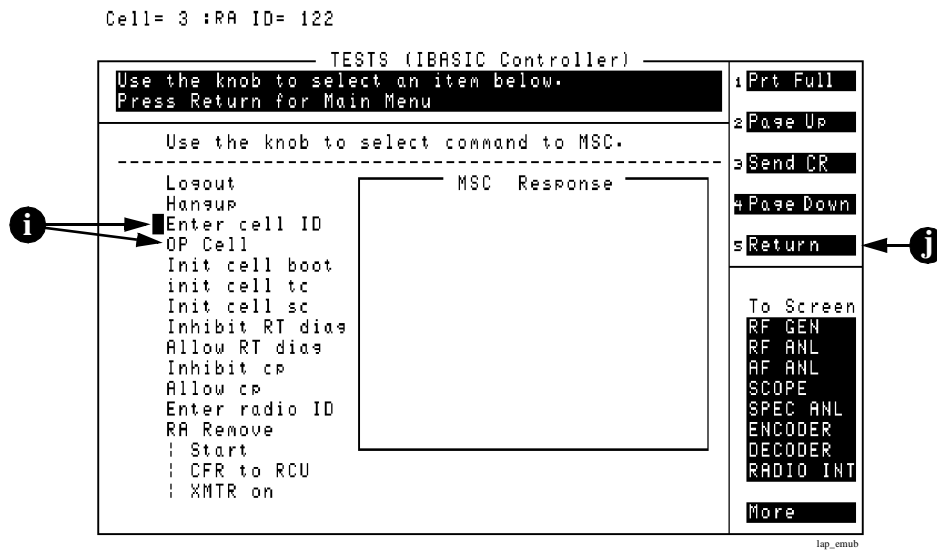
Figure 42   **Verifying site control.**

j. The radio should now be ready to receive the commands from the Test System that will be sent during testing. Exit the Laptop Emulator mode by pressing **Return** (k5).

Use of a PC to accomplish the connection to the MSC (Laptop>Modem):

You may also perform the connection sequence described in this section using a PC connected to the Test System rather than the Laptop Emulator menu. This may be necessary when negotiating an OMP or when passcodes are used. The basic steps are:

1. Go to the Laptop Emulator menu.
2. Select the Laptop > Modem mode.
3. Perform connection to MSC using the PC via the modem.
4. Once connected, exit the Laptop > Modem mode and the Laptop Emulator menu.

For more information, **see "Laptop Emulator" on page 174**.

Step 2: Enter Site Calibration Constants

Before running the TX Power Meter mode, you must enter values for calibration constants. These constants, defined per antenna per site, are used by the Software to make corrections for cable losses and Test System gains. Once you have defined the calibration constants, you may save them to a memory card to increase the speed of subsequent testing.

NOTE: The Software provides three ways to fill in calibration constants: 1) enter them directly, 2) measure them, or 3) load them from a file on a memory card. This procedure uses direct entry. For details on loading from a file and measuring the constants, refer to **"Calibration Files" on page 120**.

    a. From the Software's Main Menu, choose **Enter/View Calibration Files** (see **figure 43**).

Main Menu

```
                 ─── TESTS (IBASIC Controller) ───    ┌──────────┐
    ┌────────────────────────────────────────┐        │1│Run     │
    │Use the knob to select an item below.    │        └──────────┘
    │Press Run to start test.                 │        ┌──────────┐
    └────────────────────────────────────────┘        │2│        │
                                                       └──────────┘
         Laptop Emulator                               ┌──────────┐
         Define Frequency Plan                         │3│Cat Card│
   a ──▶ ▌Enter/View Calibration Files                 └──────────┘
         Cell Site Under Test................    3     ┌──────────┐
         ---- Selected Test and Test Variables -----   │4│        │
         Selected Test..............TX Power Meter      └──────────┘
         Measurement Port......... TX Antenna Port      ┌──────────┐
         TX Antenna Port Cable Loss [dB].....   .50     │5│Exit    │
         Antenna Number.....................     3      └──────────┘
         Channel Number.....................   242
         VRAL...............................     0        To Screen
         Send Control Commands to MSC........   YES      ┌────────┐
         Radio ID Number....................   122       │RF GEN  │
         DCCH ID Number for Antenna 3 .......  122       │RF ANL  │
                                                         │AF ANL  │
                                                         │SCOPE   │
                                                         │SPEC ANL│
                                                         │ENCODER │
                                                         │DECODER │
         User must set call processing to INHIBITED.     │RADIO INT│
                                                         └────────┘
                                                         ┌────────┐
                                                         │More    │
                                                         └────────┘
                                                                 main_6
```

Figure 43   **Selecting the Enter/View Calibration Files Menu.**

b. You will see the main calibration constant menu shown in **figure 44**. Enter the correct values for `Cell Site Number` and `Antenna Number` at the top of the list in the menu.
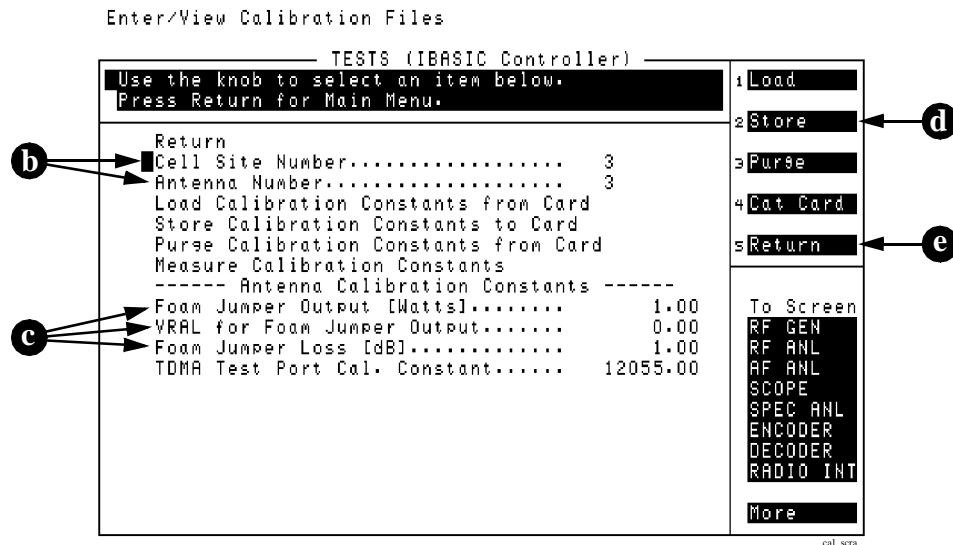
Figure 44   **Entering the calibration constants.**

c. Enter values for the following:
1. **Foam Jumper Output [Watts]**
2. **VRAL for Foam Jumper Output**
3. **Foam Jumper Loss [dB]**

NOTE: If you are measuring the power at the *output* of the foam jumper, set the **Foam Jumper Loss [dB]** field to zero (0). If measuring at the *input* to the foam jumper, you need to enter the RF loss of the foam jumper itself.

NOTE: A value for the TDMA Test Port Cal. Constant is *not required* when testing at the TX Antenna Ports, as has been assumed for these tutorials. If you plan to test using connections to the TX Test Port, **see "Testing with Connections to the TX Test Port" on page 217**.

d. Once the values have been entered, press **Store** (k2) to save them on a memory card. This completes the steps needed to define the calibration constants for a given antenna. If the site you are to test has multiple antennas, repeat these steps starting at **step b.** using a new **Antenna Number** entry.

e. When finished with entries for all antennas, press **Return** (k5) to go back to the Software's Main Menu.

Step 3: Select the TX Power Meter Mode

a. From the Software's Main Menu, choose **Selected Test** and scroll to **TX Power Meter** and press the knob (see **figure 45**). Note that with the selection of a new test, different entry fields appear below the **Selected Test** field.

```
Main Menu
                      ┌──── TESTS (IBASIC Controller) ────┐
                      │ Use the knob to select an item below. │  1▐▇▇▇▇▇▇
                      │ Press Run to start test.              │
                                                                2▐▇▇▇▇▇▇
                        Laptop Emulator                        3▐▇▇▇▇▇▇
                        Define Frequency Plan
                        Enter/View Calibration Files           4▐▇▇▇▇▇▇
                        Cell Site Under Test...............    3
                        ---- Selected Test and Test Variables -----  5▐▇▇▇▇▇▇
   (a)──────────────▶ ▌Selected Test....   Full Cell Site Test
                                            Radio Test          To Screen
                                           ▌TX Power Meter      RF GEN
                                            Spectrum Analyzer   RF ANL
                                            Insertion Loss Test AF ANL
                                                                SCOPE
                                                                SPEC ANL
                                                                ENCODER
                                                                DECODER
                                                                RADIO INT

                                                                ▌More
```
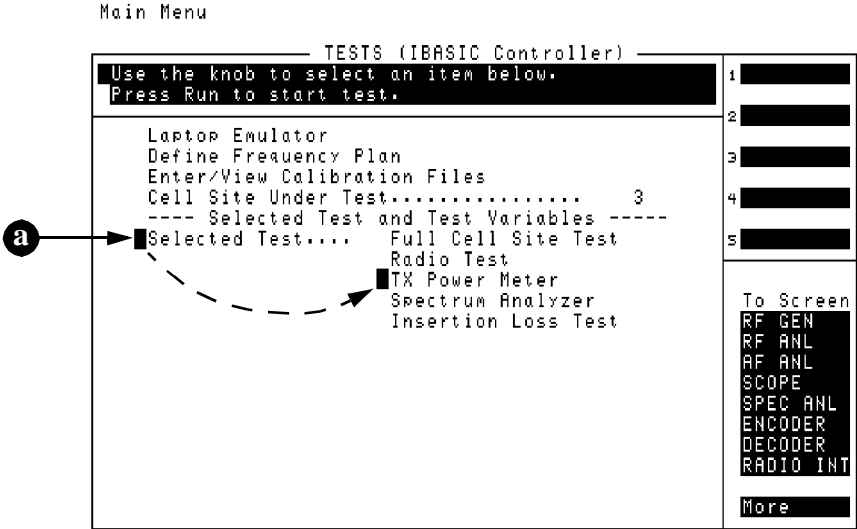
Figure 45   **Selecting the TX Power Meter mode.**

    b. Select `Measurement Port`. You may choose to measure at the `TX Antenna Port` or the `TX Test Port` (see **figure 46**). In this tutorial the `TX Antenna Port` is used.
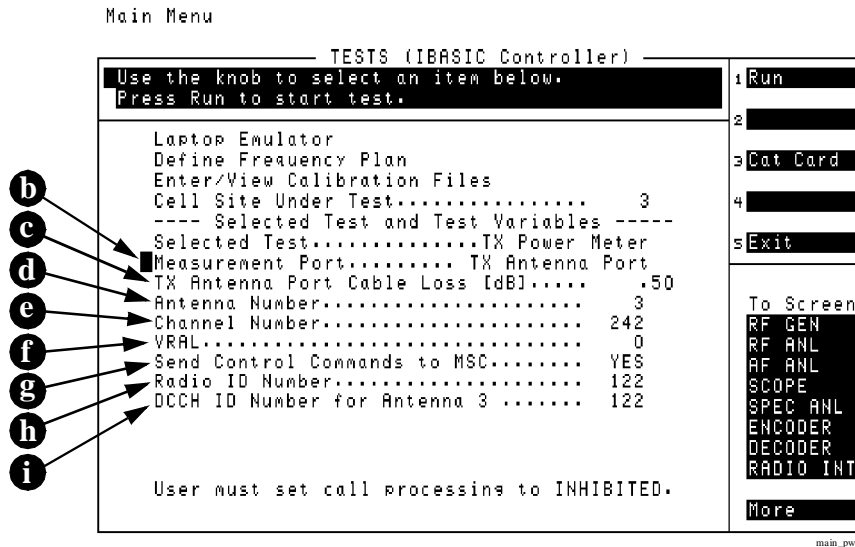
Figure 46   **Entering the Test Variables for Radio Tests**

    c. Enter the loss (in dB) through the cable connecting the Test System's RF IN/OUT port to the base station's TX Antenna Port. If you do not know the exact loss, you may use an approximate value. Error in this value will affect power measurement accuracy. To *measure* the loss through the cable, **see "Insertion Loss Test" on page 98**.

    d. Enter the `Antenna Number` for the radio being tested.

    e. Enter the channel number in the `Channel Number` field.

    f. Enter the radio's attenuation value in the `VRAL` field.

WARNING: **Maximum input power to the RF IN/OUT port of the PCS Interface is 1W (+30 dBm) for a CDMA base station transmitter. Before proceeding with testing, make sure that the test signal will not exceed this level. Damage to the Test System could result if the input is overdriven.**

    g. Set `Send Control Commands to MSC` to `YES`.

NOTE: If you set the `Send Control Commands to MSC` field to `YES` and you have selected `TX Antenna Port` as the `Measurement Port`, you will need to make sure that the site call processing is inhibited. *This requires taking the entire site off-line.* You can use the Laptop Emulator to set call processing to inhibited (**see "Laptop Emulator" on page 174**).

    h. Enter the **`Radio ID Number`** of the radio to be measured.

    i. Enter the **`DCCH ID Number for Antenna x`** value (this may be the same as the Radio ID Number).

NOTE: If the radio being tested includes the DCCH, the **`DCCH ID Number`** will be the same as the **`Radio ID Number`**. If the DCCH for antenna x is found on a different radio, enter the ID Number for the radio which includes the DCCH.

Step 4: Run the Test

At this time you are ready to start the TX Power Meter mode.

a. From the Software's Main Menu, press the **Run** (k1) USER key (see **figure 47**).
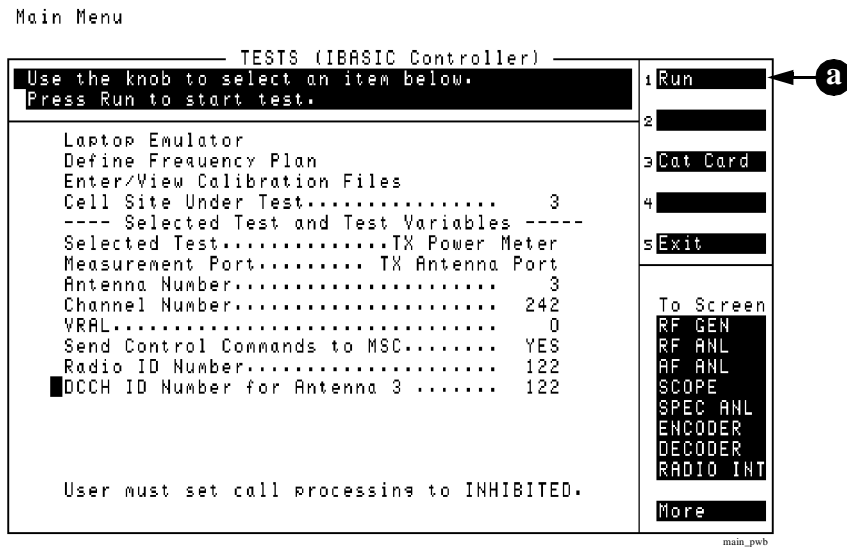
Figure 47   **Running the Power Meter mode.**

b. At the start of testing, a connection diagram will be displayed (see **figure 48**). Follow the connection instructions listed on the display (this tutorial uses control via the MSC). If you need to stop testing at this point, press **Abort** (k5).
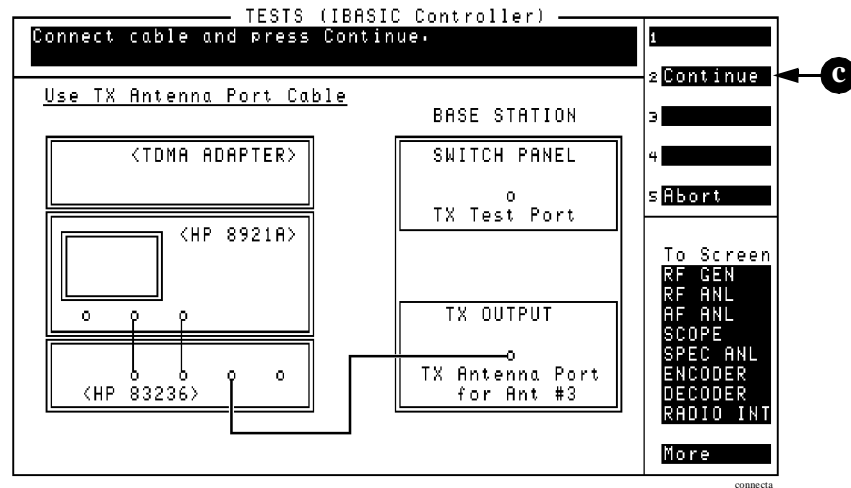
Figure 48   **Connection diagram at start of TX Power Meter mode.**

c. Press **Continue** (k2) once the connections have been made.

    d. After a pause, you will see a simulated analog meter display (see **figure 49**). Within the display are the upper and lower measurement values; these will change based on the expected power reading. At the top of the display is a digital readout that matches the "needle" indication.
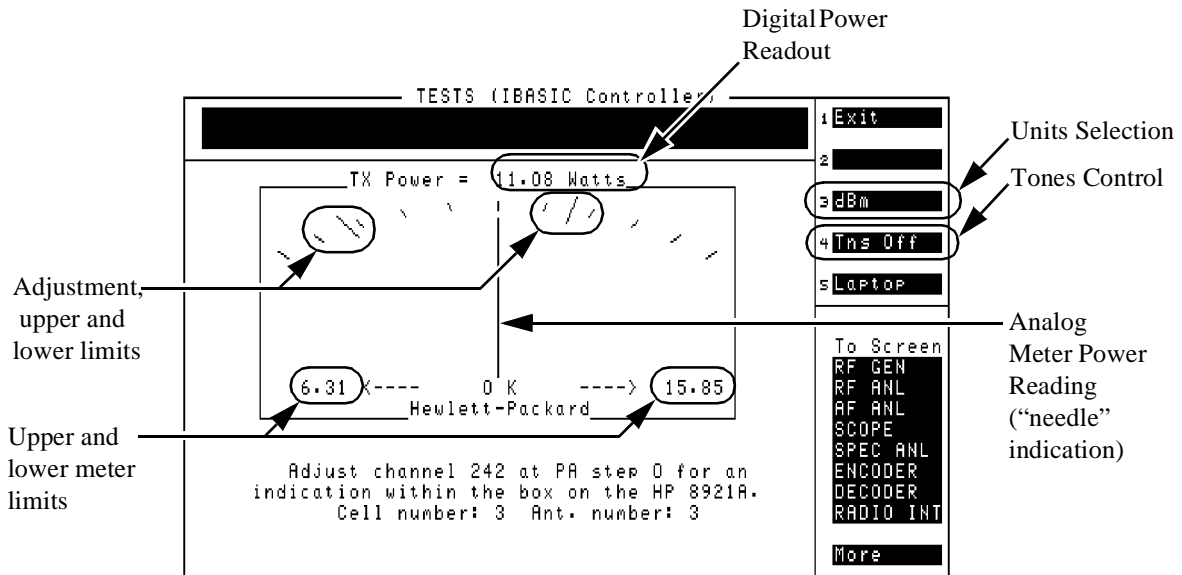
Figure 49   **The TX Power Meter display.**

    e. If you are adjusting power on a radio, you will want to adjust it so that the meter is centered in the scale. The larger tic marks on the scale (adjustment upper and lower limits) come from your entries of TX Power specification limits. If you would like to change the measurement units to dBm (rather than Watts), press **dBm** (k3). **See "TX Power Meter" on page 212** for more details on the use of this screen.

    f. When you are finished using the power meter, press **Exit** (k1) and you will return to the Software's Main Menu.

For More Information

Testing another radio:

If you would like to measure power on another radio (channel), update the following fields and repeat **"Step 4: Run the Test" on page 80**.

- `Antenna Number`
- `VRAL`
- `Channel Number`
- `Radio ID Number`
- `DCCH ID Number for Antenna x`

For details on the functions used in this step see the following descriptions:

"Laptop Emulator" on page 174
"Calibration Files" on page 120
"Test Descriptions" on page 208
"Printing and Report Generation" on page 198

If you had problems or received error messages:

See **"Troubleshooting" on page 219**.

Spectrum Analyzer

Overview

The Spectrum Analyzer mode configures the Test System to tune to a given frequency and then provides access to the Test Set's spectrum display. Once on the spectrum display, you can use spectrum analyzer functions (span, reference level, and so forth) to improve the displayed signal.

The basic steps in Spectrum Analyzer use are:

1. Using the Laptop Emulator screen to connect to the MSC and prepare for maintenance.
2. Defining calibration information.
3. Selecting the Spectrum Analyzer mode and providing required information.
4. Running the test and accessing the spectrum display.

Prerequisites

You must have completed the steps outlined in **"Installation" on page 21**. This tutorial starts with the test equipment connected and the modem initialized.

You must know the following about your system, site, and radio:

❏ Phone number, login, and password for the switch (MSC)
❏ Cell Site information, including:
- Cell Site number
- Radio ID Number for the radio being tested
- Channel number for the radio
- VRAL setting for Foam Jumper Output level
- Antenna number used for the radio
- DCCH status for the radio
- DCCH Radio ID number for each antenna
- Power output at the foam jumper
- Foam jumper loss (in dB)
❏ TX Antenna Port Cable Loss (in dB)

Step 1: Connect to MSC

First, you will use the Test System to dial up the MSC controlling the site you are planning to test. You will then log on and enter the maintenance craft shell (TIpdunix). From there, the Test System will send commands to the site when an action is required during testing.

NOTE: When testing at the TX Antenna Ports *and* using the modem to control the MSC, it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is a reminder; if unsure, you can verify the CP status by using the OP Cell command of the Laptop Emulator.

NOTE: The steps in this section describe the use of the Test Set and the Software screens to communicate to the MSC via the modem. In some cases, you may need to use a PC with the modem to make the connection (such as when negotiating through an OMP). This process is described at the end of this section (**"Use of a PC to accomplish the connection to the MSC (Laptop>Modem):" on page 88**) and in more detail in **"Laptop Emulator" on page 174**.

    a. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob (see **figure 50**).
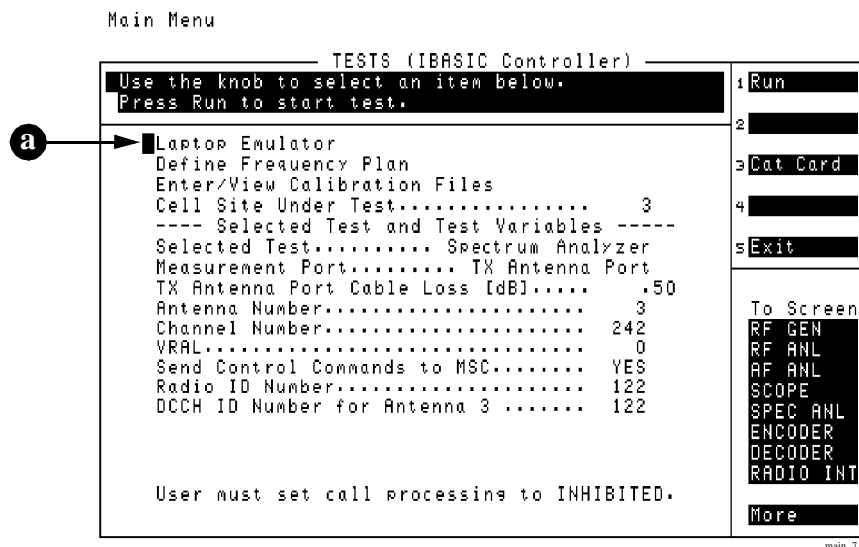
Figure 50   **Selecting the Laptop Emulator.**

    b. Make sure that your modem is connected and turned on.

    c. Scroll down to **Test Modem** and select it to verify basic modem operation (see **figure 51**). The response "OK" should appear in the **MSC Response** box.

Cell= 3 :RA ID= 122
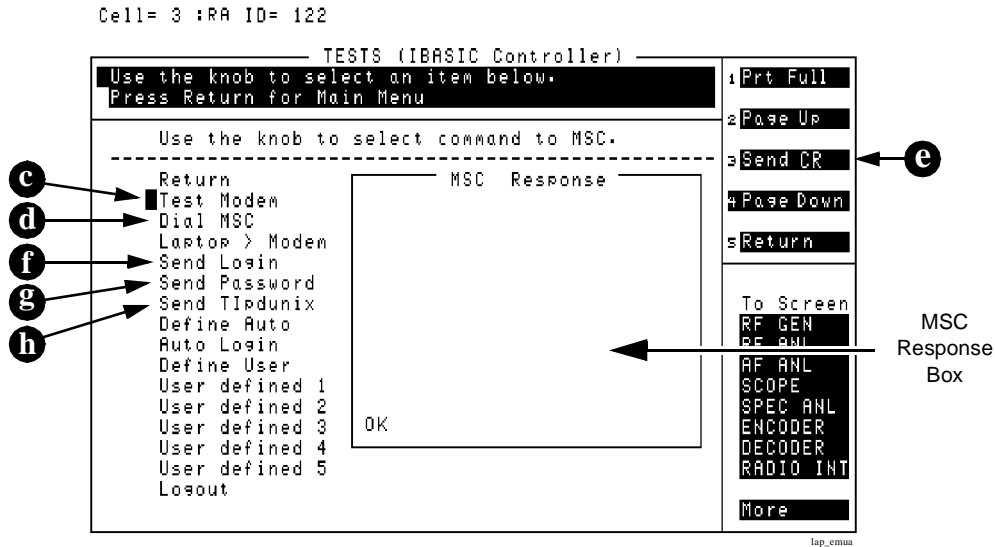
Figure 51   **Connecting to the MSC.**

    d. Now, dial up the MSC: Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it using the DATA keys and press the knob (**Done**) If you have entered the number before, it will appear at the top of the screen and you can select **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." **See "Laptop Emulator" on page 174** for details on dialling options.

    e. If a login prompt does not appear in the **MSC Response** box, press the **Send CR** (k3) USER key once or twice to get the login prompt to appear.

    f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.

    g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the characters in the **Choices** menu and select **Done** If you have entered your password previously, it will appear at the top of the screen and you can select **Done**.

h. 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 52** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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
```

Figure 52   **Typical MSC Response box display after the connection to the MSC.**

i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 53**). Select it and enter the number for the cell site to be tested. Then scroll to and select **OP Cell**.

NOTE: In the **Laptop Emulator** menu, using the **Page Up** (k2) and **Page Down** (k4) USER keys can save time.
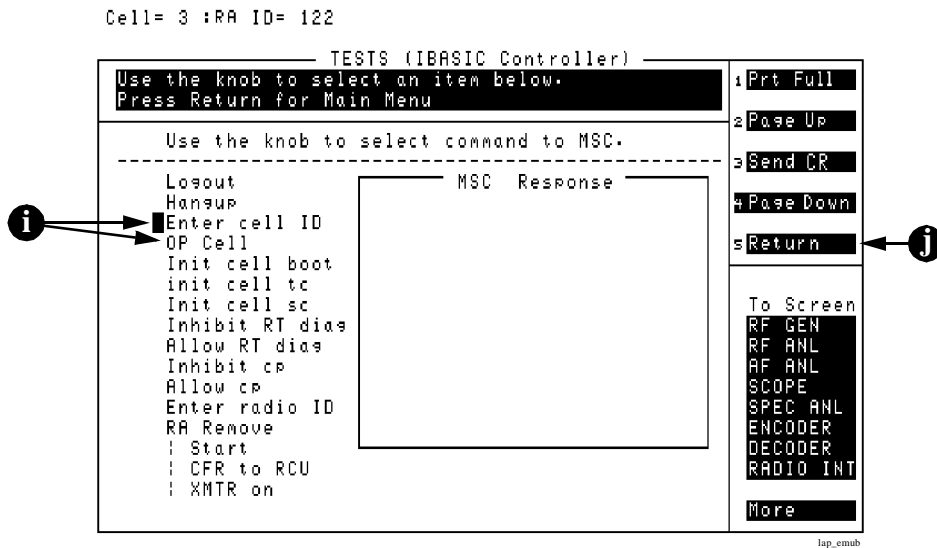
Figure 53   **Verifying site control.**

j. The radio should now be ready to receive the commands from the Test System that will be sent during testing. Exit the Laptop Emulator mode by pressing **Return** (k5).

Use of a PC to accomplish the connection to the MSC (Laptop>Modem):

You may also perform the connection sequence described in this section using a PC connected to the Test System rather than the Laptop Emulator menu. This may be necessary when negotiating an OMP or when passcodes are used. The basic steps are:

1. Go to the Laptop Emulator menu.
2. Select the Laptop > Modem mode.
3. Perform connection to MSC using the PC via the modem.
4. Once connected, exit the Laptop > Modem mode and the Laptop Emulator menu.

For more information, **see "Laptop Emulator" on page 174**.

Step 2: Enter Site Calibration Constants

Before running the Spectrum Analyzer mode, you must enter values for calibration constants. These constants, defined per antenna per site, are used by the Software to make corrections for cable losses and Test System gains. Once you have defined the calibration constants, you may save them to a memory card to increase the speed of subsequent testing.

NOTE: The Software provides three ways to fill in calibration constants: 1) enter them directly, 2) measure them, or 3) load them from a file on a memory card. This procedure uses direct entry. For details on loading from a file and measuring the constants, refer to **"Calibration Files" on page 120**.

    a. From the Software's Main Menu, choose **Enter/View Calibration Files** (see **figure 54**).

Main Menu

```
──────── TESTS (IBASIC Controller) ────────
 Use the knob to select an item below.        1 Run
 Press Run to start test.
                                              2
    Laptop Emulator
    Define Frequency Plan                     3 Cat Card
a ► Enter/View Calibration Files
    Cell Site Under Test...............    3   4
    ---- Selected Test and Test Variables -----
    Selected Test.......... Spectrum Analyzer  5 Exit
    Measurement Port......... TX Antenna Port
    TX Antenna Port Cable Loss [dB].....  .50
    Antenna Number....................    3     To Screen
    Channel Number.................... 242     RF GEN
    VRAL.............................     0     RF ANL
    Send Control Commands to MSC........ YES    AF ANL
    Radio ID Number................... 122     SCOPE
    DCCH ID Number for Antenna 3 ...... 122     SPEC ANL
                                              ENCODER
                                              DECODER
                                              RADIO INT
    User must set call processing to INHIBITED.
                                              More
                                                    main_8
```

Figure 54   **Selecting the Enter/View Calibration Files Menu.**

b. You will see the main calibration constant menu shown in **figure 55**. Enter the correct values for `Cell Site Number` and `Antenna Number` at the top of the list in the `Enter/View Calibration Files` menu.

```
Enter/View Calibration Files
        ───────── TESTS (IBASIC Controller) ─────────   1 Load
        Use the knob to select an item below.
        Press Return for Main Menu.                       2 Store
                                                          3 Purge
        Return
        Cell Site Number..................   3            4 Cat Card
        Antenna Number....................   3
        Load Calibration Constants from Card              5 Return
        Store Calibration Constants to Card
        Purge Calibration Constants from Card
        Measure Calibration Constants
        ────── Antenna Calibration Constants ──────       To Screen
        Foam Jumper Output [Watts]........     1.00       RF GEN
        VRAL for Foam Jumper Output.......     0.00       RF ANL
        Foam Jumper Loss [dB].............     1.00       AF ANL
        TDMA Test Port Cal. Constant......  12055.00      SCOPE
                                                          SPEC ANL
                                                          ENCODER
                                                          DECODER
                                                          RADIO INT

                                                          More
```
cal_scra

Figure 55   **Entering the calibration constants.**

c. Enter values for the following:
1. `Foam Jumper Output [Watts]`
2. `VRAL for Foam Jumper Output`
3. `Foam Jumper Loss [dB]`

NOTE: If you are measuring the power at the *output* of the foam jumper, set the `Foam Jumper Loss [dB]` field to zero (0). If measuring at the *input* to the foam jumper, you need to enter the RF loss of the foam jumper itself.

NOTE: A value for the TDMA Test Port Cal. Constant is *not required* when testing at the TX Antenna Ports, as has been assumed for these tutorials. If you plan to test using connections to the TX Test Port, **see "Testing with Connections to the TX Test Port" on page 217**.

d. Once the values have been entered, press `Store` (k2) to save them on a memory card. This completes the steps needed to define the calibration constants for a given antenna. If the site you are to test has multiple antennas, repeat these steps starting at **step b.** using a new `Antenna Number` entry.

e. When finished with entries for all antennas, press `Return` (k5) to go back to the Software's Main Menu.

Step 3: Select the Spectrum Analyzer Mode

a. From the Software's Main Menu, choose **Selected Test** and scroll to **Spectrum Analyzer** and press the knob (see **figure 56**). Note that with the selection of a new test, different entry fields appear below the **Selected Test** field.
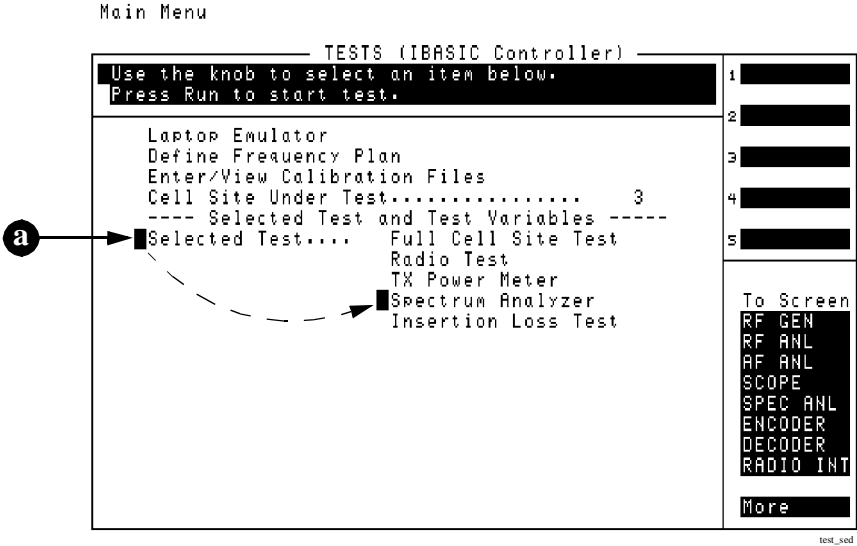
Figure 56   **Selecting the Spectrum Analyzer mode.**

b. Select **Measurement Port**. You may choose to measure at the **TX Antenna Port** or the **TX Test Port** (see **figure 57**). In this tutorial the **TX Antenna Port** is used.
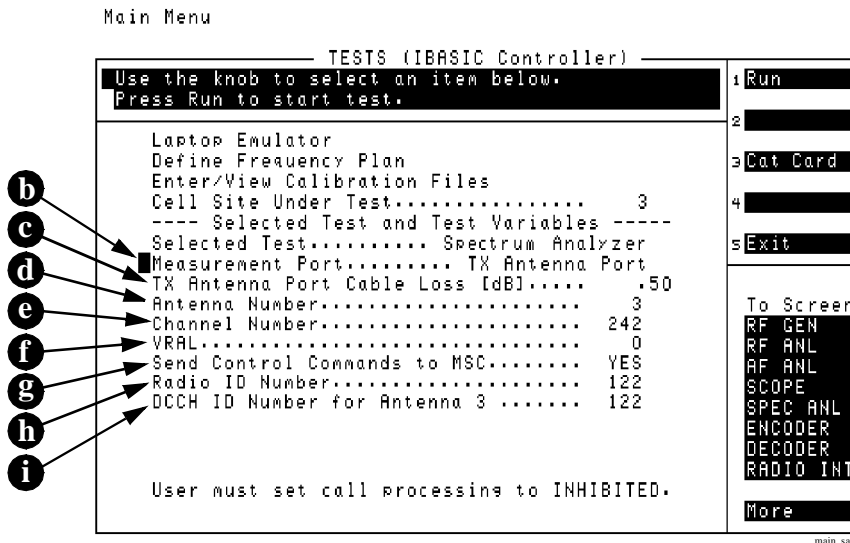
Figure 57   **Entering the Test Variables for Radio Tests**

c. Enter the loss (in dB) through the cable used to connect the Test System's RF IN/OUT port to the base station's TX Antenna Port. If you do not know the exact loss, you may use an approximate value. Error in this value will affect power measurement accuracy. To *measure* the loss through the cable, **see "Insertion Loss Test" on page 98**.

d. Enter the **Antenna Number** for the radio being tested.

e. Enter the channel number in the **Channel Number** field. This will be used to set the center frequency of the spectrum analyzer. You can change the center frequency once you are in the spectrum display screen.

f. Enter the radio's attenuation value in the **VRAL** field.

WARNING: **Maximum input power to the RF IN/OUT port of the PCS Interface is 1W (+30 dBm) for a CDMA base station transmitter. Before proceeding with testing, make sure that the test signal will not exceed this level. Damage to the Test System could result if the input is overdriven.**

g. Set **Send Control Commands to MSC** to **YES**.

NOTE: If you set the **Send Control Commands to MSC** field to **YES** and you have selected **TX Antenna Port** as the **Measurement Port**, you will need to make sure that the site call processing is inhibited. *This requires taking the entire site off-line.* You can use the Laptop Emulator to set call processing to inhibited (**see "Laptop Emulator" on page 174**).

    h. Enter a value for **`Radio ID Number`** for the radio to be measured.

    i. Enter a value for **`DCCH ID Number for Antenna x`** (may be the same as the Radio ID Number).

NOTE: If the radio being tested includes the DCCH, the **`DCCH ID Number`** will be the same as the **`Radio ID Number`**. If the DCCH for antenna x is found on a different radio, enter the ID Number for the radio which includes the DCCH.

Step 4: Run the Test

At this time you are ready to start the Spectrum Analyzer mode.

a. From the Software's Main Menu, press the **Run** (k1) USER key (see **figure 58**).
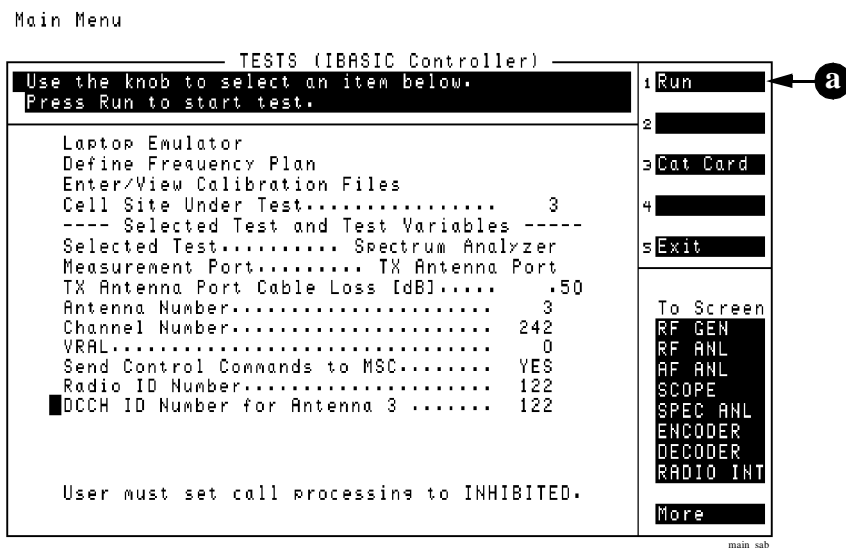
Figure 58   **Running the Spectrum Analyzer mode.**

    b. At the start of testing, a connection diagram will be displayed (see **figure 59**). Follow the connection instructions on the display (this tutorial uses control via the MSC). If you need to stop testing at this point, press **Abort** (k5).
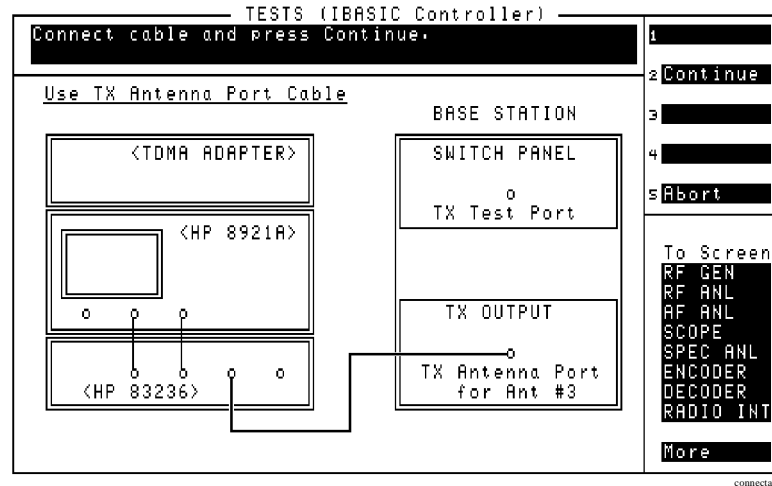
Figure 59   **Connection diagram at start of testing.**

    c. Press **Continue** (k2) after making the connections.

d. After a pause, you will see the spectrum display (see **figure 60**).You can now use the spectrum display controls (**Ref Level**, **Span**, **Marker** and so forth) just as you would when using the Test Set manually. You can use the marker controls to change the marker position and read the frequency and level from the **Marker** field.
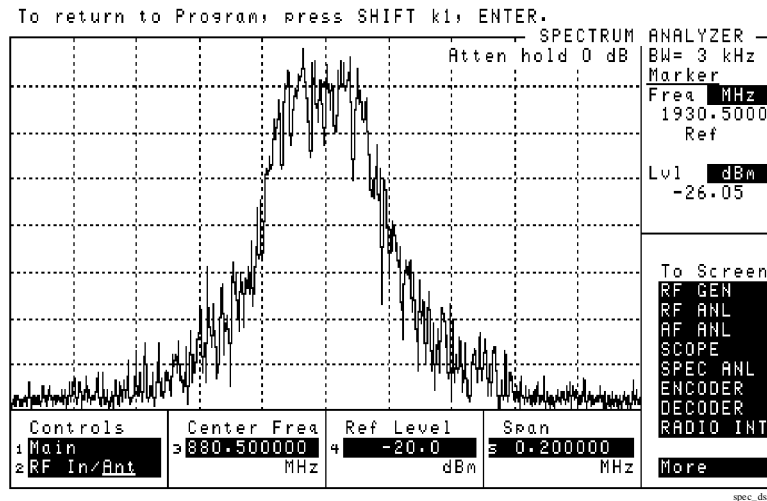
Figure 60　　　　　**Spectrum display in the Spectrum Analyzer mode.**

e. Note that the frequency appearing in the **Center Freq** field on the spectrum display will *not* match the actual tuned frequency of the Test System. If you would like to change the center frequency setting in increments of a channel (30 kHz), scroll to the Center Freq field and press the knob. Turning the knob one detent clockwise will increase the tuned frequency by 30 kHz; a turn counter-clockwise will decrease the frequency by the same amount for each detent. For large changes in frequency, it is best to return to the Software's Main Menu, enter a new value for **Channel Number**, and re-run the test.

f. When you are finished using the spectrum display, press SHIFT, k1, ENTER and you will be returned to the Software's Main Menu.

For More Information

For details on the functions used in this step see the following descriptions:

"Laptop Emulator" on page 174
"Calibration Files" on page 120
"Test Descriptions" on page 208
"Printing and Report Generation" on page 198

If you had problems or received error messages:

See "Troubleshooting" on page 219.

Insertion Loss Test

Overview

The Insertion Loss Test is a utility that you can use to measure losses through RF cables, connectors, couplers, and attenuators. The test uses a transmitter at the site as the stimulus for the measurements. Once the test is running, you can test multiple cables and devices without having to re-run the test.

The basic steps in the use of the Insertion Loss Test are:

1. Using the Laptop Emulator to connect to the MSC.
2. Defining calibration information for the test.
3. Selecting the Insertion Loss Test and providing required information.
4. Running the test and seeing insertion loss values.

Prerequisites

You must have completed the steps outlined in **"Installation" on page 21**. This tutorial starts with the test equipment connected and the modem initialized.

You must know the following about your system, site, and radio:

❑ Phone number, login, and password for the switch (MSC)
❑ Cell Site information, including:
- Cell Site number
- Radio ID Number for the radio being used for the test
- Channel number for the radio
- VRAL setting for Foam Jumper Output level
- Antenna number used for the radio
- DCCH status for the radio
- DCCH Radio ID number for each antenna
- Power output at the foam jumper
- Foam jumper loss (in dB)

Step 1: Connect to MSC

First, you will use the Test System to dial up the MSC controlling the site you are planning to test. You will then log on and enter the maintenance craft shell (TIpdunix). From there, the Test System will send commands to the site when an action is required during testing.

NOTE: When testing at the TX Antenna Ports *and* using the modem to control the MSC, it is necessary to inhibit call processing at the site. The Software will check with the MSC to see if call processing has been inhibited and, if not, will post an error message. The message at the bottom of the screen reading "User must set call processing to INHIBITED" is a reminder; if unsure, you can verify the CP status by using the OP Cell command of the Laptop Emulator.

NOTE: The steps in this section describe the use of the Test Set and the Software screens to communicate to the MSC via the modem. In some cases, you may need to use a PC with the modem to make the connection (such as when negotiating through an OMP). This process is described at the end of this section (**"Use of a PC to accomplish the connection to the MSC (Laptop>Modem):" on page 102**) and in more detail in **"Laptop Emulator" on page 174**.

a. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob (see **figure 61**).

Main Menu

```
┌──────────── TESTS (IBASIC Controller) ─────────────┐  ┌──────────┐
│ Use the knob to select an item below.              │  │1│Run      │
│ Press Run to start test.                           │  └──────────┘
│                                                    │  ┌──────────┐
│                                                    │  │2│         │
│   ▶■Laptop Emulator                                │  └──────────┘
│     Define Frequency Plan                          │  ┌──────────┐
│     Enter/View Calibration Files                   │  │3│Cat Card │
│     Cell Site Under Test...............      3     │  └──────────┘
│     ---- Selected Test and Test Variables -----    │  ┌──────────┐
│     Selected Test.........Insertion Loss Test      │  │4│         │
│     Measurement Port......... TX Antenna Port      │  └──────────┘
│     TX Antenna Port Cable Loss [dB].....    .50    │  ┌──────────┐
│     Antenna Number.....................      3     │  │5│Exit     │
│     Channel Number.....................    242     │  └──────────┘
│     VRAL...............................      0     │
│     Send Control Commands to MSC........    YES    │   To Screen
│     Radio ID Number....................    122     │  ┌──────────┐
│     DCCH ID Number for Antenna 3 .......    122    │  │RF GEN    │
│                                                    │  │RF ANL    │
│                                                    │  │AF ANL    │
│                                                    │  │SCOPE     │
│     User must set call processing to INHIBITED.    │  │SPEC ANL  │
│                                                    │  │ENCODER   │
│                                                    │  │DECODER   │
│                                                    │  │RADIO INT │
│                                                    │  └──────────┘
│                                                    │  ┌──────────┐
│                                                    │  │More      │
└────────────────────────────────────────────────────┘  └──────────┘
                                              main_9
```

a

Figure 61   **Selecting the Laptop Emulator.**

b. Make sure that your modem is connected and turned on.

c. Scroll down to **Test Modem** and select it to verify basic modem operation (see **figure 62**). The response "OK" should appear in the **MSC Response** box.


```
Cell= 3 :RA ID= 122
```

```
                      TESTS (IBASIC Controller)              1 Prt Full
  Use the knob to select an item below.
  Press Return for Main Menu                                 2 Page Up

    Use the knob to select command to MSC.                   3 Send CR  ◄── e
  -------------------------------------------
  Return                      MSC   Response                 4 Page Down
c Test Modem
d Dial MSC                                                   5 Return
  Laptop > Modem
f Send Login
  Send Password                                              To Screen
g Send TIPdunix                                              RF GEN
  Define Auto                                                RF ANL       MSC
h Auto Login                                                 AF ANL    Response
  Define User                                                SCOPE       Box
  User defined 1                                             SPEC ANL
  User defined 2                                             ENCODER
  User defined 3   OK                                        DECODER
  User defined 4                                             RADIO INT
  User defined 5
  Logout                                                     More
```
lap_emua

Figure 62   **Connecting to the MSC.**

d. Now, dial up the MSC: Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it using the DATA keys and press the knob (**Done**) If you have entered the number before, it will appear at the top of the screen and you can select **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." **See "Laptop Emulator" on page 174** for details on dialling options.

e. If a login prompt does not appear in the **MSC Response** box, press the **Send CR** (k3) USER key once or twice to get the login prompt to appear.

f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can select **Done**.

g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the characters in the **Choices** menu and select **Done** If you have entered your password previously, it will appear at the top of the screen and you can select **Done**.

h. 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 63** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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
```

Figure 63   **Typical MSC Response box display after the connection to the MSC.**

i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 64**). Select it and enter the number for the cell site to be tested. Then scroll to and select **OP Cell**.

NOTE: In the **Laptop Emulator** menu, using the **Page Up** (k2) and **Page Down** (k4) USER keys can save time.
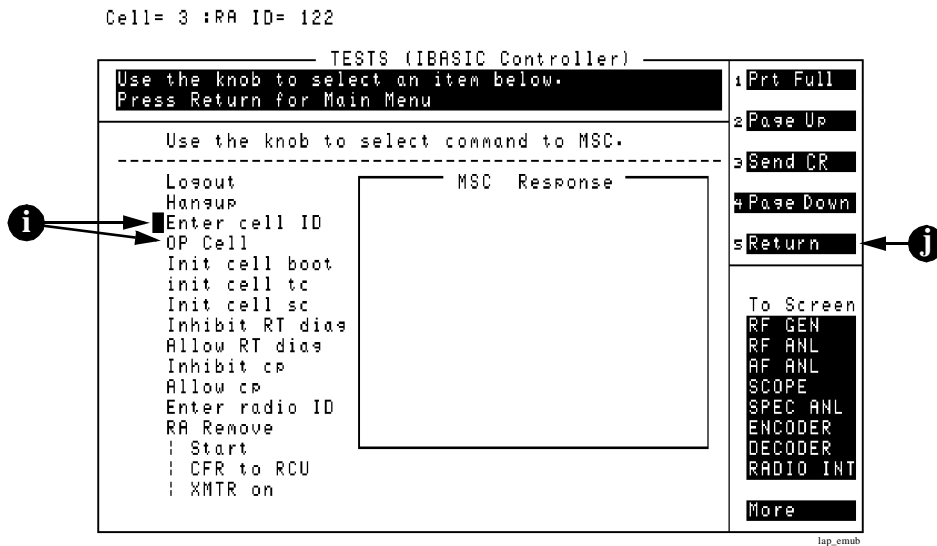
Figure 64   **Verifying site control.**

j. The radio should now be ready to receive the commands from the Test System that will be sent during testing. Exit the Laptop Emulator mode by pressing **Return** (k5).

Use of a PC to accomplish the connection to the MSC (Laptop>Modem):

You may also perform the connection sequence described in this section using a PC connected to the Test System rather than the Laptop Emulator menu. This may be necessary when negotiating an OMP or when passcodes are used. The basic steps are:

1. Go to the Laptop Emulator menu.
2. Select the Laptop > Modem mode.
3. Perform connection to MSC using the PC via the modem.
4. Once connected, exit the Laptop > Modem mode and the Laptop Emulator menu.

For more information, **see "Laptop Emulator" on page 174**.

Step 2: Enter the Site Calibration Constants

Before running the Insertion Loss Test, you must enter values for calibration constants. These constants, defined per antenna per site, are used by the Software to make corrections for cable losses and Test System gains. Once you have defined the calibration constants, you may save them to a memory card to speed up subsequent testing.

NOTE: The Software provides three ways to fill in calibration constants: 1) enter them directly, 2) measure them, or 3) load them from a file on a memory card. This procedure uses direct entry. For details on loading from a file and measuring the constants, refer to **"Calibration Files" on page 120**.

    a. From the Software's Main Menu, choose `Enter/View Calibration Files` (see **figure 65**).

```
Main Menu
                      ┌──── TESTS (IBASIC Controller) ────┐ ┌────────┐
                      │Use the knob to select an item below.│1│Run     │
                      │Press Run to start test.            │ └────────┘
                      │                                     │ ┌────────┐
                      │                                     │2│        │
                      │   Laptop Emulator                   │ └────────┘
                      │   Define Frequency Plan             │ ┌────────┐
              (a)─────►│▌ Enter/View Calibration Files      │3│Cat Card│
                      │   Cell Site Under Test...........  3 │ └────────┘
                      │   ---- Selected Test and Test Variables ----- │ ┌────────┐
                      │   Selected Test.........Insertion Loss Test│4│        │
                      │   Measurement Port......... TX Antenna Port│ └────────┘
                      │   TX Antenna Port Cable Loss [dB].....  .50 │ ┌────────┐
                      │   Antenna Number.....................    3 │5│Exit    │
                      │   Channel Number.....................  242 │ └────────┘
                      │   VRAL...............................    0 │
                      │   Send Control Commands to MSC........  YES │ To Screen
                      │   Radio ID Number...................  122 │ RF GEN
                      │   DCCH ID Number for Antenna 3 .......  122 │ RF ANL
                      │                                     │ AF ANL
                      │                                     │ SCOPE
                      │                                     │ SPEC ANL
                      │                                     │ ENCODER
                      │   User must set call processing to INHIBITED.│ DECODER
                      │                                     │ RADIO INT
                      └─────────────────────────────────────┘ ┌────────┐
                                                         main_10│More    │
                                                              └────────┘
```

Figure 65   **Selecting the Enter/View Calibration Files Menu.**

b. You will see the main calibration constant menu shown in **figure 66**. Enter the correct values for `Cell Site Number` and `Antenna Number` at the top of the list in the `Enter/View Calibration Files` menu.
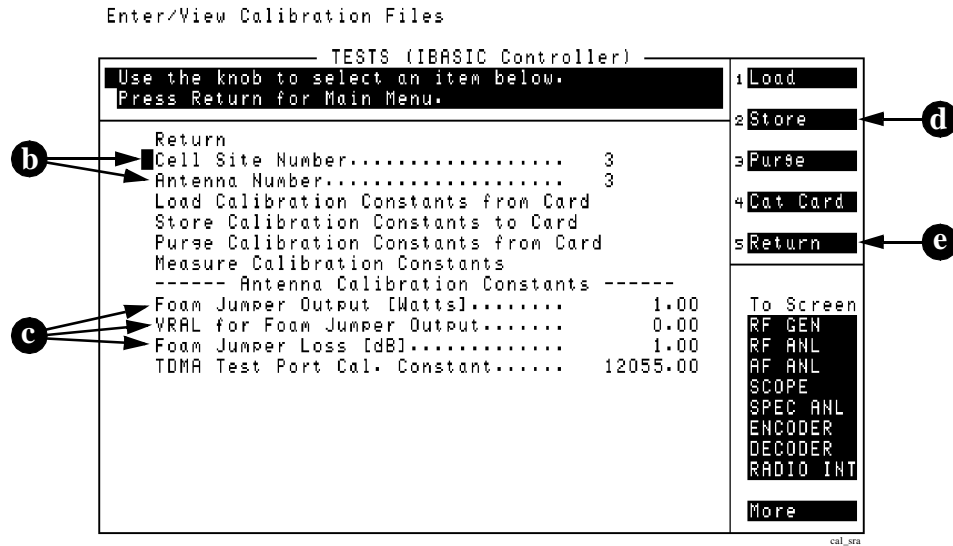
Figure 66   **Entering the calibration constants.**

c. Enter values for the following:
1. `Foam Jumper Output [Watts]`
2. `VRAL for Foam Jumper Output`
3. `Foam Jumper Loss [dB]`

NOTE: If you are measuring the power at the *output* of the foam jumper, set the `Foam Jumper Loss [dB]` field to zero (0). If measuring at the *input* to the foam jumper, you need to enter the RF loss of the foam jumper itself.

NOTE: A value for the TDMA Test Port Cal. Constant is *not required* when testing at the TX Antenna Ports, as has been assumed for these tutorials. If you plan to test using connections to the TX Test Port, **see "Testing with Connections to the TX Test Port" on page 217**.

d. Once the values have been entered, press `Store` (k2) to save them on a memory card. This completes the steps needed to define the calibration constants for a given antenna. If the site you are to test has multiple antennas, repeat these steps starting at **step b.** using a new `Antenna Number` entry.

e. When finished with entries for all antennas, press `Return` (k5) to go back to the Software's Main Menu.

Step 3: Select the Insertion Loss Test Mode

a. From the Software's Main Menu, choose **Selected Test** and scroll to **Insertion Loss Test** and press the knob (see **figure 67**). Note that with the selection of a new test, different entry fields appear below the **Selected Test** field.
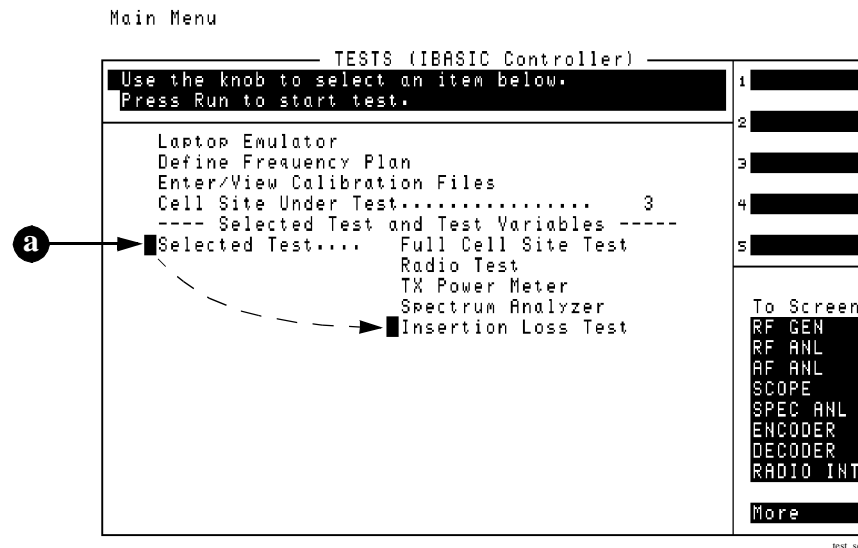
Figure 67   **Selecting the Insertion Loss Test mode.**

b. Select the **Measurement Port** you plan to use (see **figure 68**). You may choose to measure at the **TX Antenna Port** or the **TX Test Port**. In this tutorial the **TX Antenna Port** is used.
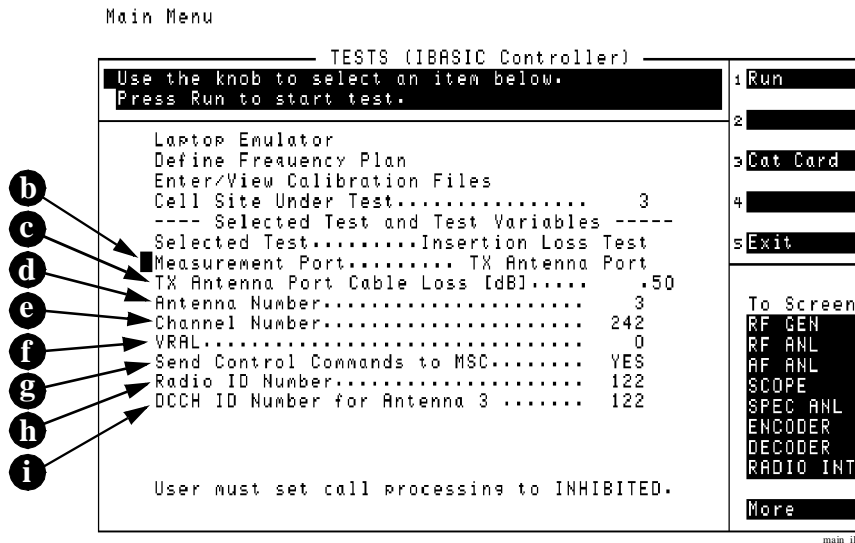
Figure 68   **Entering the Test Variables for Radio Tests**

c. Enter the loss (in dB) through the cable used to connect the Test System's RF IN/OUT port to the base station's TX Antenna Port. If you do not know the exact loss, you may use an approximate value. However, error in this value will affect power measurement accuracy. To *measure* the loss through the cable, **see "Insertion Loss Test" on page 98**.

d. Enter the **Antenna Number** for the radio being tested.

e. Enter the channel number in the **Channel Number** field.

f. Enter the radio's attenuation value in the **VRAL** field.

WARNING: **Maximum input power to the RF IN/OUT port of the PCS Interface is 1W (+30 dBm) for a CDMA base station transmitter. Before proceeding with testing, make sure that the test signal will not exceed this level. Damage to the Test System could result if the input is overdriven.**

g. Set **Send Control Commands to MSC** to **YES**.

NOTE: If you set the **Send Control Commands to MSC** field to **YES** and you have selected **TX Antenna Port** as the **Measurement Port**, you will need to make sure that the site call processing is inhibited. *This requires taking the entire site off-line.* You can use the Laptop Emulator to set call processing to inhibited (**see "Laptop Emulator" on page 174**).

h. Enter the **`Radio ID Number`** for the radio to be used for the source.

i. Enter the **`DCCH ID Number for Antenna x`** (may be the same as the Radio ID Number).

NOTE: If the radio being tested includes the DCCH, the **`DCCH ID Number`** will be the same as the **`Radio ID Number`**. If the DCCH for antenna x is found on a different radio, enter the ID Number for the radio which includes the DCCH.

Step 4: Run the Test

At this time you are ready to start the Insertion Loss Test.

a. From the Software's Main Menu, press the **Run** (k1) USER key (see **figure 69**).
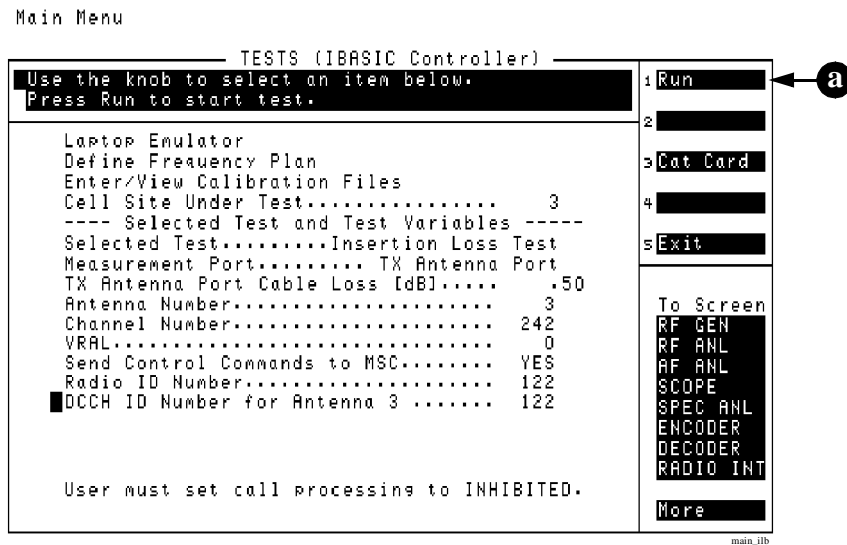
Figure 69   **Running the Insertion Loss mode.**

b. At the start of testing, a connection diagram will be displayed (see **figure 70**). Follow the connection steps listed on the display (this tutorial uses control via the MSC). If you need to stop testing at this point, press **Abort** (k5).
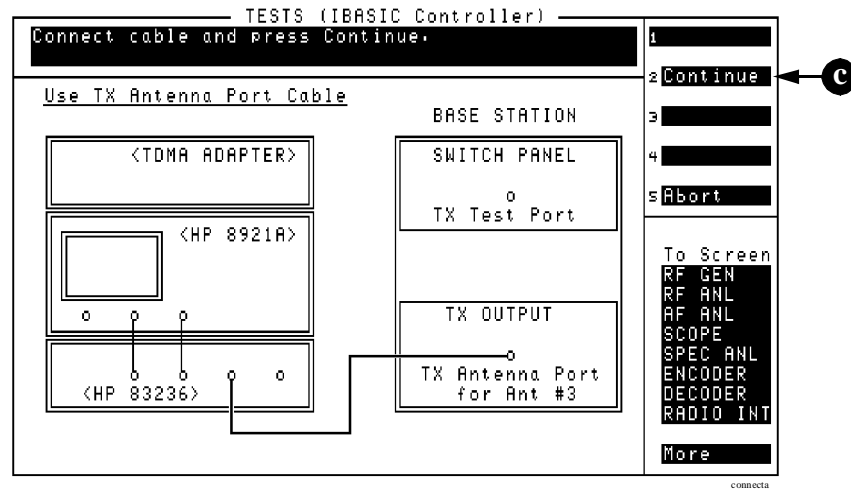
Figure 70   **Connection diagram at start of Insertion Loss Test mode.**

c. Press **Continue** (k2) after the connections have been made.

d. A second connection diagram will be displayed, showing the addition of the cable to be tested to the signal path (see **figure 71**). Add the cable you want to measure loss on and press **Continue** (k2).
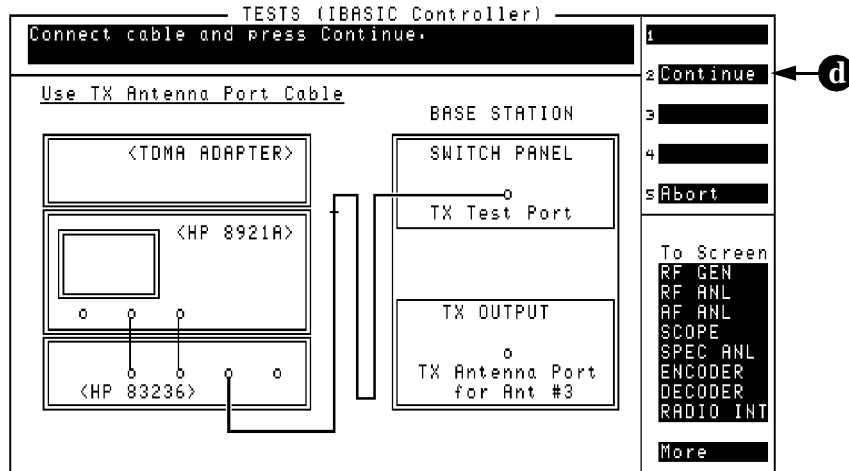
Figure 71   **Adding the cable to be tested to the signal path.**

e. After the measurement is made, it will be displayed on screen (see **figure 72**). The units of loss are decibels (dB). Once the measurement is done and the value is on the display, you will have a choice of measuring the same cable again or connecting a new cable and measuring that. If you select **Yes**, you will be prompted to insert the test cable. If you are measuring the same cable, just press **Continue** (k2). For a new cable, remove the last cable tested and replace it with the new one, then press **Continue** (k2).
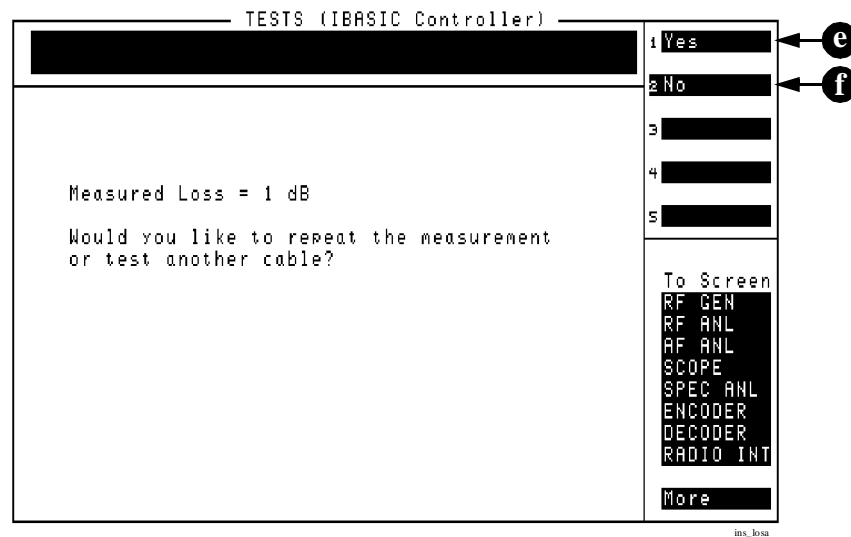
Figure 72   **The Insertion Loss Test results display.**

f. If you are done measuring insertion loss, select the **No** choice at the prompt and you will be returned to the Software's Main Menu.

For More Information

For details on the functions used in this step see the following descriptions:

"Laptop Emulator" on page 174
"Calibration Files" on page 120
"Test Descriptions" on page 208
"Printing and Report Generation" on page 198

If you had problems or received error messages:

See **"Troubleshooting" on page 219**.

4

Software Reference

This chapter describes detailed operation of the Software that was not covered in the Test Tutorials. The information in this chapter is organized by key topics, listed alphabetically. Use this chapter as a supplement when you have questions using the Test Tutorials.

Overview

Reference Information Topics

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

Acronyms List

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

CAT − Catalog
CS − Cell Site
CP − Call Processing
CR − Carriage Return
CRT − Cathode Ray Tube
dB − Decibel
DCCH − Digital Control CHannel
EVM − Error Vector Magnitude
MSC − Mobile Switching Center (also, MTSO)
MTSO − Mobile Telephone Switching Office (also, MSC)
OMP − Operations Management Platform
OOS − Out-Of-Service
OP − Output Process
PC − Personal Computer
PCS − Personal Communications Services
RA − Radio
RCU − Radio Channel Unit
TDMA − Time Division Multiple Access
TRTU − TDMA Radio Test Unit
TX − Transmitter
UCL − Unconditional
VRAL − Voice Radio Level
XMTR − Transmitter

Alarm Clock Mode

Overview

As its name implies, the Alarm Clock mode can be used to set up the Test System to perform tests of a site automatically at some later time. This can be done unattended if the Test System and mode are set up correctly before leaving the site.

This mode can be useful when you would like to test the site at low traffic times, but do not plan to be present at such times (often very early in the morning).

The use of the Alarm Clock mode follows these steps:

1. Enable the Alarm Clock mode using the TESTS (Edit Parameters) menu.
2. Makes sure that you have followed all steps to set up for Full Cell Site Test mode operation.
3. Run the Full Cell Site Test.
4. Enter the start time and date for the start of testing
5. Leave the Test System to test at a later time.
6. Return and review test results after testing is complete.

Requirements

The following requirements and limitations apply to the use of the Alarm Clock mode:

- The mode *only works with the Full Cell Site Test mode*. This implies that you must have predefined frequency plans and calibration files for the site you will test.
- The mode only supports test connections at the TX Test Port (testing at the TX Antenna Ports requires you to be there to make connections at the foam jumper).
- You must connect to the MSC before leaving or have a fully defined (and tested) Auto Login file set up.
- You should have Data Collection set up or have a printer to log the results from the testing.

Enabling the Alarm Clock Mode

The "switch" used to turn the Alarm Clock mode on and off is a parameter in the TESTS (Test Parameters) menu. These are the steps to set the Alarm Clock mode to "on":

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Parm:Test Parameters** and press the knob.
4. Once in the **TESTS (Test Parameters)** menu, press the knob again to allow scrolling.
5. Scroll down to the parameter on the list titled **Alarm Clock Start [0=no 1=yes]** and press the knob again to leave the scrolling function.
6. Turn the knob to place the cursor on the field below the parameter name.
7. Using the DATA keys, press 1 (one) and ENTER.
8. The Alarm Clock mode is now enabled and will be on the next time the Software is run (if using the Full Cell Site Test mode and testing at the TX Test Port). If you want to re-run the Software now, press the TESTS key and then **Run Test** (k1). You will return to the Software's Main Menu.

NOTE: Because the Alarm Clock mode uses the Test System's time and date, you should verify that these are properly set before going on. Refer to the *HP 8921 User's Guide*, Configure Screen documentation.

Using the Alarm Clock Mode

Follow these steps to set up the Test System for Alarm Clock mode:

Prerequisites:
- First, you should have gone through the steps outlined in **"Full Cell Site Test" on page 38**. The result of having done these steps will be valid frequency plans and calibration files for the sites you maintain. You will also have gone through the steps to connect to the MSC using the modem. It is essential that all of these elements required for the Full Cell Site Test mode are in place *and verified* before leaving the Test System to do unattended testing at a later time.
- Next, you should have configured your system for printing (see **"Printing and Report Generation" on page 198**) or data collection (see **"Data Collection (Saving and Retrieving Test Results)" on page 140**). Test results will appear on the Test System display, but will scroll off as testing proceeds.

Steps:
1. From the Software's Main Menu, scroll to **Selected Test** and press the knob. Select **Full Cell Site Test** from the list and press the knob again.
2. Scroll to **Measurement Port** and set to **TX Test Port** (if not already set).
3. You can choose to test radios at full power or at their defined (in the frequency plan) VRAL setting. Make your choice using the **Test with power set to** field.
4. Enter the cell site number for your site in the **Cell Site Under Test** field.
5. Press **Run** (k1) to start the Alarm Clock mode.
6. Make the connections shown in the connect diagram on the display. Note that you should be connecting to the TX Test Port and *not* one of the TX Antenna Ports.
7. Press **Continue** (k2) when the connections have been made.
8. You will then be asked if the modem link to the MSC is already established.
   - If you have already gone through the steps to connect to the MSC using the Laptop Modem or previous testing, press **Yes** (k1).
   - If you have not connected yet, press **No** (k2). With this choice, you will be taken to the Define Auto menu, which allows you to enter the MSC number and login information. Enter this information, if needed. If it already matches your site and MSC setup, simply press **Return** (k5). The Test System will use this information to dial up and connect when the time set in the Alarm Clock mode window matches the current time.

9. A menu showing the current Test System date and time will be shown. Enter the date (if other than the current date) and time that you wish to have the Test System start the Full Cell Site Test sequence. Press **Done** (k5) once you have made the entries.

NOTE: The format for the date entry is MMDDYY (month, day, and year, with no separating character). The format for the time is HH.MM (hour and minute, separated by a decimal point).

10. The next screen will show your settings for when the test is to start, plus the current Test System date and time. When the dates and times match, the Test System will start the Full Cell Site Test sequence. If you were not already connected to the MSC, the Test System will use the Auto Login information to dial and connect to the MSC.

11. At this point, the Full Cell Site Test mode will proceed as if you were running it yourself. It will test all the radios in the frequency plan for the site and then stop. At the conclusion of testing it will hang up the modem connection.

Turning Off the Alarm Clock Mode

The Alarm Clock mode will be "on" each time you run the Full Cell Site Test mode until you disable it using the following steps:

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Parm:Test Parameters** and press the knob.
4. Once in the **TESTS (Test Parameters)** menu, press the knob again to allow scrolling.
5. Scroll down to the parameter on the list titled **Alarm Clock Start [0=no 1=yes]** and press the knob again to leave the scrolling function.
6. Turn the knob to place the cursor on the field below the parameter name.
7. Using the DATA keys, press 0 (zero) and the ENTER key. The Alarm Clock mode is now disabled. You can turn it "on" again later by changing the field entry back to a 1.
8. If you want to re-run the Software now, press the TESTS key and then **Run Test** (k1). You will return to the Software's Main Menu.

Calibration Files

Calibration files hold the values entered for the calibration constants (calibration constants provide the Test System with information about the site's power output, power settings (VRAL), and cable losses). The files are defined on a per site per antenna basis (one file will be created for each antenna at an individual site).

The basic steps in creating calibration files are:

1. Go to the `Enter/View Calibration Files` Menu.
2. Enter values for a site and an antenna calibration constant.
3. Store the values to a memory card for later use.
4. Repeat step 2. and step 3. for other sites and-or antennas.
5. Exit the `Enter/View Calibration File` menu.

Calibration Constants Defined

The four calibration constants used by the Test System if the `Short Form Printout` parameter is set to 0 (standard printing) are:

- **Foam Jumper Output [Watts]** – this is the signal power at the output of the foam jumper cable in the site for the given antenna and VRAL setting (see "VRAL for Foam Jumper Output", below). This constant is used when making power measurements, comparing the measurements to pass-fail limits, and when displaying the power meter scale.

- **VRAL for Foam Jumper Output** – this value is used along with the Foam Jumper Output [Watts] constant. It defines the VRAL setting that will result in the power entered into the foam jumper output.

- **Foam Jumper Loss [dB]** – this constant defines the signal loss between the antenna ports and the output of the foam jumpers. You can enter this value, if known, or use the Test System to measure the loss.

- **TDMA Test Port Cal. Constant** – this constant is used to account for losses and gains in the Test System when using the Cellular Adapter to make power measurements. The value itself is a combination of several factors; it is simpler in most cases to let the Test System measure this value. For more information on this constant, **see "The TDMA Test Port Cal. Constant" on page 128**.

NOTE: If you are testing at the *TX Antenna Ports*, you will not need to provide values for the `TDMA Test Port Cal. Constant`. If you are testing at the *TX Test Port*, you do need to provide values for the `TDMA Test Port Cal. Constant`. The steps used for defining the TDMA Test Port Cal. Constant are given in **"Measuring the TDMA Test Port Cal. Constant:" on page 123**.

If the `Short Form Printout` parameter is set to 1 (short form printing), these additional calibration constants are used by the Test System (and appear in the Enter/View Calibration Files Menu):

- Antenna ERP [Watts] – this is the target Effective Radiated Power (ERP) level at the antenna for the current antenna number.

- Antenna Gain [dB] – the gain figure for the antenna used. This value is taken into account when calculating the ERP from power measurements taken at the foam jumper cable.

- Antenna Cable Loss [dB] – the loss (in dB) between the hatchplate and the connection to the antenna. This value is also used when calculating the ERP.

Entering Calibration Data

Two methods are provided to enter values for calibration constants. If you already know the power settings and cable losses, you can use direct entry. If you do not know these values, you can use the Test System to measure them and fill in the values.

Direct Entry of Calibration Constant Values:

1. From the Software's Main Menu, scroll to and select `Enter/View Calibration Files`.
2. Scroll to `Cell Site Number` and enter the number for the site you are currently defining.
3. Scroll to `Antenna Number` and enter the current antenna number.
4. Scroll down and enter values for the following calibration constants:
   - ❒ `Foam Jumper Output [Watts]`
   - ❒ `VRAL for Foam Jumper Output`
   - ❒ `Foam Jumper Loss [dB]`
   - ❒ `TDMA Test Port Cal. Constant`

NOTE: Enter the `TDMA Test Port Cal. Constant` value if you plan to do testing at the TX Test Port. Otherwise, you do not need to provide a value for this constant. You can measure this value by following the steps in **"Measuring the TDMA Test Port Cal. Constant:" on page 123**.

5. The entry part is now complete. If you would like to save the new entries to a memory card, see **"Storing Calibration Files" on page 127**.
6. If you want to define calibration constants for other antennas or sites, repeat steps 2 through 5 until all site-antenna combinations have been defined.
7. Press `Return` (k5). If you did not save the file, you will be asked if you would like to save it now. To continue without saving press `No` (k2). You will then be returned to the Software's Main Menu.

Using the Test System to Measure Calibration Values:

If you do *not* know some or all of the calibration values, the Test System can measure them for you. The following values can be measured by the Test System:

❏ **TDMA Test Port Cal. Constant**
❏ **Foam Jumper Loss**
❏ **TX Antenna Port Cable Loss [dB]**

NOTE: The last value, TX Antenna Port Cable Loss [dB] is not a site-antenna calibration constant, but is a correction factor used by the Test System. See **"TX Antenna Port Cable Loss" on page 153** for details on this value.

Measuring the TDMA Test Port Cal. Constant:

1. From the Software's Main Menu, scroll to and select **Enter/View Calibration Files**.
2. Scroll to **Cell Site Number** and enter the number for the site you are currently defining.
3. Scroll to **Antenna Number** and enter the current antenna number.
4. Scroll to **Measure Calibration Constants** and press the knob.
5. Scroll to the lower part of the menu and make the following entries under **Perform Above Tests Using**:
   a. **Measurement Port** - select **TX Antenna Port** or **TX Test Port**.
   b. **Channel Number** - enter the channel number to perform the measurement at.
   c. **VRAL** - enter the power level setting that you would like to use for making the measurement.
   d. **Send Control Commands to MSC** - set this to **YES** to have the Software control the base station for the tests. If set to **NO**, you will have to turn on the transmitter manually when prompted.
   e. **Radio ID Number** - (this field will not be displayed if **Send Control Commands to MSC** is set to **NO**) enter the ID number of the radio to be used for the test.
   f. **DCCH ID Number for Antenna x** - (this field will not be displayed if **Send Control Commands to MSC** is set to **No**) enter the DCCH ID Number for antenna x. This number may be the same as the Radio ID Number in some sites.
6. Scroll to **Measure TDMA Test Port Cal. Constant** and press the knob.
7. Make the connections shown in the connection diagram. If you are not using a modem for control of the MSC, you will also need to turn the transmitter on after making the connections (prompts at the top of the display will indicate when this needs to be done).
8. Press **Continue** (k2) after making the connections.
9. You will be prompted to reconnect the foam jumper to the Antenna Port (if testing at the TX Antenna Port) and move the test cable connection to the TX Test Port. Change the connection, make sure that the transmitter is on (if you are not using a modem for control of the MSC), and press **Continue** (k2).

10. After making the measurement of the TDMA Test Port Cal. Constant, you will be returned to the screen for measuring the calibration constants. If you do not need to measure other losses, press **Return** (k5) to return to the Software's Main Menu.

11. The measurement part is now complete. If you would like to save the new entries to a memory card, see **"Storing Calibration Files" on page 127**.

12. If you want to define calibration constants for other antennas or sites, repeat steps 2 through 11 until all site-antenna combinations have been defined.

13. Press **Return** (k5). If you did not save the file, you will be asked if you would like to save it now. To continue without saving press **No** (k2). You will then be returned to the Software's Main Menu.

NOTE: The measured **TDMA Test Port Cal. Constant** is unique to the Test System being used. Do not share the constant values on other Test Systems or inaccurate measurements may result. You should create individual constants for each Test System you use.

Measuring the Foam Jumper Loss:

1. From the Software's Main Menu, scroll to and select **Enter/View Calibration Files**.
2. Scroll to **Cell Site Number** and enter the number for the site you are currently defining.
3. Scroll to **Antenna Number** and enter the current antenna number.
4. Scroll to **Measure Calibration Constants** and press the knob.
5. Scroll to the lower part of the menu and make the following entries under **Perform Above Tests Using**:
   a. **Measurement Port** - select **TX Antenna Port** or **TX Test Port**.
   b. **Channel Number** - enter the channel number to perform the measurement at.
   c. **VRAL** - enter the power level setting that you would like to use for making the measurement.
   d. **Send Control Commands to MSC** - set this to **YES** to have the Software control the base station for the tests. If set to **NO**, you will have to turn on the transmitter manually when prompted.
   e. **Radio ID Number** - (this field will not be displayed if **Send Control Commands to MSC** is set to **No**) enter the ID number of the radio to be used for the measurement.
   f. **DCCH ID Number for Antenna x** - (this field will not be displayed if **Send Control Commands to MSC** is set to **NO**) enter the DCCH ID Number for the site. This number may be the same as the Radio ID Number in some sites.
6. Scroll to **Measure Foam Jumper Loss** and press the knob.
7. Make the connections shown in the on-screen connection diagram using the TX Antenna Port cable between the Test System and the base station. If you are not using a modem to control the MSC, you will also need to turn the transmitter on after making the connections (prompts at the top of the display will indicate when this needs to be done).
8. Press **Continue** (k2) after making the connections.
9. A second connection diagram will instruct you to add the cable being tested. In this case, the Foam Jumper. Add the cable and press **Continue** (k2).
10. The Test System will measure and calculate the loss in the Foam Jumper. If you are testing at the TX Antenna Port, you will get a prompt to reconnect the Foam Jumper. Do so, and press **Continue** (k2). You will be returned to the menu used for measuring the calibration constants.
11. The measurement is now complete. The measured value is shown on the display next to the title, **Foam Jumper Loss [dB]**.
12. If you want to define calibration constants for other antennas or sites, repeat steps 2 through 11 until all site-antenna combinations have been defined.
13. Press **Return** (k5) to return to the Enter/View Calibration Files menu. If you would like to save the measurement to a memory card, see **"Storing Calibration Files" on page 127**. Press **Return** (k5) again to get to the Software's Main Menu. If you did not save the file, you will be asked if you would like to save it now. To continue without saving press **No** (k2). You will then be returned to the Software's Main Menu.

Measuring the TX Antenna Port Cable Loss:

1. From the Software's Main Menu, scroll to and select `Enter/View Calibration Files`.
2. Scroll to `Cell Site Number` and enter the number for the site you are currently defining.
3. Scroll to `Antenna Number` and enter the current antenna number.
4. Scroll to `Measure Calibration Constants` and press the knob.
5. Scroll to the lower part of the menu and make the following entries under `Perform Above Tests Using`:
   a. `Measurement Port` - select `TX Antenna Port` or `TX Test Port`.
   b. `Channel Number` - enter the channel number to perform the measurement at.
   c. `VRAL` - enter the power level setting that you would like to use for making the measurement.
   d. `Send Control Commands to MSC` - set this to `YES` to have the Software control the base station for the tests. If set to `NO`, you will have to turn on the transmitter manually when prompted.
   e. `Radio ID Number` - (this field will not be displayed if `Send Control Commands to MSC` is set to `No`) enter the ID number of the radio to be used for the measurement.
   f. `DCCH ID Number for Antenna x` - (this field will not be displayed if `Send Control Commands to MSC` is set to `NO`) enter the DCCH ID Number for the site. This number may be the same as the Radio ID Number in some sites.
6. Scroll to `Measure TX Antenna Port Cable Loss (Parm #12)` and press the knob.
7. Make the connections shown in the on-screen connection diagram using a test cable between the Test System and the base station. If you are not using a modem to control the MSC, you will also need to turn the transmitter on after making the connections (prompts at the top of the display will indicate when this needs to be done).
8. Press `Continue` (k2) after making the connections.
9. A second connection diagram will instruct you to add the cable being tested. In this case, the TX Antenna Port Cable. Add the cable and press `Continue` (k2).
10. The Test System will measure and calculate the loss in the TX Antenna Port Cable. If you are testing at the TX Antenna Port, you will get a prompt to reconnect the Foam Jumper. Do so and press `Continue` (k2). You will be returned to the menu used for measuring the calibration constants.
11. The measurement is now complete. The measured value is shown on the display next to the title, `TX Antenna Port Cable Loss [dB]`.
12. If you want to define calibration constants for other antennas or sites, repeat steps 2 through 11 until all site-antenna combinations have been defined.
13. Press `Return` (k5) to return to the Enter/View Calibration Files menu. If you would like to save the measurement to a memory card, see **"Storing Calibration Files" on page 127**. Press `Return` (k5) again to get to the Software's Main Menu. If you did not save the file, you will be asked if you would like to save it now. To continue without saving press `No` (k2). You will then be returned to the Software's Main Menu.

Storing Calibration Files

In most cases, you will want to save your calibration constant entries to a memory card for later use. This allows you to quickly change site and antenna combinations without the need to enter any calibration constants.

1. Make sure that you have an initialized memory card in the MEMORY CARD slot on the Test Set's front panel.
2. From the Software's Main Menu, scroll to and select **Enter/View Calibration Files**.
3. Scroll to **Cell Site Number**, select it, and enter the value for the site data you would like to load.
4. Scroll to **Antenna Number**, select it, and enter the value for the antenna number you will be testing at.
5. If the values under **"Antenna Calibration Constants"** do not match your desired setting for this site-antenna combination, modify them using the steps in **"Entering Calibration Data" on page 122**.
6. Once the values are correct, press **Store** (k2) and the data will be saved to a new file.

NOTE: If the card already contains a calibration file for that site-antenna combination, you will receive this message: **"Duplicate file name"**. You may then choose to overwrite the existing file (press **Yes** (k1); the previous values will be lost), or to continue without saving anything (press **No** (k2)).

The TDMA Test Port Cal. Constant

NOTE: In normal use, you will not be entering values directly for the **TDMA Test Port Cal. Constant**. You would use the Test System to measure the constant, as described in **"Using the Test System to Measure Calibration Values:" on page 123**. This section is provided for informational use only.

The TDMA Test Port Cal. Constant contains information on the Test System's gain, losses, and coupling factors. *This constant is only required when you are performing tests using the TX Test Port.*

The number returned by the calibration constant measurement is a combination of several values and is created in the following format:

S XX YY ZZZ.ZZ

S - the first character is the sign. *A negative sign indicates an error during the measurement.* If you encounter negative values for this constant, you should re-measure the constant, paying close attention to the cable connections and transmitter control (if not using site control via the MSC).

XX - the next two character places are filled in with the loss value (in dB) through the PCS Interface. The Interface has a range of analyzer attenuation of 0 to 40 dB.

YY - the following two characters are generated from the **TDMA Gain** field of the Test System. Available gain steps are 0, 6, 12, and 18 dB.

ZZZ.ZZ - the final element of the constant is a coupling factor (in dB) for the Test System and the TX Antenna Port to TX Test Port.

NOTE: The measured **TDMA Test Port Cal. Constant** is unique to the Test System being used. Do not share the constant values on other Test Systems or inaccurate measurements may result. You should measure a separate constant for each Test System you use.

Loading Calibration Values from a Memory Card

Follow these steps to load calibration constants for a given site and antenna:

1. From the Software's Main Menu, scroll to and select **Enter/View Calibration Files**.
2. Scroll to **Cell Site Number** and enter the current site's value.
3. Scroll to **Antenna Number** and enter the number of the antenna you plan to test next.
4. Now that the Software has the site-antenna combination, you can press the **Load** (k1) USER key to load the constants. If the file values are different that those already displayed, you will see them updated on the lower part of the **Enter/View Calibration Files** screen.

NOTE: If the Test System finds no file that matches your entries for site and antenna number, you will receive this message: "File name is undefined". Fix this by correcting the site number and-or antenna number entries or create a new calibration file for that site-antenna combination. See also for instruction on viewing the calibration files on a memory card.

5. Press **Return** (k5) to return to the Software's Main Menu.

Listing (Cataloging) Calibration Files

Often, you will want to see if calibration files exist on a given memory card or look to see if a file has been generated for a particular site-antenna combination. This can be done by cataloging the memory card that is currently in the slot on the Test Set's front panel. Follow these steps to view files on a given card:

1. Insert the card you want to read into the slot on the Test Set's front panel (for calibration files, this is usually an SRAM card).
2. If you are at the Software's Main Menu, you can catalog the card by pressing **CAT Card** (k3). A list of all files on the card will be displayed on the screen. Here are the common file types and typical appearance:
   - cPCSTDMA, lPCSTDMA, - these are program files and may not appear on your SRAM cards.
   - pPCSTDMA, pxxxxxx - files beginning with lower-case "P" are procedure files.
   - uFRP_xx - these are frequency plan files, where the xx indicates the cell site number.
   - uC_xx_yy - these are calibration files. xx indicates the site number and yy the antenna number.

NOTE: You can also catalog the card in the **Enter/View Calibration Files** menu by using **CAT Card** (k4).

3. When you are finished viewing the files on the card, press **Continue** (k2) to return to the previous menu.

Purging (Deleting) Calibration Files from a Memory Card

You can always overwrite an existing calibration file using the steps in **"Storing Calibration Files" on page 127**. But if you have files on a card that you no longer use and you would like to purge (delete) them to create more space on the card, use the steps below:

First, a note about file naming on the card:

- File-naming of calibration files is automatic; you cannot assign unique names.
- All calibration files created by the Test System begin with "uC_".
- To this prefix, the cell site number is appended, followed by another underscore.
- Finally, the antenna number is added to the end.
- As an example, the calibration file created for site number 12, antenna 3 would be named: uC_12_3.

Follow these steps to purge a calibration file:

1. From the Software's Main Menu, scroll to and select **Enter/View Calibration Files**.
2. Insert the memory card containing the calibration files into the slot on the Test Set's front panel.
3. If you would like to see all the files on the card before purging any, follow the steps in **"Listing (Cataloging) Calibration Files" on page 130** before going on.
4. Scroll to **Cell Site Number** and enter the value that corresponds to the file you wish to purge.
5. Do the same for **Antenna Number**. With these two values you have identified a unique calibration file name.
6. Press **Purge** (k3).
7. As a safety check, you will be asked to confirm that you want to purge that particular file. If you still want to purge the file, press **Yes** (k1) and the file will be purged. Otherwise, press **No** (k2) and no action will be taken.
8. You may now purge other files by repeating step 3. through step 7. If you have finished purging files, press **Return** (k5) to go to the Software's Main Menu.

Connections

Refer to the following sections for details on making connections:

- **"Connections to the TDMA Base Station" on page 133**
- **"Modem Connections" on page 135**
- **"Printer Connections" on page 137**
- **"Connector Kit" on page 139**

Connections to the TDMA Base Station

Connecting the base station to the Test System requires only one cable connection. The port used at the base station end will be determined by your choice of **Measurement Port** in the Software's Main Menu prior to running the test. There are two choices for this selection: **TX Antenna Port** and **TX Test Port**.

Testing at the TX Antenna Ports:

If you choose to test at the TX Antenna Ports, connections will be made as shown in figure 73. Use the TX Antenna Port cable to connect from the antenna number being tested to the RF IN/OUT port of the Test System.
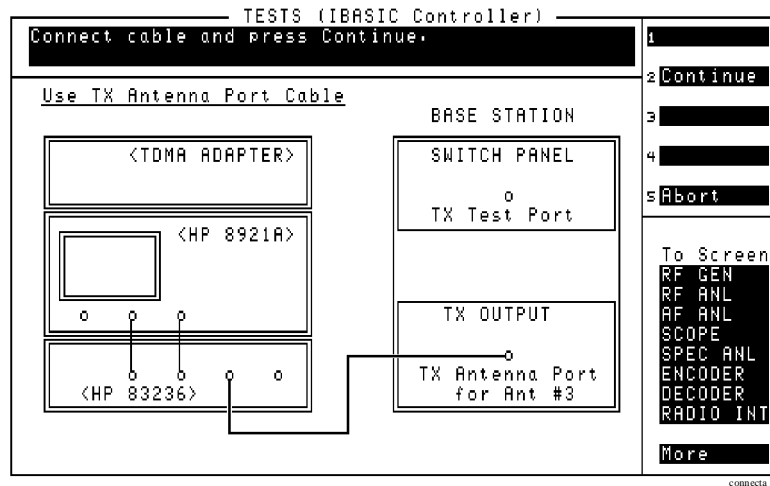
Figure 73   **Connections when testing at the TX Antenna Ports.**

Testing at the TX Test Port:

If you choose to test at the TX Test Port, connections will be made as shown in **figure 74**. Use the TX Test Port cable to connect from the TX Test Port to the RF IN/OUT port of the Test System.
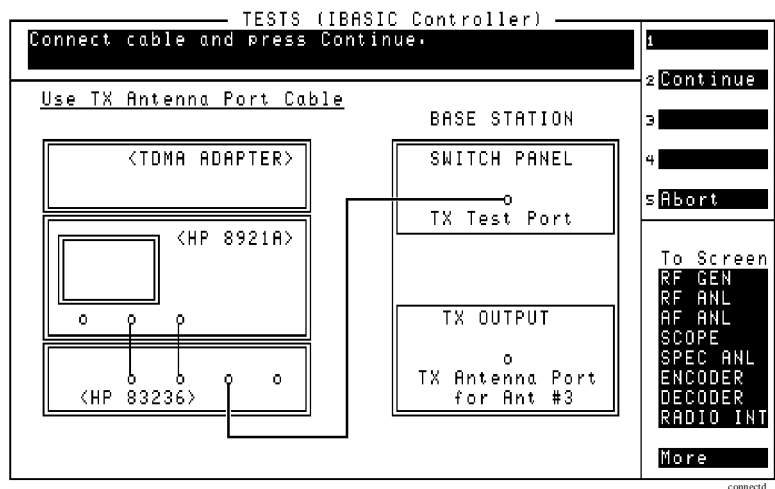
Figure 74   **Connections when testing at the TX Test Port.**

Modem Connections

Figure 75 shows the connections between the Test System, modem, and PC (if one is used). Part numbers for cables and adapters are indicated in the figure.
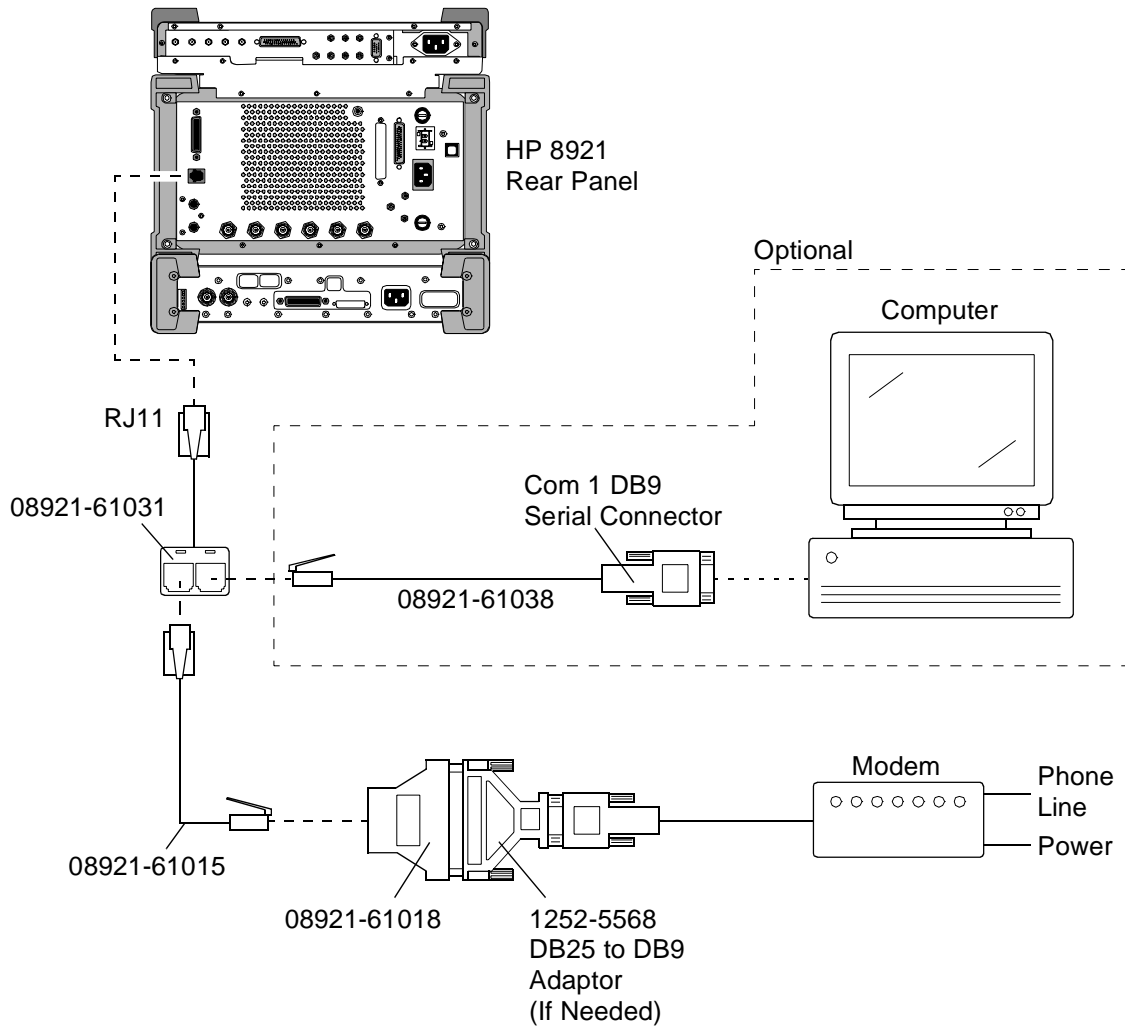
Figure 75   **Serial Connections for the HP 8921A, Modem and PC**

Figure 76 gives the pin assignments for the Cell Site Test Set rear-panel serial port. Note that there are two serial interfaces off the one connector. Serial 9 is used for printing and connection to the PC (if used). Serial 10 is used to communicate with the MSC via the modem (if used).

This diagram is provided for reference and can be used if you need to make a custom cable.
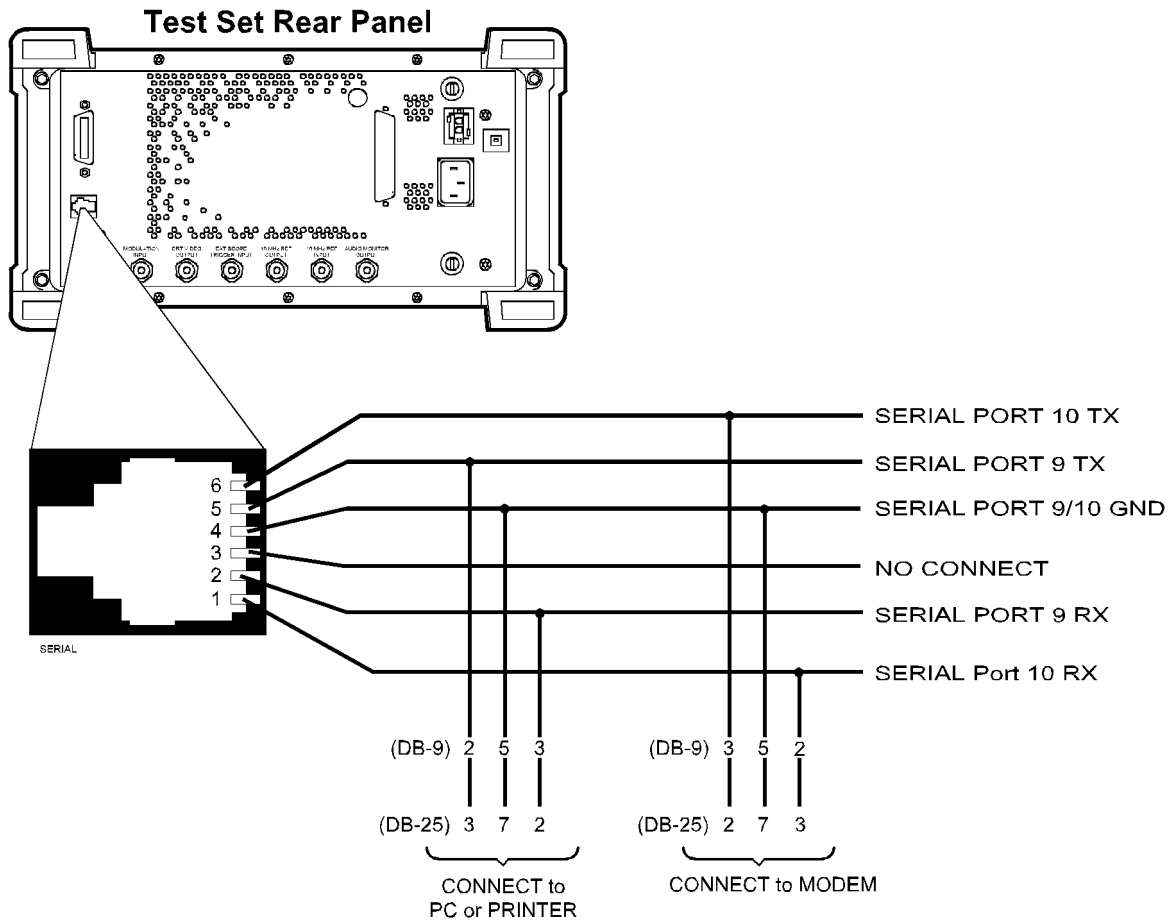
Figure 76   **Serial port pin assignments for the Cell Site Test Set.**

Printer Connections

Use the following figures to make the connections between the Test System and the printer you plan to use. Diagrams are provided for the following printer types:

- Serial printer (see **figure 77**)
- HP-IB and parallel printers (see **figure 78**)
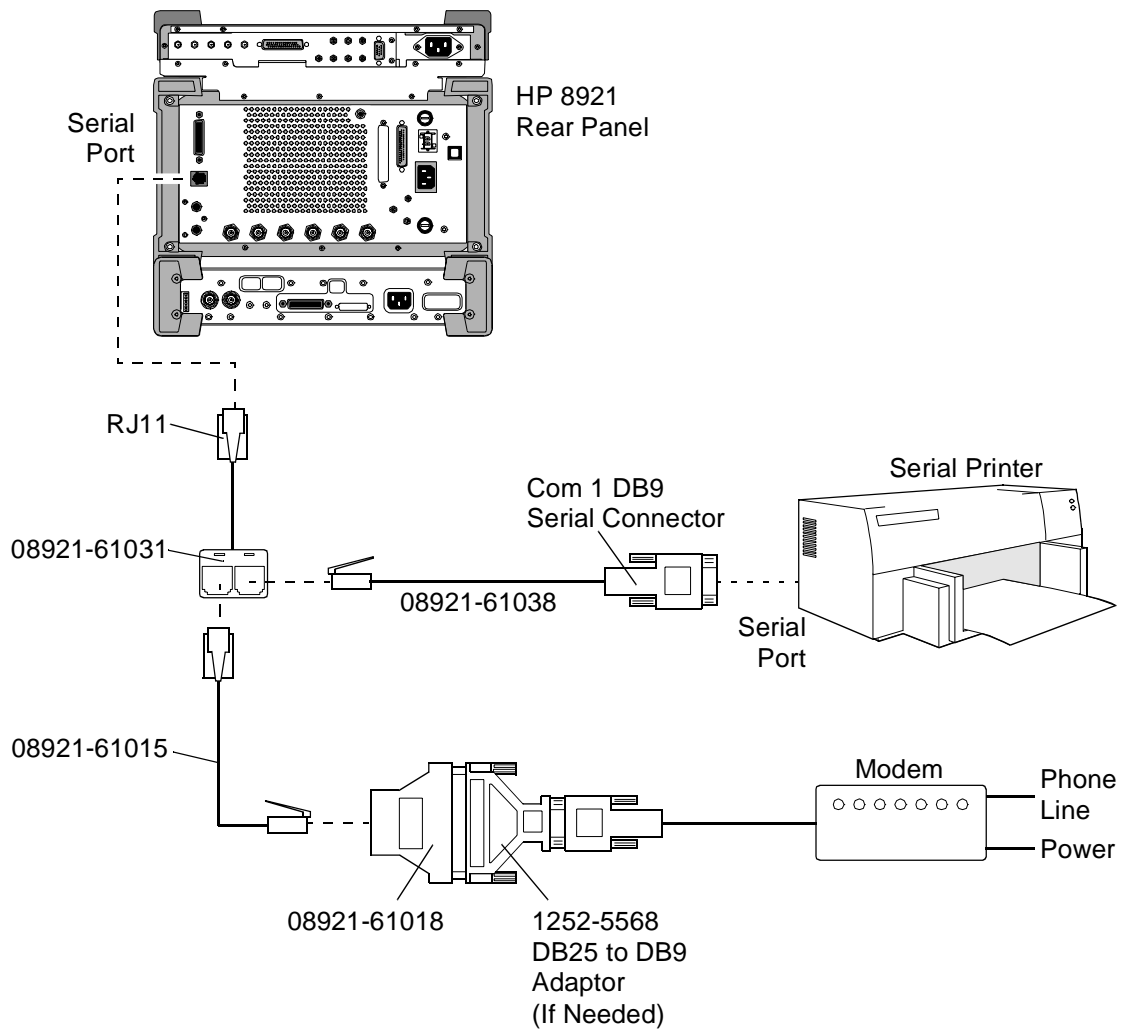
Figure 77   **Connections for the Test System, modem, and serial printer.**

HP-IB Printer

HP 8921
Rear Panel

HP-IB
Port

HP-IB
Port

HP 10833A, B, C

Parallel Printer

Parallel
Port

Parallel
Port

HP 8921
Rear Panel

C2950A
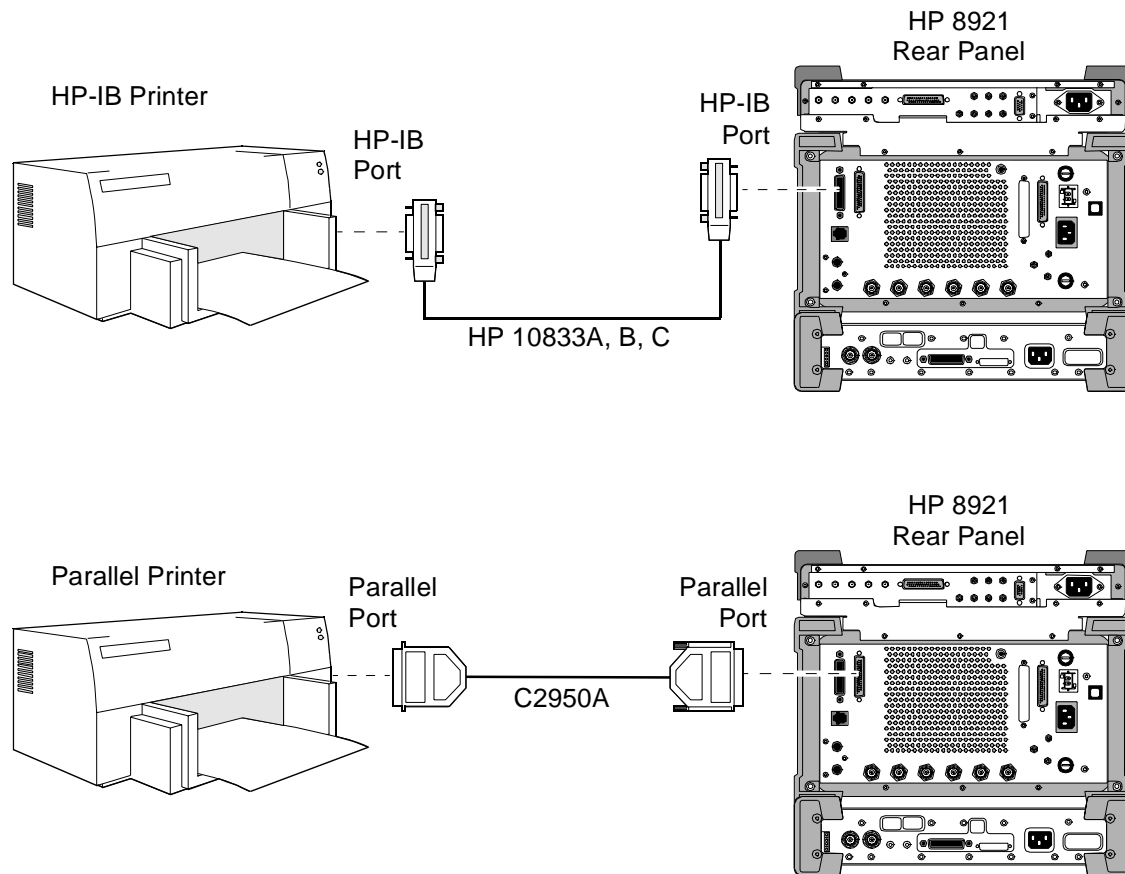
Figure 78   **Connections for the Test System and printer (HP-IB and parallel).**

Connector Kit

A cable kit for use with the Software can be used to supply the required parts to connect the Test System to the base station equipment and modem. The HP 83202A Option 093 Cable Accessory Kit supplies serial cables, RF cables and adapters needed to connect the Test System for testing. Refer to **table 2** for a list of parts included with the HP 83202A Option 093 Cable Accessory Kit.

Table 2   **HP 83202A Option 093 Cable Accessory Kit Contents.**

Part	Part Number	Quantity	Use
Adapter, N(m) to BNC(f)	1250-0780	1	Adapts PCS Interface RF IN/OUT to BNC.
Adapter, SMA(m) to BNC(f)	1250-1200	2	Connects to base station TX Test Port.
Adapter, DB25(f) to DB9(m)	1252-5568	1	Serial cable (modem) adapter.
Cable assembly, N(m) to N(m), 10 ft.	08921-61010	1	Connects the base station TX Antenna Ports to the Test System RF IN/OUT port.
Cable assembly, BNC(m) to BNC(m), 10 ft.	08921-61011	2	Connects the base station TX Test Port to the Test System RF IN/OUT port.
Cable assembly, RJ11(m) to RJ11(m), 25 ft.	08921-61015	2	Serial (modem) cable.
Adapter, RJ11(f) to DB25(m)	08921-61018	1	Serial (modem) adapter.
Cable assembly, RJ11(m) to dual RJ11(f)	08921-61031	1	Splits the serial path to allow connection to modem and PC.
Cable assembly, RJ11(m) to DB9(f), 7 ft.	08921-61038	1	Connects the Test System serial path to a PC or printer.

Data Collection (Saving and Retrieving Test Results)

The Software has the capability to save test results (from the Full Cell Site Test and Radio Test modes) to an SRAM memory card for archival or printing at a later time. Once test result files are on a memory card, a software utility can be used to print the results or transfer them to a printer.

NOTE: You can also send test results to a PC for collection. This is covered in **"Printing Results to a PC via the Serial Port" on page 202**.

Configuring for Data Collection to a Memory Card

You make entries into the `Cnfg:External Devices` screen to enable data collection.

To Configure External Devices entries for Data Collection:

1. If the Software is running, exit it by pressing the `Exit` (k5) USER key from the Software's Main Menu.
2. Press the TESTS key.
3. Scroll to and select `Cnfg:External Devices` from the `SET UP TEST SET` list.
4. Scroll to the first available `Calling Name` field and press the knob.
5. If your firmware revision is A.14.00 or higher, you can scroll down the list in the `Choices` menu and select `DATA COLLECTION`. With previous revisions of firmware, you will have to use the text characters to enter the string `DATA C` into the `Calling Name` field. The entry will look like:
    ```
    1   DATA C
    ```
6. When finished entering the `Calling Name`, scroll to `Addr` and press the knob.
7. Using the DATA keys, enter a number into the `Addr` field. For data collection to a memory card, enter 1.

The Software supports data storage on Logical Interchange Format (LIF) and Disk Operating System (DOS) disk formats. Storage can be to any of the following file types:

- ASCII files under LIF
- BDAT files under LIF
- HP-UX files under LIF
- DOS files under DOS

You will be specifying the file type with the entry you make into the `Options` field immediately below `DATA COLLECTION`. If no file type is entered, and the card format is LIF, the Software will select an HP-UX file type.

If no file type is entered, and the card format is DOS, the Software will select a DOS file type. For example, if you are using a DOS file and you are not using an extension on the file name, the entry on this screen will look like:

```
1    DATA C                        1
```

If you are using an ASCII, BDAT or HP-UX file, you can specify the number of records allocated to the file. The DOS file is automatically updated as data is stored, so record allocation is not required. If you are using HP-UX files, you will have to enter **REC=** to establish a usable number of records. **REC=20480** sets the size to be the same as the default number of 256 byte records used for ASCII files (80×256). You can enter the **REC=** after the file type. For example, to use an ASCII file with 200 records of 256 bytes each, you will enter **ASCII REC=200** into the **Options** field.

NOTE: For some instrument firmware revisions, **REC=** and **ASCII REC=** will appear in the **Choices** menu. In this case, you may select **REC=** or **ASCII REC=**, enter the number of records using the DATA keypad, then select **Done**, instead of typing in each character individually.

The display will appear as follows:

```
1  DATA C                   1
   ASCII REC=200
```

The default number of records, used when no **REC=** entry is made, is 80.

NOTE: The size of the data collection files created by the Software may become important if you have limited memory space on the card. With the default ASCII file and 80 records, a file of approximately 20 KB will be created on the card.

Items in the **Options** field can be separated by a comma or a space.

Using Data Collection when Running Tests

The data collection feature stays "on" once you have performed the steps in **"Configuring for Data Collection to a Memory Card" on page 140**. Each time you run the Software you will be prompted for a new file name (or you can use a previous name and overwrite the existing file).

Data collection files are automatically created 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 143** to transfer the data to a PC or printer.

Turning Data Collection Off

Follow the steps in **"To Configure External Devices entries for Data Collection:" on page 140**, *except set the Addr entry to zero (0)*. This will allow you to leave the other information in the `Cnfg:External Devices` screen. You can then turn data collection back on by changing the `Addr` field entry back to 1.

Retrieving Data from a Memory Card

A software utility that is included in every HP 8921A Cell Site Test Set 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 the PCS TDMA Software in the memory space of the Test Set. This means that you will have to reload the PCS TDMA Software when you are done with file transfer. For this reason, it is best to do transfers in groups and not at a time at which you will need to test cell sites immediately thereafter.

Transferring Data to a Printer via the Serial Port:

1. If the Software is running, exit it by pressing the **Exit** (k5) USER key from the Software's Main Menu.
2. Check to make sure that your serial printer is on and set up to print once the serial data is sent.
3. Press the TESTS key.
4. Scroll to **Select Procedure Location:** and press the knob.
5. In the **Choices** menu, scroll to **ROM** and press the knob. This allows the loading of various utility programs resident in the Test Set.
6. Scroll to **Select Procedure Filename:** and press the knob.
7. In the **Choices** menu, scroll down the list to **FILE_XFER** and press the knob.
8. Run the utility software by pressing **Run Test** (k1).
9. You will be prompted to insert the SRAM card that contains the data collection files. Insert your card and press **Continue** (k1).
10. The file transfer menu will be shown. Scroll to **Output Port** and press the knob until it shows **Serial Port, 9600 baud**. This configures the software to send the data out the serial port (serial 9).
11. 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 to get the asterisk.

NOTE: All files on the SRAM 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 that they are true data collection files.

12. When all files to be transferred have been selected, scroll up to **Start Transfer** and press the knob. The data will be sent out the serial port to the printer.
13. 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.
14. To use the Software again, rerun it by following the steps in **"Step 2: Load and Run the Lucent PCS TDMA BS Test Software" on page 25**.

Transferring Data to a Printer via the HP-IB Port:

1. If the Software is running, exit it by pressing the **Exit** (k5) USER key from the Software's Main Menu.
2. Check to make sure that your HP-IB printer is on and set up to print once the data is sent.
3. Press the TESTS key.
4. Scroll to **Select Procedure Location:** and press the knob.
5. In the **Choices** menu, scroll to **ROM** and press the knob. This allows the loading of various utility programs resident in the Test Set.
6. Scroll to **Select Procedure Filename:** and press the knob.
7. In the **Choices** menu, scroll down the list to **FILE_XFER** and press the knob.
8. Run the utility software by pressing **Run Test** (k1).
9. You will be prompted to insert the SRAM card that contains the data collection files. Insert your card and press **Continue** (k1).
10. The file transfer menu will be shown. Scroll to **Output Port** and press the knob until it shows **HPIB, Addr 701**. This configures the software to send the data to an HP-IB printer at an address of 701.
11. 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 to get the asterisk.

NOTE: All files on the SRAM 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.

12. When all files to be transferred have been selected, scroll up to **Start Transfer** and press the knob. The data will be sent out the HP-IB printer.
13. 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.
14. To use the Software again, re-run it by following the steps in .

Transferring Data to a PC via the Serial Port:

1. If the Software is running, exit it by pressing the **Exit** (k5) USER key from the Software's Main Menu.
2. Connect the Test System to your PC using the serial port (see **figure 87 on page 167**).
3. Load a PC software utility for communicating on the serial port and logging and storing text files.
4. Use the PC utility software to prepare the PC to receive a text file via the serial port.
5. Press the TESTS key.
6. Scroll to **Select Procedure Location:** and press the knob.
7. In the **Choices** menu, scroll to **ROM** and press the knob. This allows the loading of various utility programs resident in the Test Set.
8. Scroll to **Select Procedure Filename:** and press the knob.
9. In the **Choices** menu, scroll down the list to **FILE_XFER** and press the knob.
10. Run the utility software by pressing **Run Test** (k1).
11. You will be prompted to insert the SRAM card that contains the data collection files. Insert your card and press **Continue** (k1).
12. The file transfer menu will be shown. Scroll to **Output Port** and press the knob until it shows **Serial Port, 9600 baud**. This configures the software to send the data out the serial port (serial 9).
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 to get the asterisk.

NOTE: All files on the SRAM 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.

14. When all files to be transferred have been selected, scroll up to **Start Transfer** and the data will be sent out the serial port.
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.
16. Re-run the PCS TDMA Sofware by following the steps in **"Step 2: Load and Run the Lucent PCS TDMA BS Test Software" on page 25**.

Demo (Demonstration) Mode

A good way to become familiar with the 11807B Option 093 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. In the demo mode, the Software will still expect a frequency plan (for Full Cell Site Test mode) and calibration files. When it gets to the point that measurements are displayed, it provides sample numbers in order to show what the printout format will look like.

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

Entering the Demo Mode

The "switch" used to turn the demo mode on and off is a parameter in the Test Parameters menu. These are the steps to set the demo mode to "on":

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Parm:Test Parameters** and press the knob.
4. Once in the **TESTS (Test Parameters)** menu, press the knob again to allow scrolling.
5. Scroll down to the parameter on the list titled **ZZZZ Test Demo Mode** and press the knob again to leave the scrolling function.
6. Turn the knob to place the cursor on the field below the parameter name.
7. Using the DATA keys, press 1 and then press ENTER.
8. That is all it takes to set it up. The demo mode will be on the next time the Software is run. If you want to run the demo mode now, press the TESTS key and then **Run Test** (k1). You will return to the Software's Main Menu in the demo mode.

Exiting the Demo Mode

The steps to turn the demo mode off are the same as those used to turn it on except that you will enter a value of 0 for the demo mode setting:

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Parm:Test Parameters** and press the knob.
4. Once in the **TESTS (Test Parameters)** menu, press the knob again to allow scrolling.
5. Scroll down to the last parameter on the list, titled **ZZZZ Test Demo Mode** and press the knob again to leave the scrolling function.
6. Turn the knob to place the cursor on the field below the parameter name.
7. Using the DATA keys, press 0 and then print ENTER.
8. The demo mode is now off and will not be in effect the next time the Software is run. If you want to run the Software now, press the TESTS key and then **Run Test** (k1). You will return to the Software's Main Menu in the normal operating mode.

Editing the Parameters (Test Parameters)

The Software uses your entries in the Test Parameters screen to customize testing, to configure the modem, and to compensate for test cable losses. An additional parameter allows you to run the Software in a demo mode, which is useful for familiarization with the operation of the Test Set (**see "Demo (Demonstration) Mode" on page 146**).

This section lists the parameters, describes their use, and gives steps for changing them.

Accessing the Parameters Screen

To get to the TESTS (Test Parameters) screen, follow these steps:

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Parm:Test Parameters** and press the knob. The Parameters menu is now ready for editing (see **figure 79**).
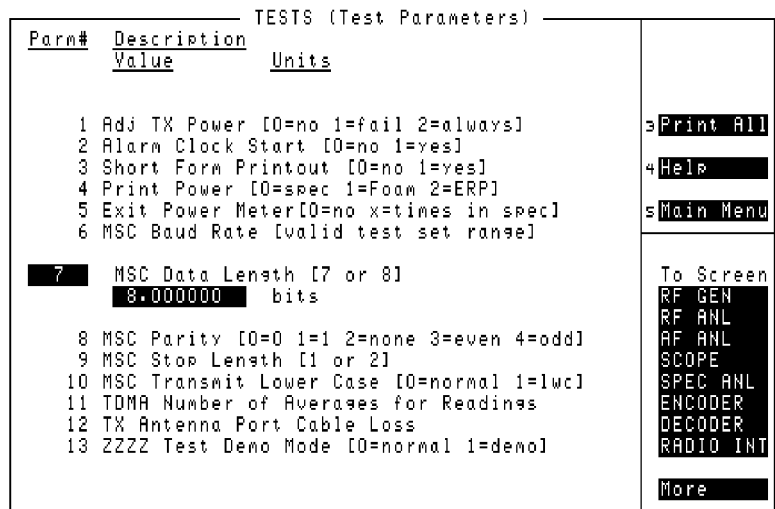
Figure 79   **The Test Parameters screen.**

Parameters List and Descriptions

1. **`Adj TX Power`**

   You may set the conditions for adjusting the transmitter power when running the tests as follows:

   - **`No`** - With this setting, you will never be prompted to adjust the power level. The power will be measured and reported and the testing will continue. The adjustment meter display will not be seen.
   - **`Fail`** - If you select the "fail" setting, you will only be allowed to adjust the power level if the measured level is outside of the specifications you have defined. The adjustment meter display is used in this case. If the measurement is within the specification, the test continues uninterrupted.
   - **`Always`** -This setting will cause the tests to pause every time a power reading is to be taken to allow you to make adjustments to the transmitter power. The adjustment display is used for this purpose.

2. **`Alarm Clock Start`**

   You can use the Alarm Clock feature of the Software to start a testing sequence at a specified on time. **See "Alarm Clock Mode" on page 116** for details of alarm clock mode usage.

3. Short Form Printout

The Software's standard printout is a line-by-line list of each test as it is run, with measured results, specification limits, and pass-fail status. You may be familiar with the use of a "short form" printout which summarizes the results for multiple radios on a single page. Set this parameter to 1 (yes) if you would like to get the short form printout rather than the full-length version.

```
                         CELL SITE FCC RECORD

Cell Site Identification: 1     Operator's Signature_____
Equipment Used: Hewlett-Packard,8921A,3612A03050,A.16.00

Equipment calibration Date_____

Date [MM/DD/YY] 100996     Time [HH.MM] 09.43

Lucent PCS TDMA base station tests

        Signal level at TX test port for TX antenna 0_____dBm



        TX antenna 0 Gain_____dB Cable loss_____dB



                                               Page  ____of____

Cell Site Identification: 1     Operator's Signature_____
```

Radio ID		Carrier Frequency			Power Level Calculated				Peak Frequency Deviation		
ID #	Chan No	Channel Freq MHz	Meas Freq Err Hz	Foam Jmpr Watts	Foam Jmpr dBm	Ant Gain (-) Loss dB	Eff Rad Pwr (ERP) Watts	EVM %	Adj Chan Pwr dB	Alt Chan Pwr dB	Alt 2 Chan Prw dB
0	232	1936.980	5	1.6	32.0	10.0	15.9	.9	-45.0	-46.0	
0	234	1937.040	5	1.6	32.0	10.0	16.0	.9	-46.0	-47.0	
0	236	1937.100	6	3.9	36.0	10.0	39.4	.9	-49.0	-50.0	

Figure 80 **Short form printout example.**

4. `Print Power`

NOTE: This parameter entry is used only if the **`Short Form Printout`** parameter is set to 1 (yes).

Setting choices for this parameter are:

- 0 = spec - prints all output power values based on specified values.
- 1 = Foam - prints the foam jumper output power value based on measurements; prints the ERP output value based on specified values.
- 2 = ERP - prints all output power values based on measurements.

5. `Exit Power Meter`

If you set Parameter number 1 (**`Adj TX Power`**) to allow adjustments to power levels, you will see a simulated analog meter on the display of the Test Set. The setting for the **`Exit Power Meter`** parameter has the following effect:

- **`No`** - With this setting, the Software will wait in the analog meter mode until you press the **`Continue`** (k2) key, even if the power falls within your defined adjustment limits.
- **`X=times in spec`** - With this entry, the Software will stay in the analog meter mode until it has measured power within your defined range as many times as are set in this Parameter. For example, if you enter an 8, the Software will compare your value to the adjustment limits and if it meets them for eight consecutive readings, the analog meter is automatically exited and testing continues.

6. MSC Baud Rate

NOTE: Parameters 6 through 10 are used to set up serial communications. Normally, you will only have to enter these once unless you change modem settings or have multiple MSCs (using different data rates and so forth) to connect to.

Enter the baud rate used by your switch when communicating via a modem. Typical entries for this parameter are 2400 and 9600 baud. This number can be entered directly using the DATA keys.

7. MSC Data Length

Select from either 7 or 8 bits for your serial communication data link. This number can be entered directly using the DATA keys.

8. MSC Parity

Set to match your communication link to the MSC. Enter the number value to indicate your desired setting as indicated below:

0 - zero parity
1 - ones parity
2 - parity equals "none"
3 - even parity
4 - odd parity

9. MSC Stop Length

Enter the number of stop bits that matches your communication link with the MSC. You can choose 1 or 2 stop bits. Enter these values directly, using the DATA keys.

10. MSC Transmit Lower Case

To communicate with some MSC sites, it is necessary to send commands only in lower case. If this is true for your MSC, set this parameter to 1 and any commands entered in upper case will be automatically converted to lower-case characters before they are sent to the switch.

11. `TDMA Number of Averages`

If you have run multiple tests and see that one or more of the TDMA measurements vary substantially from test to test, you can add averaging to "smooth out" this variability and improve your test results. Simply enter the number of averages you would like to be used for each TDMA measurement (the default value is 1; no averaging is performed)

12. `TX Antenna Port Cable Loss`

This value is used to represent the loss in the test cable that you use to connect your base station's output to the input of the Test System. If you already know the RF loss (in dB) of your cable for the frequencies you test at, simply enter the number into this field. If you do not know the loss, you can measure it using the Enter/View Calibration Files menus (**see "Measuring the TX Antenna Port Cable Loss:" on page 126**).

13. `ZZZZ Test Demo Mode`

Use this parameter to put the Software into the "demo mode." The demonstration mode will let you run the tests without really testing or connecting to a base station. This allows you to become familiar with Software's operation. For details, **see "Demo (Demonstration) Mode" on page 146**.

Changing Parameter Values

Follow these steps to change settings for any parameter on the
`TESTS (Test Parameters)` screen:

1. Exit any Software program that may be running on the Test Set. If the Test Set is displaying an asterisk (*) in the upper right of the display, a program is running. One method of exiting a program is to press the SHIFT key, then the CANCEL key.
2. Press the TESTS key.
3. Scroll down to `Parm:Test Parameters` and press the knob. You will then enter the `TESTS (Test Parameters)` menu.
4. To access any parameter, place the cursor on the `Parm#` field and press the knob to highlight the field. Then turn the knob to scroll up and down until you reach the parameter that you would like to view-change (when you are "pointing" to a single parameter, an entry area appears underneath the selection).
5. Press the knob again to disable the scrolling and turn the knob to move the cursor onto the `Value` field.
6. Use the DATA keys to enter your value. Note that for some parameters, a number may equate to a specific setting (for example, to set for even `MSC Parity`, you would enter a value of 3).
7. Repeat these steps to change other parameters that need new values. When finished entering values, your parameter values can be saved to a memory card. **See "Procedure Files" on page 203**.
8. When finished in the parameters menu, you can press the TESTS key to return to the TESTS Main Menu. Press the `Run Test` (k1) USER key if you want to re-run the Software.

Storing the Parameter Values to a Memory Card

See "Procedure Files" on page 203

Printing the Parameter Values

If you would like a summary of all your entries in the TESTS (Test Parameters) screen, and you have a printer connected to your Test System, you can print them. This can be useful for record-keeping and it also allows you to see all the values at once (in the TESTS (Test Parameters) menu, you can only see the value for one parameter at a time).

1. Exit any Software program that may be running on the Test Set. If the Test Set is displaying an asterisk (*) in the upper right of the display, a program is running. One method of exiting a program is to press the SHIFT key, then the CANCEL key.
2. If you have not yet done printing with the Test System, make sure that it is configured for printing of test results (**see "Printing and Report Generation" on page 198**). If you have already done printing make sure the printer is on and that it is loaded with paper.
3. Press the TESTS key.
4. Scroll down to **Parm:Test Parameters** and press the knob. You will then enter the **TESTS (Test Parameters)** menu.
5. Press **Print All** (k3) and the entire list of parameters and values will be sent to your printer. You should get a one-page summary as shown in **figure 81**.

```
Procedure: PCSTDMA     Library: PCSTDMA      10/15/96 10:26:00 am
Parm#  Parameter Description                     Units          Value
-----  ----------------------------------------  --------  ------------
    1  Adj TX Power [0=no 1=fail 2=always]                      0.000000
    2  Alarm Clock Start [0=no 1=yes]                           0.000000
    3  Short Form Printout [0=no 1=yes]                         0.000000
    4  Print Power [0=spec 1=Foam 2=ERP]                        2.000000
    5  Exit Power Meter[0=no x=times in spec]                   0.000000
    6  MSC Baud Rate [valid test set range]      baud        9600.000000
    7  MSC Data Length [7 or 8]                  bits            8.000000
    8  MSC Parity [0=0 1=1 2=none 3=even 4=odd]                 2.000000
    9  MSC Stop Length [1 or 2]                  bits            1.000000
   10  MSC Transmit Lower Case [0=normal 1=lwc]                 1.000000
   11  TDMA Number of Averages for Readings      number          1.000000
   12  TX Antenna Port Cable Loss                dB             40.000000
   13  ZZZZ Test Demo Mode [0=normal 1=demo]                    1.000000
```

Figure 81   **Printed Summary of values in the TESTS (Tests Parameters) Menu.**

6. When finished, you can press the TESTS key to return to the TESTS Main Menu. Press the **Run Test** (k1) USER key if you want to re-run the Software.

Editing the Specifications (Pass/Fail Limits)

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, explains how they are used, and gives steps for changing and saving them.

Accessing the Specifications (Pass/Fail Limits) Screen

To get to the TESTS (Pass/Fail Limits) screen, follow these steps:

1. If the Software is running (displaying an asterisk (*) in the upper right of the display), use the **Exit** (k5) key of the Software's Main Menu to stop it.
2. Press the TESTS key to get to the TESTS Main Menu.
3. Scroll to **Spec: Pass/Fail Limits** and press the knob. The Specifications menu is now ready for editing (see **figure 82**).

Figure 82   **Editing the TESTS (Pass/Fail Limits).**

Specifications List and Descriptions

1. **`Output Power Adjustment Error`**

   These limits determine how the power meter is displayed and affects the "exit on x good readings" setting (**see "Exit Power Meter" on page 151**). When the power meter display is shown, it has major tic 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 tic marks one dB up and one dB down from center.

2. **`Output Power Error`**

   The **`Output Power Error`** values determine whether or not the power measurement made in automated testing meets specifications. If you set Output Power Error limits of ± 2 dB, these 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 will result. In general, it is best to have the **`Output Power Adjustment Error`** limits set narrower (smaller) than the **`Output Power Error`** limits.

3. **`Adjacent Channel Power`**

   These are the limits for the adjacent channel power test, which measures the power that spills into the upper and lower adjacent channels. The limits are given in dB relative to the in-channel signal (carrier). Typically, there is only an upper limit.

4. **`Error Vector Magnitude`**

   This sets the limit for the Error Vector Magnitude test on the TDMA carrier. Typically, only the upper limit is set.

5. **`First Alternate Channel Power`**

   These are the pass-fail limits for the test that measures the amount of signal power that leaks into the next alternate channels (two channels above and below the carrier's center frequency).

6. **`Frequency Error`**

   These are the error limits for the measure of the frequency measured as compared to the ideal center-channel frequency.

7. **`Magnitude Error`**

   These are the pass-fail limit settings for the magnitude error of the TDMA carrier. Typically, only an upper limit is used.

8. **`Origin Offset`**

   The measured TDMA origin offset is compared to these limits.

9. **`Phase Error`**

   These are the pass-fail limit settings for the phase error of the TDMA carrier. Typically, only an upper limit is used.

10. **`Second Alternate Absolute Power`**

These are the test limits for the measure of the power in the spectrum three channels away from the carrier. This limit is for the absolute signal level in that channel when the TDMA carrier is on, so the limits are in units of dBm.

11. **`Second Alternate Channel Power`**

These are the test limits for the measure of the power in the spectrum three channels away from the carrier. This limit is for the signal level in that channel, relative to the carrier signal level, so the limits are in units of dB relative to the carrier level.

Changing Specification (Pass/Fail) Values

These are the steps used to change the setting for any specification in the `TESTS (Pass/Fail Limits)` screen:

1. Exit any Software program that may be running on the Test Set. If the Test Set is displaying an asterisk (*) in the upper right of the display, a program is running. One method of exiting a program is to press the SHIFT key, then the CANCEL key.
2. Press the TESTS key.
3. Scroll down to `Spec:Pass/Fail Limits` and press the knob. The Test Set will display the `TESTS (Pass/Fail Limits)` menu.
4. To access any specification, place the cursor on the `Spec#` field and press the knob to highlight the field. Then use the knob to scroll up and down until you reach the limits that you would like to view-change (when you are "pointing" to a single specification, two entry fields (`Lower Limit` and `Upper Limit`) appear underneath the selection).
5. Press the knob again to disable the scrolling and turn the knob to move the cursor onto one of the limit fields.
6. Use the DATA keys to enter your limits.

NOTE: The pass-fail entries allow you to specify whether you want to check the upper limit, the lower limit, or both. In most cases, the default is set to "Both". If you want to change for upper or lower limit checks, scroll to the `Check` column and press the knob. Then select from `Lower` or `Upper` in the `Choices` menu.

7. Repeat these steps to change other specifications that need new limits.
8. When finished, you can press the TESTS key to return to the TESTS Main Menu. Press the `Run Test` (k1) USER key if you want to re-run the Software.
9. Your pass-fail values can be saved to a memory card. **See "Procedure Files" on page 203**.

Storing the Specifications to a Memory Card

Specification limits are not stored independently, but are a part of a procedure file. Refer to the section on creating and saving procedure files (**see "Procedure Files" on page 203**).

Printing the Specification Limits

If you would like a summary of all your entries in the `TESTS (Pass/Fail Limits)` screen, and you have a printer connected to your Test System, you can print them. This can be useful for record-keeping and it also allows you to see all the limits at once (in the `TESTS (Pass/Fail Limits)` menu, you can only see the limits for the one specification at a time).

1. Exit any Software program that may be running on the Test Set. If the Test Set is displaying an asterisk (*) in the upper right of the display, a program is running. One method of exiting a program is to press the SHIFT key, then the CANCEL key.
2. If you have not yet done printing with the Test System, make sure that it is configured for printing of test results (**see "Printing and Report Generation" on page 198**). If you have already done printing make sure the printer power is on and that it is loaded with paper.
3. Press the TESTS key.
4. Scroll down to `Spec:Pass/Fail Limits` and press the knob. The Test System will display the `TESTS (Pass/Fail Limits)` menu.
5. Press `Print All` (k3) and the entire list of specifications and values will be sent to your printer. You should get a one-page summary as shown in **figure 83**.

```
Procedure: PCSTDMA     Library: PCSTDMA      10/15/96 01:03:00 pm
   # Test Specification Description        Units     Lower Limit  Upper Limit
  -- -------------------------------------- --------  ------------ ------------
   1 Output Power Adjustment Error          dB          -1.000000     1.000000
   2 Output Power Error                     dB          -2.000000     2.000000
   3 Adjacent Channel Power                 dB                       -26.000000
   4 Error Vector Magnitude                 %                         12.500000
   5 First Alternate Channel Power          dB                       -45.000000
   6 Frequency Error                        Hz        -217.000000   217.000000
   7 Magnitude Error                        %                         12.500000
   8 Origin Offset                          dB                       -30.000000
   9 Phase Error                            deg                        7.000000
  10 Second Alternate Absolute Power        dBm                      -13.000000
  11 Second Alternate Channel Power         dB                       -45.000000
```

Figure 83   **Printed Summary of limits in the TESTS (Pass/Fail Limits) Menu.**

6. When finished, you can press the TESTS key to return to the TESTS Main Menu. Press the `Run Test` (k1) USER key if you want to re-run the Software.

Frequency Plans

When running the Full Cell Site Test mode (**see "Full Cell Site Test" on page 38**), you must provide the Test System with information on the radios in the site 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 (**see "Method 1: Defining a Frequency Plan Using the Test Set" on page 162**). The second method uses an external PC as the editor; the plans are defined and then downloaded to the Test Set for storage (**see "Method 2: Defining a Frequency Plan Using a PC" on page 166**).

Method 1: Defining a Frequency Plan Using the Test Set

These steps describe the use of the Software's editor to define, edit, and store frequency plans using the Test Set. If you would like to save time by using a PC to define the plans, **see "Method 2: Defining a Frequency Plan Using a PC" on page 166**.

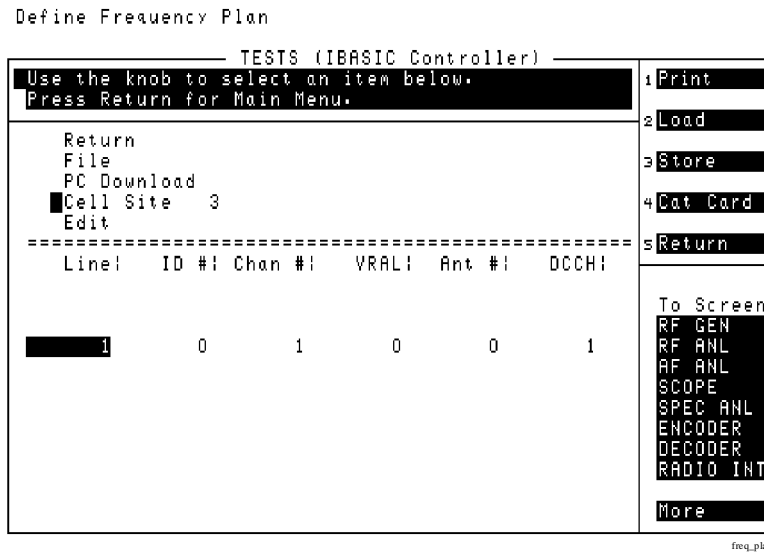**a.** From the Software's Main Menu, scroll to `Define Frequency Plan` and press the knob (see **figure 84**).

```
Main Menu
                      ─── TESTS (IBASIC Controller) ───        ┌──────────┐
                     ┌───────────────────────────────────┐  1 │Run       │
                     │Use the knob to select an item below.│   └──────────┘
                     │Press Run to start test.           │  2 │          │
                     │                                   │    └──────────┘
                     │   Laptop Emulator                 │  3 │Cat Card  │
                     │  ■Define Frequency Plan           │    └──────────┘
                     │   Enter/View Calibration Files    │  4 │          │
                     │   Cell Site Under Test...........  3│    └──────────┘
                     │   ---- Selected Test and Test Variables -----│ 5 │Exit  │
                     │   Selected Test........ Full Cell Site Test  │   └──────────┘
                     │   Measurement Port......... TX Antenna Port  │
                     │   TX Antenna Port Cable Loss [dB].....  .50  │  To Screen
                     │   Test with power set to............. VRAL   │ │RF GEN  │
                     │                                   │          │ │RF ANL  │
                     │                                   │          │ │AF ANL  │
                     │                                   │          │ │SCOPE   │
                     │                                   │          │ │SPEC ANL│
                     │                                   │          │ │ENCODER │
                     │                                   │          │ │DECODER │
                     │                                   │          │ │RADIO INT│
                     │   User must set call processing to INHIBITED.│ │More    │
                     └───────────────────────────────────┘          └────────┘
                                                                      main_1
```

Figure 84   **Selecting the Define Frequency Plan menu.**

b. You will see the frequency plan menu shown in **figure 85**. 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. Enter the number for the site that you will be defining the frequency plan for using the DATA keys. Press the knob to enter the value.

```
Define Frequency Plan

            ── TESTS (IBASIC Controller) ──      ┌──────────┐
┌───────────────────────────────────────────┐    1│Print    │
│Use the knob to select an item below.      │    └──────────┘
│Press Return for Main Menu.                │    ┌──────────┐
│                                           │    2│Load     │
│    Return                                 │    └──────────┘
│    File                                   │    ┌──────────┐
│    PC Download                            │    3│Store    │
│  ■Cell Site   3                           │    └──────────┘
│    Edit                                   │    ┌──────────┐
│=============================================│    4│Cat Card │
│    Line│ ID #│ Chan #│  VRAL│  Ant #│  DCCH│    └──────────┘
│                                           │    ┌──────────┐
│                                           │    5│Return   │
│      ██████1     0      1      0      0      1 │    └──────────┘
│                                           │    To Screen
│                                           │    ┌──────────┐
│                                           │    │RF GEN   │
│                                           │    │RF ANL   │
│                                           │    │AF ANL   │
│                                           │    │SCOPE    │
│                                           │    │SPEC ANL │
│                                           │    │ENCODER  │
│                                           │    │DECODER  │
│                                           │    │RADIO INT│
│                                           │    └──────────┘
│                                           │    ┌──────────┐
└───────────────────────────────────────────┘    │More     │
                                            freq_pla└──────────┘
```

Figure 85   **Entering the site frequency plan.**

c. Scroll down to `Edit` and press the knob. The lower part of the screen is now active for editing and the first line should show a highlighted one (1).

 d. Press the `Ins Line` (k3) key several times to add lines to the list (see **figure 86**).
 e. Press the knob and the highlight will be removed from the `Line:` field. You can now scroll to any one of the five entry fields for that line number.
 f. Use the `Line:` fields to select the different radios in the site and then fill in these values:
   1. `ID #` – the Radio ID number (0 to 199)
   2. `Chan #` – the PCS-TDMA channel number (2 to 1998)
   3. `VRAL` – Voice RAdio Level setting for that radio (0 to 7)
   4. `Ant #` – the antenna number for that radio (0 to 6)

NOTE: Typically, Antenna 0 indicates an omni antenna. Antennas 1, 2, and 3 are the alpha, beta, and gamma faces. Antennas 4, 5, and 6 are the alpha', beta', and gamma' faces in a six-sectored site.

   5. `DCCH` – set to 1 if the radio is used as a DCCH, else set to 0.

NOTE: You *must have* at least one DCCH radio configured for each antenna number in the frequency plan.
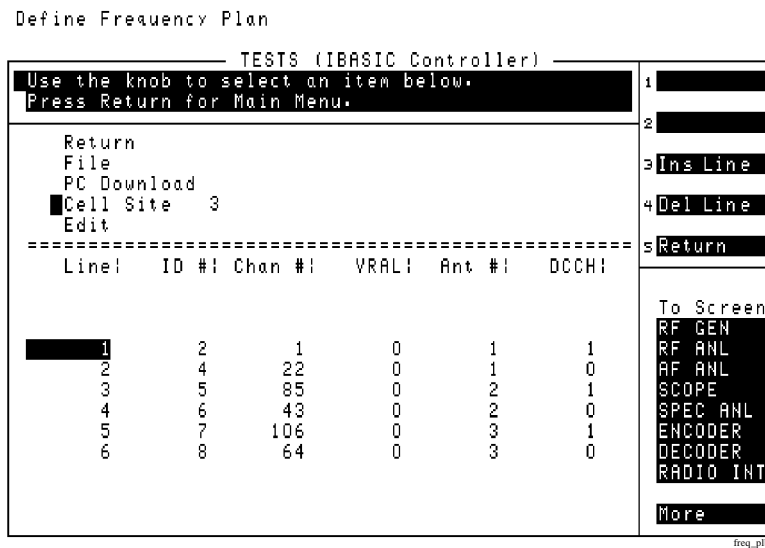
Figure 86 **An example frequency plan.**

 g. To get to the next line and enter data for another radio, scroll the cursor back to the `Line:` field and press the knob. You can now scroll down to the next line or back up to a previous line. When on the next blank line, press the knob again to begin filling in the data. Repeat step e. and step f. to enter all the data for a particular site.

 Once you have filled in a few lines, the display will look similar to **figure 86**.

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

i. To store your frequency plan, press **Store** (k3) (you must have an initialized RAM card in the slot to store your data).

j. If you wish to define plans for other sites, repeat step b. through step i.

k. Press **Return** (k5) to get back to the Software's Main Menu.

Method 2: Defining a Frequency Plan Using a PC

Entering frequency plans using the Test Set's user interface is somewhat time-consuming if you have a number of sites to define. You can create frequency plans faster with a personal computer and then download the plans to the Test Set. You can create a number of plans in a short time and once you have defined them, they can be reused and updated as needed. This section describes the steps used to create and download plans using a PC.

Requirements:

❐ A personal computer (PC) with an available serial communications port.
❐ PC Software programs for text editing and serial communications (for example, Windows *Write* and *Terminal* programs).
❐ Serial cables for connecting the Test Set to the PC.
❐ An initialized SRAM memory card for storing the frequency plans once defined.

Summary of steps:

1. Connect the serial communications path.
2. Create the plan.
3. Send the plan from the PC to the Test System and store the plan to a memory card.

Connect the Test Set to your PC:

The serial connection for frequency plan transfer can be the same as that used for testing of the radio. **See "Serial Connections for the HP 8921A, Modem and PC" on page 24** if you have not already made these connections. If you do not use a modem for MSC control, you may use a simpler setup as shown in **figure 87**.
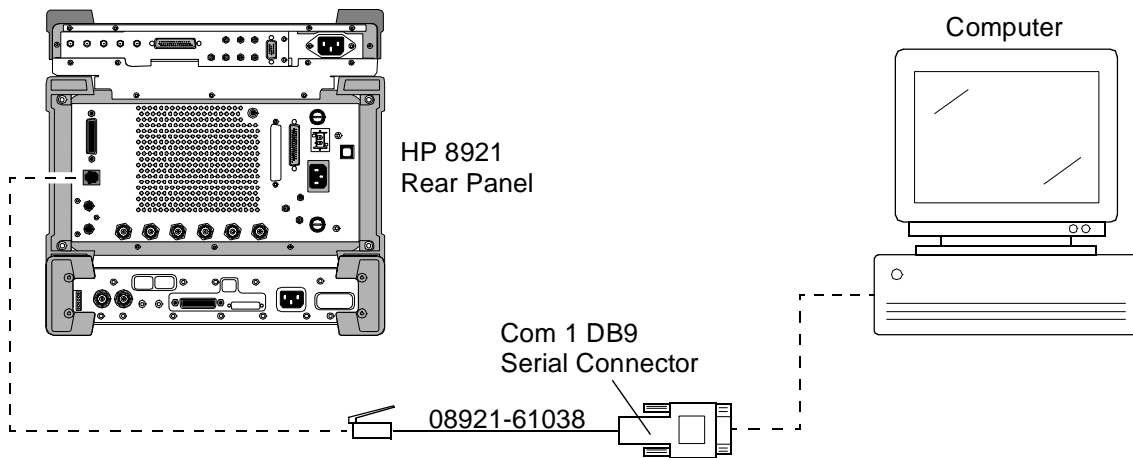
Figure 87   Serial Connections for the HP 8921A and PC

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.
2. Open a new file to begin editing.
3. Create a plan for one site, using the following guidelines:
   - You can enter the data in one long string or you can enter it in a tabular format.
   - Separation between the numbers (delimiters) 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.
   - 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 #, Chan #, VRAL, Ant # (see **table 3**), and DCCH). See **figure 88 on page 169** for an example of a frequency plan definition (again, the text is optional and you can use other text or none at all).

Table 3   **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	Alpha' face of a six-sectored site
5	Beta' face of a six-sectored site
6	Gamma' face of a six-sectored site

   - Add additional lines for each additional radio, again making sure that data for each field is entered.
   - Increment the Line field by one for each additional line you use.

```
Filename: CELL9PLN.TXT
CellSite 9

Line 1      ID 66      Chan 432      VRAL 3      Ant 4      DCCH 1
Line 2      ID 67      Chan 453      VRAL 3      Ant 4      DCCH 0.
```

Figure 88 **An example frequency plan on the PC.**

4. Once your entries match the site configuration, save the file in an ASCII format. Often, the extension expected by file transfer programs will be .TXT, so you may want to use that extension for your frequency plan files.
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. Use the following steps:

NOTE: 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. Start the PC's communications program that will be used to transfer the file via the serial port.
2. Make any required settings to prepare for serial transfers. Your settings for baud rate, data length, stop bits, and parity should match the entries in the `TESTS (Test Parameters)` menu (**see "Editing the Parameters (Test Parameters)" on page 148**).
3. From the Software's Main Menu, scroll to and select `Define Frequency Plan`.
4. Scroll to and select `PC Download`. When the `"Waiting for data from PC."` prompt appears, the Test Set is ready to receive the file information.
5. In the PC application, open the file to be transferred or select it from the program's transfer menu.
6. Use the PC software to send the file to the serial port. Any characters received at the Test Set will be posted on the display. If all is set up correctly, you should see characters scrolling on the screen. After a pause, you will be returned to the `Define Frequency Plan` menu and the data should appear in the table (see **figure 89**). If you are not ready or able to send data, you can press `Abort` (k1) to exit the transfer mode.

Figure 89   **Downloaded information in the frequency plan table.**

7. With the correct **Cell Site** number and frequency plan data displayed, press **Store** (k3). A new frequency plan will be created for that cell site number.

NOTE: If you change the Cell Site number before storing, *the data will be lost*.

8. If you have additional files to transfer for defining other sites, repeat step 4. through step 7. until all files have been sent to the Test Set and stored to the card.
9. Exit the PC communications program if you are done sending files.
10. To exit the **Define Frequency Plan** menu, press **Return** (k5).

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 are ever editing a saved plan on the Test Set and then decide *not* to make the changes, press the `Load` (k2) 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. From the Software's Main Menu, scroll to `Define Frequency Plans` and press the knob.
2. Scroll to `Cell Site`, press the knob, and enter the number of the site that corresponds to the file you wish to delete.
3. Scroll to `File` and press the knob to pull up a menu of file functions.
4. In the file function menu choices, scroll to `Purge From Card` and press the knob.
5. You will be asked to verify the purge operation for the cell site number entered. Press `Yes` (k1) to purge the file.
6. Press `Return` (k5) to return to the Software's Main Menu.

Printing a Frequency Plan

If you have a printer connected to your Test System 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 yet done printing with the Test System, make sure that it is configured for printing of test results (**see "Printing and Report Generation" on page 198**). 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 **Define Frequency Plan**.
3. Select the plan to print by scrolling to **Cell Site**, pressing the knob, and entering the site number that corresponds to the plan you would like to print.
4. Press **Print** (k1) and the frequency plan values will be sent to your printer (see **figure 90**).

```
Frequency plan for cell 3

   Line|    ID #| Chan #|   VRAL|  Ant #|   DCCH|
      1       2       2       0       1       1
      2       4      22       0       1       0
      3       5      85       0       2       1
      4       6      43       0       2       0
      5       7     106       0       3       1
      6       8      64       0       3       0
```

Figure 90   **Example frequency plan printout.**

5. If you would like to print other plans, change the **Cell Site** number and repeat step 4.
6. When finished, press the **Return** (k5) key to go back to the Software's Main Menu.

Laptop Emulator

Overview

The Test Set has the ability to send control commands to the switch, via a modem, to control the radios at the cell site. This enables the Test System to perform tests in the shortest amount of time and with little operator intervention. The menu used for site control via the MSC is called the Laptop Emulator. This section deals with detailed use of the Laptop Emulator menu.

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

Setup and Basic Use of the Laptop Emulator

This section outlines the steps required to configure the Test System for use of the Laptop Emulator menu. These are the steps used in Laptop Emulator use:

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 MSC.
3. Send commands to the MSC.

Set up the Modem for Communication to the MSC

Make the Serial Communications Connections

Connect the modem and PC (if you are using the optional PC) to the Test System and the phone lines as shown in **figure 91**.

HP 8921
Rear Panel

Optional

Computer

RJ11

08921-61031

Com 1 DB9
Serial Connector

08921-61038

08921-61015

08921-61018

1252-5568
DB25 to DB9
Adaptor
(If Needed)

Modem

Phone
Line

Power
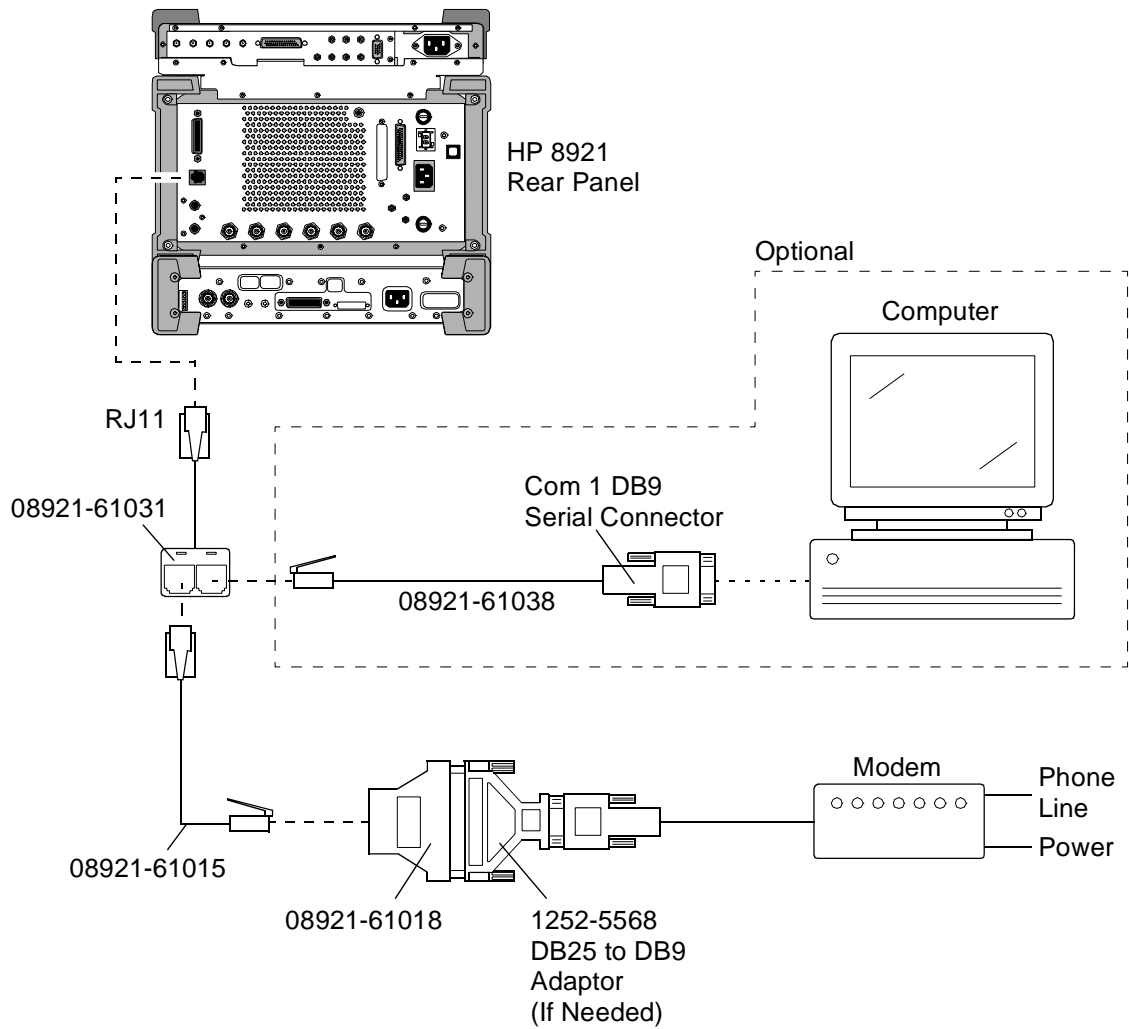
Figure 91   **Serial connections for modem use.**

Configure the Serial Ports

You need to follow these steps only once when setting up the Test System for the first time.

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

❒ Baud rate
❒ Data length
❒ Parity
❒ Stop length

To configure the serial ports, you will have to temporarily exit the Software environment. These steps will show you how to exit the Software, make the settings, then return to Software control:

1. From the Software's Main Menu, press **Exit** (k5). The Software will be stopped.
2. Press the TESTS key.
3. Scroll to and select **Parm:Test Parameters** near the bottom of the screen.
4. Using the cursor to select the **Parm #** and modifying the **Value** fields, change *parameters 6, 7, 8, 9, and 10* to match the serial port settings of the MSC (see **figure 92**).

```
                    TESTS (Test Parameters)
  Parm#   Description
          Value        Units

     1 Adj TX Power [0=no 1=fail 2=always]        3 Print All
     2 Alarm Clock Start [0=no 1=yes]
     3 Short Form Printout [0=no 1=yes]           4 Help
     4 Print Power [0=spec 1=Foam 2=ERP]
     5 Exit Power Meter[0=no x=times in spec]     5 Main Menu
     6 MSC Baud Rate [valid test set range]

   [  7  ]   MSC Data Length [7 or 8]               To Screen
         [ 8.000000 ]   bits                        RF GEN
                                                    RF ANL
     8 MSC Parity [0=0 1=1 2=none 3=even 4=odd]     AF ANL
     9 MSC Stop Length [1 or 2]                     SCOPE
    10 MSC Transmit Lower Case [0=normal 1=lwc]     SPEC ANL
    11 TDMA Number of Averages for Readings         ENCODER
    12 TX Antenna Port Cable Loss                   DECODER
    13 ZZZZ Test Demo Mode [0=normal 1=demo]        RADIO INT

                                                    More
```

Figure 92   **Parameter screen, showing modem setup parameters.**

5. To return to Software control, press the TESTS key followed by `Run Test` (k1).

6. If you have connected a computer as shown in **figure 91 on page 175**, set up your PC terminal program for a serial port connection with the same settings made in the parameters menu, above. 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.

NOTE: The settings you have made in the Test Parameters screen are saved in non-volatile memory and will be retained even if you turn the Test Set off. However, if you load another program, the settings will be lost. You can save your settings in a "procedure file" for later use after running other programs. **See "Procedure Files" on page 203** for instructions on creating procedure files.

Initialize the Modem

These steps prepare the modem for communications with the MSC. *You need to do these steps only once when setting up the Test System for the first time, as the settings will be saved within the modem when done.*

In these steps, you will send pre-defined strings to the modem that will initialize it for use with the Software. In most cases, these pre-defined strings will be 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 customize the strings. The steps for creating custom strings and a summary of the pre-defined strings are given in **"Creating User-Defined Commands" on page 186**.

1. From the Software's Main Menu, scroll to and select **Laptop Emulator** (see **figure 93**).

```
Main Menu

          ━━━━━━━━ TESTS (IBASIC Controller) ━━━━━━━━    ┌─────────┐
         ┌──────────────────────────────────────────┐  1│Run      │
         │ Use the knob to select an item below.     │   └─────────┘
         │ Press Run to start test.                  │  2┌─────────┐
         └──────────────────────────────────────────┘   └─────────┘
            ■Laptop Emulator                            3┌─────────┐
             Define Frequency Plan                        │Cat Card │
             Enter/View Calibration Files                 └─────────┘
             Cell Site Under Test................   3    4┌─────────┐
             ---- Selected Test and Test Variables -----   └─────────┘
             Selected Test........ Full Cell Site Test    5┌─────────┐
             Measurement Port......... TX Antenna Port      │Exit     │
             TX Antenna Port Cable Loss [dB].....  .50      └─────────┘
             Test with power set to.............. VRAL    ┌─────────┐
                                                          │To Screen│
                                                          │RF GEN   │
                                                          │RF ANL   │
                                                          │AF ANL   │
                                                          │SCOPE    │
                                                          │SPEC ANL │
                                                          │ENCODER  │
                                                          │DECODER  │
                                                          │RADIO INT│
             User must set call processing to INHIBITED.  ├─────────┤
                                                          │More     │
                                                          └─────────┘
                                                                    main_2
```

Figure 93   **Selecting the Laptop Emulator.**

2. If your modem is not already turned on, turn it on now.

3. Position the cursor at **Test Modem** and press the knob. In the **MSC Response** window the modem should respond "OK". This confirms that the Test Set can communicate with the modem via the serial port.

```
Cell= 3 :RA ID= 122
                   ┌───── TESTS (IBASIC Controller) ─────┐   ┌─────────┐
                   │ Use the knob to select an item below.│   │1 Prt Full│
                   │ Press Return for Main Menu           │   └─────────┘
                   │                                      │   ┌─────────┐
                   │   Use the knob to select command to MSC.│   │2 Page Up │
                   │ ─────────────────────────────────────│   └─────────┘
                   │   Return            ┌── MSC  Response ──┐   ┌─────────┐
                   │ ▌Test Modem         │                   │   │3 Send CR │
                   │   Dial MSC          │                   │   └─────────┘
                   │   Laptop > Modem    │                   │   ┌─────────┐
                   │   Send Login        │                   │   │4 Page Down│
                   │   Send Password     │                   │   └─────────┘
                   │   Send TIpdunix     │                   │   ┌─────────┐
                   │   Define Auto       │                   │   │5 Return  │
                   │   Auto Login        │                   │   └─────────┘
                   │   Define User       │                   │
                   │   User defined 1    │                   │    To Screen
                   │   User defined 2    │                   │   RF GEN
                   │   User defined 3    │ OK                │   RF ANL
                   │   User defined 4    │                   │   AF ANL
                   │   User defined 5    │                   │   SCOPE
                   │   Logout            │                   │   SPEC ANL
                   │                     └───────────────────┘   ENCODER
                   │                                      │   DECODER
                   │                                      │   RADIO INT
                   └──────────────────────────────────────┘   ┌─────────┐
                                                               │ More    │
                                                               └─────────┘
```
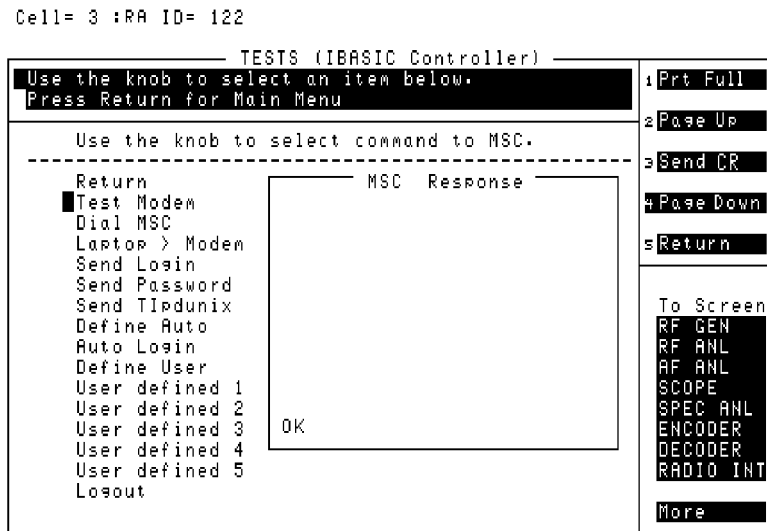
Figure 94   **The Laptop Emulator screen.**

4. Scroll down to **Define User** and select it by pressing the knob.
5. To load a set of available modem commands, press the **File Name** (k1) user key (screen not shown).
6. You will use the pre-defined set for modem use. Press the **Modem** (k5) user key (menu screen not shown). You should see modem setup strings appear in the menu under the lines marked **User Action x to MSC** (screen not shown).

7. You should not need to make any changes to these strings, so press the **Return** (k5) user key. You should now have choices of **Modem Init 1**, **Modem Init 2**, and **Modem Save** in the Laptop Emulator menu (see **figure 95**).

```
Cell= 3 :RA ID= 122

                      —— TESTS (IBASIC Controller) ——       1 Prt Full
 Use the knob to select an item below.
 Press Return for Main Menu                                 2 Page Up

     Use the knob to select command to MSC.                 3 Send CR
 -------------------------------------------------
 Return                      —— MSC   Response ——           4 Page Down
 Test Modem
 Dial MSC                                                   5 Return
 Laptop > Modem
 Send Login
 Send Password
 Send TIpdunix                                              To Screen
 Define Auto                                                RF GEN
 Auto Login                                                 RF ANL
 Define User                                                AF ANL
 ▌Modem Init 1                                              SCOPE
 Modem Init 2                                               SPEC ANL
 Modem Save                                                 ENCODER
 User defined 4                                             DECODER
 User defined 5                                             RADIO INT
 Logout
                                                            More
```

Figure 95   **Laptop Emulator screen after selecting the Modem user definition.**

8. The modem for MSC communication can now be initialized.
  a. Position the cursor on **Modem Init 1**. The top of the display will show the command string that will be sent to the modem. Press the knob to send the command and wait for the "OK" response in the MSC Response window.
  b. Position the cursor on **Modem Init 2** and select it. This sends the second command string. Again, wait for the "OK" response.
  c. If the modem accepted the two command strings, you will probably want to save the settings in the modem. Scroll to **Modem Save** and press the knob. This will save the settings in the non-volatile memory of the modem so you can skip these steps in the future.
9. To exit the Laptop Emulator mode, press **Return** (k5).

Dialling 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.

a. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob (see **figure 96**).

```
Main Menu
                    ─── TESTS (IBASIC Controller) ───        1 Run
                   ┌─────────────────────────────────┐
                   │ Use the knob to select an item below. │  2
                   │ Press Run to start test.         │
                   │                                  │       3 Cat Card
                   │ ■Laptop Emulator                 │
                   │  Define Frequency Plan           │       4
                   │  Enter/View Calibration Files    │
                   │  Cell Site Under Test............    3   5 Exit
                   │  ---- Selected Test and Test Variables ----- │
                   │  Selected Test........ Full Cell Site Test │    To Screen
                   │  Measurement Port......... TX Antenna Port │   RF GEN
                   │  TX Antenna Port Cable Loss [dB].....   .50│   RF ANL
                   │  Test with power set to............. VRAL  │   AF ANL
                   │                                  │          SCOPE
                   │                                  │          SPEC ANL
                   │                                  │          ENCODER
                   │                                  │          DECODER
                   │                                  │          RADIO INT
                   │  User must set call processing to INHIBITED.│
                   └─────────────────────────────────┘          More
                                                           main_2
```

Figure 96   Selecting the Laptop Emulator.

b. Make sure that your modem is connected and turned on.

c. Scroll down to **Test Modem** and press the knob to check basic modem operation (see **figure 97**). The response "OK" should appear in the MSC Response box.

```
Cell= 3 :RA ID= 122
```


MSC
Response
Box
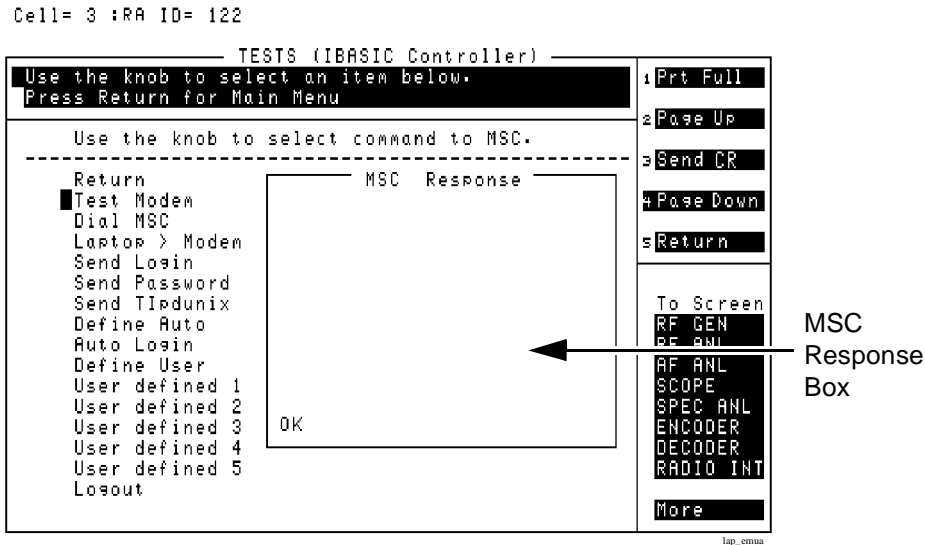
Figure 97   **Connecting to the MSC.**

d. Now, dial up the Mobile Switching Center (MSC): Scroll down to **Dial MSC** and press the knob. You will be prompted to enter the phone number for the switch; enter it using the DATA keys and press the knob (**Done**) (if you have entered the number before, it will appear at the top of the screen and you can simply select **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".

e. You now need to get to the login prompt. This may require that you send a few carriage returns (CR). Press the **Send CR** (k3) user key 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 185**

f. When prompted by the MSC for a login, select **Send Login**. Use the knob to enter your login from the characters in the **Choices** menu, then select **Done**. If you have entered your login previously, it will appear at the top of the screen and you can simply select **Done**.

g. When prompted by the MSC for a password, select **Send Password**. Use the knob to enter your password from the characters in the **Choices** menu and select **Done** (if you have entered your password previously, it will appear at the top of the screen and you can simply select **Done**).

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    h. 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 98** shows the typical appearance of the **MSC Response** box after a connection sequence.

```
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
```

Figure 98   **Typical Laptop Emulator display after the connection to the MSC.**

    i. You can now verify that you can control the site via the MSC. Scroll to **Enter cell ID** (see **figure 99**). Select it and enter the number for the cell site to be tested.

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

    j. Scroll to and select **OP Cell**. You should see a response to the Op Cell command in the MSC Response box on the display.

```
Cell= 3 :RA ID= 122
```

```
┌──────────────── TESTS (IBASIC Controller) ────────────────┐  ┌─────────┐
│ Use the knob to select an item below.                     │ 1│Prt Full │
│ Press Return for Main Menu                                │  └─────────┘
│                                                           │  ┌─────────┐
│     Use the knob to select command to MSC.               │ 2│Page Up  │
│ ------------------------------------------------          │  └─────────┘
│     Logout              ┌──── MSC   Response ────┐        │ 3│Send CR  │
│     Hangup              │                        │        │  └─────────┘
│ ■ Enter cell ID         │                        │        │ 4│Page Down│
│     OP Cell             │                        │        │  └─────────┘
│     Init cell boot      │                        │        │ 5│Return   │
│     init cell tc        │                        │        │  └─────────┘
│     Init cell sc        │                        │        │
│     Inhibit RT diag     │                        │        │  To Screen
│     Allow RT diag       │                        │        │  RF GEN
│     Inhibit cp          │                        │        │  RF ANL
│     Allow cp            │                        │        │  AF ANL
│     Enter radio ID      │                        │        │  SCOPE
│     RA Remove           │                        │        │  SPEC ANL
│   ¦ Start               └────────────────────────┘        │  ENCODER
│   ¦ CFR to RCU                                            │  DECODER
│   ¦ XMTR on                                               │  RADIO INT
└───────────────────────────────────────────────────────────┘  ┌─────────┐
                                                                │More     │
                                                                └─────────┘
                                                         lap_emub
```
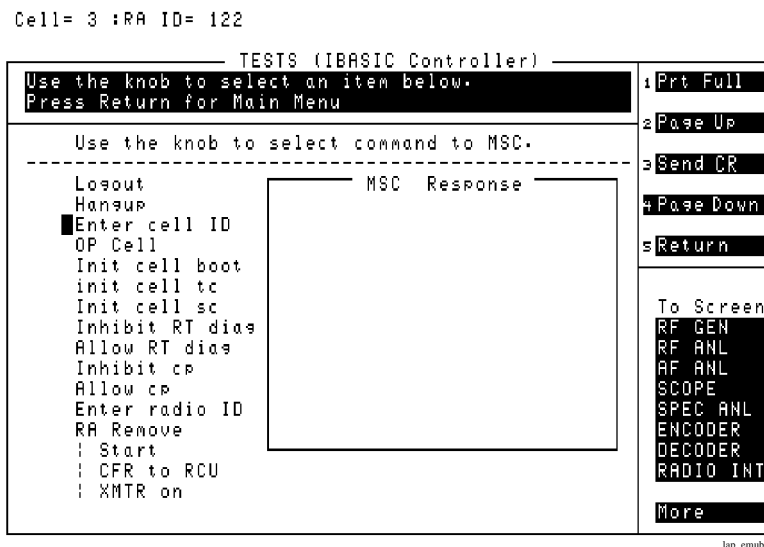
Figure 99   **Verifying site control.**

    k. The site is now ready to receive the commands from the Test System that will be sent during testing. Scroll to the command you wish 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 the serial port of the Test System (**figure 77 on page 137**) you can use the Laptop > Modem mode to bypass Test System control of the MSC.

This may be necessary when you are negotiating an OMP in logging on to the switch. 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:

1. First, make sure that you have connected the modem and PC to the serial ports as shown in **figure 77 on page 137**.
2. Prepare your PC for use by starting a communications software application (sometimes called a "terminal emulator").
3. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob.
4. Scroll to **Laptop > Modem** and press the knob.
5. You can now type commands on the PC. The commands are passed, via the Test System, to the modem and then the MSC. Responses from the modem and MSC will appear on your PC's display or monitor, not the Test System'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).

6. When finished using the PC to communicate, press **EXIT L > M** (k3) to return to the Laptop Emulator menu.
7. If you would like to return to the Software's Main Menu, press **Return** (k5).

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 screen.

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:

1. Insert an initialized SRAM card into the Test Set's front-panel MEMORY CARD slot. Make sure that the switch on the card is *not* in the SAFE position.
2. From the Software's Main Menu, scroll to and select **Laptop Emulator**.
3. Scroll down to **Define User** and select it by pressing the knob.
4. Press the **File Name** (k1) user key. There are five file areas available for storage of commands. One of them, **Modem**, is predefined and cannot be changed. You may create your own commands and save them to the remaining files (**uKEYS**, **uKEYS2**, **uKEYS3**, and **uKEYS4**).
5. Select from one of the uKEYS files by pressing USER key k1 through k4.
6. Scroll to **User Title 1** and press the knob.
7. The title you enter will show up 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 recognizable title for your command. When done spelling the name, scroll up to **Done** and press the knob.
8. Scroll to **User Action 1 to MSC** and press the knob.
9. 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**.
10. If you have other commands to define, repeat step 6. through step 9. for User Actions 2 through 5.
11. Once the commands have been entered, store the entries by scrolling to **Store Information to Card** and pressing the knob.
12. Return to the Laptop Emulator menu by pressing **Return** (k5). Command strings that you entered will appear immediately after the **Define User** selection.
13. To exit the Laptop Emulator mode, press **Return** (k5).

Loading and Using your User-Defined Commands:

1. Insert the SRAM card you stored the file on into the Test Set's front-panel MEMORY CARD slot.
2. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob.
3. If you have not yet loaded your user-defined commands (your commands do not appear on the list available in the Laptop Emulator screen):
   a. Scroll to **Define User** and press the knob.
   b. Press **File Name** (k1).
   c. Press a USER key (k1 through k4) corresponding to the file name to load.
   d. Scroll to **Load Information from Card** and press the knob.
   e. The definitions for your user-defined commands should appear in the list on the display. Press **Return** (k5) to go back to the Laptop Emulator.
4. Scroll down to the user-defined command area (follows the **Define User** choice in the Laptop Emulator) to the command you wish to use. With the cursor in front of the command, and *before* pressing the knob, read the command characters to be sent at the top of the display.
5. Press the knob to send the command to the MSC.
6. Select and send other commands, as needed, in the Laptop Emulator.
7. To exit the Laptop Emulator, press **Return** (k5).

Purging User-Defined Command Files:

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

1. Insert the SRAM card you stored the files on into the Test Set's front-panel MEMORY CARD slot.
2. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob.
3. Scroll to **Define User** and press the knob.
4. Press **File Name** (k1).
5. Press a USER key (k1 through k4) corresponding to the file that you plan to delete. The name will appear under the **Purge file:** heading.
6. Scroll to the **Purge file:** line and press the knob. The file will be deleted from the memory card.
7. Press **Return** (k5) to leave the user-defined command screen.
8. To exit the Laptop Emulator, press **Return** (k5).

Using Auto Login

Once you have become familiar with the steps to dial the MSC and log on, you can use the Auto Login mode to save time on subsequent connections. Using Auto Login, you define the basic information during connecting to the MSC and the Test System then performs the steps automatically.

Auto Login is set up by entering in the commands to be sent to the MSC during the logon sequence. You will also enter the responses coming back from the MSC so the Test System will know when to send the next commands.

Defining and Storing the Auto Login File:

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

1. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob.
2. Scroll to **Define Auto** and press the knob.
3. Fill in the sequence of command-response fields as required. Up to seven (7) sets of command-response pairs can be entered in this menu (although you may need less than that).
   a. Scroll to **MSC number to dial** and press the knob. Using the DATA keys, enter the phone number for the MSC to be dialled. Select **Done** from the **Choices** menu when the complete number has been entered.
   b. Scroll to **Key response 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.
   c. Scroll to **Command 1 to MSC** 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.
   d. Repeat these steps to enter the MSC responses and commands to send from the Test System. Typically, you can include the commands up to and including sending the TIpdunix command to put the site into the maintenance mode.
   e. When finished with the command-response entries, press **Return** (k5).
   f. If you made changes, you will be asked if you would like to save them to the memory card. Press **Yes** (k1). After the file is saved, you will be returned to the Laptop Emulator menu.

NOTE: The Auto Login information is automatically saved to a file named **aSIGN**. You cannot use another file name, nor can you have more than one Auto Login file.

4. To exit the Laptop Emulator, press **Return** (k5).

Running the Auto Login Sequence:

Use the following steps to initiate the Auto Login 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, scroll to **Laptop Emulator** and press the knob.
3. Scroll to **Auto Login** and press the knob. The Test System will begin the process of connecting to the MSC. The modem will be activated and the MSC will be dialled. Once the MSC responds, the command exchange will take place up to the point that you defined in the **Define Auto** menu. The responses from the MSC will be displayed as they are received to allow you to follow the progress of the connection sequence.

NOTE: If you would like to stop the Auto Login process, press the **Abort** (k2) key. There can be a delay of up to 30 seconds while the Test System ends the connect process. You will then be returned to the Laptop Emulator menu.

4. 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 System.
5. To exit the Laptop Emulator, press **Return** (k5).

Command Summary

Table 4 lists the commands available in the Laptop Emulator menu 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 RA *y* the current Radio ID number.

Table 4   **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 185***)*
Send Login	sends *login*
Send Password	sends *password*
Send TIpdunix	TIpdunix
Define Auto	*allows user to build an auto login sequence* (**see "Using Auto Login" on page 188***)*
Auto Login	*executes the auto login sequence* (**see "Using Auto Login" on page 188***)*
Define User	*allows user to customize command* (**see "Creating User-Defined Commands" on page 186**)
User Defined 1	*sends user defined customized command 1*
User Defined 2	*sends user defined customized command 2*
User Defined 3	*sends user defined customized command 3*
User Defined 4	*sends user defined customized command 4*
User Defined 5	*sends user defined customized command 5*
Logout	Two Control - D's
Hangup	+ + +

Table 4   **Laptop Emulator Commands**

Command	Command Syntax Sent to MSC
Enter Cell ID	*stores cell ID info for recall later*
Op Cell	OP:CELL*x*
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 Radio ID	*stores radio ID info for recall later*
RA Remove	RMV:CELL*x*,RA*y*;UCL
|Start	CFR:CELL*x*,RA*y*;START
|CFR to RCU	CFR:CELL*x*,RA*y*;CONFIG 150
|XMTR on	CFR:CELL*x*,RA*y*;XMITC 300
|RCU full pwr	CFR:CELL*x*,RA*y*;VRADPC 357
|Stop	STOP:CFR;CELL*x*,RA*y* ORIG
|Perform diags	DGN:CELL*x*,RA*y* ORIG
|Restore UCL	RST:CELL*x*,RA*y* ORIG;UCL
|Restore	RST:CELL*x*,RA*y* ORIG
|Download	DNLD:CELL*x*,RA*y* ORIG
|OP Cell	OP:CELL*x*,RA*y*
TRTU Restore	RST:CELL*x*,TRTU;UCL
Enter Command	*allows user to enter command (use quotes if comma is used)*

Logging of Control Commands

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

You may choose to display the commands on the display (CRT) or on a printer (serial, parallel, or HP-IB).

NOTE: Because the logging mode shows the communications between the Test System and the MSC controlling the site being tested, commands will only be seen if you have set the **Send Control Commands to MSC** field to **YES**.

To Configure the External Devices Menu for Logging:

1. If the Software is running, you must exit it before making the settings for the logging mode. From the Software's Main Menu, press **Exit** (k5).
2. Press the TESTS key.
3. Scroll to **Cnfg:External Devices** on the **SET UP TEST SET** list and press the knob.
4. Scroll to the first available **Calling Name** field (the field will be blank) and press the knob.
5. If your firmware revision is A.14.00 or higher, you can scroll down the list in the **Choices** menu and select **LOGGING**. With earlier revisions of firmware, you will have to use the text characters to enter the string **LOGGING** into the **Calling Name** field. Once **LOGGING** is in the **Calling Name** field, scroll to **Done** and press the knob.
6. Scroll to the **Addr** field and press the knob.
7. Using the DATA keys, enter a number into the **Addr** field:
   - If you would like to view commands on the display (CRT), enter a 1.
   - To send the commands to the serial port (to a PC or printer), enter a 9.
   - To send the commands to an HP-IB printer, enter the printer's HP-IB address (typically 701).
   - To send the commands to a parallel printer, enter 15.
8. The logging mode is now enabled. To rerun the Software, press the TESTS key then press **Run Test** (k1).

Using the Logging Mode when Running Tests

The logging mode stays "on" once you have performed the steps in **"To Configure the External Devices Menu for Logging:" on page 192**.

When testing begins, the commands appear (on the printer or CRT, depending on your entry for Addr in the **Cnfg:External Devices** menu). Commands sent from the Test System to the MSC will be prefixed by "To CS:". Commands received from the MSC (responses) will be prefixed by "From CS" (see **figure 100**).

```
To CS  :op:cell 3
From CS:CP ALW CP INH
To CS  :rmv:cell 3,ra 2;ucl
From CS:COMPLETED
To CS  :rmv:cell 3,ra 5;ucl
From CS:COMPLETED
To CS  :rmv:cell 3,ra 7;ucl
From CS:COMPLETED
To CS  :op:cell 3,ra 2
To CS  :cfr:cell 3,ra 2;start
To CS  :cfr:cell 3,ra 2;config 150
To CS  :cfr:cell 3,ra 2;xmitc 300
To CS  :cfr:cell 3,ra 2;vradpc 357
To CS  :stop:cfr;cell 3,ra 2
From CS:COMPLETED
To CS  :op:cell 3,ra 4
To CS  :cfr:cell 3,ra 4;start
To CS  :cfr:cell 3,ra 4;config 150
To CS  :cfr:cell 3,ra 4;xmitc 300
To CS  :cfr:cell 3,ra 4;vradpc 357
To CS  :stop:cfr;cell 3,ra 4
From CS:COMPLETED
To CS  :rst:cell 3,ra 4;ucl
From CS:COMPLETED
```

Figure 100   **Sample results from use of logging mode.**

Turning the Logging Mode Off

Follow the steps in **"To Configure the External Devices Menu for Logging:" on page 192**, *except set the Addr entry to zero (0)*. This will allow you to leave the other information in the **Cnfg:External Devices** screen. You can then turn the logging mode back on by changing the **Addr** field entry back to your previously-used setting (1, 9, 15, or 701).

Media Use

There are two types of memory cards used with the Test Set: one-time-programmable (OTP) cards that are read-only, and static RAM (SRAM) cards that can be used to store new files. This section deals primarily with the use of SRAM cards and file creation, manipulation, and deletion.

Memory Card Usage

The Lucent PCS TDMA Base Station Test Software is supplied with two memory cards:

❏ An OTP card with the program files
❏ An SRAM card which can be used for custom files

The types of files you might store on the SRAM card include:

•   Procedure files
•   Frequency plans
•   Calibration constant files
•   Laptop Emulator User-Defined Command files
•   The Laptop Emulator Auto Login file
•   Program files (originally on the OTP card supplied with the Software)
•   Data Collection files

Displaying the Contents of a Memory Card

Viewing a list of the files on a memory card can be done in the PCS TDMA Base Station Test Software menus. Follow these steps:

1. From the Software's Main Menu, press **CAT Card** (k3). A list of all files on the card will be displayed on the screen. The files are not sorted by name or type, but listed in the order they appear on the card.
2. When finished viewing the files, press **Continue** (k2) to return to the Software's Main Menu.

Initializing a Memory Card

A new SRAM card must be initialized before any files can be stored to it. Initialization is similar to the formatting of a new disk on a PC.

Follow these steps to initialize a new card:

NOTE: *Initializing a card will delete all files on the card.* Be very sure that the card you use for the following steps does not contain files that you need. **See "Displaying the Contents of a Memory Card"** to check card contents before initialization.

1. Insert the SRAM memory card into the MEMORY CARD slot on the Test Set's front panel.
2. If you are running a program, exit it now. For this Software, use the **Exit** (k5) USER key.
3. Press the TESTS key.
4. Scroll down to **Proc:Save/Delete Procedure** and press the knob.
5. Press **Init Card** (k3).
6. You will be prompted on the display to press **YES** if you are sure that you want to initialize the card (and clear all contents on the card). Press the YES (ON/OFF) key if you want to continue with the initialization.
7. An asterisk (*) will appear in the upper right of the display while the card is being initialized. Wait until the asterisk returns to a dash (−).
8. This completes the initialization of the card. If you would like to resume running a software program, press the TESTS key followed by the **Run Test** (k1) USER key.

Loading a File

File types that can be loaded are listed below with references to the pages that give the details on loading that type of file:

- Frequency plan files -
  "Loading a Frequency Plan from a Memory Card" on page 172
- Calibration constant files -
  "Loading Calibration Values from a Memory Card" on page 129
- Procedure files -
  "Loading a Procedure File" on page 206
- User-defined key files -
  "Loading and Using your User-Defined Commands:" on page 187
- Auto login file -
  "Running the Auto Login Sequence:" on page 189
- Program files -
  "Step 2: Load and Run the Lucent PCS TDMA BS Test Software" on page 25

Storing a File

Steps for storing different types of files to a memory card are listed in the following sections:

- Frequency plan files -
  "Method 1: Defining a Frequency Plan Using the Test Set" on page 162 and
  "Method 2: Defining a Frequency Plan Using a PC" on page 166
- Calibration constants -
  "Storing Calibration Files" on page 127
- Procedure files -
  "Creating Procedure Files" on page 204
- User key files -
  "Creating User-Defined Commands" on page 186
- Auto login file -
  "Defining and Storing the Auto Login File:" on page 188

Purging (Deleting) a File

The steps used to purge (delete) a file from a memory card are given in the following sections:

- Frequency plan files -
  "Method 1: Defining a Frequency Plan Using the Test Set" on page 162 and
  "Method 2: Defining a Frequency Plan Using a PC" on page 166
- Calibration constants -
  "Purging (Deleting) Calibration Files from a Memory Card" on page 131
- Procedure files -
  "Deleting a Procedure File" on page 206
- User key files -
  "Purging User-Defined Command Files:" on page 187

Printing and Report Generation

Basic Steps

This section describes printing results from tests and printing information about your Software setup. The basic steps for using a printer with the Test System are:

1. Verify that your printer is one of the supported models -
   see "Supported Printers" (below).
2. Connect the printer to the Test System using the serial, parallel, or HP-IB port -
   see "Printer Connections" on page 137.
3. Configure the Test System for printing -
   see "Configuring the Test System for Printouts" on page 199.
4. Generate the printout. You can print:
   - Test results from the Full Cell Site Test or Radio Test modes -
     see "Configuring the Test System for Printouts" on page 199
   - Frequency plans -
     see "Printing a Frequency Plan" on page 173
   - Parameters (Test Parameters) and their entries -
     see "Printing the Parameter Values" on page 155
   - Specifications (Pass/Fail Limits) and their entries -
     see "Printing the Specification Limits" on page 160

See also:

"Printing Results to a PC via the Serial Port" on page 202
"Short Form Printout" on page 150

Supported Printers

The Test System supports the following printers:

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

Making Printer Connections

See "Printer Connections" on page 137

Configuring the Test System for Printouts

To set the Test System up for printouts, follow these steps:

1. If the Software is running, stop it by pressing **Exit** (k5) from the Software's Main Menu.
2. Press the TESTS key.
3. Scroll to **Print:Printer Setup** and press the knob.
4. To have the Test System work with your printer model and type, make the following entries:
   a. Scroll to **Model:** and press the knob. In the **Choices** menu, scroll to your printer model from the list and press the knob to select it.
   b. Scroll to **Printer Port:** and press the knob. Scroll to and select the interface you have connected the printer to (**Parallel**, **HPIB**, or **Serial**).

NOTE: *If you have selected HP-IB as the printer port*, you also need to enter the address of the printer. Scroll to **Printer Adrs**, press the knob, and use the DATA keys to enter the HP-IB address. Often printers with HP-IB interfaces default to an address of one (1).

5. Optional:
   a. Update the entries in the following fields to customize printouts and form feeds: **Lines/Page:**, **FF at Start:** and **FF at End:**.
   b. If you do not want to see all the test results from the Full Cell Site Test and Radio Test modes, but only want to see the measurement values when a test fails, scroll to **Output Results For:** and press the knob until **Failure** is underlined.
   c. If you would like to add comments to the beginning of the test results printout, enter your comments in the **Output Heading:** field. Do this by scrolling to the field, pressing the knob, and selecting the characters from the **Choices** menu. Scroll to **Done** when finished and press the knob.
6. Enable printing of the test results by scrolling to **Output Results To:** and pressing the knob until **Printer** is underlined.

NOTE: If you want to disable printing at a later time, all you need to do is change the **Output Results To:** setting back to **Crt**. You do not have to change any of the other settings in this screen.

7. To resume running the Software, press the TESTS key followed by the **Run Test** (k1) USER key.

Sending Printer Escape Sequences:

Printer setup commands are often handled by sending escape sequences to define printer configuration settings such as text pitch, margin size, and number of lines per page.

Escape sequences are sent at the time the Software is first run. Use these steps to define the escape character sequence to send:

1. If the Software is running, press the **Exit** (k5) USER key to stop it.
2. Press the TESTS key.
3. Scroll to **Cnfg:External Devices** and press the knob.
4. Scroll to the **Inst#** field, press the knob, and scroll to the first blank line in the screen (no entry under the **Calling Name** field). This would be the first line if you have not used the External Devices menu for other purposes. Press the knob again to de-activate the **Inst#** field.
5. Scroll to the **Calling Name** field and press the knob.
6. Scroll to **ESCAPE SEQUENCE** from the **Choices** menu and press the knob (you can also spell out the phrase using individual characters in the **Choices** menu).
7. Scroll up to **Done** in the **Choices** menu and press the knob.
8. Scroll to the **Addr** field and press the knob. Use the DATA keys to enter the address of the printer you are using:
   • Serial printers - enter 9
   • Parallel printers - enter 15
   • HP-IB printers - enter 7xx, where xx is the printer address (typically 701).
9. Scroll to the **Options** field (under the **Calling Name** field) and press the knob.
10. You can now choose from pre-defined escape sequences (see **table 5**) or build your own. Use the selection in the **Choices** menu to enter your escape sequence.

NOTE: If your sequence exceeds the length of the **Options** field, you can put in more than one escape sequence string. Use the next **Calling Name** field to continue the escape sequence definition.

11. When you are done inputting the escape sequence, scroll up to **Done** and press the knob. This completes the entry. This sequence will be sent each time you press the **Run Test** (k1) USER key in the TESTS screen.
12. To re-run the Software and send the escape sequence, press the TESTS key followed by the **Run Test** (k1) USER key.

Table 5   **Pre-defined escape sequences and their functions.**

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

Printing Results to a PC via the Serial Port

In addition to generating test printouts, you can also send the results to a PC. The test results can be captured and stored as a file for archiving and for generating reports. The steps in this section demonstrate the use of the Test System's serial port to send results to a PC.

1. Connect a PC via the serial port as shown in **figure 87 on page 167**.
2. On the PC, select and run an application for transferring text characters and files. Set up the software to *receive* a text file.
3. If the Software is running, stop it by pressing **Exit** (k5) from the Software's Main Menu.
4. Press the TESTS key.
5. Scroll to **Print:Printer Setup** and press the knob.
6. Scroll to **Printer Port:** and press the knob. Scroll to and select the **Serial** setting.
7. Enable "printing" of the test results by scrolling to **Output Results To:** and pressing the knob until **Printer** is underlined.

NOTE:　　　If you want to disable printing at a later time, all you need to do is change the **Output Results To:** setting back to **Crt**. You do not have to change any of the other settings in this screen.

8. To resume running the Software, press the TESTS key followed by the **Run Test** (k1) USER key.
9. Now, when you run the Full Cell Site Test or the Radio Test, the results summary will appear on your PC display and the data will be logged to a file.
10. When finished testing, stop the transfer of data to the PC, which will close and store the file.

Procedure Files

Overview

Procedure files are used by the TESTS menus of the HP 8921A Cell Site Test Set. These files store information that you have defined for the Test System and for the equipment that you are testing. *Procedure files are optional*; you do not have to create any new procedure files in order to run the Software.

NOTE: Procedure files are unrelated to and separate from frequency plan files and calibration constant files. For more information on those file types, see **see "Frequency Plans" on page 161** and **"Calibration Files" on page 120**.

Why Use a Procedure File?

Changes that you make to the TESTS menus (for example, the Test Parameters or Pass/Fail Limits screens) remain in internal, non-volatile memory of the Cell Site Test Set until you load and run another program. Running another program will result in the loss of your custom entries. To prevent the loss of your data, you can store the information in a procedure file and load the values again at a later time.

Creating Procedure Files

Procedure file creation is basically a two-step process. First, you need to put in the values that define your setup, how you want to test, and the specification limits you want to test to. Second, you will create the file that will store these entries. Here are the steps:

1. Prepare a memory card:
   a. Locate an SRAM memory card that has at least 5 KB of available space on it. This can be the same card that you use to store your frequency plans and calibration data.
   b. Make sure that the write-protect switch is *not* in the SAFE position (data can be written to the card).
   c. Insert the card into the front-panel MEMORY CARD slot.
2. Enter the Tests Parameters:
   a. If you are running a program (an asterisk (*) appears in the upper right of the display), you must exit or pause it. Use the CANCEL key to pause a program or press the **Exit** (k5) key if running the PCS TDMA Software.
   b. Press the TESTS key to get to the **TESTS (Main Menu)** screen.
   c. Verify that **PCSTDMA** is displayed next to the heading of **Library:** on the TESTS screen. If it does not, you need to reload the Software. Follow the steps in **chapter 2, "Installation"** to load the Software.
   d. Scroll the cursor to **Parm:Test Parameters** near the bottom of the display and press the knob.
   e. With the cursor under the **Parm#** column, press the knob to enable scrolling up and down.
   f. Scroll through the list, checking to see that the correct values are entered. If not, press the knob and go to the **Value** field and enter the correct number.
   g. When the values are correct, press the TESTS key to return to the TESTS Main Menu screen.
3. Enter the Pass-Fail Limits:
   a. Scroll the cursor to **Spec:Pass/Fail Limits** near the bottom of the display and press the knob.
   b. With the cursor under the **Spec#** column, press the knob to enable scrolling up and down.
   c. Scroll through the list, checking to see that the correct test limits (upper and lower) are entered. If not, press the knob and go to the **Limit** fields and enter the correct values.
   d. When all values are correct, press the TESTS key to return to the **TESTS (Main Menu)** screen.

4. Create the procedure file:
  a. Scroll to **Proc:Save/Delete Procedure** and press the knob.
  b. Verify that **Select Procedure Location:** is set to **Card**.
  c. Scroll to the field under **Enter Procedure Filename:** and press the knob.
  d. Enter a name for the procedure using the knob to select characters from the **Choices:** menu. Scroll to the top of the list and select **Done** when the name entry is finished.
  e. The **Procedure Library:** field should be set to <u>**Current**</u> and the **Code Location:** should indicate **Card**. If not, make required changes to these fields now.
  f. Press **Save Proc** (k1) and the new procedure will be saved to your memory card.
  g. Press the TESTS key and then **Run Test** (k1) to return to Software operation. The Software will run using your latest entries into the parameters and specifications menus.

Loading a Procedure File

As discussed previously, your settings in the Test Parameters and Pass/Fail Limits menus are maintained in the Cell Site Test Set's non-volatile memory. Typically, the only time you will need to load a new procedure file is:

- When you have loaded and run another software application and want to return to using the PCS TDMA Base Station Test Software.
- When you want to change to another "set" of test conditions. For example, you may use different pass-fail limits from site to site or for different vintages of base station equipment.

The steps for loading a procedure file are given in **"Step 2: Load and Run the Lucent PCS TDMA BS Test Software" on page 25**. The only difference is that you would select from one of your own procedures rather than the PCSTDMA procedure that is shipped with the Software. Here are the steps in brief:

1. Insert the memory card containing your procedures into the MEMORY CARD slot on the Test Set's front panel.
2. Press the TESTS key to get to the TESTS Main Menu screen.
3. If the `Select Procedure Location:` field does not indicate `Card`, scroll to the field, press the knob and select `Card`.
4. Scroll to the `Select Procedure Filename:` field and press the knob.
5. If there are procedures on the card, you will see a list of them in the `Choices`: menu. Scroll to the procedure you wish to load and press the knob to select it.
6. After a brief pause, the name of your procedure will appear in the `Select Procedure Filename:` field. If you now wish to run the Software using your new procedure, press the `Run Test` (k1) USER key.

Deleting a Procedure File

If you have procedure files which are no longer being used, you can delete them to create additional memory space on the card. To delete a given procedure:

1. Insert the memory card that has the saved procedures into the MEMORY CARD slot on the Test Set's front panel.
2. Press the TESTS key to get to the Tests (Main Menu).
3. Scroll to `Proc:Save/Delete Procedure` and press the knob.
4. Scroll to the field under `Enter Procedure Filename:` and press the knob.
5. Enter the name of the procedure you would like to delete by using the knob to select from the list of names or by using the characters in the `Choices:` menu. Scroll to the top of the list and select `Done` when the name entry is finished.
6. Press `Del Proc` (k2). You will get a prompt to confirm that you want to delete the file. Press the YES (ON/OFF) key if you are sure, and the procedure file will be deleted from the memory card.
7. Press the TESTS key and then `Run Test` (k1) to return to Software operation.

Related Documents

Refer to the manuals in **table 6** for more information on the elements (Test Set, Dual Mode Cellular Adapter, and PCS Interface) of the Test System:

Table 6

Manual	Description	Part Number
HP 8921A User's Guide	Describes general operation of the HP 8921A Cell Site Test Set	08921-90022
HP 83201A User's Guide	Describes TDMA measurements with the HP 83201A Dual Mode Cellular Adapter	83201-90033
HP 83204A User's Guide	Describes TDMA measurements with the HP 83204A Dual Mode Cellular Adapter	83204-90009
HP 83236A,B Operating Manual	Describes the setup, programming, and general use of the PCS Interface	83236-90100

Test Descriptions

The five test modes of the Software are described in this section. Refer to the following pages, based on the test mode you plan to use:

Full Cell Site Test

When you want to test the performance of all the radios in a site in a short amount of time, use the Full Cell Site Test mode. This mode uses the Test System to control the radios at a site to step through tests on each radio, one at a time.

For each radio tested, the following TDMA tests are performed:

Transmitter Power
Transmitter Frequency Error
Origin Offset
Magnitude Error
Phase Error
Error Vector Magnitude (EVM)
Adjacent Channel Power (upper and lower)
Alternate Channel Power (first and second, upper and lower)

Requirements for the Full Cell Site Test mode:

Before you can successfully run the Full Cell Site Test mode and test TDMA radios, you must have created and stored the following file types:

- Frequency Plan for each site (**see "Frequency Plans" on page 161**)
- Calibration Constant File(s) for each antenna (**see "Calibration Files" on page 120**)

For a tutorial on the use of the Full Cell Site Test mode, **see "Full Cell Site Test" on page 38**.

Radio Test

Intended for testing an individual radio at a site (or several radios, one radio at a time), the Radio Test mode will perform the following TDMA tests:

Transmitter Power
Transmitter Frequency Error
Origin Offset
Magnitude Error
Phase Error
Error Vector Magnitude (EVM)
Adjacent Channel Power (upper and lower)
Alternate Channel Power (first and second, upper and lower)

Requirements for the Radio Test mode:

Before you can successfully run the Radio Test mode and test TDMA radios, you must have created and stored the following file types:

• Calibration Constant File(s) for each antenna
(**see "Calibration Files" on page 120**)

For a tutorial on the use of the Radio Test mode, **see "Radio Test" on page 56**.

Spectrum Analyzer

At times, you may want to have the functions and features of a standard spectrum analyzer, but operating at PCS frequencies. This test mode sets up the Test System to act as a spectrum analyzer and allows tuning to various PCS frequencies.

Unlike the other test modes, the Spectrum Analyzer mode exits the Software execution while allowing the use of the spectrum display. You then return to Software control, once finished with spectrum analysis. The basic flow is:

1. Select the Spectrum Analyzer test mode.
2. Fill in information needed to tune the spectrum analyzer.
3. Run the test.
4. Make any required connections between the Test System and cell site.
5. Use the spectrum display screen (the Software is now paused).
6. When finished, exit the spectrum display and continue Software operation.

NOTE: Because you can make changes to fields in the spectrum analyzer (and other) screens, the Software stores away the status of the instrument before allowing use of the spectrum display. Upon re-running the Software these saved settings are restored.

For a tutorial on the use of the Spectrum Analyzer mode, **see "Spectrum Analyzer" on page 84**.

TX Power Meter

Use this mode when you need to measure transmitter power for a radio, but do not
need to test the other TDMA performance. You can measure the power of a single
radio from either the TX Antenna Port or the TX Test Port.

The meter display:

When you run the TX Power Meter mode, you will first be prompted to make
connections between the Test System and the radio to be tested. After the
connections are made and you continue on, you will see a meter on the Test
System display (see **figure 101**). The meter simulates an analog movement,
showing transmitter power level at the RF input to the Test System.
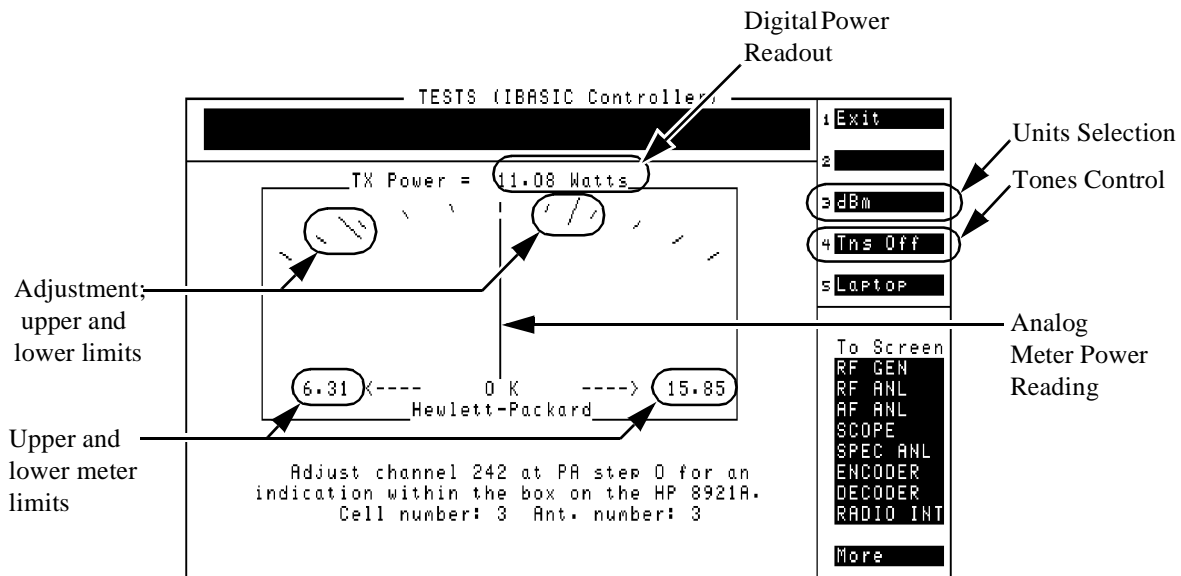
Figure 101   **The TX Power Meter display.**

Changing measurement units:

Once in the meter display screen, you can select from two measurement units for the power readings. The default is Watts, but you can switch to dBm (decibels relative to a milliwatt) by pressing `dBm` (k3). To return to Watts as measurement units, press `Watts` (k3).

Using the audio tones for adjustments:

The Test System can generate audio tones while displaying the power readings. These tones are useful when you are making adjustments to the power level and cannot easily see the meter display shown on the Test System.

The tones are off by default. You can set them to "quiet" by pressing the `Tns off` (k4) USER key. To step the volume up to a higher level, press `Tns quiet` (k4). This will result in the maximum tone volume. To return the tones to off, press `Tns loud` (k4).

The tone pitch and durations are related to the latest reading as compared to the ideal (center of the meter) setting. The tones are set as shown in **table 7**.

For a tutorial on the TX Power Meter mode, see **"TX Power Meter" on page 70**.

Table 7   **Audio tones in the TX Power Meter mode.**

Meter position	Tone
Below the adjustment range	Low tone (100 Hz); 1 second duration
Within adjustment range, but below center	Medium low tone (500 Hz); 0.5 second duration
Within adjustment range, but above center	Medium high tone (1500 Hz); 0.5 second duration
Above the adjustment range	High tone (3000 Hz); 1 second duration

Insertion Loss Test

You often need to know the loss through a cable, an attenuator, or a directional coupler. In fact, you need to know some of these losses to run the Full Cell Site Test and Radio Test modes (for example, you are asked to provide a value for the `TX Antenna Port Cable Loss [dB]` field).

This test routine uses a radio at the cell site as a signal source to make measurements of loss through an RF network.

Basic Insertion Loss Test flow:

In general, the Insertion Loss Test follows these steps:

1. Select the Insertion Loss Test mode from the Software's Main Menu.
2. Enter the required information on the Software's Main Menu screen.
3. Run the test.
4. Connect a test cable between the radio and the Test System for calibration.
5. Add in the cable or device whose loss is to be measured.
6. The Test System measures and displays the loss through the cable or device.
7. Measure other cables or return to the Software's Main Menu.

For a tutorial on the Insertion Loss Test mode, see **"Insertion Loss Test" on page 98**.

Test Execution Conditions

In some situations, you may wish to change the way the Software works when a test result is obtained. The `Test Execution Conditions` screen allows you to do this.

`Test Execution Conditions` are accessed from the `SET UP TEST SET` list on the TESTS (Main Menu) screen. Press TESTS, then select `Exec:Execution Cond` to display them.

NOTE: `Test Execution Conditions` are not retained after a Test System power cycle.

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

Output Results To: (Output Destination)

You can select either: `Crt` or `Printer`. The default is `Crt`.

If you select `Crt`, test results will be displayed on the test set's CRT (display). If you select `Printer`, test results will be sent to the CRT *and* to a printer. You must connect and configure a printer if you select `Printer`. See **"Printing and Report Generation" on page 198**.

Output Results For: (Output Results)

You can select either: `All` or `Failures`. The default is `All`.

You can specify if you want only the failed results to be displayed or printed. This will be useful if you generally do not print test results, and want to ensure that failed results are displayed or printed.

Output Heading

You can use this field to enter a heading that will be printed or displayed.

Select the `Output Heading` field. Use the knob to choose and enter the characters that you want to appear in the heading.

Choose `Done` when you are finished.

If Unit-Under-Test Fails (If UUT Fails)

You can select either: `Continue` or `Stop`. The default is `Continue.`

If you set this to `Stop`, and a pass-fail result is `F` (fail), the program will stop.

Test Procedure Run Mode (Run Mode)

You can select either: `Continuous` or `Single Step` The default is `Continuous`.

You can make tests pause at certain times. If you set this to `Single Step`, the program will pause after a comparison is made between a test determination and the expected result. For example, tests will pause after the program compares the results to a specification. You can continue from the paused state by pressing `Continue` (k2).

Autostart Test Procedure on Power-Up

You can select either: `On` or `Off`. The default is `Off`.

You can set up the Test Set so that if the procedure was previously loaded, the procedure will be immediately executed when the Test Set is powered on.

Testing with Connections to the TX Test Port

The **"Test Tutorials" in chapter 3** provide detailed steps for the five test modes of the PCS TDMA Software. The steps outlined in that chapter *assume that your testing is performed using the TX Antenna Ports* of the site for the RF connection, *not* the TX Test Port.

If you *are* using the TX Test Port, the following considerations apply:

• You must provide the Software with a valid **TDMA Test Port Cal. Constant** (in the Calibration File for a given site and antenna).

When testing at the TX Antenna Ports, all calibration constants *except* the **TDMA Test Port Cal. Constant** must be provided. When you test at the TX Test Port, you need to enter values for *all* calibration constants, including the **TDMA Test Port Cal. Constant**.

The easiest way to provide a value for the TDMA Test Port Cal. Constant is to let the Test System measure it. **See "Measuring the TDMA Test Port Cal. Constant:" on page 123**.

• Call Processing does *not* have to be inhibited.

When testing at the TX Antenna Ports *and* when using the modem to control the cell site via the MSC, you must inhibit call processing for the site before performing tests. Using the TX Test Port, it is not necessary to inhibit call processing at the site prior to testing (whether you are using the modem to control the site or not).

Testing without MSC Control

The **"Test Tutorials" in chapter 3** list the steps for the five test modes of the Software. The tutorials use a modem to control the cell site via the MSC.

If you *are using a Test System setup without a modem*, the following considerations apply:

• The connection diagrams will include prompts to apply or remove power for the radio being tested. You must control the transmitter signal (on and off) manually at the site.

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

• Call Processing does *not* have to be inhibited if testing at the TX Antenna Ports.

When testing at the TX Antenna Ports *and* when using the modem to control the cell site via the MSC, you must inhibit call processing for the site before performing tests. If you are controlling the site manually, it is not necessary to inhibit call processing at the site prior to testing.

5

Troubleshooting

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

Error Summary

Errors While Loading and Running the Software

- **"Message: The HP 8921A must be configured in Control Mode. No other controllers may be on the HP-IB bus. Do you want to put the HP 8921A in Control Mode?" on page 222**
- **"Message: To run this program, a TDMA top box must be attached to your HP 8921A. Make sure the top box is plugged in and (and) operating properly and try again. Program terminated." on page 222**
- **"Message: Verify PCS Interface is connected and on. Retry?" on page 223**
- **"Symptom: Memory Overflow Errors" on page 224**
- **"Message: Call processing must be inhibited to perform test at the TX Antenna Port. Call processing can be inhibited from the Laptop Emulator screen. Press 'Continue' to return." on page 225**

Frequency Plans and Calibration Files

- **"Symptom: You have run the Full Cell Site Test, but no test results are reported." on page 226**
- **"Message: No DCCH radio found in plan for antenna x." on page 226**
- **"Message: Multiple DCCH radios found in plan for antenna x." on page 226**
- **"Message: Cal file for cell x, antenna y not found on card." on page 227**
- **"Message: Calibration data for cell x, antenna y are not currently loaded. Press 'Card' to load cell x, antenna y calibration data from a memory card. Press 'Create' to create a new calibration file. Press 'Default' to use the default calibration data." on page 227**

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." on page 228**
- **"Message: Test Set was not able to establish contact with the MSC. Testing aborted." on page 228**
- **"Messages: Base station did not answer the <command name> with a response of <command response> in three tries. Base station did not answer the <command name> with a response of IP and ALL WENT WELL in three tries." on page 228**

Communication Errors During Testing

- **"Message: Communication with MSC failure. Select 'Laptop' key to interface with the MSC." on page 229**

Troubleshooting Checks for Communication Problems

- **"Cable connections between the Test System, modem, and phone line:" on page 230**
- **"Modem operation:" on page 230**
- **"Dialling difficulties:" on page 230**
- **"Modem autobaud being set to "on":" on page 230**
- **"MSC not accepting upper-case characters:" on page 231**
- **"MSC is not configured to send responses to commands:" on page 231**
- **"Extended connect time is needed for the Alarm Clock mode:" on page 231**

Error While Attempting Measurements

- **"Message: Measurement time out. Test aborted." on page 233**
- **"Weak clock. Difficult to find data clock phase." on page 233**
- **"ADC under driven. Absolute value of the peak sample is less than 30 dB below FS of the ADC." on page 233**
- **"Synchronization to received data did not occur." on page 233**
- **"Sync word contained errors or was not found." on page 233**

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. The errors are presented here with the error text, followed by a description of the cause, followed by some possible solutions.

- **Message: The HP 8921A must be configured in Control Mode. No other controllers may be on the HP-IB bus. Do you want to put the HP 8921A in Control Mode?**

  When the Software is first run, it checks to see that the IBASIC controller of the Cell Site Test Set is the "system controller." If it is not the system controller, it needs to be configured so that it can issue commands to the PCS Interface.

  Select **Yes** to continue with Software operation.

  The one reason you might choose **No** is if you have another controller connected to the HP-IB bus. In that case, bus control conflicts will result. If you wish to continue with Software use, remove the other system controller from the bus and select **Yes**.

- **Message: To run this program, a TDMA top box must be attached to your HP 8921A. Make sure the top box is plugged in and (and) operating properly and try again. Program terminated.**

  A required element of the Test System is a Cellular Adapter, which is used to make the TDMA tests. Your Test System can use the HP 83201A or the HP 83204A Adapter.

  If the Cellular Adapter is present and you still encounter this error, check the following:

  ❑ Verify that you have supplied the Cellular Adapter with AC power. The Cellular Adapter has a separate power cord (it is not powered by the Cell Site Test Set). The front-panel PWR light should be lit if the Cell Site Test Set is on.

  ❑ If the unit is powered on and you still get this message, you will need to check the rear-panel connections between the Test Set and Cellular Adapter, especially the CONTROL I/O cable between the two units. Refer to the Installation chapter of the Cellular Adapter's User Guide for connections.

• **Message: Verify PCS Interface is connected and on. Retry?**

This error message occurs when the Test Set is unable to communicate with the PCS Interface via the HP-IB bus. Check the following:

❒ Make sure that the PCS Interface is plugged in and the power switch is set to the "on" position. The front-panel POWER indicator should be lit.

❒ Check that there is an HP-IB cable connected between the Test Set and the PCS Interface. Other devices on the HP-IB bus may interfere with bus communications. Remove any other devices (printers and so forth) until this error message is eliminated.

❒ The PCS Interface has a serial communications setting that is not used in this application. Make sure that the rear-panel HP-IB address selector switch is set to "HP-IB" and not "Ser". If set to "Ser", set it to "HP-IB" then cycle the power to the PCS Interface.

- **Symptom: Memory Overflow Errors**

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

  To correct this, you will need to clear 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 all storage registers at once (globally).

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

To delete a single register:

1. Press the RECALL key.
2. Scroll the cursor to the register to be deleted.
3. Press the ON/OFF key.
4. Press the YES key (same key) to confirm.
5. The register is cleared.

To delete *all* saved registers:

1. Press the RECALL key.
2. Scroll down to ***Clr All*** and press the knob.
3. Press the YES key to confirm.
4. All Save registers are now cleared.

• **Message: Call processing must be inhibited to perform test at the TX Antenna Port. Call processing can be inhibited from the Laptop Emulator screen. Press 'Continue' to return.**

If you are testing with connections to the TX Antenna Ports (rather than the TX Test Port) *and* you are using the modem to control the site via the MSC, then call processing at the site must be inhibited prior to testing.

NOTE: *Inhibiting call processing removes the site from service.* Before following the steps outlined below, make sure that you have entered the correct site ID and that the site is available for servicing.

When the Software is first run, it will check to see if you are testing at the TX Antenna ports and using modem control. If so, it will then check to see if call processing in inhibited for the site to be tested. If not, the error message above will be posted.

To set the call processing status to inhibited (after you have already established a modem link to the MSC. If you have not established a modem link, **see "Laptop Emulator" on page 174**):

1. From the Software's Main Menu, scroll to **Laptop Emulator** and press the knob.
2. Scroll down to **Enter cell ID** and press the knob.
3. Use the DATA keys to enter the cell site number for the site that you plan to test. Press the ENTER key when the correct value appears in the ID field.
4. Scroll down to **Inhibit cp** and press the knob. You will see a prompt to verify that you want to inhibit call processing and that you want to inhibit it for the site number listed. If you are sure that you want to inhibit call processing, press **Yes** (k1). If not, press **No** (k2).
5. Continue with testing as discussed in the **"Test Tutorials" on page 35**.

Frequency Plans and Calibration Files

- **Symptom: You have run the Full Cell Site Test, but no test results are reported.**

  There are two common causes for this:

  > You do not have a frequency plan defined for the cell site number entered. When the test is run, the Software looks to the memory card for a frequency plan matching your entry for cell site number. If none is found, a message to reconnect the foam jumpers is posted and the Software returns to the Main Menu. Fix this by defining a plan for the cell site number entered or insert the memory card containing the plan into the slot on the Test Set's front panel.

  > You entered a cell site number of 0. To fix this, make sure that you have a valid site number (the range of cell site numbers is 1 to 222) in the Software's Main Menu screen before running the test.

- **Message: No DCCH radio found in plan for antenna x.**

  This message is generated when running the Full Cell Site Test mode only (the other test modes do not use frequency plans). If the plan you have defined for a site does not have at least one DCCH radio defined per antenna, you will see this error message.

  To fix this condition, go to the Define Frequency Plan menu and correct the plan for the site number being tested. **See "Frequency Plans" on page 161**.

- **Message: Multiple DCCH radios found in plan for antenna x.**

  This message is generated when running the Full Cell Site Test mode only (the other test modes do not use frequency plans). The message will occur if there is more than one DCCH defined for a single antenna.

  To fix this condition, go to the Define Frequency Plan menu and correct the plan for the site number being tested. **See "Frequency Plans" on page 161**.

- **Message: Cal file for cell x, antenna y not found on card.**

  This message appears when you are running the Full Cell Site Test mode and have a frequency plan defined, but not a calibration file. You must have a calibration file for each antenna at the site before running the test. Follow the steps in **"Calibration Files" on page 120** to create the necessary calibration files.

  This message could also appear if you do not have the memory card with your calibration files in the card slot when you run the test. If this is the case, insert the proper card and re-run the test.

- **Message: Calibration data for cell x, antenna y are not currently loaded. Press 'Card' to load cell x, antenna y calibration data from a memory card. Press 'Create' to create a new calibration file. Press 'Default' to use the default calibration data.**

  This message will occur when running the Radio Test mode if you do not have a calibration file defined for the site-antenna combination being tested.

  This could be caused if you did not have the memory card with your calibration files in the card slot when you ran the test. If this is the case, insert the proper card and press **Card** (k2). The Software will look at the new card for the valid calibration file and continue on with the test if it is found.

  Another cause may be that you have not yet defined calibration data for one or more antennas for the site being tested. To correct this you can:

  > **Create** (k4) - this choice will take you to the Enter/View Calibration Files menu and the fields will contain the last-entered values. You can then enter values for the current antenna, store them to the card (optional), and continue on with testing.

  > **Default** (k5) - similar to the Create choice, this key will also take you to the Enter/View Calibration Files menu, but will fill all entries on that screen with default values. You can still make changes to the values, store them to the card (optional), and continue with the Radio Test.

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's parameters for serial communication via the modem. **See "Step 3: Set up the Modem for Communication to the MSC" on page 28**.

- **Message: Test Set was not able to establish contact with the MSC. Testing aborted.**

  If the Software has difficulty when attempting to dial the MSC or there are no responses from the MSC on the serial path, the error above is generated.

  There can be several causes for this error message. Refer to **"Troubleshooting Checks for Communications Problems" on page 230** for a list of items to check when you have received this error.

- **Messages: Base station did not answer the <command name> with a response of <command response> in three tries. Base station did not answer the <command name> with a response of IP and ALL WENT WELL in three tries.**

  These two messages indicate that basic communications with the MSC are 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 230** for a list of items to check when you have received this error.

Communications Errors During Testing

- **Message: Communication with MSC failure. Select 'Laptop' key to interface with the MSC.**

  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" on page 230** 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 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 System serial port, the modem, the phone line, and the PC (if used). See the connection diagram in **figure 77 on page 137**.

A list of cables and their part numbers is provided in **table 2 on page 139**.

❒ **Modem operation:**

Verify that you have supplied power to the 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 System and MSC. See **"Step 3: Set up the Modem for Communication to the MSC" on page 28**.

❒ **Dialling difficulties:**

In some cases, you may have to customize the dialling information in order to properly dial and connect to the MSC. For example, if you have a "9" in your dialling 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 174**) and in a custom file in the Define Auto menu (**see "Creating User-Defined Commands" on page 186**).

❒ **Modem autobaud being set to "on":**

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

❐ **MSC not accepting upper-case characters:**

Some MSCs are set up to accept only lower-case characters from remote computers. You can set the Software to send lower-case commands automatically using a parameter in the TEST (Edit Parameters) menu (**see "Editing the Parameters (Test Parameters)" on page 148**).

❐ **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.

❐ **Extended connect time is needed for the Alarm Clock mode:**

In the Alarm Clock mode, you can choose to log on to the MSC before leaving the Test System or you can have the Test System perform the Auto Login when the timer reaches the test time.

If you choose to connect to the MSC before leaving the site with the Test System set up for Alarm Clock mode, the result can be a long connect time on the MSC. You may have to ask a switch technician for a longer service period so you are not disconnected before the Test System is able to run the Full Cell Site Test.

Tools for Troubleshooting 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:

- Serial connections between the Test System and modem. Make sure that you are using a Test System cable that connects the modem to the serial 10 port. See the cable accessories table for part numbers (**table 2 on page 139**).
- Power to the modem and that the power switch is "on."
- Settings in the TESTS (Edit Parameters) menu for serial communications (baud rate, parity, stop bits, and so forth). **See "Editing the Parameters (Test Parameters)" on page 148**.
- Verify modem configuration. Follow the steps in **"Step 3: Set up the Modem for Communication to the MSC" on page 28**.

Use the Laptop > Modem mode and a PC to perform the connection and to send custom commands once connected. **See "Laptop Emulator" on page 174**.

❑ **Logging Data Communications:**

The Software provides a "logging" feature that prints the commands between the Test System and the MSC. This allows you to view the outgoing command and the MSC's response (if any). **See "Logging of Control Commands" on page 192**.

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.

Errors While Attempting Measurements

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

- **Message: Measurement time out. Test aborted.**

  This message will be posted if the Test System is set up for a TDMA measurement and does not get a triggered reading for approximately 10 seconds. A possible cause for this condition is a low signal level at the RF IN/OUT port of the PCS Interface. To make accurate TDMA tests, an adequate signal level is needed. Make sure that you consider not only the transmitter's power setting, but losses through cables, attenuators, and couplers that affect the signal level to the Test System.

  It is often useful to run the Spectrum Analyzer mode to view the input signal. This allows you to see that the signal is on frequency and of sufficient signal strength to make a measurement. It can also show if there is a lack of modulation or if there are interfering signals.

- **Messages:**
  - ❐ **Weak clock. Difficult to find data clock phase.**
  - ❐ **ADC under driven. Absolute value of the peak sample is less than 30 dB below FS of the ADC.**
  - ❐ **Synchronization to received data did not occur.**
  - ❐ **Sync word contained errors or was not found.**

  These errors are generated from the TDMA measurement process. They will be posted on the display when the test results are posted. Unlike the time out case discussed previously, measurements may be returned with these errors. The measured values may be inaccurate and you should take steps to eliminate the cause of the error.

  You should check to see that you have a valid entry into the **TDMA Test Port Cal. Constant** field of your calibration file (if using the TX Test Port for tests). You may need to remeasure and acquire a new value. A negative number returned for that constant indicates an error when generating the value.

  Other possible causes are much the same as those listed in the time out case, above. Again, using the Spectrum Analyzer mode may be helpful.

  For more information on TDMA errors refer to the HP 83201A or HP 83204A *Dual Mode Cellular Adapter User's Guides*.

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