HP E6388A LGIC Base Station Test Software

User's Guide

Software Version: A.00.02 and above

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In this Book

Chapter 1, Product Description

Refer to this chapter for general information on the HP E6388A LGIC CDMA PCS Base Station Test Software. A flowchart (**Figure 1 on page 20**) is included to give you a brief overview of how to set up and run this Software. Required and optional equipment for running this software is listed in **"Test Set Hardware" on page 21**.

Chapter 2, Installation

Follow the steps in this chapter to connect the test equipment and to load and run the E6388A LGIC CDMA PCS Base Station Test Software. *You must complete the steps in this chapter before attempting measurements with the Software.*

Chapter 3, Test Configuration and Parameters for CDMA Tests

Follow the steps in this chapter to enter test configuration information and to define test parameters and specifications before running the tests. This chapter also includes procedures for saving, recalling and filing test procedures in the PC card. You must complete the steps of the **"Test Configuration and Setup" on page 41** in this chapter before attempting CDMA measurements with the Software.

Chapter 4, Performing CDMA Tests

This chapter shows detailed steps used in running each of the CDMA tests and utilities which are available in the Software.

Chapter 5, CDMA Tests Software Reference

This chapter provides information about connecting the Test Set for printing and other communications and using a laptop emulator to control the site. This chapter also contains definitions for acronyms used throughout this manual.

Chapter 6, General Software Reference

This chapter contains general Software operating instructions for use with the Test Set. These include information on SOFTWARE MENU screen overview and how to load the Software. This chapter also includes the description on how to setup external devices for data collection.

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1

Product Description

Refer to this chapter for general information on the HP E6388A LGIC CDMA PCS Base Station Test Software. A flowchart (**Figure 1 on page 20**) is included to give you a brief overview of how to set up and run this Software. Required and optional equipment for running this software is listed in **"Test Set Hardware" on page 21**.

Software Overview

The HP E6388A LGIC CDMA PCS Base Station Test Software is designed specifically to automate testing for CDMA Personal Communication Services (PCS) band Base Transceiver Stations (BTS) manufactured by LGIC. This Software combined with the HP 8935 Base Station Test Set improves installation and maintenance technician's efficiency, by reducing the time it takes to test a CDMA BTS. This Software is an Instrument BASIC (IBASIC) application and runs on the HP 8935 Test Set's internal IBASIC controller.

Available Tests

Using this Software you can perform the following tests:

- RX Level - RXFU Test
- RX IF Level - BSCA Test
- RX C/N - BSCA Test
- TX IF Level - BSCA Test
- TX Level - UDCA Test
- TX Level - HPA Test
- TX Level - TXHU Test
- TX Spurious - TXHU Test
- RX Spurious Test
- Rho/Pilot Only Tests
- Rho/Traffic Tests
- Code Domain Tests
- RX Noise Figure Test
- Occupied BW Test - *This test is not available at this time.*

Available Utilities

The Software provides you with the following utilities:

- RF Tools
- Laptop Emulator
- PN Offset Search
- Coupling Port Calibration
- Cable Insertion Loss Test
- Check Even Second Clock
- Check 19.6608 MHz Clock
- Check 10 MHz Clock

BTS Control for Testing

By connecting a serial cable between the Test Set's SERIAL 10 port and the BTS's control port (RS 232 port of RFPA or BSPA card), the Software can send control commands to the BTS to set the BTS to desired conditions during each CDMA test.

Thorough Testing in Less Time

The fast measurement speed of the HP 8935 CDMA Base Station Test Set coupled with this automated test software, results in less out-of-service time for the BTS and faster troubleshooting.

All base stations are uniformly tested with the same procedure, which provides virtually no errors due to test variability. Additionally the Software also improves efficiency by reducing human errors. Predefined tests allow technicians at all skill levels to obtain consistent and accurate results.

As tests are run, the measured results are compared to specification limits that are predefined from the factory or that you specifically define. These test results can be printed or stored to a PC card or to an external PC. By analyzing these test results, trends can be identified and required steps taken to avoid costly BTS downtime.

Who should use the LGIC CDMA PCS BS Test Software?

If you are installing, commissioning, or maintaining LGIC CDMA PCS cell site equipment, this Software will assist you in performing key CDMA tests of PCS transceiver performance.

Included with the Software

Included with the HP E6388A Software:

- ❒ Memory card (OTP) containing the program files (HP part number E6388-10001)
- ❒ Blank RAM card (HP 83231A) for saving/recalling test procedures and test results
- ❒ 3.5-inch disk containing the BTS laptop utility program
- ❒ This manual (HP part number E6388-90001)
- ❒ Software License Agreement

Software Operation Overview

Figure 1 illustrates the basic steps for Software operation. After loading the Software, you can run one test at a time or a suite of tests without pausing between tests.

Chapter 4, "Performing CDMA Tests" gives step-by-step instructions to explain how to run each of the tests. If you have questions, further details can be found in **Chapter 5, "CDMA Tests Software Reference"**. If you encounter errors, **Chapter 7, "Troubleshooting"** can assist you.

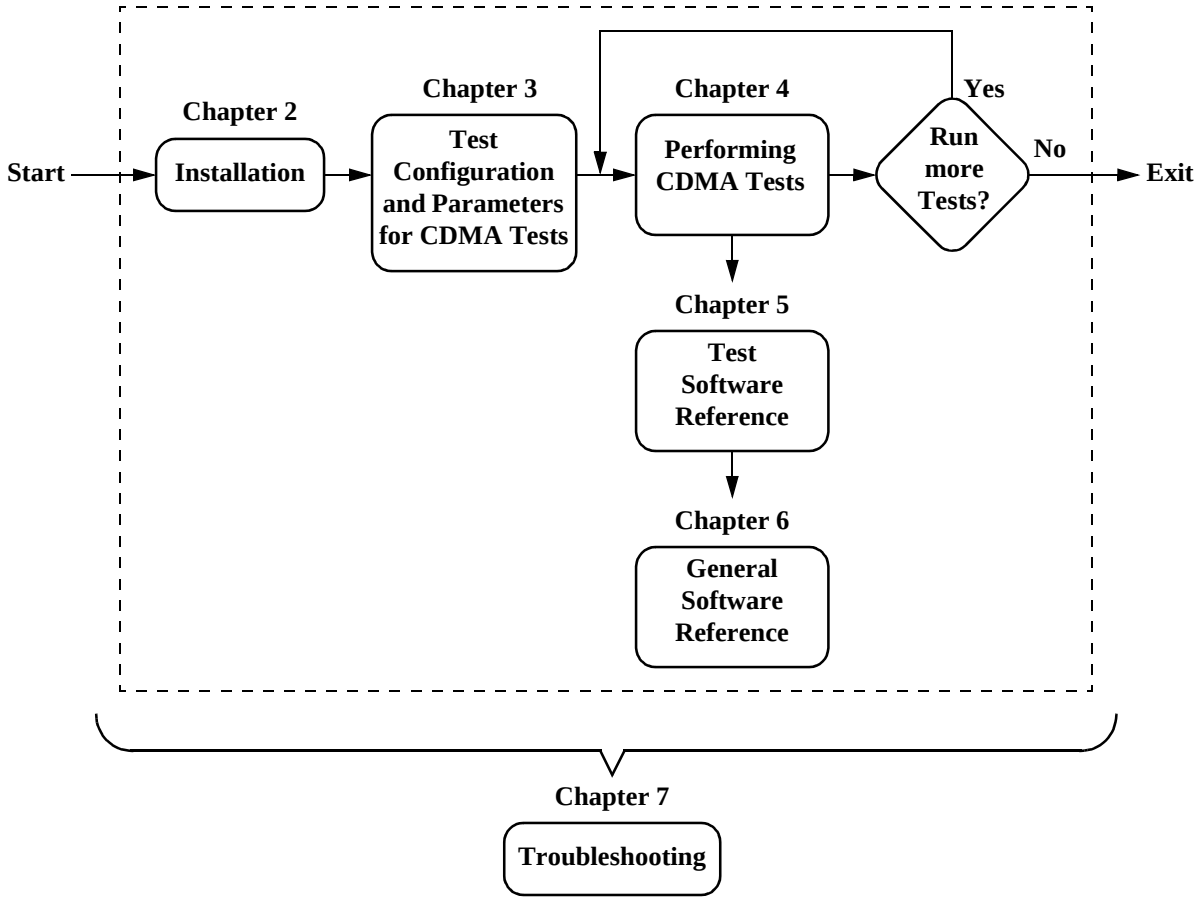


Figure 1 **Steps for the Use of the CDMA Software**

Test Set Hardware

Required Equipment

Test Equipment

The Software is written specifically to work with the HP 8935 Series E6380 CDMA Base Station Test Set.

Optional Equipment

Connection Kit

See **"Connection Kit Contents" on page 134** for information on an optional connection kit that supplies required cables and adapters for connecting the Test Set to the base station equipment.

NOTE: The optional connection kit is *not included* with the HP E6388A. It is bundled together with the HP E6388A if you order the HP E6551A LGIC CDMA PCS Base Station Test Solution.

Printer

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

The Test Set supports printing via the SERIAL 9, PARALLEL 15, and HP-IB ports. The following printers are supported:

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

Personal Computer (PC)

The Test Set and Software will support to use a PC for data collection. The PC is connected to the Test Set's SERIAL 9 port. Most PC's with an available serial port are compatible with the Test Set. This requires a terminal emulator program running on the PC (Hyper terminal program in Widows 95®[1] or BTS Laptop Utility program supplied with the E6388A Software).

BTS Laptop Utility Program

The BTS laptop utility is a Windows based program designed to work in conjunction with the Software. The utility allows a cell cite technician to link the Test Set to a laptop computer for use in recording test results and capturing the Test Set's screen images. See **"BTS Laptop Utility Program" on page 148**.

GPS Time and Frequency Reference Receiver

The HP E6388A Software supports to use the HP 58503A GPS time and frequency reference receiver for supplying the timebase signal normally taken from the base station equipment.

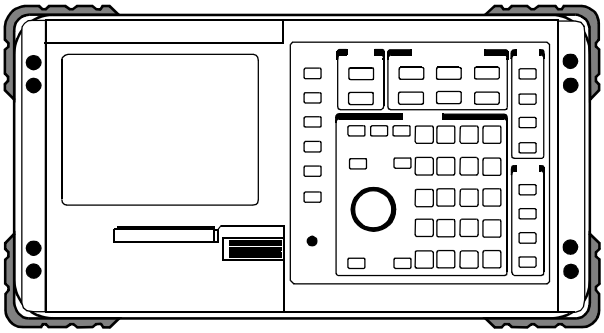
When connecting the base station's GPSR modules as the timing reference, the Software must assume that the signals out of the modules are correctly timed to GPS time to provide the correct PN offset. If a problem exists in the base station's GPS reference, the base station's PN offset will likely be incorrect.

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

See **Figure 42, "Connections Using an HP 58503A GPS Time and Frequency Reference Receiver," on page 131**.

1. Windows is a registered trademark of Microsoft Corp.

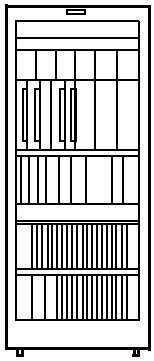
Test Equipment required:



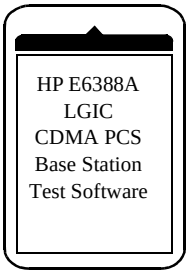
HP 8935 Series E6380A CDMA Base Station Test Set

You must supply:

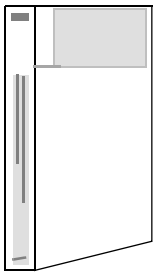
LGIC CDMA
PCS Base Station



Supplied with the HP E6388A Software:



CDMA PCS Base Station Test Software on OTP card



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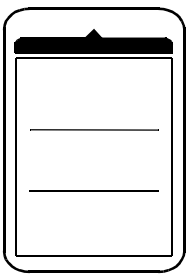
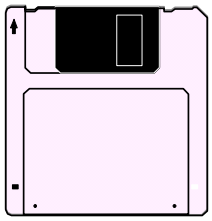
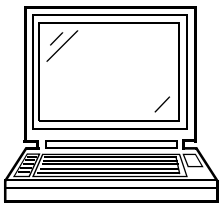


Blank 1MByte RAM Card with battery.

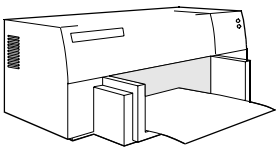


BTS Laptop Utility Program on 3.5-inch disk

Optional Equipment:



Laptop PC or printer for data collection



Connection kit for connecting the Test Set to the BTS

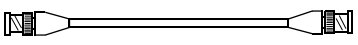


Figure 2 Required Equipment.

2

Installation

Follow the steps in this chapter to connect the test equipment and to load and run the HP E6388A LGIC CDMA PCS Base Station Test Software. *You must complete the steps in this chapter before attempting measurements with the Software.*

Test System Installation

This chapter outlines the steps to set up the Test System for CDMA transceiver testing.

The steps in this chapter are:

1. **"Connect the Test Set for Measurements" on page 27**
2. **"Connect the Test Set for BTS Control" on page 32**
3. **"Load and Run the LGIC CDMA PCS BTS Test Software" on page 33**

You can control the base station by sending control commands (step 2, above) using the Test Set's laptop emulator through the Test Set's SERIAL 10 port. See **"Laptop Emulator" on page 136** for detailed information.

Connect the Test Set for Measurements

To perform the CDMA tests, you need to connect the Test Set to the base station. **Figure 4 on page 29** and **figure 5 on page 30** show the BTS and Test Set's connection ports that are used for each CDMA test. **Table 1 on page 30** lists Test Set and BTS's ports to be connected to each other to run each of the CDMA tests. Some CDMA tests also require a reference timebase (19.6608 MHz) and an even-second clock signal. The most typical configuration utilizes the BTS's clocks for the Test Set's reference.

If you are using a separate GPS reference instead of the cell site's clocks, see **figure 42 on page 131**.

NOTE: When connecting the clock signals on the base station, be sure that the base station's GPSR module is locked (**active**).

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

The Test Set's ANT IN port is only used for very low signal levels ≤60 mW (17.78 dBm). Therefore, to prevent damage to the Test Set, *never* connect ANT IN to the BTS TX antenna port. The ANT IN port is typically connected to the BTS coupling port. See **figure 4, "Base Station Connection and Test Ports," on page 29**.

The Test Set's RF IN/OUT port is for CDMA signal of ≤15 W (41.77 dBm). Do not apply more than 15 W to the RF IN/OUT port. When you connect this port to the BTS TX antenna port, make sure that the power level of the antenna port does not exceed 15 W. If you suspect to be above this level, you should use a power attenuator.

Which BTS Port to Use - TX Coupling Port or TX Antenna Port?

Testing Using the Coupling Port

The TX coupling port (indicated as ‘‘***Sample***’’ on the TXFU module of LGIC BTS) gets its signal through a directional coupler connection to the TX antenna port (indicated as ‘‘***Tx (ANT)***’’ on the TXFU module) as shown in **figure 3 on page 28**. This allows you to make measurements without disconnecting the transmit antenna. A “Coupling Factor” (loss) through the directional coupler is entered into the Software to compensate power measurements. The coupling factor is typically 37 dB, but can vary depending on the base station design.

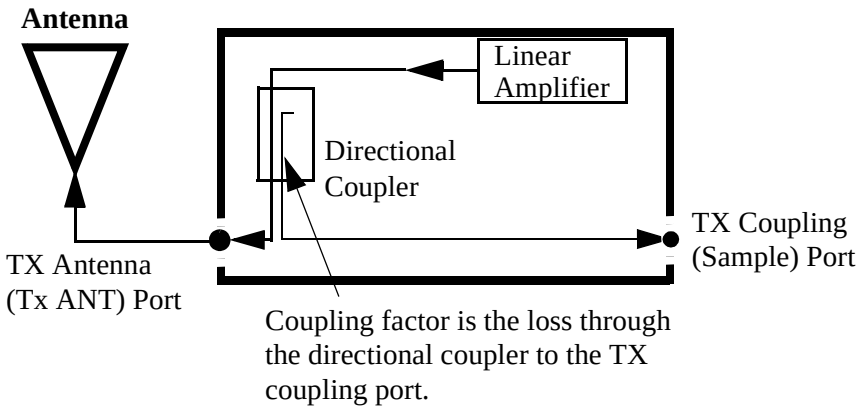


Figure 3 **Simplified Diagram of the Transmitter (TXFU module) Output Path**

If you do not know the exact coupling factor, the Software contains a utility to measure the coupling factor. See **"Coupling Port Calibration" on page 121** for information on how to calibrate the coupling port.

One disadvantage to using the coupling port to make measurements is the possibility that its coupler is malfunctioning and therefore will cause erroneous measurements. If power measurements fail by a large amount, but you suspect that the actual *transmitted* power is correct, you should make measurements at the TX antenna port to verify the failing reading. If the Software is correctly configured, power measurements using the coupling port and antenna port should not vary significantly.

Testing Using the TX Antenna Port

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

NOTE: The signal level at HPAU direct output port usually exceeds the maximum input level at the Test Set's ANT IN port. When you measure the signal level at this port, you should connect it to the Test Set's RF IN/OUT port. Moreover, if you suspect that the power level at the direct output port exceeds 15 W, you should use a power attenuator and enter the attenuation value in the `Configuration and Setup` menu. See **"Attenuation at HPAU, TXHU [dB]" on page 43**.

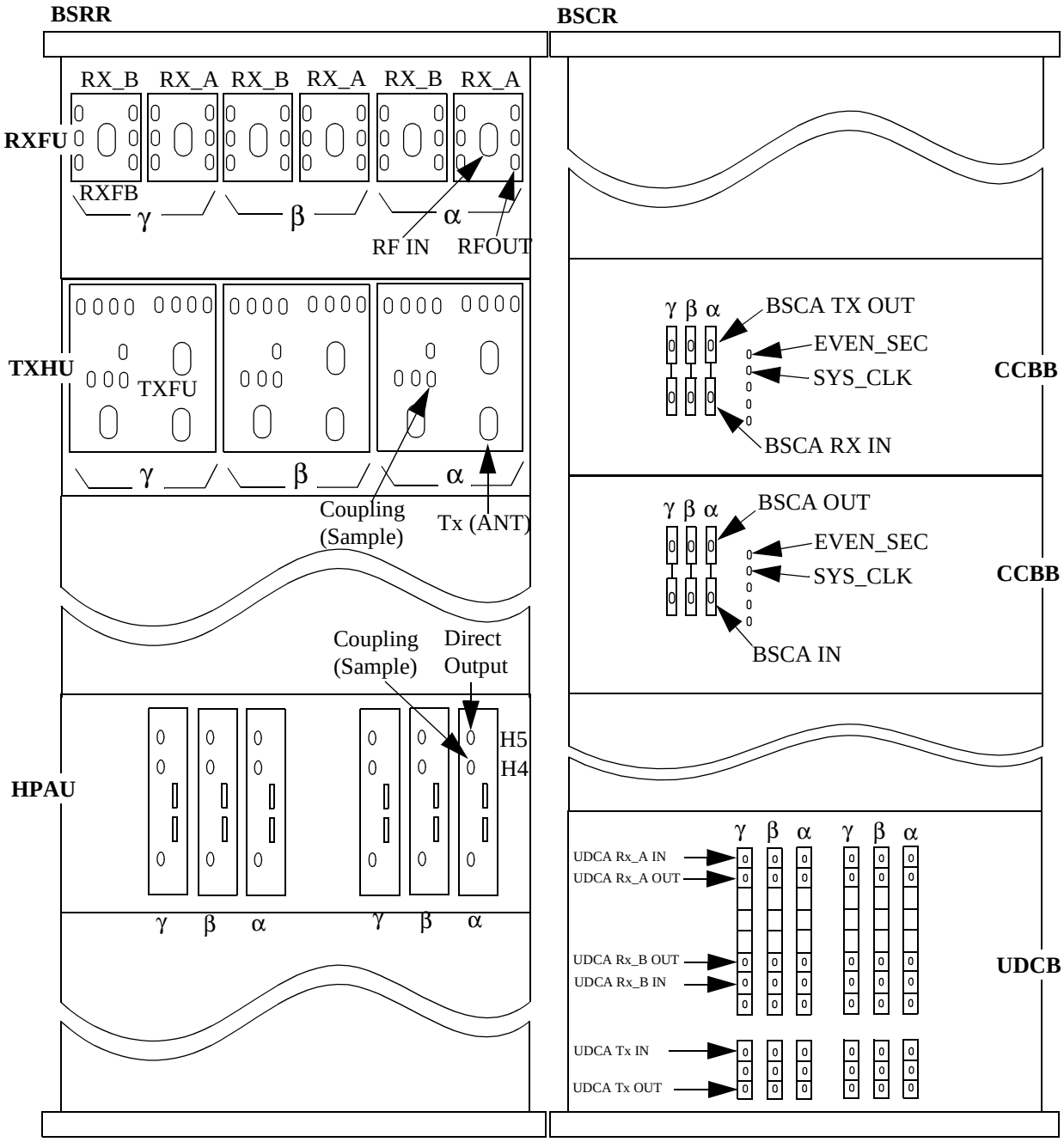


Figure 4 Base Station Connection and Test Ports

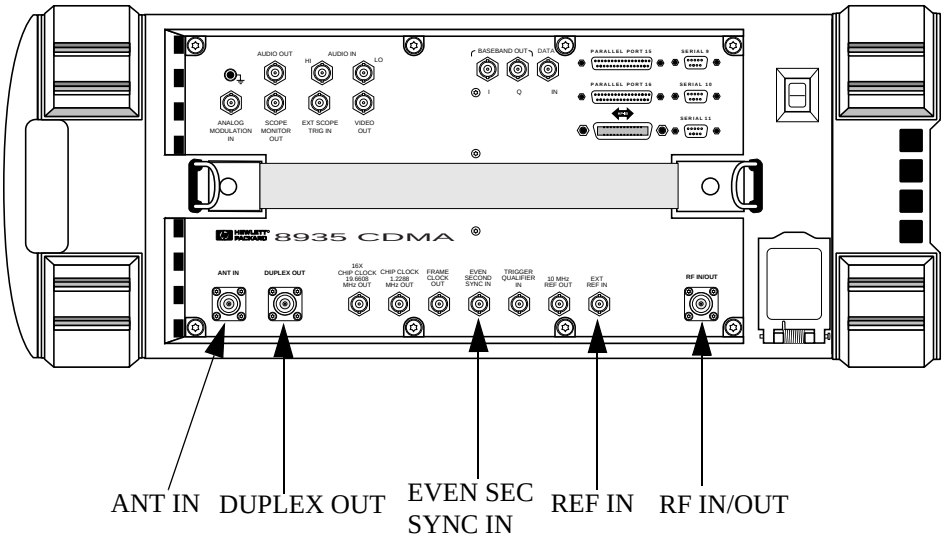


Figure 5 **Test Set Connectors**

The following table lists the Test Set connectors and BTS ports to be connected to each other when running each of CDMA tests.

Table 1 **Connections for CDMA Tests**

CDMA Test	Test Set Connectors	BTS Ports	Cable
RX Level - RXFU test	ANT IN DUPLEX OUT	RF OUT RF IN	Cable 1 Cable 2
RX IF Level - BSCA test	ANT IN DUPLEX OUT	UDCA RX OUT RF IN	Cable 1 Cable 2
RX C/N test	ANT IN DUPLEX OUT	UDCA RX OUT RF IN	Cable 1 Cable 2
TX IF Level - BSCA test	ANT IN	BSCA TX OUT	Cable 1
TX Level - UDCA test	ANT IN	UDCA TX OUT	Cable 1
TX Level - HPAU test	ANT IN (or RF IN/OUT)	H4 (Sample) (or H5, direct output)	Cable 1

Table 1 Connections for CDMA Tests

CDMA Test	Test Set Connectors	BTS Ports	Cable
TX Level - TXHU test	ANT IN (or RF IN/OUT)	Sample (or Tx ANT)	Cable 1
TX Spurious - TXHU test	RF IN/OUT	Tx ANT	Cable 1
RX Spurious test	ANT IN	RF IN	Cable 1
Rho/Pilot Only test Rho/Traffic test Code Domain test	EVEN SEC REF IN ANT IN (or RF IN/OUT)	EVEN_SEC SYS_CLK Sample (or Tx ANT)	RF Cable RF Cable Cable 1
RX Noise Figure test	ANT IN DUPLEX OUT	UDCA RX OUT RF IN	Cable 1 Cable 2

NOTE: At the start of each test sequence when you run the tests, the Test Set displays connection diagrams which show the test cable connections between the Test Set and BTS. After measuring the losses of each test cable, be sure to properly connect the cables as shown in the connection diagram. The losses are used by the Software when calculations are made to compensate the losses if the `Compensate Cable Loss` parameter is set to `Yes`. See **"Compensate Cable Loss [Yes, No]" on page 42** and **"Channel & Cable Loss Table" on page 43** for information on how to compensate and measure the test cable losses.

Connect the Test Set for BTS Control

The Test Set has the ability to send control commands to the BTS using the Test Set's laptop emulator. This enables you to set the base station to the desired conditions for the tests in the shortest amount of time. Connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port (RS-232 port of RFPA or BSPA card). Once you have set up the connection, the Test Set can control the base station by sending commands. **See "Laptop Emulator" on page 136** for detailed information on how to send control commands using the Test Set's laptop emulator.

Notice that, additionally, an *external* laptop PC can be connected to the Test Set's SERIAL 9 port to allow you to send control commands from the external laptop PC. This gives you more freedom in sending control commands. See **"Site Control Using the Laptop > BTS Mode" on page 139**.

Figure 6 shows the basic connection of the Test Set, BTS, and laptop PC (optional).

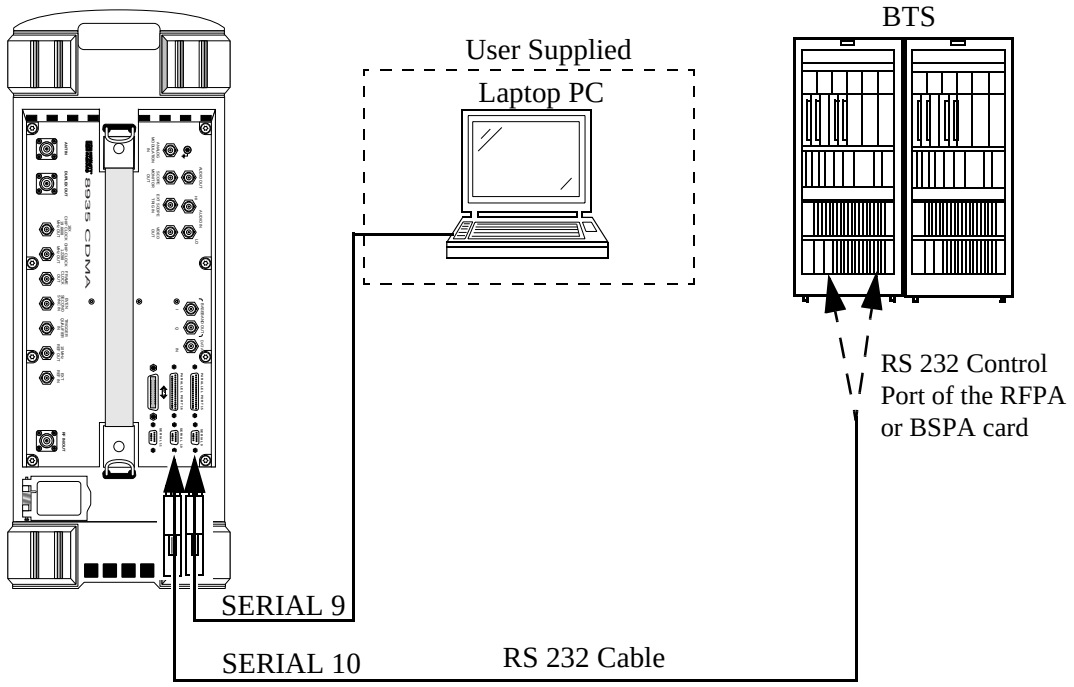


Figure 6 **Serial Connections for BTS Control**

Load and Run the LGIC CDMA PCS BTS Test Software

The next step is to get the LGIC CDMA Base Station Test Software loaded into the Test Set and running on the IBASIC controller.

Locate the PC card supplied with the Software package and follow the steps outlined in **Figure 7** and **Figure 8 on page 34**.

NOTE: Once loaded and run, the Software is preserved in memory, even after turning the Test Set off or removing the Software card from the PC card slot, unless you load another program or update the Test Set's operating system (firmware). If you set the `Autostart on Power-Up` parameter to `Yes`, the Software is automatically loaded and run whenever the Test Set is turned on. See **"Autostart on Power-Up [Yes, No]" on page 42**.

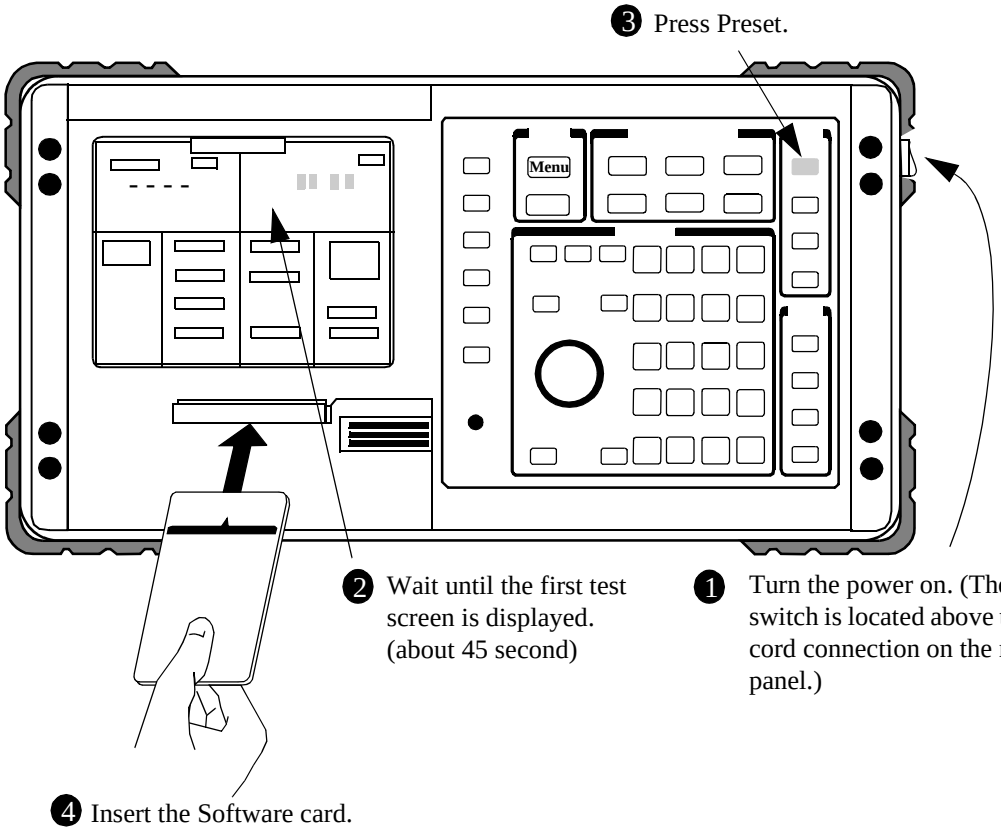
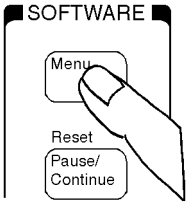
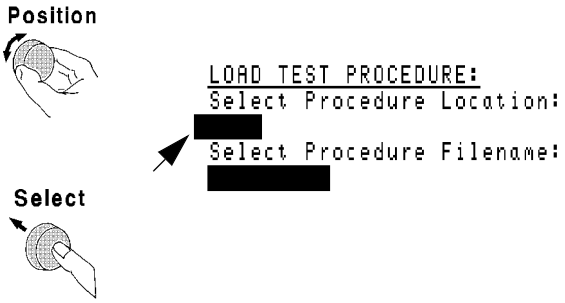


Figure 7 Loading the Software

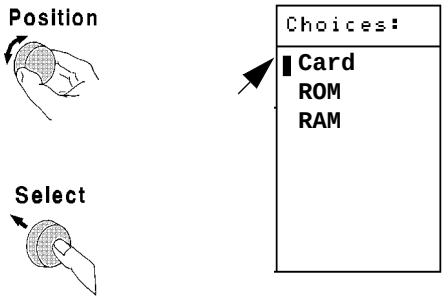
5 Press the SOFTWARE **Menu** key to display the **Software Menu** screen.



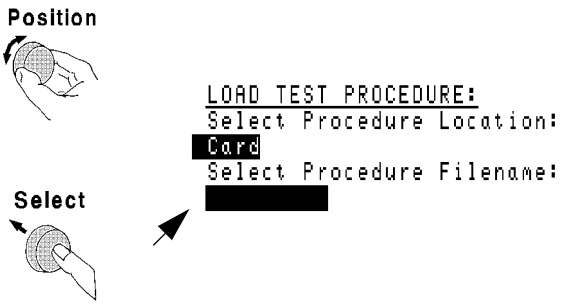
6 Position the cursor at **Select Procedure Location:** and select it.



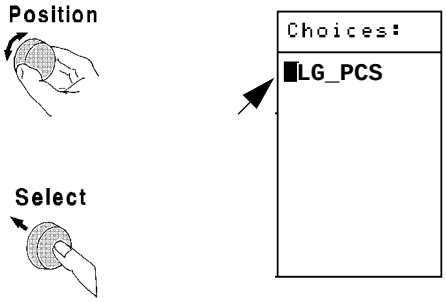
7 Position the cursor at **Card** and select it.



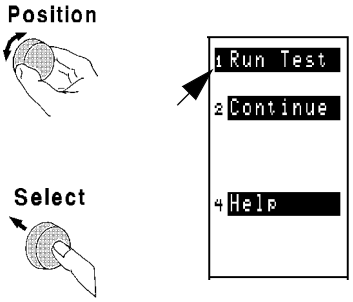
8 Position the cursor at **Select Procedure Filename:** and select it.



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



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



Loading Time:

First time: approximately 20 seconds.

After first time: approximately 15 seconds.

Figure 8 Running the Software

Navigation of the LGIC CDMA PCS Base Station Test Software

After the Software is loaded, you will see the Software's `Test Selections Menu` screen on the Test Set's display. To access other menus, press k5 (`Menus`).

The `Test Selections`, `Configuration and Setup`, `Test Parameters/Specs`, `Utilities`, `Print/Data Collection`, and `Save/Recall/File` menus appear in a list of `Menus:` choice. Turn the knob to move the cursor to the choice you want to select, and press the knob to access the selected menu.

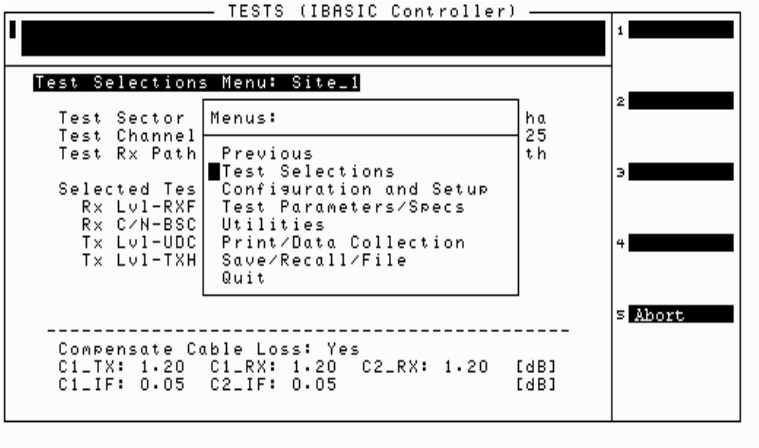


Figure 9 **LGIC CDMA PCS BS Test Software Menu Choice Screen**

Menu Functions

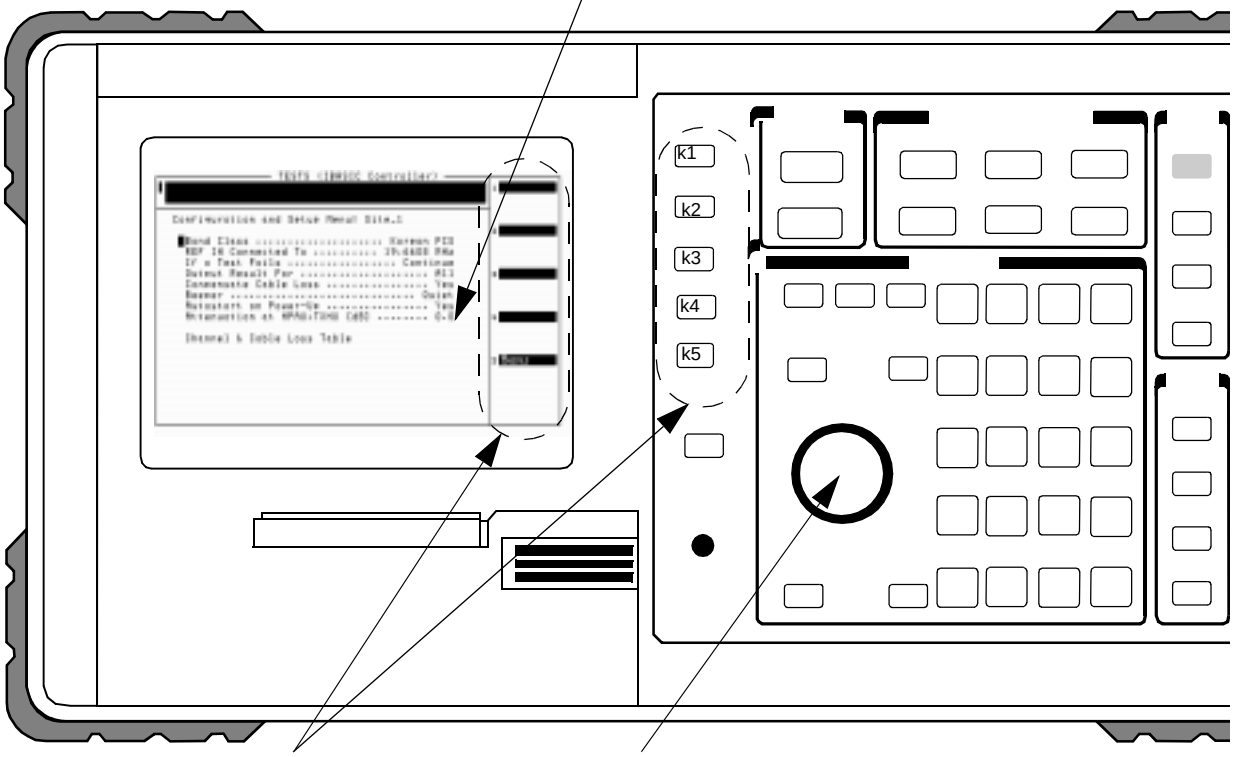
- `Test Selections` menu is where you can do the following:
  - ❒ Select a sector
  - ❒ Select a channel
  - ❒ Select a RX path
  - ❒ Select the CDMA tests to run
  - ❒ Execute the selected CDMA tests

- `Configuration and Setup` menu is where you enter information to run the tests.
  - ❒ Select a band class (channel standard).
  - ❒ Select a timing reference signal source.
  - ❒ Select to continue testing if a test point fails, or to stop and wait for further interactions by user before continuing.
  - ❒ Select whether to show all the test results or only failed test results when measurements are finished.
  - ❒ Select whether to compensate test cable loss during the tests or not.
  - ❒ Set the beeper's volume or turn off the beeper.
  - ❒ Select to automatically load and run the Software whenever the Test Set's power switch on.
  - ❒ Enter the attenuation value of the power attenuator connected at TXHU antenna or HPAU direct output port.
  - ❒ Measure or enter test cable losses
- `Test Parameters/Specs` menu is where you define the test parameters and pass/fail limits that are used during testing. The Software has the predefined default settings and values for all of the test parameters and pass/fail limits derived from LGIC's CDMA base station test procedures. You can change the test parameters or pass/fail limits for your specific needs.
- `Utilities` menu is where you can use the utilities of the Software such as RF tools program, PN offset value search, coupling factor and cable insertion loss measurements, and even second clock, 19.6608 MHz clock, and 10 MHz clock checks. You can also access the Software's laptop emulator in this menu.
- `Print/Data Collection` menu is where you can enable or disable the BTS laptop utility program, select the Test Set's port for printing test results, or select the external device for saving test results data. You can also configure the communication settings for the Test Set's SERIAL 9 port and configure the printer using this menu.
- `Save/Recall/File` menu is where you can store test procedures you have specifically defined and retrieve them later. This feature eliminates the task of re-entering the test configuration information in the `Configuration and Setup` menu, re-defining the test parameters and pass/fail limits in the `Test Parameters/Specs` menu, and re-selecting the CDMA tests to run in the `Test Selections` menu. Normally, test procedures are saved on a PC card. You can also do file management tasks on a PC card in this menu. These tasks include cataloging a PC card, deleting or transferring a file from PC card, and viewing a data file on the Test Set's display.

Changing Settings and Using USER Keys

Figure 10 illustrates how to make selections and settings and how to use fields on the Test Set's screens.

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



USER Keys and their Fields
The USER Keys (**k1** - **k5**) correspond to fields 1-5 on the right side of the test screen. They are used for navigation through menus and for making selections. In a submenu, a "Menus" key is provided to take you back to the list of main menu choices screen. Also in many lower-level menus, a "Return" key is provided to take you back to the previous screen.

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

Scroll or **position** means to turn the knob to move the cursor from field to field. **Select** is used to mean to scroll to the field and then press the knob in this manual.

Figure 10 Using the Knob, USER Keys, and Screen Fields

If You Had Problems

If you were unable to load and run the software, or you encountered error messages, refer to **"Troubleshooting" on page 165** for help.

3

Test Configuration and Parameters for CDMA Tests

Follow the steps in this chapter to enter test configuration information and to define test parameters and specifications before running the tests. This chapter also includes procedures for saving, recalling, and filing test procedures on a PC card. *You must complete the steps of the* **"Test Configuration and Setup" on page 41** *in this chapter before attempting CDMA measurements with the Software.*

Overview

You should enter test configuration and setup information which is commonly used by all tests using the `Configuration and Setup Menu`. Sometimes you need to define the test parameters and pass/fail limits of each CDMA test using the `Test Parameters/Specs Menu`. The Software uses your settings in these menus for customizing testing.

This chapter discusses the following topics needed to prepare the Software to make CDMA tests:

- Entering test configuration and setup information used by all tests.
- Measuring test cable losses.
- Defining individual test parameters and pass/fail limits used by each of the CDMA tests.
- Saving, recalling, or filing a test procedure on a PC card.

Once defined, these settings are preserved in memory, even after turning the Test Set off, unless you load another program or update the Test Set's operating system (firmware). You can also save these settings as a test procedure on a PC card for future use.

Test Configuration and Setup

When you are starting to test a base station with the Software, you must enter test configuration and setup information which is commonly used by all tests. The Software uses your entries in the `Configuration and Setup Menu` when running the CDMA tests. You can also tell the Software to compensate for the cable losses over TX and RX frequency ranges for accurate measurements in this menu.

To enter test configuration and setup information, you need to go to `Configuration and Setup Menu` by following these steps:

1. Load and run the Software (**see "Load and Run the LGIC CDMA PCS BTS Test Software" on page 33**.). The `Test Selections Menu` is displayed.
2. Press k5 (`Menus`) to go to the list of `Menus:`.
3. Select `Configuration and Setup Menu`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.).

You will see the screen shown in **figure 11**. *Change the selections in the entry fields to provide test configuration and setup information to the Software*. See **"Changing Settings and Using USER Keys" on page 37** to learn how to use the knob and keys to change settings.

See **"Configuration and Setup Fields and Their Use" on page 42** for detailed information.

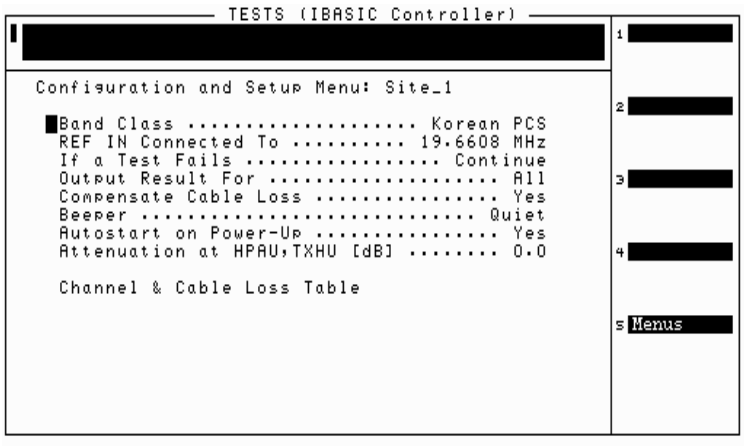


Figure 11 **Configuration and Setup Menu**

Configuration and Setup Fields and Their Use

This section describes the fields on the `Configuration and Setup Menu` and explains how they are used.

1. `Band Class [Korean PCS, North American PCS]`

   This parameter tells the Software which channel standard (Korean PCS Band, or North American PCS Band) to use when you enter channel numbers.

2. `REF IN Connected To [10 MHz, 19.6608 MHz]`

   This parameter identifies the source of the signal connected to the Test Set's EXT REF IN connector. This is typically a 19.6608 or 10 MHz clock and comes from the cell site's GPS receiver or a stand-alone GPS receiver.

   See **"Test Set Connections for Establishing a Timebase" on page 130** when you are using the cell site's clock. See **"Connections Using an HP 58503A GPS Time and Frequency Reference Receiver" on page 131** when you are using a separate GPS reference.

3. `If a Test Fails [Continue, Stop]`

   This parameter determines whether to continue testing if a test point fails, or to stop and wait for further interactions by user before continuing.

4. `Output Result For [All, Fail]`

   This parameter determines if the measurement values (output results) will be shown when you review test results. If set to `All`, the measurement values will be shown in the test results table whether or not the measurement's results fall inside the specified pass/fail limits. If set to `Fail`, the measurement values will be shown when only the measurement results fall outside the specified pass/fail limits. See **"An Example of Test Results" on page 78**.

5. `Compensate Cable Loss [Yes, No]`

   This parameter determines whether the cable losses entered in the `Channel & Cable Loss Table` should be compensated for during testing or not.

6. `Beeper [Off, Quiet, Loud]`

   The beeper alerts you to important operating and measurement conditions. It beeps any time a message is displayed at the top of the screen. These messages warn you of conditions such as exceeding the RF input level or trying to set a field to an unacceptable value. Therefore, it is recommended that you do not turn off the beeper.

7. `Autostart on Power-Up [Yes, No]`

   When this field is set to `Yes`, the Software is automatically loaded and run whenever the Test Set is turned on. If this parameter is set to `No`, the Test Set will default to its normal power-on state.

8. `Attenuation at HPAU, TXHU [dB]`

When you connect the Test Set's RF IN/OUT port to the HPAU direct output or TXHU antenna port, you should use an external power attenuator if you suspect that the power level exceeds 15 W (41.77 dBm).

The value in this parameter is the attenuation level of the power attenuator that you are connecting. If you connected a 40 dB attenuator, enter 40 dB. This parameter is used by the Software when calculations are performed to determine the true power level of the CDMA signal at the HPAU direct output or TXHU antenna port. The maximum allowable attenuation level is 40 dB.

9. `Channel & Cable Loss Table`

This parameter is used to *enter* or *measure* the signal losses through the test cables over the TX and RX frequency ranges including the IF frequency (4.95 MHz).

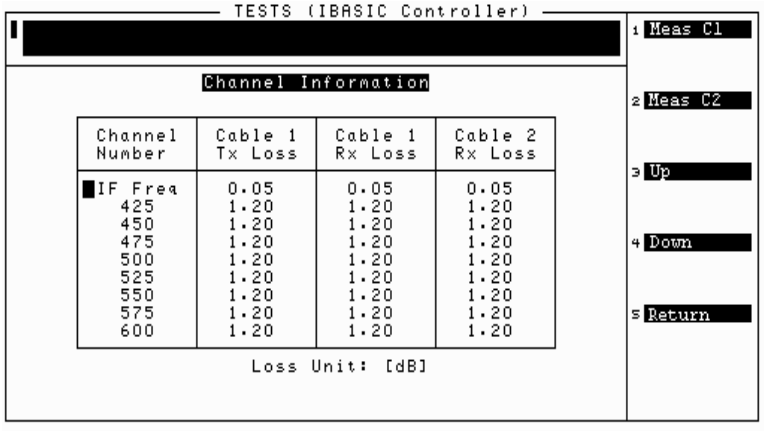


Figure 12 **Channel and Cable Loss Screen**

The `Cable 1 Tx Loss` or `Cable 1 Rx Loss` columns show the signal losses through the cable connected between the Test Set's **ANT IN** (or **RF IN/OUT**) port and the **base station's measurement** port. See **Table 1, "Connections for CDMA Tests" on page 30**.

The `Cable 2 RX Loss` columns show the signal losses through the cable connected between the Test Set's **DUPLEX OUT** port and the base station's **RX input** (RF IN) port. See **Table 1, "Connections for CDMA Tests" on page 30**.

If you know the cable losses, you can directly enter the signal losses using the DATA ENTRY keys. If you do not know them, follow these steps to measure the signal losses:

a Press k1 (`Meas C1`) for Cable 1 loss measurements over all the TX and RX frequencies listed in the `Channel Information` table, or press k2 (`Meas C2`) for Cable 2 loss measurements over RX frequencies listed in the table.

NOTE: If you press k1 (`Meas C1`), the Test Set shows a connection diagram to connect **Cable 2** as a calibration cable and two 6-dB pads (attenuators), first, between the Test Set's ANT IN and DUPLEX OUT ports to make reference measurement.

If you press k2 (`Meas C2`), the Test Set shows a connection diagram to connect **Cable 1** as a calibration cable and two 6-dB pads (attenuators), first, between the Test Set's ANT IN and DUPLEX OUT ports to make reference measurement.

b Press k1 (`Proceed`) when the reference measurement connection has been made. The Test Set turns on the source and makes the reference measurement for the calibration cable. It takes up to 3 minutes.

c After making a reference measurement, add the test cable to be measured, in series, with the calibration cable and pads. Press k1 (`Proceed`) again when the connection has been made. It takes up to 3 minutes to measure the test cable losses over the frequencies of all the channels in the table.

d The measurement results will be automatically entered into the `Channel Information` table.

e Press k5 (`Return`) to return to the previous menu.

NOTE: You can use k3 (`Up`) or k4 (`Down`) key to move the cursor upward or downward quickly in the `Channel Information` table.

At the start of each test sequence when you run the tests, the Test Set displays connection diagrams which show the test cable connections between the Test Set and base station. After measuring the losses of each test cable, be sure to properly connect the cables as shown in the connection diagram. The losses are used by the Software when calculations are made to compensate for the losses if the `Compensate Cable Loss` parameter is set to `Yes`. See **"Compensate Cable Loss [Yes, No]" on page 42** and **"Channel & Cable Loss Table" on page 43** for information on how to compensate for and measure the test cable losses.

Test Parameters and Specifications

This section lists the test parameters and specifications (pass/fail limits) to be used when running each of CDMA tests and describes their use. The `Test Parameters/Specs Menu` contains individual test parameters and pass/fail limits for each of the CDMA tests.

Because most of the test parameters and pass/fail limits fields contain valid default settings and values derived from the LGIC's CDMA base station test procedures, usually, it *is not* necessary to change these values.

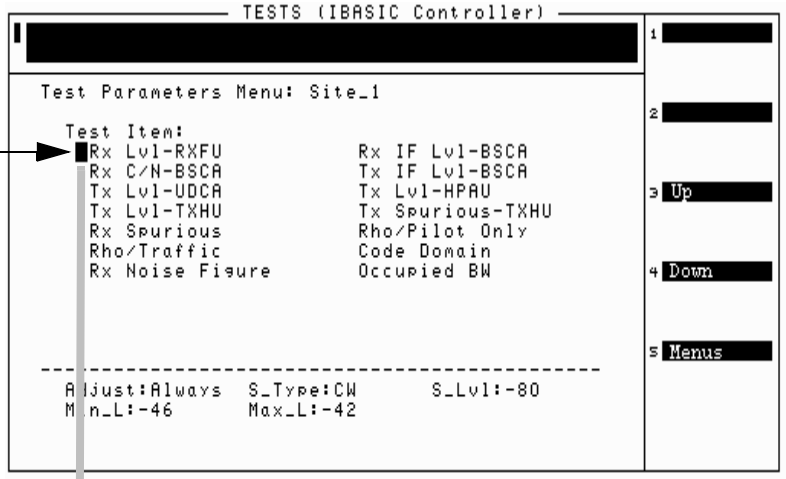
Even though the Software comes with default settings and values, you may change the test parameters and pass/fail limits for your specific needs. To change them, follow these steps:

1. Load and run the Software (see **"Load and Run the LGIC CDMA PCS BTS Test Software" on page 33**.). The `Test Selections Menu` is displayed.
2. Press k5 (`Menus`) to go to the list of `Menus:`.
3. Select `Test Parameters/Specs`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.). The Test Set shows the list of test items. See the upper screen in **figure 13 on page 46**.

NOTE: You can use k3 (`Up`) or k4 (`Down`) key to move the cursor upward or downward quickly in the columns of the `Test Parameters/Specs Menu`.

4. Select the test for which you want to change the test parameters and pass/fail limits. The Test Set shows the predefined test parameters and pass/fail limits for the selected test. See **figure 13 on page 46**.
5. Select the test parameter or pass/fail limits you desire to change. A list of choices will be shown or the entry field will be highlighted to allow you to change the value. Turn the knob to change the field or use the DATA ENTRY keys to enter a value. Repeat this step for the other items you want to change.
6. Press k5 (`Return`) to return to the `Test Parameters/Specs Menu`. At this point you can select other test items or exit this menu by pressing k5 (`Menus`).

Select to access the test parameters and pass/ fail limits of the test item. (in this case, RX Lvl - RXFU test is selected.)



Change the settings or values in the parameters/specs screen of the selected test item (in this case, RX Lvl - RXFU Parameters/Specs screen is shown.).

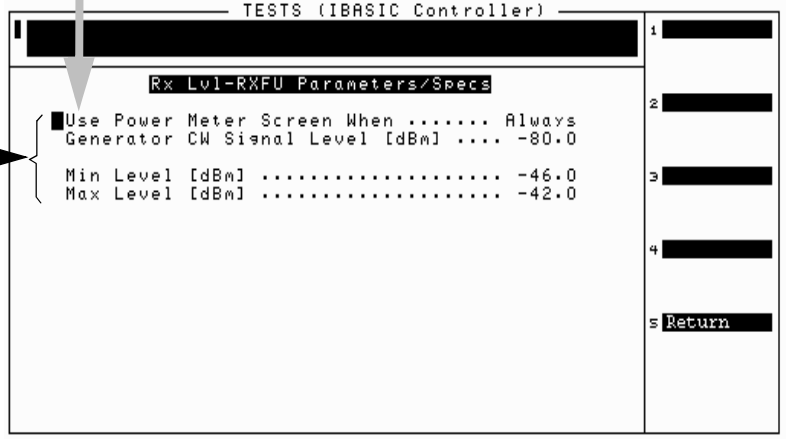


Figure 13 Test Parameters/Specs Menu

Test Parameters and Specifications Fields and Their Use

This section lists the names of the test parameters and specifications (pass/fail limits) which are associated with each of the CDMA tests and explains how they are used.

RX Level - RXFU

The following test parameters and pass/fail limits are used when running the RX Level - RXFU test.

1. `Use Power Meter Screen When [Always, Fail, None]`

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

   - If set to `Always`, the power meter screen (see **figure 16 on page 74**) will be displayed any time power measurements are made, whether the measurement values are within the specified pass/fail limits or not.
   - If set to `Fail`, the power meter screen will be displayed if the measured power is outside the specified pass/fail limits. You may then adjust the power level of the base station to within the limits and continue with testing.
   - If set to `None`, the power meter screen will not be displayed. The test result table of the power measurements will be directly displayed.

2. `Generator CW Signal Level [dBm]`

   The Test Set generates a CW signal for this test and applies it to the BTS's RX input (RF IN) port through Test Set's DUPLEX OUT port. This parameter is used to set the level of the CW signal.

   The default level is –80 dBm.

3. `Min Level [dBm]`

   This parameter specifies the *lower* limit of the power level measured at the RXFU output (RF OUT) port. The Test Set measures the power level at the BTS RXFU output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is –46 dBm.

4. `Max Level [dBm]`

   This parameter specifies the *upper* limit of the power level measured at the BTS RXFU output (RF OUT) port. The Test Set measures the power level at the RXFU output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is –42 dBm.

RX IF Level - BSCA

The following test parameters and pass/fail limits are used when the Test Set performs the RX IF Level - BSCA test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Generator CW Signal Level [dBm]`

   The Test Set generates a CW signal for this test and applies it to the BTS RX input (RF IN) port through Test Set's DUPLEX OUT port. This parameter is used to set the level of the CW signal.

   The default level is –80 dBm.

3. `Min Level [dBm]`

   This parameter specifies the *lower* limit of the IF level measured at the UDCA RX output port. The Test Set measures the power level at the UDCA RX output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is –4 dBm.

4. `Max Level [dBm]`

   This parameter specifies the *upper* limit of the IF level measured at the UDCA RX output port. The Test Set measures the power level at the UDCA output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is 0 dBm.

RX C/N - BSCA

The following test parameters and pass/fail limits are used when the Test Set performs the RX C/N - BSCA test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Generator CW Signal Level [dBm]`

   The Test Set generates a CW signal for this test and applies it to the BTS RX input (RF IN) port through Test Set's DUPLEX OUT port. This parameter is used to set the level of the CW signal.

   The default level is –119 dBm.

3. `Min C/N Ratio [dB]`

   This parameter specifies the minimum difference between the signal level measured at the carrier frequency and the noise level measured at f_c ±200 kHz. The Test Set measures the signal and noise levels when applying a CW signal at the BTS RX input (RF IN) port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is 6 dB.

TX IF Level - BSCA

The following test parameter and pass/fail limits are used when the Test Set performs the TX IF Level - BSCA test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Min Level [dBm]`

   This parameter is used to specify the *lower* limit of a CDMA signal level which is measured at the BSCA TX output port. The Test Set measures the power level at this port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is –11.5 dBm.

3. `Max Level [dBm]`

   This parameter is used to specify the *upper* limit of a CDMA signal level which is measured at the BSCA TX output port. The Test Set measures the power level at this port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is –9.5 dBm.

TX Level - UDCA

The following test parameter and pass/fail limits are used when the Test Set performs the TX Level - UDCA test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Min Level [dBm]`

   This parameter is used to specify the *lower* limit of a CDMA signal level which is measured at the UDCA TX output port. The Test Set measures the power level at the UDCA TX output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is –19.5 dBm.

3. `Max Level [dBm]`

   This parameter is used to specify the *upper* limit of a CDMA signal level which is measured at the UDCA TX output port. The Test Set measures the power level at the UDCA TX output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is –15.5 dBm.

TX Level - HPAU

The following test parameters and pass/fail limits are used when the Test Set performs the TX Level - HPAU test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Base Station Measurement Port [HPAU Coupling Port, HPAU Output Port, Both]`

   This parameter selects an HPAU output port to make TX-Level measurements; `HPAU Coupling Port` (which comes from a directional coupler in the HPAU RF output), `HPAU Output Port` (which supplies the HPAU RF output directly to the TXHU module), or `Both` (both the directional coupler and the direct HPAU output port).

3. `Coupling Factor Table`

   You need to tell the Software the coupling factors (losses) of the sector and channel (FA) you are testing if you measure the signal level at the coupling port. The Software compensates for the coupling factor when making power measurements at the coupling port (**H4** port on the HPAU module).

   This coupling factor will be used when you set the `Base Station Measurement Port` to `Coupling`. You have to directly enter the value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. **See "Coupling Port Calibration" on page 121** for information on how to measure it in the `Utilities Menu`.

4. `Min Level [dBm]`

   This parameter is used to specify the *lower* limit of a CDMA signal level which is measured at the HPAU output (coupling or direct) port. The Test Set measures the power level at the selected port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is 29 dBm.

5. `Max Level [dBm]`

   This parameter is used to specify the *upper* limit of a CDMA signal level which is measured at the HPAU output (coupling or direct) output port. The Test Set measures the power level at the selected port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is 35 dBm.

TX Level - TXHU

The following test parameters and pass/fail limits are used when running the TX Level - TXHU test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Base Station Measurement Port [TXHU Coupling Port, TXHU Antenna Port, Both]`

   This parameter selects an output port to make power measurements on the TXHU module; `TXHU Coupling Port` (which comes from a directional coupler in the TXFU output), `TXHU Antenna Port` (which supplies the TXFU output directly to the antenna), or `Both` (both the directional coupler and the direct antenna port).

3. `Alpha Coupling Factor [dB]`

   This parameter is used to tell the Software to compensate for the coupling factor (loss) when making power measurements at the alpha sector's TXFU output port (**Sample** port of the *alpha* system in the TXFU module).

   This coupling factor will be used when you set the `Base Station Measurement Port` to `Coupling`. You have to directly enter the value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. **See "Coupling Port Calibration" on page 121** for information on how to measure it in the `Utilities Menu`.

4. `Beta Coupling Factor [dB]`

   This parameter is used to tell the Software to compensate for the coupling factor (loss) when making power measurements at the beta sector's TXFU output port (**Sample** port of the *beta* system in the TXFU module).

   This coupling factor will be used when you set the `Base Station Measurement Port` to `Coupling`. You have to directly enter the value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. **See "Coupling Port Calibration" on page 121** for information on how to measure it in the `Utilities Menu`.

5. `Gamma Coupling Factor [dB]`

   This parameter is used to tell the Software to compensate for the coupling factor (loss) when making power measurements at the gamma sector's TXFU output port (**Sample** port of the *gamma* system in the TXFU module).

   This coupling factor will be used when you set the `Base Station Measurement Port` to `Coupling`. You have to directly enter the value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. **See "Coupling Port Calibration" on page 121** for information on how to measure it in the `Utilities Menu`.

6. `Min Level [dBm]`

   This parameter is used to specify the *lower* limit of a CDMA signal level which is measured at the TXFU output (coupling or antenna) port. The Test Set measures the power level at the TXFU output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default minimum limit is 27.2 dBm.

7. `Max Level [dBm]`

   This parameter is used to specify the *upper* limit of a CDMA signal level which is measured at the TXFU output (coupling or antenna) port. The Test Set measures the power level at the TXFU output port and compares the result with this limit to determine if the measurement meets your test requirements.

   The default maximum limit is 33.2 dBm.

TX Spurious - TXHU

The following test parameter and pass/fail limits are used when the Test Set performs the TX Spurious - TXHU test.

1. `Use Power Meter Screen When [Always, Fail, None]`

   See **"RX Level - RXFU" on page 47** for description of this parameter.

2. `Min at fc +/- 885 kHz [dB]`

   This parameter specifies the minimum allowable difference between the levels at the center frequency and the level of spurious emissions at ±885 kHz from the center frequency. For this test, the Software uses the 30 kHz RBW of the spectrum analyzer.

   The default for the lower limit is 29 dB.

3. `Min at fc +/- 1.25 MHz [dB]`

   This parameter specifies the minimum allowable difference between the levels at the center frequency and the level of spurious emissions at ±1.25 MHz from the center frequency. For this test, the Software uses the 30 kHz RBW of the spectrum analyzer.

   The default for the lower limit is 36 dB.

4. `Min at fc +/- 2.25 MHz [dB]`

   This parameter specifies the minimum allowable difference between the levels at the center frequency and the level of spurious emissions at ±2.25 MHz from the center frequency. For this test, the Software uses the 30 kHz RBW of the spectrum analyzer.

   The default for the lower limit is 55 dB.

RX Spurious

The following pass/fail limits are used when the Test Set performs the RX Spurious test.

1. `Max at 4 - 1750 MHz [dBm]`

   This parameter specifies the maximum allowable level of spurious emissions in the 4 MHz to 1750 MHz frequency range.

   The default for the upper limit is –47 dBm.

2. `Max at 1750 - 1780 MHz [dBm]`

   This parameter specifies the minimum allowable level of spurious emissions in the 1750 MHz to 1780 MHz frequency range.

   The default for the upper limit is –80 dBm.

3. `Max at 1780 - 1840 MHz [dBm]`

   This parameter specifies the minimum allowable level of spurious emissions in the 1780 MHz to 1840 MHz frequency range.

   The default for the upper limit is –47 dBm.

4. `Max at 1840 - 1870 MHz [dBm]`

   This parameter specifies the minimum allowable level of spurious emissions in the 1840 MHz to 1870 MHz frequency range.

   The default for the upper limit is –60 dBm.

5. `Max at 1870 - 2000 MHz [dBm]`

   This parameter specifies the minimum allowable level of spurious emissions in the 1870 MHz to 2000 MHz frequency range.

   The default for the upper limit is –47 dBm.

Rho/Pilot Only

The following test parameters and pass/fail limits are used when the Test Set performs a suite of CDMA tests on a carrier with only the pilot channel active (no active traffic or paging).

1. `Base Station Measurement Port [TXHU Coupling Port, TXHU Antenna Port]`

   This parameter selects a TXHU output port to make rho/pilot only measurements; `TXHU Coupling Port` (which comes from a directional coupler in the TXHU output), or `TXHU Antenna Port` (which supplies the TXHU output directly to the antenna).

2. `Alpha PN Offset`

   This parameter is used to identify the PN offset of the alpha sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

3. `Beta PN Offset`

   This parameter is used to identify the PN offset of the beta sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

4. `Gamma PN Offset`

   This parameter is used to identify the PN offset of the gamma sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

5. `Max Time Offset [+/- us]`

   This parameter is used when measuring the transmitter's time-alignment to the system time (BTS's GPSR time).

   The default for the upper and lower limits are ±10 µs.

6. `Max Freq Error [+/- Hz]`

   The Test Set measures the transmitter's center frequency and compares it to the ideal frequency, based on your entry for channel number. The difference between these two frequencies is the frequency error and this parameter specifies the maximum allowable upper and lower limits.

   The defaults for the upper and lower limits are ±90 Hz, respectively.

7. `Max Carrier FeedThru [dB]`

   This parameter specifies the pass/fail limits for the test that measures the performance of the I/Q modulator of the CDMA transmitter.

   The default for the upper limit is –25 dB.

8. `Min Rho`

   This parameter specifies the pass/fail limits when measuring rho, a measure of the modulation quality of a CDMA transmitter.

   The default for the lower limit is 0.912.

Rho/Traffic

The following test parameters and pass/fail limits are used when the Test Set performs a suite of CDMA tests on a carrier.

1. `Base Station Measurement Port [TXHU Coupling Port, TXHU Antenna Port]`

   This parameter selects a TXHU output port to make Rho/Traffic measurements; `TXHU Coupling Port` (which comes from a directional coupler in the TXHU output), or `TXHU Antenna Port` (which supplies the TXHU output directly to the antenna).

2. `Alpha PN Offset`

   This parameter is used to identify the PN offset for the alpha sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

3. `Beta PN Offset`

   This parameter is used to identify the PN offset for the beta sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

4. `Gamma PN Offset`

   This parameter is used to identify the PN offset for the gamma sector. You have to directly enter this value using the DATA ENTRY keys. If you do not know this value, you can measure it in the `Utilities Menu`. See **"PN Offset Search" on page 119**.

5. `Max Time Offset [+/- us]`

   This parameter is used when measuring the transmitter's time-alignment to system time (the BTS's GPSR time).

   The default for the upper and lower limits are ±10 µs.

6. `Max Freq Error [+/- Hz]`

   The Test Set measures the transmitter's center frequency and compares it to the ideal frequency, based on your entry for channel number. The difference between the these frequencies is the frequency error and this parameter specifies the maximum allowable upper and lower limits.

   The defaults for the upper and lower limits are ±90 Hz, respectively.

7. `Max Carrier FeedThru [dB]`

   This parameter specifies the pass/fail limits for the test that measures the performance of the I/Q modulator of the CDMA transmitter.

   The default for the upper limit is –25 dB.

8. `Min Rho`

   This parameter specifies the pass/fail limits when measuring rho, a measure of the modulation quality of a CDMA transmitter.

   The default for the lower limit is 0.912.

Code Domain

The following test parameters and pass/fail limits are used when the Test Set performs a suite of CDMA tests on the specified channel.

1. `Base Station Measurement Port [TXHU Coupling Port, TXHU Antenna Port]`

   This parameter selects a TXHU output port to make Code Domain measurements; `TXHU Coupling Port` (which comes from a directional coupler in the TXHU output), or `TXHU Antenna Port` (which supplies the TXHU output directly to the antenna).

2. `Inactive Walsh Code Threshold [dB]`

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

   The default for the upper limit is –23 dB.

3. `Max Inactive Walsh Code [dB]`

   This parameter specifies the maximum level of the **inactive** Walsh channel.

   The default for the upper limit is –27 dB.

4. `Max Timing Error [+/- ns]`

   This parameter is used to measure the time error of a Walsh channel compared to the pilot channel (Walsh 0) and compares the results to these limits.

   The defaults for the upper and lower limits are +50 ns and –50 ns, respectively.

5. `Max Phase Error [+/- mrad]`

   This parameter is used to measure the phase of a Walsh channel compared to the pilot channel (Walsh 0) and compares the results to these limits.

   The defaults for the upper and lower limits are +50 mrad and –50 mrad, respectively.

RX Noise Figure

The following pass/fail limit is used to measure the receiver noise figure.

1. `Max Noise Figure [dB]`

   This parameter is used to determine whether or not the noise figure measurement meets the specification, measured at the UDCA RX output.

   The default for maximum limit is 4 dB.

Saving/Recalling/Filing a Test Procedure

Sometimes it is preferable to save a test procedure for future use or for saving time when you are required to reuse the same test procedures. The Software provides the ability to save and recall a test procedure from an external PC card.

A test procedure is a collection of the settings and selections in the `Configuration and Setup Menu`, `Test Parameters/Specs` menu, and `Test Selections Menu`. After you have set up a test procedure you can save it as a test procedure to a PC card. The number of test procedures saved on a PC card depends on the amount of available space on the card.

NOTE: **See chapter 4, "Performing CDMA Tests"** for information on how to select the test items.

This section contains the procedures for saving and recalling a test procedure from a PC card. It also includes information about file management operations on PC card such as cataloging, purging, and viewing files. The procedures covered in this section are as follows:

- Save a test procedure in the PC card
- Recall a test procedure from the PC card
- Catalog the PC card
- Remove a test procedure or data collection file from the PC card
- Transfer a data file to a pc or printer via SERIAL 9 port
- View a data file from the PC card

After setting up a test procedure, you can save or recall a test procedure by selecting `Save/Recall/File`.

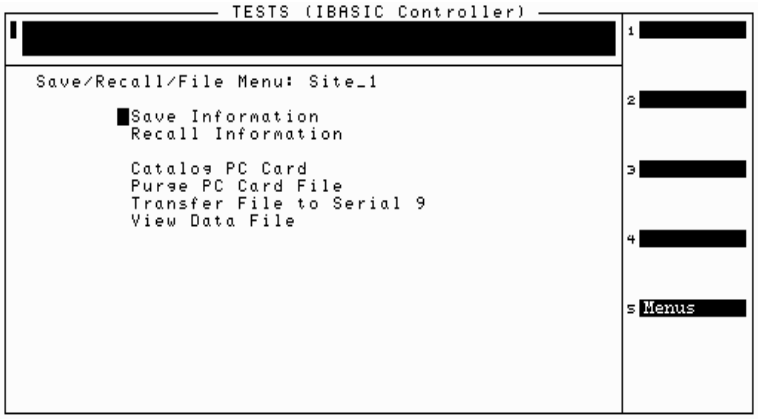


Figure 14 Save/Recall/File Menu

How to Save a Test Procedure

To save a test procedure to a PC card, follow these steps:

1. Create a test procedure by entering information in the `Configuration and Setup Menu`, by changing default values or selections in the `Test Parameters/ Specs Menu`, and by selecting the tests to run in the `Test Selections Menu` (**See "Test Configuration and Setup" on page 41**, **"Test Parameters and Specifications" on page 45**, and **Chapter 4, "Performing CDMA Tests"**.).
2. Insert a PC card into the Test Set's front-panel PC card slot.

NOTE: Before saving files to the PC card, ensure that the PC card is formatted. For PC card formatting instructions, see **"Initializing a PC Card" on page 164**.

3. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.).
4. Select `Save Information`.
5. Enter a name for the test procedure using the characters in the `Choices:` list. Position the cursor in front of the desired characters and press the knob to enter each character. Then select `Done` (at the top of the choices list) to save the test procedure.

   The file is saved on the PC card with a ''.CNF'' appended to the name.

NOTE: You can use the backspace key ← or select `Bk Space` in the `Choices:` menu to delete a character.

6. You can exit the `Save/Recall/File Menu` by pressing k5 (`Menus`).

How to Recall a Test Procedure

To recall a test procedure from a PC card, follow these steps:

1. Insert the PC card into the Test Set's front-panel PC card slot.
2. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Select `Recall Information` and choose the test procedure you desire to recall in the `Recall:` list. Note that the test procedure has the ''.CNF'' extension.
4. You can exit the `Save/Recall/File Menu` by pressing k5 (`Menus`).

How to Catalog a PC Card

You can list the names of the files stored on a PC card. To display a list of files, follow these steps:

1. Insert the PC card into the Test Set's front-panel PC card slot.
2. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Select `Catalog PC Card`. A list of file names is shown on the display.
4. You can go back to the `Save/Recall/File Menu` by pressing k5 (`Done`).

NOTE: All files in the PC card are displayed, not just test procedure files. The ''.TXT'' is appended to the file name of test result data and ''.LGD'' is appended to screen image files of test results or plot. See **"Sending Test Results to a PC or PC Card" on page 156**.

How to Remove a File from a PC Card

A test procedure or data collection file can be removed from a PC card by doing the following.

1. Insert the PC card into the Test Set's front-panel PC card slot.
2. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Select `Purge PC Card File` and choose a file you desire to remove.
4. Press k1 (`Yes`) to remove the test procedure.

NOTE: All files on the PC card are displayed. Remember that test procedure files append the ''.CNF'' extension to the name. ''.TXT'' or ''.LGD'' is appended to the name for data collection files.

How to Transfer a Data Collection File from a PC Card

The data collection file of test results can be transferred from a PC card to a serial printer or a PC through the Test Set's SERIAL 9 port. The data collection files append ‘‘.TXT’’ to the file name.

Transferring Data to a Serial Printer

You can print the data files of test results by transferring them from a PC card to a serial printer.

1. Make sure that your serial printer is connected to the Test Set's SERIAL 9 port and turned on.
2. Configure the communication parameters of the Test Set's SERIAL 9 port to match those of your printer you are connecting. See **"Configuring the Test Set's SERIAL 9 Port" on page 161** for information on how to change the Test Set's SERIAL 9 port settings.
3. Insert the PC card into the Test Set's front-panel PC card slot.
4. Select `Save/Recall/File` from the list of `Menus:` choice. (To “select,” turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
5. Select `Transfer File to Serial 9`.
6. Select a data collection file you desire to transfer.

NOTE: All files on the PC card are displayed, not just the data collection files of test results. Look for data collection files with ‘‘.TXT’’ appended to the file name.

7. When finished printing, you can transfer other files or go to the list of `Menus:` by pressing k5 (`Menus`).

Transferring Data to a PC

Transferring data collection files to a PC requires a configured terminal emulator. See **"BTS Laptop Utility Program" on page 148** to transfer using the BTS Laptop Utility or **"Configuring PC Terminal Programs" on page 158** to transfer using the Hyper terminal[1] in Windows 95®[2].

1. Make sure that your PC is connected to the Test Set's SERIAL 9 port through a null modem cable.
2. Load and run a terminal emulator program and configure the communication parameters of the Test Set's SERIAL 9 port to match those of your PC you are connecting. See **"Configuring the Test Set's SERIAL 9 Port" on page 161** for information on how to change the Test Set's SERIAL 9 port settings.
3. Insert the PC card into the Test Set's front-panel PC card slot.
4. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
5. Select `Transfer File to Serial 9`.
6. Select a data file you want to transfer by turning the knob and start to transfer by pressing the knob.

NOTE: All files on the PC card are displayed, not just the data collection files of test results. Look for data collection files with ''.TXT'' appended to the name.

7. When finished sending a data collection file to the PC, you can transfer other files or go to the list of `Menus:` by pressing k5 (`Menus`).

1. Hyper terminal is a U.S registered trademark of Microsoft Corp.
2. Windows 95 is a U.S registered trademark of Microsoft Corp.

How to View a Screen Image File on the Test Set's Display

You can view the screen image files that are saved on the PC card on the Test Set's display. ''.LGD'' is appended to the name of screen image files. See **"Sending Test Results to a PC Card" on page 159** for information on how to save the screen images. To view them on the Test Set's display, follow these steps:

1. Insert the PC card into the Test Set's front-panel PC card slot.
2. Select `Save/Recall/File` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Select `View Data File`. A list of screen image file names is shown on the display.
4. Select a screen image file you want to view from the `View:` list. The screen image will be shown on the Test Set's display.
5. When finished reviewing the file, you can print it by pressing k1 (`Print`) or go back to the `Save/Recall/File Menu` by pressing k5 (`Return`).

4

Performing CDMA Tests

This chapter shows detailed steps used in running each of the CDMA tests and utilities that are available in the Software.

Overview

This chapter provides details about each CDMA test in the `Test Selections` menu and is intended to be used after your Test System has been installed. This chapter also describes how to use tests in the `Utilities` menu.

The following test procedures are intended to take you from setting up a test to getting and reviewing test results. These procedures call attention to certain steps that should be made prior to making measurements.

Getting Ready to Run Tests

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

1. The Software has been loaded and run, and test information in the `Configuration and Setup` is correctly entered. Make sure you have performed all steps in the previous chapters, including:
   - **"Load and Run the LGIC CDMA PCS BTS Test Software" on page 33**.
   - **"Test Configuration and Setup" on page 41**.
2. You have changed the test parameters and pass/fail limits in the `Test Parameters/Specs` to run each CDMA test for your specific needs. See **"Test Parameters and Specifications" on page 45**.

   When testing begins, the Software uses the test parameters and pass/fail limits associated with each test to alter test system settings. The test parameter entries affect how tests run and how test results appear. The values entered into the pass/fail limits fields are used to determine if measurement results pass or fail.

   Default values of the pass/fail limits are predefined in the Software at the factory, and they are derived from the LGIC's CDMA base station test procedures. These default values may be changed to suit your specific requirements, but usually, it *is not* necessary to change them.

   The test parameters and pass/fail limits used by each test are listed with the test descriptions in this chapter. You should review the parameters and limits for each test to make sure that their settings match your testing conditions.

Selecting Tests

Tests are selected from the `Test Selections` menu. To select the tests you want to run, follow these steps:

1. Select `Test Selections` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.).
2. Select `Test Sector` and choose a sector to be tested.
3. Select `Test Channel` and choose a channel number to be tested.
4. Select `Test Rx Path` and choose a receiver path from the list of `Rx Path:` choices if you want to run the receiver tests.
5. Select the tests you desire to run. Press k2 (`Add test`) or k3 (`Del test`) on the `Test Selections Menu`.

   You can choose `*Add All` to choose all the test items, or you can choose `*Delete All` to delete all the test items.

   The Software runs the suite of tests in the order shown in the `Selected Test Items:` *list, one at a time.*
6. Position the cursor to `*Done` and press the knob or press k5 (`Done`) to exit the add/delete mode.

   After selecting the test items, review the cable loss compensation selection (`Yes` or `No`) and the settings in the cable loss information section at the bottom of the screen before starting testing. **See "Test Configuration and Setup" on page 41** for information on how to measure and compensate for cable loss.

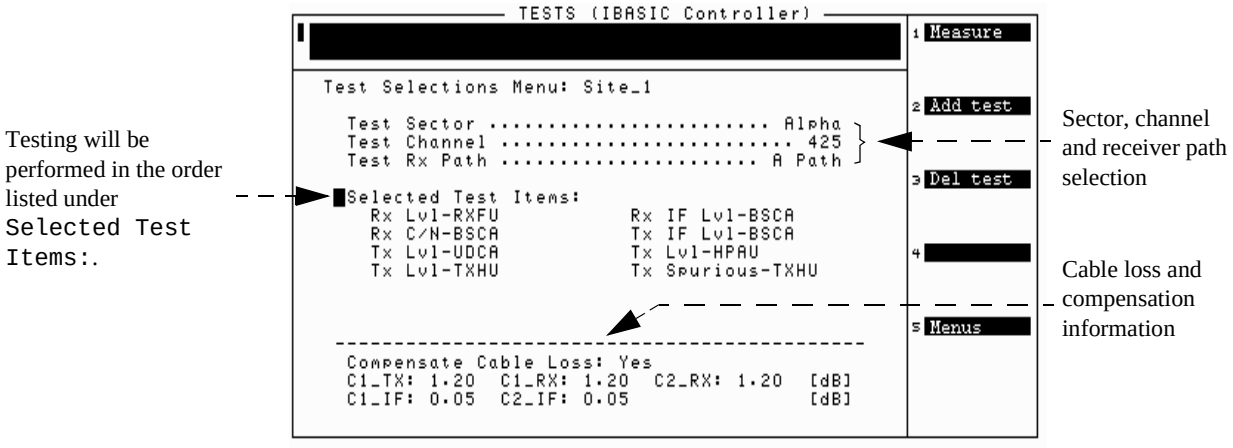


Figure 15 Test Selections Menu

The Software allows you to make measurements for the following tests. Use the following list to locate the detailed procedures for running each test:

Saving a Test Procedure

A test procedure is a collection of the settings and selections in the `Configuration and Setup`, `Test Parameters/Specs`, and `Test Selections` menus. It is recommended that you save all of the configurations and settings within the Software as a test procedure file for later retrieval. This eliminates the need to re-enter the information if you run a different program, if you change the configurations and test parameters and specifications when testing another cell site, or if you install new operating system firmware in your Test Set. See **"Saving/Recalling/Filing a Test Procedure" on page 63**.

Selecting Print/Data Collection

Sometimes it is preferable to record the test results for future reference or evaluation. The Test Set and Software provide the capability to send test results to external devices such as a PC, printer, or PC card. Before you start testing, you need to tell the Software how the test results be recorded. See **"How to Setup External Devices" on page 147** for more information.

Running Tests

After selecting the tests, you are now ready to run CDMA tests.

1. Press k1 (`Measure`) on the `Test Selections Menu` to start testing. At the start of each test sequence, you will be prompted to make connections between the Test Set and base station. See **figure 4 on page 29** and **figure 5 on page 30** to locate the test ports and **table 1 on page 30** to see how to make connections for each of tests. Press k1(`Proceed`) when the connections have been made.

   The connections used by each test are also listed with the test ports in this chapter.

NOTE: Some tests include steps that prompt you to set the base station to the desired conditions for the tests using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode and send the control commands to the base station. See **"Laptop Emulator" on page 136** for detailed information on how to use the laptop emulator. After setting to the desired conditions, exit the laptop emulator mode by pressing k5 (`Return`) and press k1 (`Proceed`) to make measurements.

CAUTION: The Test Set's ANT IN port is only used for very low signal levels ≤60 mW (17.78 dBm). Therefore, to prevent damage to the Test Set, *never* connect this port to the base station's TX antenna or HPAU direct output port. The ANT IN port is typically connected to the base station's coupling (sample) port.

The Test Set's RF IN/OUT port is used for CDMA signal ≤15 W and is connected to the TX antenna or HPAU direct output port. If you suspect that these ports are above this level, you should use a power attenuator and enter the attenuation value in the `Attenuation at HPAU, TXHU` parameter. See **`"Attenuation at HPAU, TXHU [dB]"` on page 43**.

2. Most of tests use the `Use Power Meter Screen When` parameter on the `Test Parameters/Specs` menu. If you set this parameter to `Always` or `Fail`, the Test Set will first display a power meter bar and power levels as numeric values in units of both dBm and µW, mW or W during testing on the Test Set's display (see **figure 16 on page 74** or **figure 18 on page 76**).

   If you set this parameter to `None`, or if the test does not have the `Use Power Meter Screen When` parameter, the Test Set will show a connection diagram for the next test item or show the test result table if all the selected test items have been measured.

   The power meter screen allows you to *adjust* the BTS's power level until the measurements are within the lower (`min`) and upper (`max`) limits if the measurement's results fall outside the specified limits (see **page 76** and **figure 18 on page 76**).

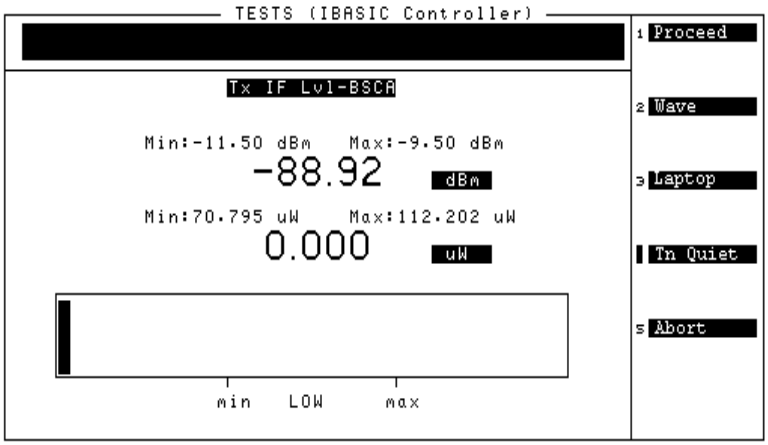


Figure 16 **An Example Power Meter Screen (before adjusting BTS's power level)**

The following list explains how to use the power meter screen's USER keys (k1 through k5).

a Press k1 (`Proceed`) to run the next test.

The Test Set will display a connection diagram of the next test item or the Test Set will go to the test results table if this test is the last test item you have selected. See **"Reviewing Test Results" on page 77** for information on how to use the USER keys on this screen.

b Press k2 (`Wave`) to view a plot of power level versus frequency. This screen also shows the power level of the center frequency (`CF`), span, peak frequency, and peak level as numeric values.

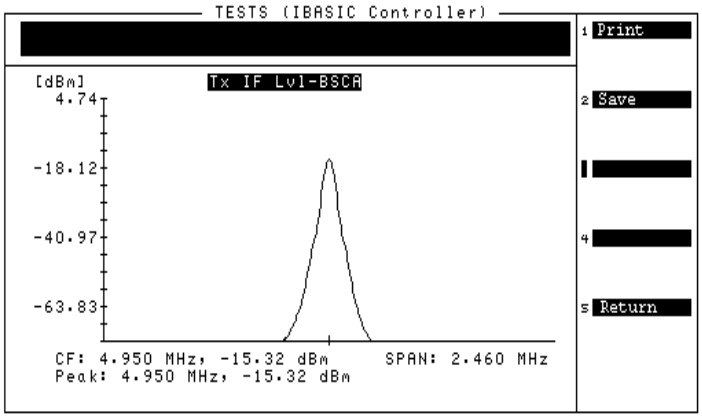


Figure 17 An Example Screen Showing a Waveform

You can send the plot directly to a printer, PC, or PC card as a screen image. The following list explains how to use the USER keys on the waveform screen.

- Press k1 (`Print`) or the **Print** UTILS key to send the plot to a printer or PC as a screen image file. Notice that when you press the k1 (`Print`) key, a different set of softkeys is displayed. See **"Sending Test Results to a Printer" on page 154** or **"Sending Test Results to a PC or PC Card" on page 156** for detailed information on how to send the plot to a printer or PC.
- Press k2 (`Save`) and enter a file name to save the plot to a PC card as a screen image file. To enter the file name, use the characters in the `Choices:` list. Position the cursor in front of the desired characters and press the knob to enter each character. Then select `Done` (at the top of the choices list).

  After saving the file to the PC card, you can transfer the file to a PC or printer, or you can review it on the Test Set's display. See **"How to Transfer a Data Collection File from a PC Card" on page 66** or **"How to View a Screen Image File on the Test Set's Display" on page 68**.
- Press k5 (`Return`) to return to the previous screen.

c Press k3 (`Laptop`) to adjust the BTS power level by sending control commands using the Test Set's laptop emulator.

- You have to connect an RS-232 cable between Test Set's SERIAL 10 port and the base station to send control comands. See **"Connect the Test Set for BTS Control" on page 32**.
- After connection has been made, press k1 (`Proceed`) to enter into the laptop emulator mode, and adjust the power level. See **"Laptop Emulator" on page 136** for detailed use of the Test Set's laptop emulator. Note that the baud rate of the Test Set's SERIAL 10 port is set to 9600.
- After you have finished using the laptop emulator, press k5 (`Return`) to exit the laptop emulator mode. The power meter's bar should now be within the lower and upper limits if you adjusted the BTS's power level properly (see **figure 18 on page 76**). Repeat these steps if the power meter bar still falls outside specified limits.

  You can also adjust BTS's power level by manually controlling the base station.

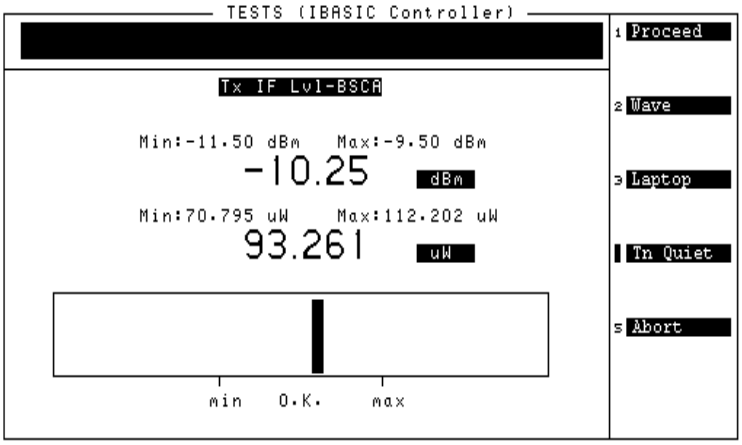


Figure 18 **An Example Power Meter Screen (after adjusting BTS's power level)**

d A beeping tone accompanies the measurement to assist in adjusting your base station's power without looking at the display. Adjust the tone's volume by pressing k4 (`Tn Quiet`/`Tn Loud`/`Tn Off`).

e Press k5 (`Abort`) if you need to stop the measurement. Depending on the state of the system, it can take up to 30 seconds for the test to stop. The Test Set shows only the results of the tests which are already performed on the display but the other tests will be cancelled.

Reviewing Test Results

When testing is complete for all the selected test items, the Test Set will show a test results table on the display. If a measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column (see **figure 19 on page 78**). The following list explains how to use the USER keys on this screen.

- Press k1 (`Print`) or the **Print** UTILS key to send the test results table to a printer or to a PC as a screen image. Notice that when you press the k1 (`Print`) key, a different set of softkeys is displayed. See **"Sending Test Results to a Printer" on page 154** or **"Sending Test Results to a PC or PC Card" on page 156** for detailed information on how to configure the Software.

NOTE: The test results can be sent directly to a printer through the Test Set's SERIAL 9, PARALLEL 15 or HP-IB port. When the test results are printed out, you can see the ''lower'' and ''upper'' limits defined in the `Test Parameters/Specs` menu. See **"Sending Test Results to a Printer" on page 154**.

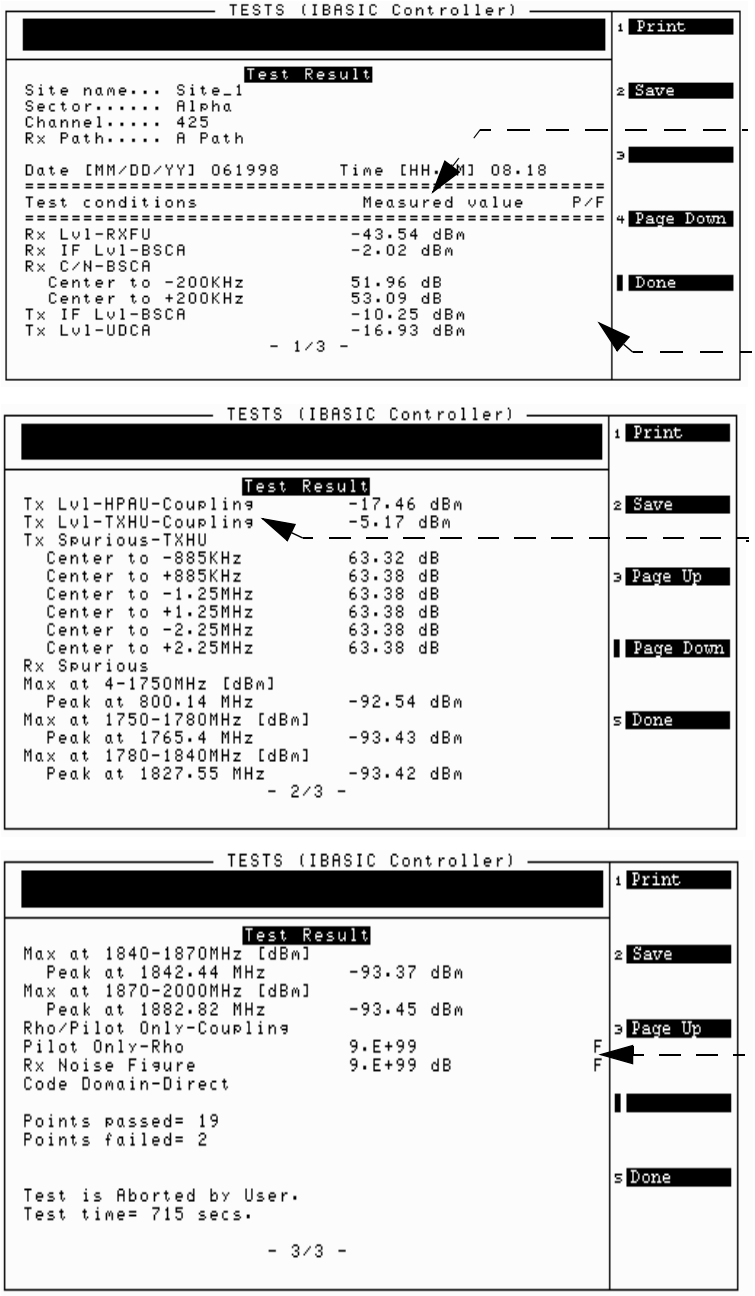
- Press k2 (`Save`) and enter a file name to save the test result to a PC card. To enter the file name, use the characters in the `Choices:` list. Position the cursor in front of the desired characters and press the knob to enter each character. Then select `Done` (at the top of the choices list).

  After saving the file to the PC card, you can transfer the file to a PC or printer or view it on the Test Set's display. See **"How to Transfer a Data Collection File from a PC Card" on page 66** or **"How to View a Screen Image File on the Test Set's Display" on page 68**.

NOTE: The test results can be directly sent to a PC via the Test Set's SERIAL 9 port or to a PC card. When you review the test results, you can see the ''lower'' and ''upper'' limits defined in the `Test Parameters/Specs` menu. See **"Sending Test Results to a PC" on page 156** or **"Sending Test Results to a PC Card" on page 159**.

- Press k5 (`Done`) to return to the `Test Selections Menu` screen.

NOTE: You may use k3 (`Page Up`) or k4 (`Page Down`) when you review the test results.



If you set the `Output Result For` parameter to `All`, the measurement values will be shown whether or not the results fall inside the pass/fail limits, but if you set it to `Fail`, the measurement values will be shown when only the results fall outside the limits.

If an‘‘F’’ is not shown in the pass/fail column, the measurements fall inside your specified limits (pass).

This tells you that the measurement has been made at the ‘‘Coupling’’ port.

The F (Fail) tells you that the measured value falls outside of the specified limits.

Figure 19 An Example of Test Results

RX Lvl - RXFU Test

The RX Level - RXFU test measures the level of a CW signal at the RX output (RF OUT) port on the RXFU module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for detailed descriptions.

Parameters:

- `Use Power Meter Screen When`
- `Generator CW Signal Level`

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **RF OUT** port on the base station's RXFB module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.
- Connect *Cable 2* (see **page 43**) between the Test Set's **DUPLEX OUT** port and **RF IN** port on the base station's RXFB module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 21**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

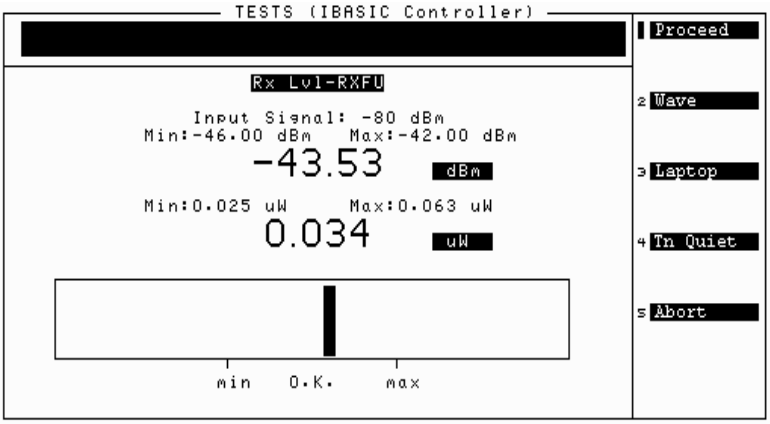


Figure 20 **Power Meter Screen for RX Level - RXFU Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 20 on page 80**), the Test Set will show the test result table on the display when the testing is complete. If the measurement results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

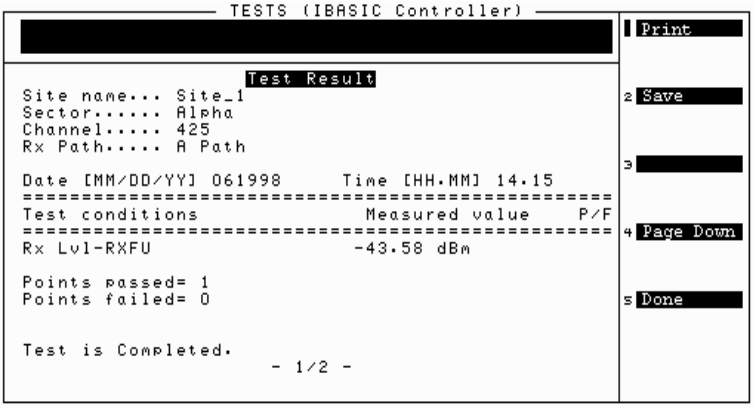


Figure 21 **Test Results Table for RX Level - RXFU Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

RX IF Lvl - BSCA Test

The RX IF Level - BSCA test measures the level of the 4.95 MHz IF CW signal at the UDCA RX output port on the UDCB module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`
- `Generator CW Signal Level`

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **UDCA RX OUT** port on the base station's UDCB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.
- Connect *Cable 2* (see **page 43**) between the Test Set's **DUPLEX OUT** port and **RF IN** port on the base station's RXFB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing (see **figure 23**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

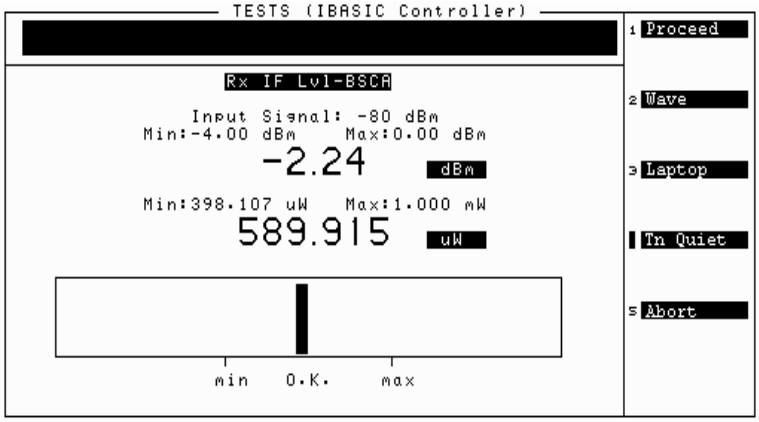


Figure 22 **Power Meter Screen for RX IF Level - BSCA Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 22 on page 83**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

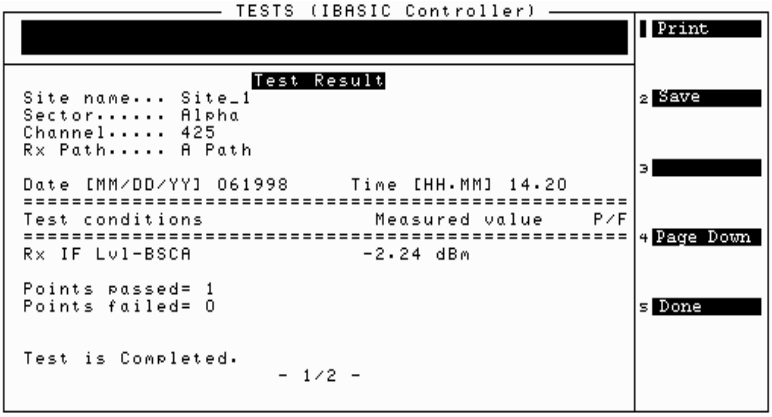


Figure 23 **Test Results Table for RX IF Level - BSCA Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

RX C/N - BSCA Test

The RX C/N - BSCA test measures the signal level at both the carrier frequency (f_c) and f_c ±200 kHz. The difference between these levels is the RX carrier-to-noise (C/N) value. This test is measured at the UDCA RX output port on the UDCB module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`
- `Generator CW Signal Level`

Specifications (Pass/Fail Limits):

- `Min C/N Ratio`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **UDCA RX OUT** port on the base station's UDCB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.
- Connect *Cable 2* (see **page 43**) between the Test Set's **DUPLEX OUT** port and **RF IN** port on the base station's RXFB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 25**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

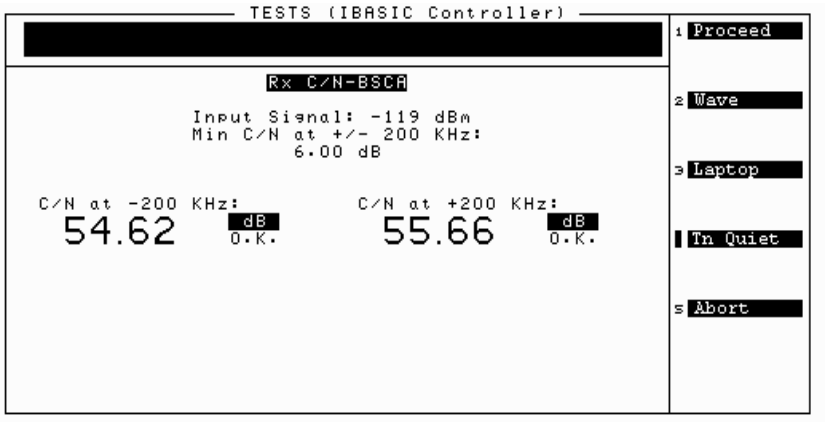


Figure 24 **Power Meter Screen for RX C/N - BSCA Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 24 on page 86**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's result falls outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

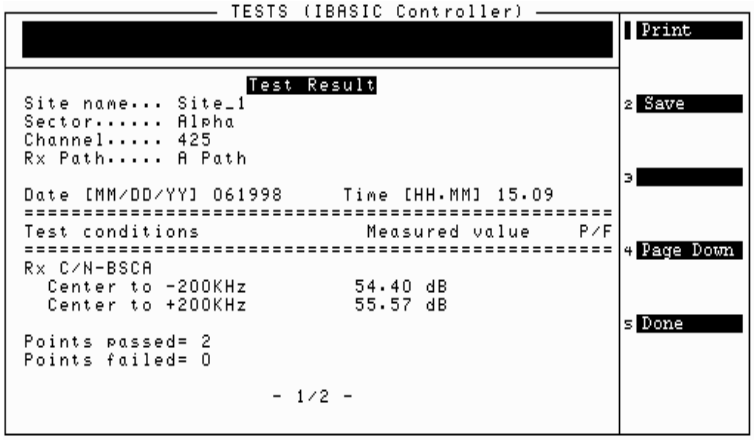


Figure 25 **Test Results Table for RX C/N - BSCA Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

TX IF Lvl - BSCA Test

The TX IF Level - BSCA test measures the level of the 4.95 MHz IF CDMA signal at the BSCA TX output port on the CCBB module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **BSCA OUT** port on the base station's CCBB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 27**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

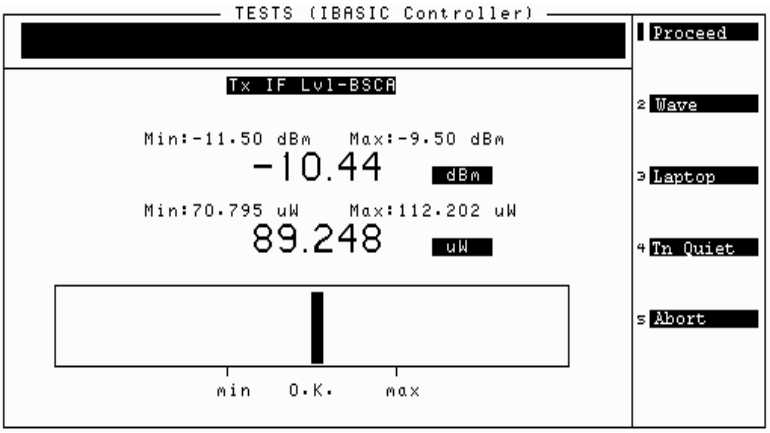


Figure 26 **Power Meter Screen for TX IF Level - BSCA Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 26 on page 90**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

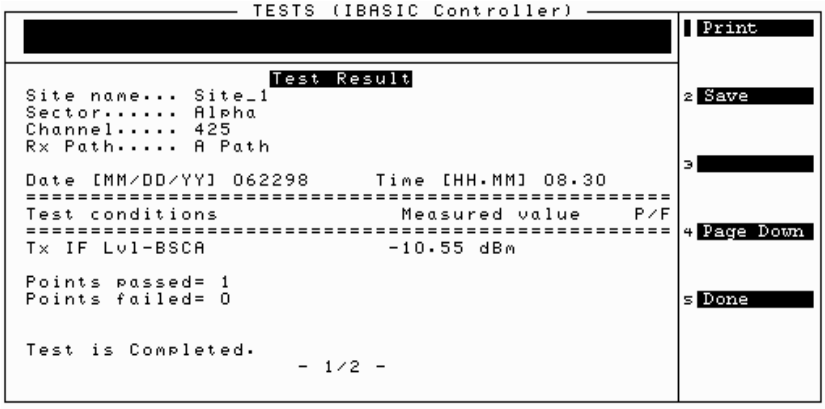


Figure 27 **Test Results Table for TX IF Level - BSCA Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

TX Lvl - UDCA Test

The TX Level - UDCA test measures the level of the CDMA signal at the UDCA TX output port on the UDCB module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **UDCA TX OUT** port on the base station's UDCB module. You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 29**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

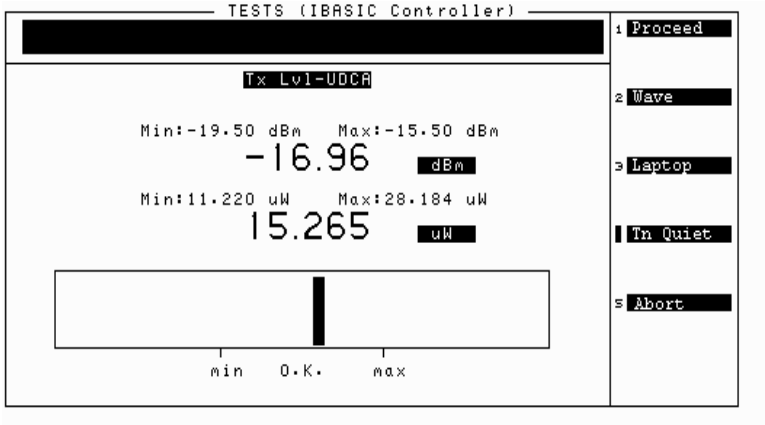


Figure 28 **Power Meter Screen for TX Level - UDCA Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 28**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

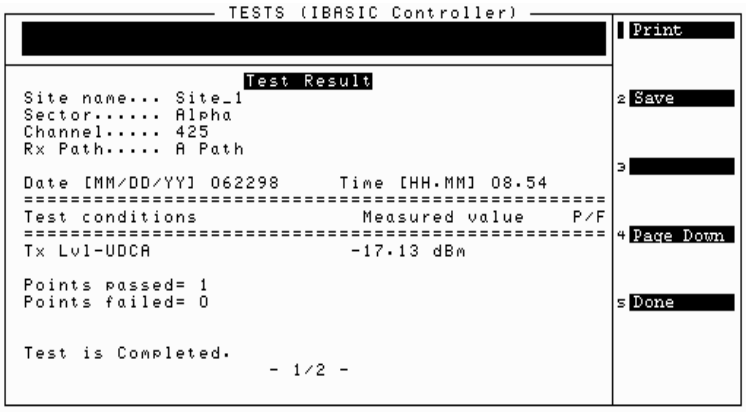


Figure 29 **Test Results Table for TX Level - UDCA Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

TX Lvl - HPAU Test

The TX Level - HPAU test measures the level of the CDMA signal at the HPAU output port on the HPAU module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`
- `Base Station Measurement Port`
- `Coupling Factor Table` - You enter the coupling factors for each of sectors and channels in this table.

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** or **RF IN/OUT** port and **HPAU OUTPUT** (RF OUT) port on the base station's HPAU module. If you set the `Base Station Measurement Port` to `HPAU Coupling Port`, connect the Test Set's **ANT IN** port to the ''**Sample (H4)**'' port. If you set the `Base Station Measurement Port` to `HPAU Output Port`, connect the Test Set's **RF IN/OUT** port to the ''**Direct Output (H5)**'' port.

  You must connect this cable to the sector and channel that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's direct output exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 31**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

This shows that the coupling port is selected as `Base Station Measurement Port` on the `Test Parameters/Specs` menu.

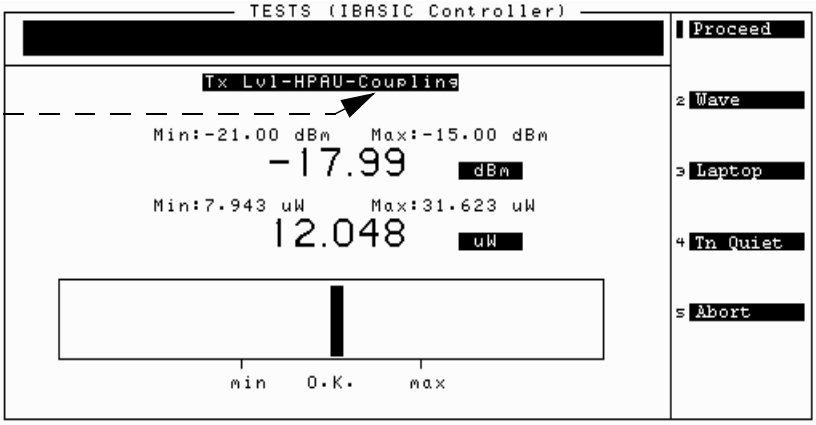


Figure 30 **Power Meter Screen for TX Level - HPAU Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 30**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

This shows that the coupling port is selected as `Base Station Measurement Port` on the `Test Parameters/Specs` menu.

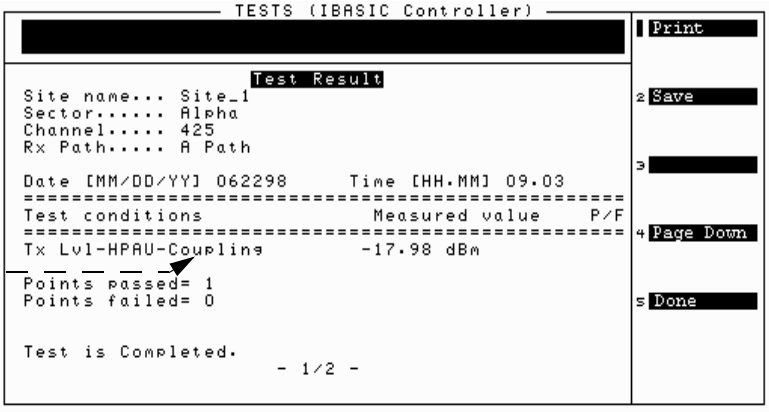


Figure 31 **Test Results Table for TX Level - HPAU Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

TX Lvl - TXHU Test

The TX Level - TXHU test measures the level of the CDMA signal at the TXHU output port.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`
- `Base Station Measurement Port`
- `Alpha Coupling Factor`
- `Beta Coupling Factor`
- `Gamma Coupling Factor`

Specifications (Pass/Fail Limits):

- `Min Level`
- `Max Level`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** or **RF IN/OUT** port and **TXHU OUTPUT** port on the base station's TXHU module. If you set the `Base Station Measurement Port` to `TXHU Coupling Port`, connect the Test Set's **ANT IN** port to the ''**Sample**'' port. If you set the `Base Station Measurement Port` to `TXHU Antenna Port`, connect the Test Set's **RF IN/OUT** port to the ''**Tx (ANT)**'' port.

  You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's antenna port exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 33**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

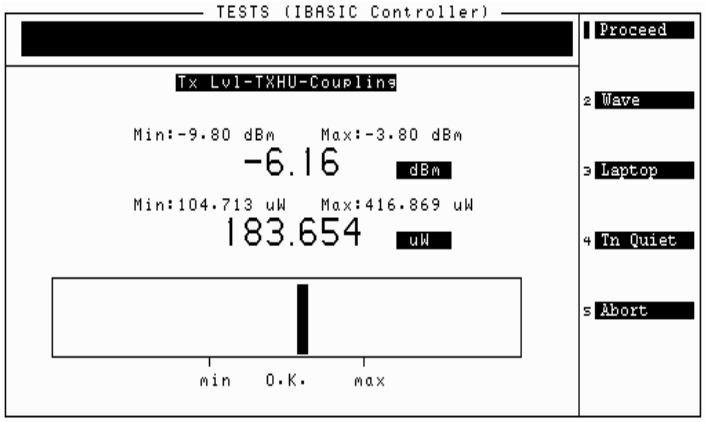


Figure 32 **Power Meter Screen for TX Level - TXHU Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 32 on page 99**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

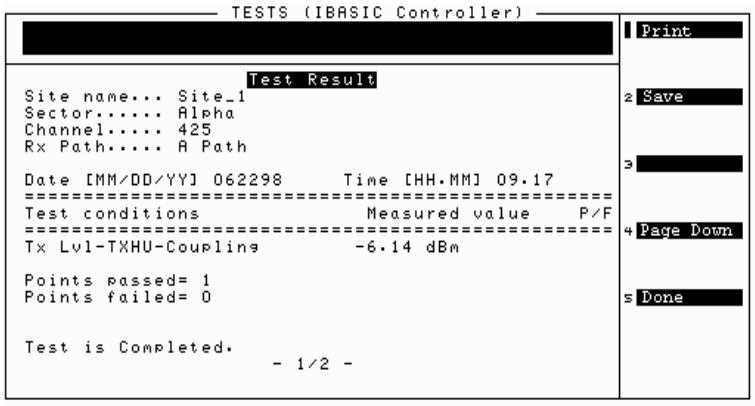


Figure 33 **Test Results Table for TX Level - TXHU Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

TX Spurious - TXHU Test

The TX Spurious - TXHU test measures spurious emissions at frequencies that are outside the specified CDMA channel, measured at the TXHU output port.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Use Power Meter Screen When`

Specifications (Pass/Fail Limits):

- `Min at fc +/- 885 kHz`
- `Min at fc +/- 1.25 MHz`
- `Min at fc +/- 2.25 MHz`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **RF IN/OUT** port and **TXHU OUTPUT (Tx ANT)** port on the base station's TXHU module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's antenna port exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

If you set the `Use Power Meter Screen When` parameter to `Always` or `Fail`, the Test Set will show the power meter screen and power levels as numeric values in units of both dBm and µW, mW or W on the display.

The descriptions of the USER keys on this screen are briefly listed below. See **"Running Tests" on page 73** for more detailed information on how to use the USER keys (softkeys) on this screen.

- Press k1 (`Proceed`) to proceed to the test results table when you are finished testing on this screen (see **figure 35**).
- Press k2 (`Wave`) to view a plot of power versus frequency.
- Press k3 (`Laptop`) to send control commands to the base station.
- Press k4 (`Tn Quiet` / `Tn Loud` / `Tn Off`) to adjust the tone's volume.
- Press k5 (`Abort`) to stop the measurement.

This shows that the measurement results fall inside of your specified limits.

This shows that the measurement results fall outside of your specified limits.

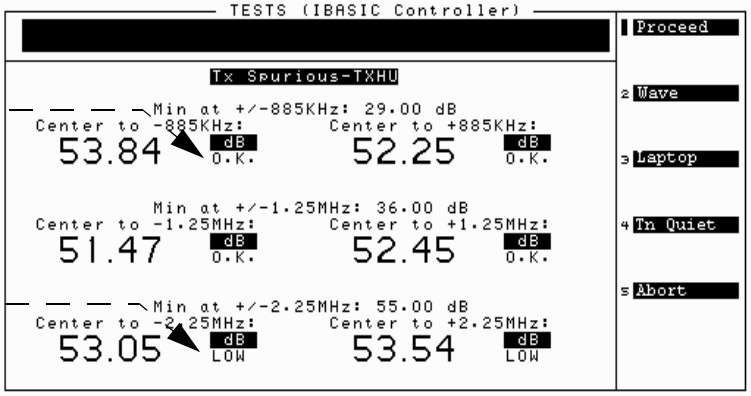


Figure 34 **Power Meter Screen for TX Spurious - TXHU Measurement**

Review the Results

1. If you set the `Use Power Meter Screen When` parameter to `None` or if you press k1 (`Proceed`) on the power meter screen (see **figure 34 on page 101**), the Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

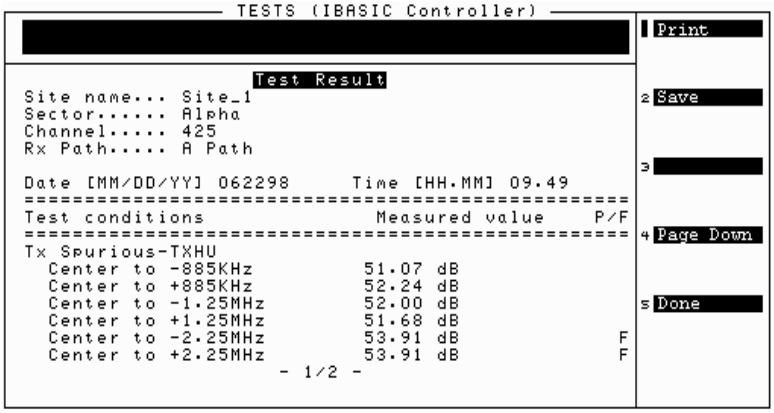


Figure 35 **Test Results Table for TX Spurious - TXHU Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

RX Spurious Test

The RX Spurious - TXHU test measures spurious emissions which are generated or amplified inside the BTS, then appear at the RX input port.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- *None used for this test*

Specifications (Pass/Fail Limits):

- `Max at 4 - 1750 MHz`
- `Max at 1750 - 1780 MHz`
- `Max at 1780 - 1840 MHz`
- `Max at 1840 - 1870 MHz`
- `Max at 1870 - 2000 MHz`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **RF INPUT (RF IN)** port on the base station's RXFB module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

NOTE: This test may include steps that prompt you to disable the RF output of the transmitter.

Select and Run the Test

See "Selecting Tests" on page 71 and "Running Tests" on page 73 for the steps on how to select and run the test.

Review the Results

1. The Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an F in the P/F column.

   See "Reviewing Test Results" on page 77 for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

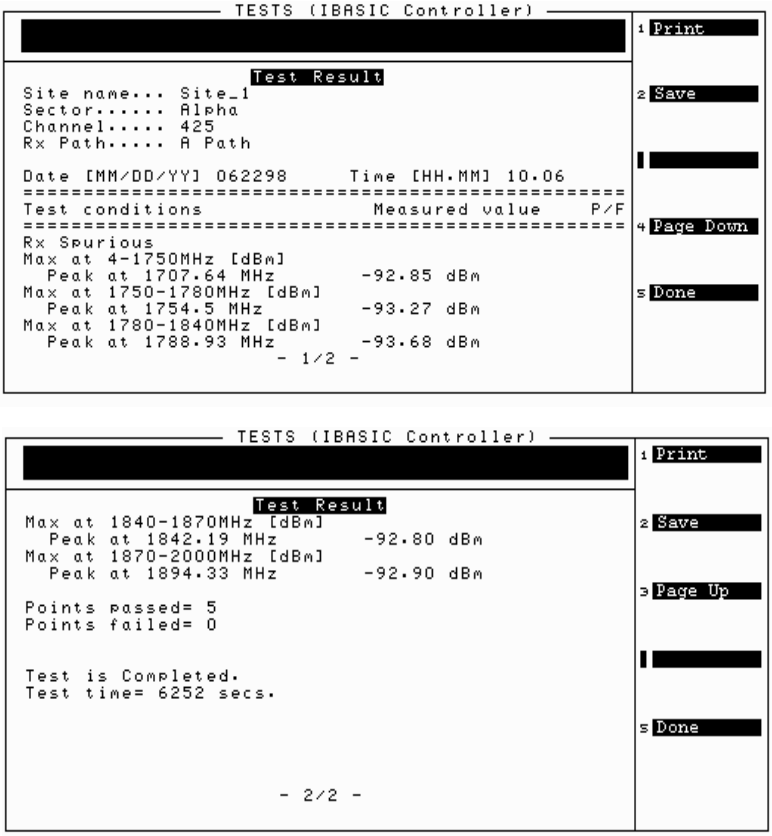


Figure 36 **Test Results Table for RX Spurious Measurement**

2. Press k5 (Done) to return to the Test Selections Menu.

Rho/Pilot Only Test

The Rho/Pilot Only Test performs a suite of CDMA tests on a carrier with only the pilot channel active (no active traffic or paging channels). This is out-of-service testing of the base station. The tests performed are:

- Rho (modulation quality)

  Rho is a measure of CDMA waveform quality. In this measurement, the modulated CDMA signal is compared to an ideal reference waveform to determine the performance of the transmitter's modulation circuitry.

- Time offset

  Time offset measures how well the transmitter's signal is time-aligned to system time (GPSR time).

- Frequency error

  Frequency error measures the difference between the transmitter's actual center frequency and the specified CDMA transmit frequency assignment.

- Carrier feedthrough

  Carrier feedthrough is a result of the RF carrier signal feeding through the I/Q modulator and getting on the transmitter's output circuitry without getting modulated. The most common cause of high carrier feedthrough is I/Q modulator DC offsets.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Base Station Measurement Port`
- `Alpha PN Offset`
- `Beta PN Offset`
- `Gamma PN Offset`

Specifications (Pass/Fail Limits):

- `Max Time Offset`
- `Max Freq Error`
- `Max Carrier FeedThru`
- `Min Rho`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect the Test Set's **EVEN SECOND SYNC IN** port to the base station's even second clock port (**EVEN_SEC**) on the CCBB module.
- Connect the Test Set's **EXT REF IN** port to the base station's system clock port (**SYS_CLK**) on the CCBB module.
- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** or **RF IN/OUT** port and **TXHU OUTPUT** port on the base station TXHU module. If you set the `Base Station Measurement Port` to `Coupling`, connect the Test Set's **ANT IN** port to the ''**Sample**'' port. If you set the `Base Station Measurement Port` to `Direct`, connect the Test Set's **RF IN/OUT** port to the ''**Tx ANT**'' port.

  You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's antenna port exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** for the steps on selecting a test and **"Running Tests" on page 73** for running a test.

NOTE: The Test Set displays instructions that prompt you to configure the base station appropriately for this test. You can set the base station to the desired conditions using the Test Set's laptop emulator. Press k3 (`Laptop`) to enter into the laptop emulator mode from this screen. See **"Laptop Emulator" on page 136** for information on how to send control commands using the Test Set's laptop emulator.

You must connect an RS-232 cable between the Test Set's SERIAL 10 port and the base station's control port to send the control commands. See **"Connect the Test Set for BTS Control" on page 32**.

Review the Results

1. The Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an F in the P/F column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

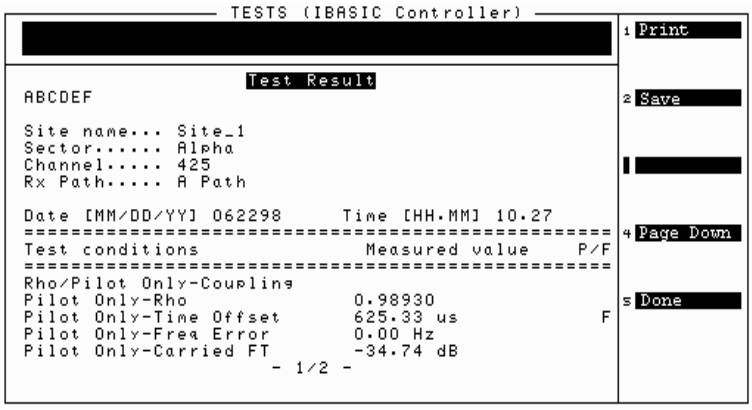


Figure 37 **Test Results Table for Rho/Pilot Only Measurement**

2. Press k5 (Done) to return to the Test Selections Menu.

Rho/Traffic Test

Unlike the Rho/Pilot Only test, the Rho/Traffic test performs a suite of CDMA tests on a carrier with all the CDMA channels active. *This test is identical to the* `Rho/Pilot Only` *test except it is performed with the base station in-service*. The tests performed are:

- Rho (modulation quality)

  Rho is a measure of CDMA waveform quality. In this measurement, the modulated CDMA signal is compared to an ideal reference waveform to determine the performance of the transmitter's modulation circuitry.

- Time offset

  Time offset measures how well the transmitter's signal is time-aligned to system time (GPSR time).

- Frequency error

  Frequency error measures the difference between the transmitter's actual center frequency and the specified CDMA transmit frequency assignment.

- Carrier feedthrough

  Carrier feedthrough is a result of the RF carrier signal feeding through the I/Q modulator and getting on the transmitter's output circuitry without getting modulated. The most common cause of high carrier feedthrough is I/Q modulator DC offsets.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Base Station Measurement Port`
- `Alpha PN Offset`
- `Beta PN Offset`
- `Gamma PN Offset`

Specifications (Pass/Fail Limits):

- `Max Time Offset`
- `Max Freq Error`
- `Max Carrier FeedThru`
- `Min Rho`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect the Test Set's **EVEN SECOND SYNC IN** port to the base station's even second clock port (**EVEN_SEC**) on the CCBB module.
- Connect the Test Set's **EXT REF IN** port to the base station's system clock port (**SYS_CLK**) on the CCBB module.
- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** or **RF IN/OUT** port and **TXHU OUTPUT** port on the base station TXHU module. If you set the `Base Station Measurement Port` to `Coupling`, connect the Test Set's **ANT IN** port to the ''**Sample**'' port. If you set the `Base Station Measurement Port` to `Direct`, connect the Test Set's **RF IN/OUT** port to the ''**Tx ANT**'' port.

  You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's antenna port exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

Review the Results

1. The Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an F in the P/F column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

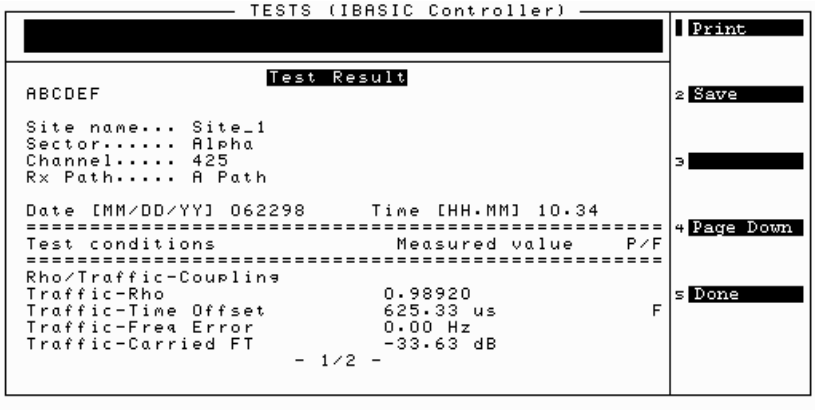


Figure 38 **Test Results Table for Rho/Traffic Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

Code Domain Tests

The code domain tests perform a suite of CDMA transmitter tests on the selected channels and sectors.

The tests performed are:

- Walsh Code Timing

  This test measures the time error of each of the active Walsh channels relative to the received pilot channel (Walsh channel 0).

- Walsh Code Phase

  This test measures the phase difference between each of the active Walsh channels relative to the pilot channel (Walsh channel 0).

- Maximum Inactive Walsh Code Power

  This test measures the *relative* power of the maximum *inactive* Walsh code power. Power levels measured are relative to the total of the signal in a 1.23 MHz bandwidth.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- `Base Station Measurement Port`
- `Inactive Walsh Code Threshold`

Specifications (Pass/Fail Limits):

- `Max Inactive Walsh Code`
- `Max Timing Error`
- `Max Phase Error`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect the Test Set's **EVEN SECOND SYNC IN** port to the base station's even second clock port (**EVEN_SEC**) on the CCBB module.
- Connect the Test Set's **EXT REF IN** port to the base station's system clock port (**SYS_CLK**) on the CCBB module.
- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** or **RF IN/OUT** port and **TXHU OUTPUT** port on the base station TXHU module. If you set the `Base Station Measurement Port` to `Coupling`, conenct the Test Set's **ANT IN** port to the ''**Sample**'' port. If you set the `Base Station Measurement Port` to `Direct`, conenct the Test Set's **RF IN/OUT** port to the ''**Tx ANT**'' port.

  You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

NOTE: If you suspect that the power level at the base station's antenna port exceeds 15 W (41.77 dBm), you should use a power attenuator and enter the attenuation value into the `Attenuation at HPAU, TXHU` parameter on the `Configuration and Setup` menu before running this test.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

Review the Results

1. The Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

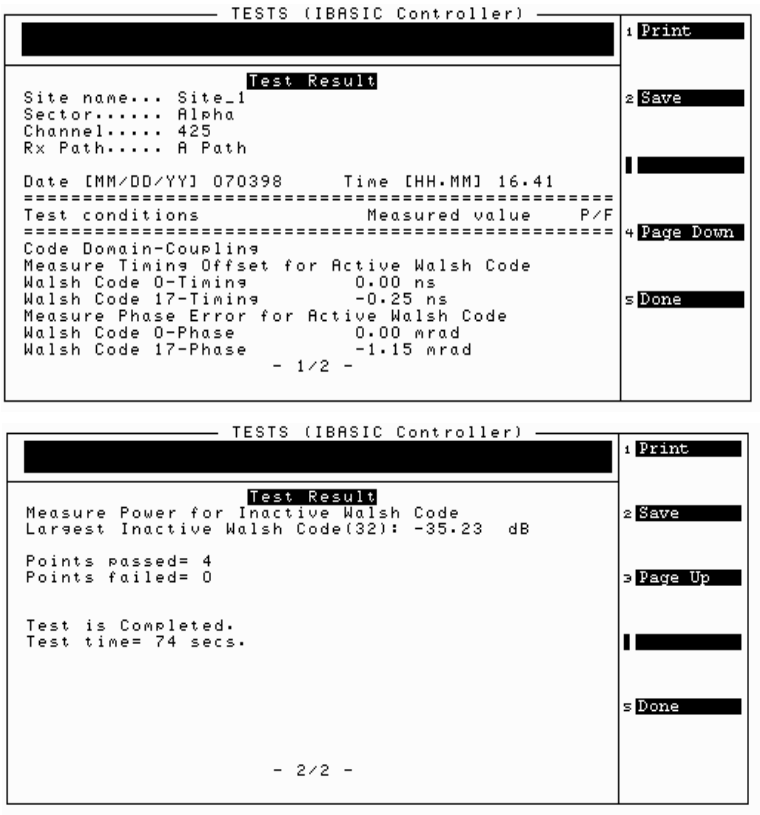


Figure 39 **Test Results Table for Code Domain Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

RX Noise Figure Test

The sensitivity of the receiver is set by the noise presented to the receiver with the desired CDMA signal. Noise figure is defined as the ratio of the input signal-to-noise to the output signal-to-noise of the receiver, and it is measured at the UDCA RX output port on the UDCB module.

Parameters and Specifications Used

The following test parameters and specifications are used when running this test. Refer to **"Test Parameters and Specifications Fields and Their Use" on page 47** for descriptions of these parameters.

Parameters:

- *None used for this test*

Specifications (Pass/Fail Limits):

- `Max Noise Figure`

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect *Cable 1* (see **page 43**) between the Test Set's **ANT IN** port and **UDCA RX OUT** port on the base station UDCB module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.
- Connect *Cable 2* (see **page 43**) between the Test Set's **DUPLEX OUT** port and **RF IN** port on the base station RXFB module. You must connect this cable to the sector that you have selected on the `Test Selections Menu`.

See **figure 4 on page 29** to locate the base station connection ports.

Select and Run the Test

See **"Selecting Tests" on page 71** and **"Running Tests" on page 73** for the steps on how to select and run the test.

Review the Results

1. The Test Set will show the test result table on the display when the testing is complete. If the measurement's results fall outside the specified limits, the measurement will fail. A failure is indicated by an `F` in the `P/F` column.

   See **"Reviewing Test Results" on page 77** for detailed information on how to send the test results table to a PC or printer as a screen image file or to save the test results to a PC card.

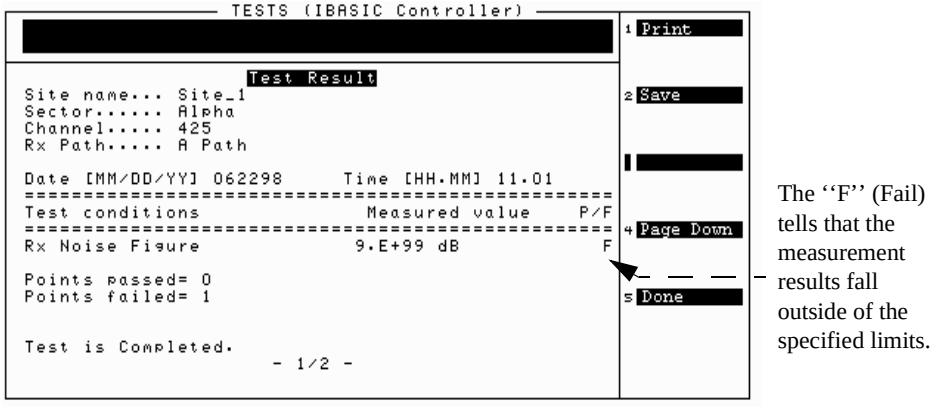


Figure 40 **Test Results Table for RX Noise Figure Measurement**

2. Press k5 (`Done`) to return to the `Test Selections Menu`.

Using the Utilities

The following sections describe the utilities which are available in the Software. The utilities included in the Software's `Utilities` menu are as follows:

- RF Tools
- Laptop Emulator
- PN Offset Search
- Coupling Port Calibration
- Cable Insertion Loss Test
- Check Even Second Clock
- Check 19.6608 MHz Clock
- Check 10 MHz Clock

See "Laptop Emulator," in chapter 5, on page 136 for detailed information on how to use the laptop emulator.

RF Tools

You can access the RF Tools program in two places: in the Test Set's ROM, and in the Software.

- Running the RF Tools program from the Test Set's ROM purges the Software from the Test Set's memory. You must reload the Software and reconfigure all previous settings when you exit the RF Tools ROM program.
- Loading the RF Tools program from the `Utilities` in the Software will temporarily remove the Software from Test Set's memory, then restore both the Software and all settings you made in the Software when you exit the RF Tools program.

NOTE: Before running the RF tools program from the Software, insert the PC card containing the Software's *procedure* and *code* files into the Test Set's front-panel PC card slot. When you load the RF Tools program in the Software, the Test Set will check your card to make sure the correct files are on the PC card. To correctly restore the Software when exiting the RF tools, you must have the PC card which contains the Software procedure and code files inserted in the PC card slot.

Before running the RF tools, you should save any changes in the Software such as settings and values on the `Configuration and Setup`, `Test Parameters/Specs`, test item selections, and testing order on the `Test Selections` menus that you want to use later.

See **"Saving/Recalling/Filing a Test Procedure" on page 63** for information on how to save a test procedure.

The following tests and utilities programs are available in the RF Tools.

- Swept Gain
- Discrete Frequency Insertion Loss
- Swept Insertion Loss
- Swept Return Loss
- Cable Fault
- Replot Data Files
- Transfer Stored Data
- SA (Spectrum Analyzer) Self Calibration ON/OFF
- Catalog PC (Memory) Card
- Test Results/PC Utilities Setup

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, press the knob to activate your choice.)
2. Select `RF Tools`.

NOTE: This procedure includes steps that prompt you to save any changes in the Software before running the RF Tools program and insert the PC card which contains the Software procedure and code files into the Test Set's front-panel PC card slot.

3. Press k1 (`Yes`) to load the RF Tools.
4. Press k1 (`CDMA`) to determine the type of instrument. The `Select Test (Main) Menu` is displayed.
5. Position the cursor at the test you want to run in the `Choices:` list.
6. Press k1 (`Sel Test`) to start the test.
7. Follow the displayed instructions and diagrams to proceed with the test.

   Refer to the HP 8935 Reference Guide supplied with the Test Set for details on how to set the parameters for the specific measurements and how to review the test results of each measurement.
8. After running the test, press k5 (`Quit`) or select `Return to LGIC CDMA PCS TEST` in `Choices:` list. The Test Set will restore the Software.

PN Offset Search

The PN Offset Search is a utility that can be used when you are testing a sector and do not know its PN offset value. This utility has the Test Set tune to the CDMA channel and search to find the valid PN offset.

Parameters Used

The following test parameters are used when running this test.

- `Estimated Max Power`

  This parameter specifies the estimated maximum power of the signal which is applied to the Test Set's input port.

- `Test Frequency`

  This parameter is used so the Test Set can tune to the CDMA channel of the base station and search for the valid PN offset.

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect the Test Set's **EVEN SECOND SYNC IN** port to the base station's even second clock port (**EVEN_SEC**) on the CCBB module.
- Connect the Test Set's **EXT REF IN** port to the base station's system clock port (**SYS_CLK**) on the CCBB module.
- Connect a cable between the Test Set's **ANT IN** or **RF IN/OUT** port and the base station's test port. If the base station's power is less than 0 dBm (for example, the **Sample** port of the TXHU module or **H4** of HPAU module), you must connect the cable to the ANT IN port. If the base station's power is greater than 0 dBm (for example, the **TX Antenna** port of the TXHU module or **H5** port of the HPAU module), you must connect the cable to the RF IN/OUT port. The connection diagram shown on the display is dependent upon the settings of the `Estimated Max Power` parameter.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `PN Offset Search` from the `Utilities Menu`.
3. Set the following information, if not already applicable.
   - ❒ `Estimated Max Power`
   - ❒ `Test Frequency`
4. Press k1 (`Proceed`).
5. You will be prompted to make connections between the Test Set and base station. Press k1(`Proceed`) when the connections have been made.

Review the Results

The Test Set will begin searching for the PN offset. This is an iterative process and it may take several seconds before returning the PN offset value. Once the value has been found, it will be displayed on the screen.

1. When the PN offset value is displayed, press k1 (`Proceed`) then k5 (`Return`) to return to `Utilities Menu`.

Coupling Port Calibration

The coupling factor is the loss through the directional coupler used to provide the transmitter signal to the coupling port.

This factor is used when you measure the signal level at the base station's coupling ports. It allows the Software to calculate the transmitter's true output power. After measuring the coupling factors, you can enter the values into the fields for the coupling factors on the `Test Parameters/Specs` menu. See **"Test Parameters and Specifications" on page 45** for information on how to enter the coupling factors.

This calibration first measures the level at the coupling port, then measures the level at the antenna or direct output port. The difference in these levels, plus factors such as attenuation losses, is used to determine the loss through the coupling port.

Parameters Used

The following parameter is used when running this test.

- `Test Frequency`

  This parameter is used so the Test Set can tune to the CDMA channel of the base station.

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- First, connect the cable between the Test Set's **ANT IN** port and the base station's **Coupling (Sample)** port. Then connect the cable between the Test Set's **RF IN/OUT** port and the base station's **antenna** or **direct output** port.

NOTE: If you suspect that the power level exceeds 15 W (41.77 dBm) at base station's antenna or direct output port, you should use a power attenuator. To calculate the true coupling factor, you have to add the attenuation value to the measured coupling factor.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Coupling Port Calibration` from the `Utilities Menu`.
3. Set the following information, if not already applicable.

   ❒ `Test Frequency`
4. Press k1 (`Proceed`).
5. You will be prompted to disconnect all the cables from the Test Set and make a connection between the Test Set and base station. Press k1(`Proceed`) when the connection has been made.
6. Follow the displayed instructions and diagram as prompted to continue to make the measurement.

Review the Results

The coupling factor is calculated and displayed at the frequency you specified. Record this value on a label next to the coupling port for future use.

1. When testing is completed, press k1 (`Proceed`) then k5 (`Return`) to return to `Utilities Menu`.

Cable Insertion Loss Test

This test is a utility that can be used to measure the loss associated with RF test cables. You can also measure the insertion loss of filters and other passive devices using this utility. This test uses the Test Set's internal source and measures the relative loss through the cable or device.

This routine requires the use of two external 6 dB attenuators (pads) and a calibration cable. These parts are not standard equipment with the Test Set, but are included in the optional connector kit. See **"Connector Kit" on page 133**.

Parameters Used

The following parameter is used when running this test.

- `Test Frequency`

  This parameter is used so the Test Set can tune to the CDMA channel of the base station.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Cable Insertion Loss Test` from the `Utilities Menu`.
3. Set the following information, if not already applicable.

   ❒ `Test Frequency`
4. Press k1 (`Proceed`).
5. Follow the displayed instructions and diagram as prompted to make connections and measurements.

Review the Results

The measured cable loss is displayed as a single numeric value in units of dB.

1. When testing is completed, press k1 (`Proceed`) then k5 (`Return`) to return to `Utilities Menu`.

Check Even Second Clock

The Check Even Second Clock Signal test is a utility that can check if the even-second clock is found in the base station.

Parameters Used

The following parameter is used when running this test.

- *None used for this test*

Making Connections

For running this test, make connections between the Test Set and the base station as follows:

- Connect a cable between the Test Set's **TRIGGER QUALIFIER IN** port and the base station's even-second clock (**EVEN_SEC**) port on the CCBB module of the base station's rear panel.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Check Even Second Clock` from the `Utilities Menu`.
3. Make the connection as displayed then press k1 (`Proceed`).

Review the Results

1. Once the even-second clock has been found in the base station, a message (`EVEN SECOND CLOCK FOUND`) is displayed on the Test Set's display. When the test result is displayed, press k5 (`Return`) to return to `Utilities Menu`.

Check 19.6608 MHz Clock

The Check 19.6608 MHz Clock test is a utility that can check if the 19.6608 MHz system clock is found in the system.

Parameters Used

The following parameter is used when running this test.

- *None used for this test*

Making Connections

For running this test, make connections as follows:

- Connect a cable between the Test Set's **EXT REF IN** port and the system clock port you desire to check.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Check 19.6608 MHz Clock` from the `Utilities Menu`.
3. Make the connection as displayed then press k1 (`Proceed`).

Review the Results

1. Once the system clock has been found in the system, the green ''External'' indicator on the Test Set's front panel will be turned on.
2. Press k1 (`Proceed`) to return to the `Utilities Menu`.

Check 10 MHz Clock

The Check 10 MHz Clock test is a utility that can check if the 10 MHz reference clock is found in the system.

Parameters Used

The following parameter is used when running this test.

- *None used for this test*

Making Connections

For running this test, make connections as follows:

- Connect the Test Set's **EXT REF IN** port to the system's 10 MHz reference port.

Select and Run the Test

1. Select `Utilities` from the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Check 10 MHz Clock` from the `Utilities Menu`.
3. Make the connection as displayed then press k1 (`Proceed`).

Review the Results

1. Once the 10 MHz reference clock has been found in the system, the green ''External'' indicator on the Test Set's front panel will be turned on.
2. Press k1 (`Proceed`) to return to the `Utilities Menu`.

5

CDMA Tests Software Reference

This chapter describes detailed operation of the Software that was not covered in the **Chapter 4, "Performing CDMA Tests"**. Use this chapter as a supplement when you have questions using the CDMA tests.

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.

BTS – Base Station Transceiver Subsystem
BW – Band Width
CDMA – Code Division Multiple Access
C/N – Carrier to Noise
dB – deciBel
dBm – deciBels with respect to a milliwatt
FA – Frequency Assignment
GPS – Global Positioning System
GPSR – Global Positioning System Receiver
HPA– High Power Amplifier
IF – Intermediate Frequency
PC – Personal Computer
PCS – Personal Communications Services
PN – pseudonoise
RF – Radio Frequency
RX – Receiver
TRX – Transmitter and Receiver
TX – Transmitter

Connections

Refer to the following sections for details on making connections:

Test Set Connections for Establishing a Timebase

Figure 41 shows the most typical configuration for connecting the reference timebase and even-second clock between the base station and the Test Set. This configuration utilizes the base station's clocks for the Test Set's reference.

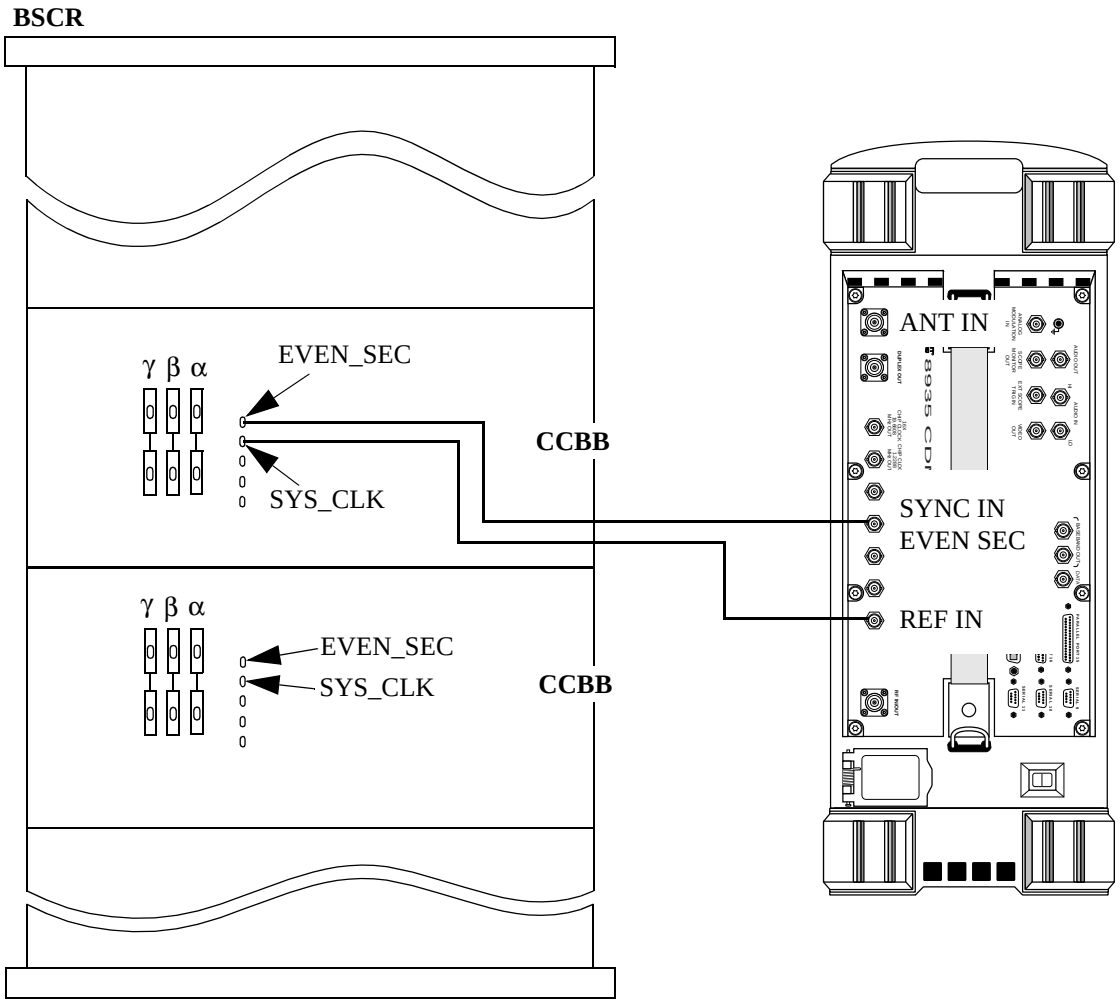


Figure 41 Connections for Base Station's Clocks

Figure 42 shows the connections to the Test Set when using an HP 58503A GPS time and frequency reference receiver to establish a time base. This configuration utilizes a GPS signal for the Test Set's timebase. See **"GPS Time and Frequency Reference Receiver" on page 22** for information on why you use the HP 58503A.

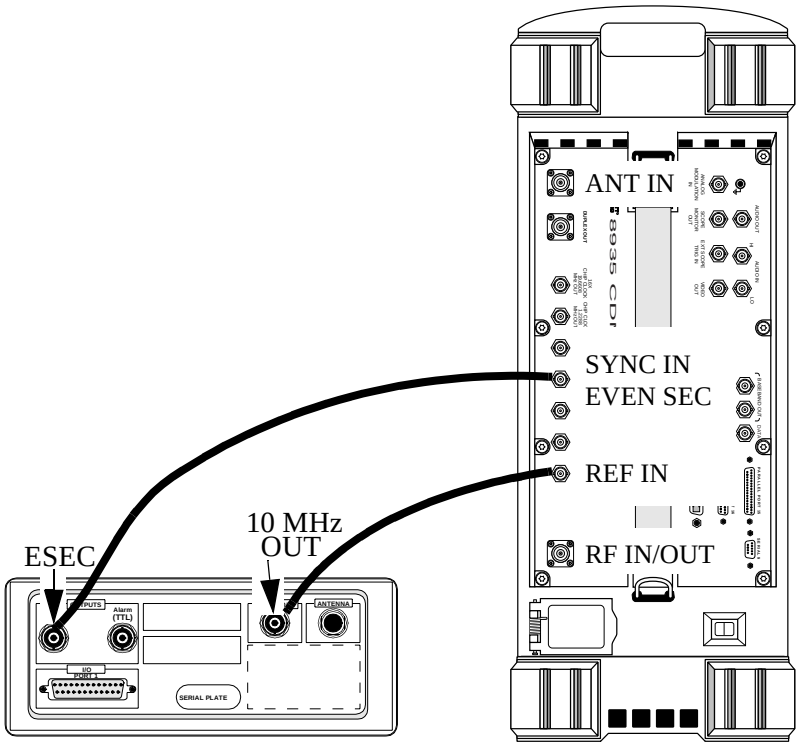


Figure 42 **Connections Using an HP 58503A GPS Time and Frequency Reference Receiver**

Connections for BTS Control

Figure 43 illustrates the connections between the Test Set and base station necessary to send site control commands. You can send control commands directly from the Test Set's laptop emulator or alternatively from the keyboard of the external PC. See **"Laptop Emulator" on page 136** for detailed information on how to use the Test Set's laptop emulator. To send the commands using the external PC keyboard, you need to connect the external laptop PC, additionally, to the Test Set's SERIAL 9 port. See **"Site Control Using the Laptop > BTS Mode" on page 139**.

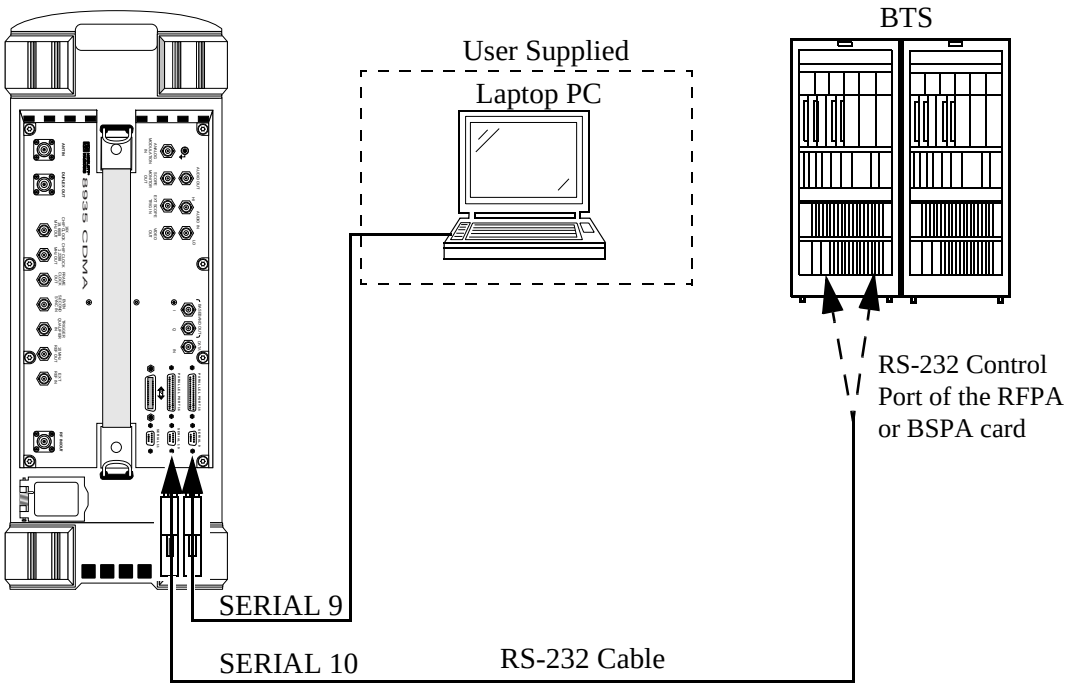


Figure 43 **Connections for Site Control**

Printer Connection

Test results and screen images can be printed to a hard copy (paper). You can connect a printer through the Test Set's SERIAL 9, PARALLEL 15, or HP-IB port. When connecting a printer to the Test Set's SERIAL 9 port, you cannot have an external laptop PC connected at the same time.

For information on connecting and configuring a printer, see **"How to Setup External Devices" on page 147**.

Connector Kit

A special cable kit supplies serial cables, RF cables and adapters needed to connect the Test Set for testing while running the Software. Refer to **Table 2 on page 134** for a list of parts included with the cable accessory kit.

NOTE: The cable accessory kit is *optional*, and is *not included* with the HP 8935, or HP E6388A Software. They are bundled together with the HP E6388A if you order the HP E6551A LGIC CDMA PCS Base Station Test Solution.

Table 2 Connection Kit Contents

Part	Part Number	Quantity	Use
RF Coaxial Cable N(m) to N(m) 3 m (10 ft)	08921-61010	1	Connects the BTS antenna port to the Test Set's RF IN/OUT port or DUPLEX OUT port to BTS receiver input.
RF Coaxial Cable SMB(f) to BNC(m) 3 m (10 ft)	E6551-61002	2	Connects BTS even second clock and 19.6608 MHz clock to Test Set.
RF Coaxial Cable SMA(m) to N(m) 3.7 m (12 ft)	E8300-61002	1	Connects the BTS receiver output to the Test Set's ANT IN or RF IN/OUT port.
Null Modem Cable DB9(f) to DB9(f) 3 m (10 ft)	5182-4794	2	Connects the PC's serial port to the Test Set's SERIAL 9 and the Test Set SERIAL 10 to BTS serial port.
RF Coaxial Fixed Attenuator 6 dB N(m) to N(f)	0955-0819	2	Used for cable insertion loss calibration routines.
RF Adapter, SMA(f) to N(m)	1250-1250	1	Needed for test cable to adapt to a Type N connector.
Adapter DB9(m) to DB9(m)	1253-0062	1	Needed for test cable to adapt to a BTS serial port.
Adapter N(f) to N(f)	1250-0777	1	Used in the cable insertion loss calibration routines for determining insertion loss
Velcro Cable Wrap	1400-2157	10	Used for securing and organizing cables for transporting and during testing.
RF Cable Strain Relief Assy	E8300-61004	2	Used to provide strain relief on RF coaxial cables connected to the base station.
Verification Guide	E6551-90001	1	Used as a checklist for connector kit contents.
Connection Kit Case	E6551-61003	1	Organizes and transports connectors and cables.

Hardware Accessory Kit

The HP 8935 RF Tools Hardware Accessory Kit contains the equipment necessary to run the RF Tools programs. Refer to the Test Set's *Reference Guide* for more information about the RF Tools programs.

NOTE: The RF Tools hardware accessory kit is *optional*, and is *not included* with the HP 8935, or HP E6388A Software. *It can be ordered as Option 001 when the HP E6551A is ordered*.

Table 3 HP 8935 RF Tools Hardware Accessory Kit

Part	Part Number	Quantity	Use
RF Coaxial Cable N(m) to N(m) 0.6 m (2 ft)	8120-8687	2	Used to connect the Test Set to the VSWR bridge.
RF VSWR Bridge N(f)	0955-0829	1	Used during return loss test.
Coaxial 50 Ω Termination N(m)	1250-2656	1	Used to terminate transmission lines.
Short Circuit N(m)	1250-2655	1	Used to terminate the DUT port of the VSWR bridge during return loss test.
2-Way Power Splitter N(f)	0955-0827	1	Used during cable fault test.

Laptop Emulator

Overview

The Test Set has the ability to send control commands to the base station using the Test Set's laptop emulator through the SERIAL 10 port. The laptop emulator can be used instead of (or in conjunction with) a separate laptop PC. This enables you to perform tests without carrying the laptop PC to the base station. Most of the control commands for LGIC CDMA PCS base station tests are defined in the command set of the laptop emulator. This allows you to *set* the base station to the desired conditions or *adjust* the power level during testing.

The Test Set's laptop emulator uses the IBASIC controller and serial I/O capabilities to emulate a terminal device for communications to the base station.

You can access the laptop emulator by pressing k3 (`Laptop`) during testing or by selecting the `Laptop Emulator` from the `Utilities` menu.

Making Connections for the Laptop Emulator

Connect an RS-232 cable between the Test Set's SERIAL 10 port and the RS-232 port of the BTS control port (RS-232 port on the RFPA or BSCA board). See **"Connections for BTS Control" on page 132**.

NOTE: The baud rate of the Test Set's SERIAL 10 port is set (fixed) to 9600 for serial communication. Check that the baud rate of the BTS control port is 9600.

Site Control using the Laptop Emulator

Once the Test Set is connected to the base station, you can send control commands to the base station using the laptop emulator. You can access the laptop emulator by just pressing k3 (`Laptop`) during testing or by selecting the `Laptop Emulator` in the `Utilities` menu.

Follow these steps to send commands by selecting the `Laptop Emulator` in the `Utilities` menu:

1. Select `Utilities` in the list of `Menus:`. (To "select," turn the knob to move the cursor to your choice, press the knob to activate your choice.).
2. Select `Laptop Emulator` in the `Utilities Menu` screen. The Software will instruct you to make a serial connection between the Test Set and base station. If the connection has been made, proceed to the next step.
3. Press k1 (`Proceed`). The laptop emulator screen will be displayed (see **figure 44 on page 138**).
4. The Test Set is now ready to send control commands to the site and receive the response from the base station. Select the command you desire to send under the `Laptop Command:` list.

The response of the base station will appear on the Test Set's display whenever you send the control command. Now, you can set the base station to the desired conditions or adjust the power level by sending control commands.

The laptop command set includes most of commands necessary to control the LGIC CDMA PCS base station. The following commands also are available in the Test Set's laptop emulator.

- The `Enter Command` allows users to enter commands (use quotes if comma is used).
- The `<ESC>` command provides the same function as the ESC key of the laptop PC keyboard.
- The `<Enter>` command provides the same function as the Enter key of the laptop PC keyboard.
- The `<LapT-BTS>` command allows user to enter into the Laptop > BTS mode.

Even though the laptop emulator provides most common commands needed to control the site, in some cases you may want to use commands that are not available in the laptop emulator menu. For one-time use, you can use the `Enter Command` selection in the menu and type-in the command directly. If you need to use the command more than once, it is probably best to enter the command by accessing and using the Laptop > BTS mode. See **"Site Control Using the Laptop > BTS Mode" on page 139**.

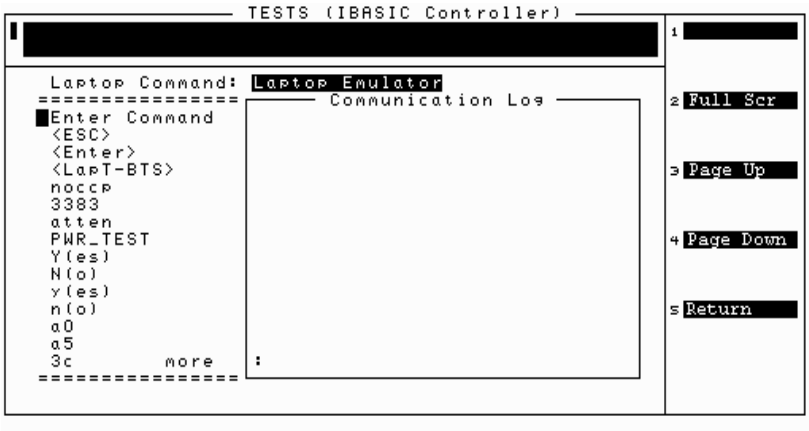


Figure 44 Laptop Emulator Screen

NOTE: In the Test Set's laptop emulator screen, the use of k3 (`Page Up`) and k4 (`Page Down`) can be a time-saver. Press k2 (`Full Scr`) to view the full command syntax which is sent or received from the base station. Press k5 (`Return`) to exit the laptop emulator mode.

Site Control Using the Laptop > BTS Mode

If you have connected an external laptop PC, additionally, to the Test Set's SERIAL 9 port (see **"Connections for Site Control" on page 132**) you can use the `<LapT-BTS>` (laptop > BTS) mode to bypass Test Set communications to the base station. The Test Set merely routes the commands back and forth between the base station and the laptop PC without sending any commands of its own.

This gives you more freedom in sending control commands; you can send any ''type-in'' command from the keyboard of the laptop PC. You are not limited to the built-in commands of the Test Set's laptop emulator.

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

1. First, make sure that you have connected the external laptop PC to the Test Set's SERIAL 9 port as shown in **figure 43 on page 132**.
2. Prepare your PC for use by starting a communications software application.
3. Select `Laptop Emulator` in the `Utilities Menu` screen.
4. Select `<LapT-BTS>` command in the Test Set's emulator.

   You can now type commands on the external laptop PC. The commands are passed, via the Test Set to the base station. Response from the base station will appear on the laptop PC's monitor, not the Test Set's display.

NOTE: While using the Laptop > BTS mode, you can no longer choose and send commands from the Test Set's laptop emulator. You must first exit the Laptop > BTS mode.

5. When finished using the laptop PC to communicate, press k3 (`Exit L<>B`) to return to the laptop emulator mode.
6. If you would like to exit the laptop emulator mode, press k5 (`Return`).

6

General Software Reference

This chapter contains general Software information and operating instructions for use with the Test Set. It includes a SOFTWARE MENU screen overview, and provides instructions for loading test procedures. This chapter also includes the description on how to setup external devices for data collection.

SOFTWARE MENU Screen Overview

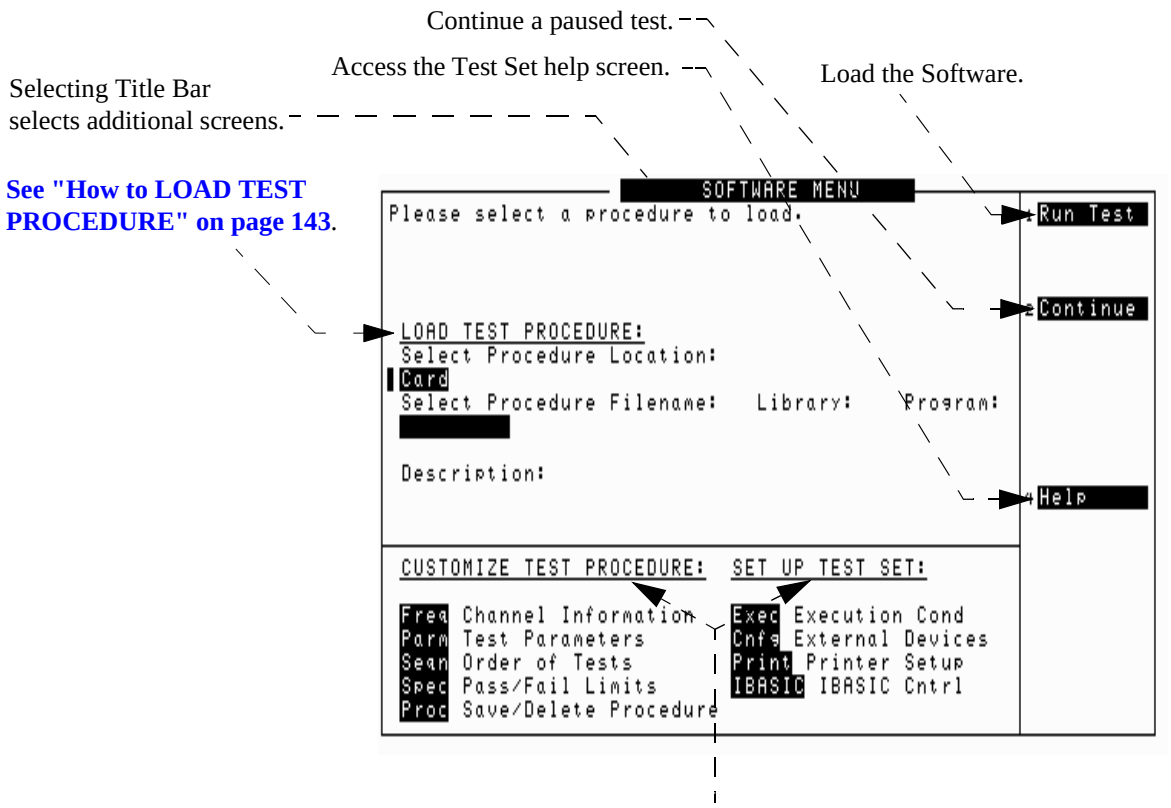


Figure 45 **Tests Subsystem**

Pressing the front-panel **Menu** key will display the `SOFTWARE MENU` screen. This screen allows the user to run the Software, access Help, proceed with a paused procedure, or access additional test screens.

NOTE: The LGIC CDMA PCS Base Station Software package may not allow to access menus under `CUSTOMIZE TEST PROCEDURE:` and `SET UP TEST SET:`. If you try to enter a menu which is not supported with your package, the message “Access to secured test information denied” will be displayed.

How to LOAD TEST PROCEDURE

Selects the location and file name of the test procedure.

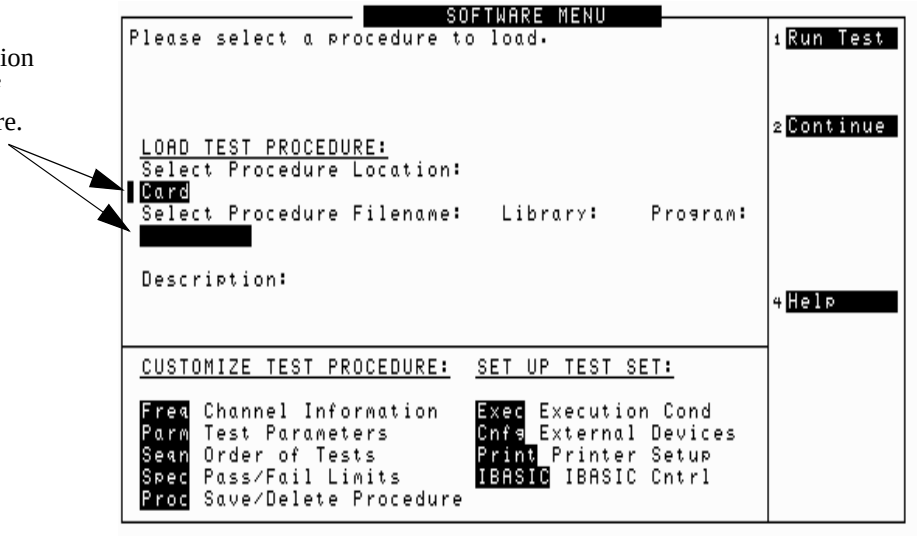


Figure 46 **LOAD TEST PROCEDURE**

HOW TO TROUBLESHOOT THE INSTALLATION

See **"Troubleshooting the Software Installation" on page 146** for some hints to help debug any problems you may have during the installation of the Software.

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

The first time you select a procedure the actual Software program does not get loaded into the Test Set's memory until you press the k1 (`Run Test`) from the USER keys on the Test Set. It will take approximately 20 seconds for the Software program to be loaded at that time. The program will remain in memory after a power-down/power-up cycle, unless it is manually deleted or a new program is loaded.

When you set the `Autostart on Power-Up` to `Yes` in the `Configuration and Setup` menu of the Software, the Software is automatically loaded and run whenever the Test Set is turned on. If this parameter is set to `No`, the Test Set will default to its normal power-on state. See**"Autostart on Power-Up [Yes, No]" on page 42**.

Loading the Software Card

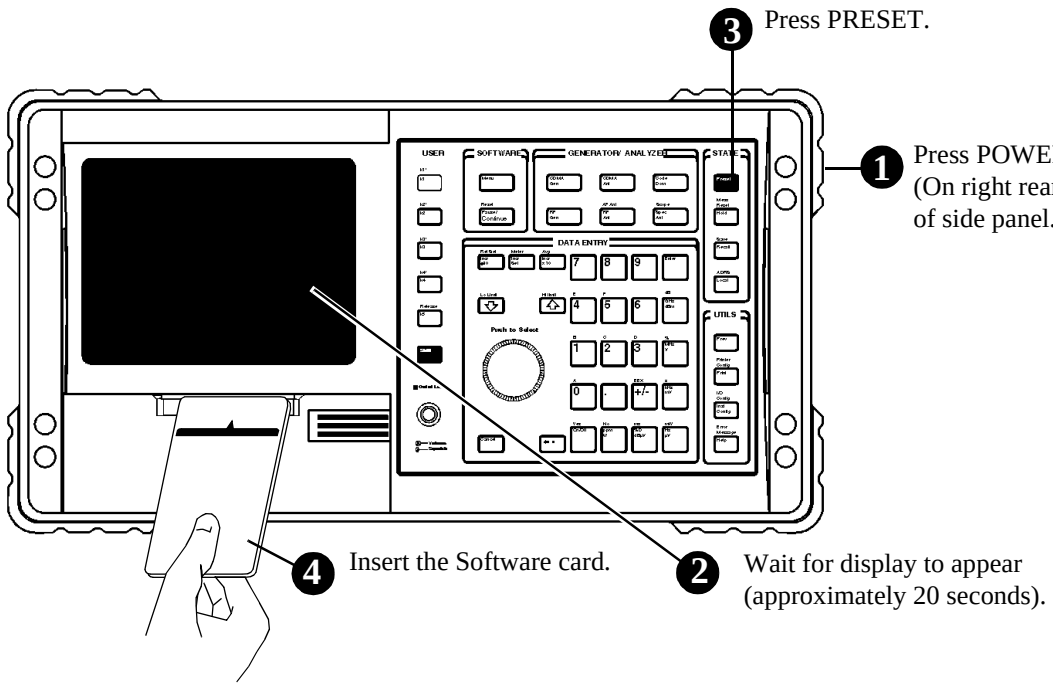
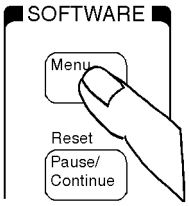
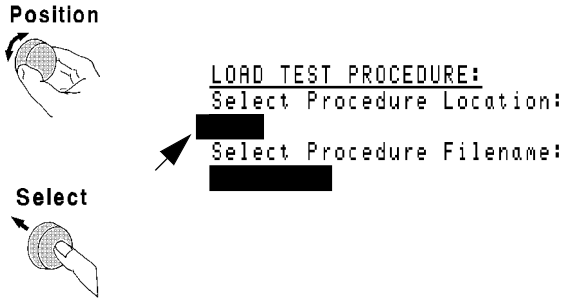


Figure 47 Loading the Software Card

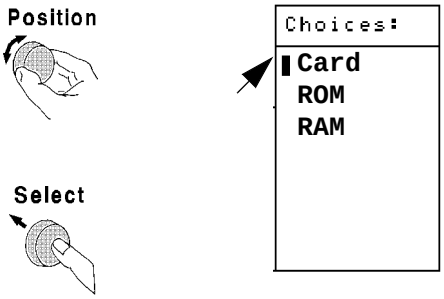
5 Press the SOFTWARE **Menu** key to display the **Software Menu** screen.



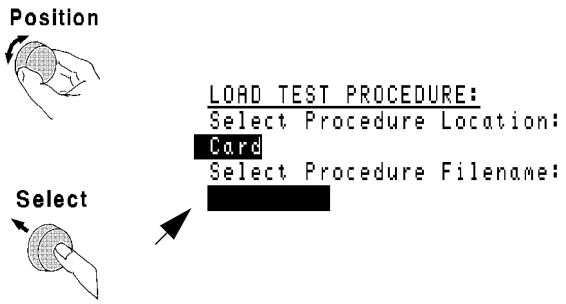
6 Position the cursor at **Select Procedure Location:** and select it.



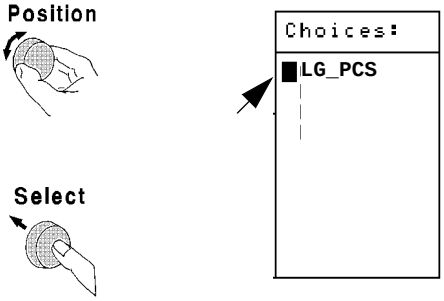
7 Position the cursor at **Card** and select it.



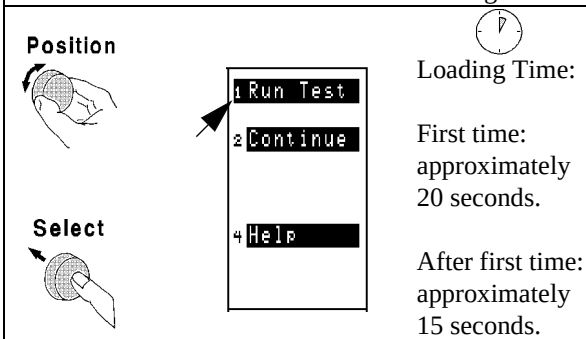
8 Position the cursor at **Select Procedure Filename:** and select it.



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



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



Loading Time:

First time: approximately 20 seconds.

After first time: approximately 15 seconds.

Figure 48 Running the Software

Troubleshooting the Software Installation

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

- Is power on?
- Is the PC card inserted in the right direction?
- Is the PC card firmly seated in the slot? It should slide in loosely, then must be firmly pushed in to make proper contact.
- Did you get to the SOFTWARE MENU screen? Pressing the **Preset** key should take you to the CDMA ANALYZER screen, and pressing the **Menu** key on the front panel should take you to the SOFTWARE MENU screen

NOTE: If the Test Set displays an error that states “One or more self-tests failed”, you have a hardware problem. In this case, refer to the Test Set’s *Assembly Level Repair Guide*. If a problem persists, call the HP Factory Hotline from anywhere in the USA or Canada (1-800-922-8920), 8:30 am - 5:00 pm Pacific time or in Korea (02-3770-0400), 8:30 am - 5:30 pm.

- Do you see TESTS (IBASIC Controller) at the top of the display after pressing k1 (`Run Test`)? If not, make sure you have specified the correct procedure location and procedure filename.

How to Setup External Devices

The Test Set and Software offer the ability to send test results to an external devices such as a PC, printer, or PC card. Sending test results to a PC requires a configured terminal emulator. You can use the BTS laptop utility program supplied with the Software as one of the PC terminal emulator.

To find out more on this subject:

- See **"BTS Laptop Utility Program" on page 148**
- See **"Sending Test Results to a Printer" on page 154**
- See **"Sending Test Results to a PC or PC Card" on page 156**.

BTS Laptop Utility Program

The BTS laptop utility program is shipped with the LGIC CDMA PCS Base Station Test Software on a separate 3.5” disk. This program provides the capability to use a PC terminal program for displaying the test results from the Software and capturing the current screen the Test Set is displaying. The program also provides some other functions that can be used with other BTS Test Software.

The BTS Laptop Utility provides the LGIC Software with the following functions:

- **Test Set Terminal** window to receive the data file from a PC card.
- **Test Results** window where automated test results are displayed and can be saved for later use.
- **Test Set Screen Capture** window to capture screen images and save them as bit mapped images. This is very helpful when using the Test Set’s spectrum analyzer or other screens where you want to capture the contents of the screen. (IBASIC operation must be paused first to print any of the TESTS screens used for automated testing.)

For additional information on using the BTS laptop utility program after installation, refer to the on-line Help information for that program.

System Requirements for BTS Laptop Utility

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

- 133 MHz Pentium Processor
- 16 MBytes or RAM
- Windows 95®[1] or Windows NT® 4.01 (Intel based)
- Available RS-232 serial port

1. Windows 95 and Windows NT are U.S. registered trademarks of Microsoft Corp.

Test Set to Laptop PC Connections

You need to connect the Test Set and PC through serial ports to use the BTS laptop utility program. **Figure 49** shows the Test Set to laptop PC connections. The laptop PC must also be connected to the Test Set using a null modem cable.

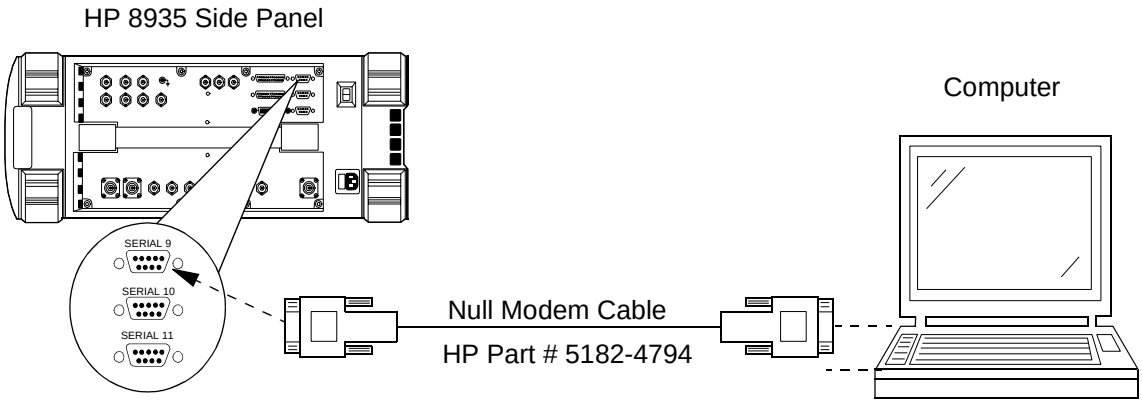
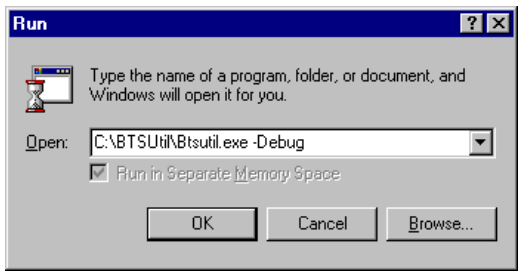


Figure 49 Serial Connections for the Test Set and PC

Installing and Configuring the BTS Laptop Utility Program



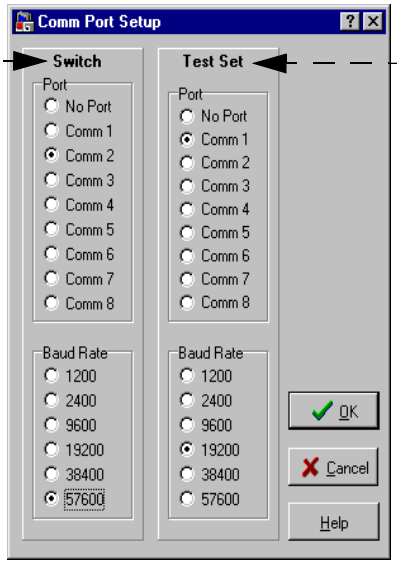
The BTS laptop utility program comes compressed on an install disk for easy setup on your laptop. Simply insert the floppy into your drive and select `Start`, then `Run`, then type A:\Setup. The install shield will lead you through the installation process.

After installing the BTS laptop utility program, you need to configure the laptop PC's serial port to communicate with the Test Set.

To configure the laptop's serial port, follow these steps.

1. Load and Run the BTS laptop utility program in your laptop PC.
2. Click the `TR(Test Results)` button.
3. Select `Preferences` and `Comm Port Setup`. The following screen will be displayed. Set the serial port configuration menu settings to work with the Test Set.

You do not need to configure the parameters under the **Switch** field to communicate with the Test Set.



The parameters under the **Test Set** field should be configured before communicating with the Test Set.

Figure 50 **Serial Communication Port Settings**

- **Test Set Port** - This is the port your laptop uses to communicate with the Test Set. Choose the port you have connected the cable.
- **Test Set Baud Rate** - This is the speed that the laptop PC communicates with the Test Set. This value should match the baud rate found on the Software's `Print/Data Collection Menu` screen. See **"Configuring the Test Set's SERIAL 9 Port" on page 161** to configure the Test Set's SERIAL 9 port. This value will not automatically adjust during the session. The recommended baud rate is 19200.

NOTE: Only two communication parameters under the ''Test Set'' field should be determined before communicating with the Test Set. Note that you do not need to configure the communication parameters under the ''Switch'' field for recording the test results and capturing screen images with HP E6388A Software.

Descriptions of BTS Laptop Utility Program's Main Window

The following three functions can be used together with the LGIC CDMA PCS Software.

- TS (Test Set Terminal) : This screen is used to view the data files transferred from the PC card. See also **"How to Transfer a Data Collection File from a PC Card" on page 66**.
- TR (Test Results) : This screen displays the measurement results from the Software. Before results can be displayed, you must activate `Use BTS Laptop Utility` in the `Print/Data Collection Menu` screen of the Software (see below section).
- SC (Test Set Screen Capture) : This screen captures the current screen that the Test Set is displaying when the **Print** UTILS key is pressed. If the Software is running, the k1 (`Print`) or **Pause/Continue** SOFTWARE key must be pressed first to pause the Software.

Activating the Test Set Software to Work with the BTS Laptop Utility Program

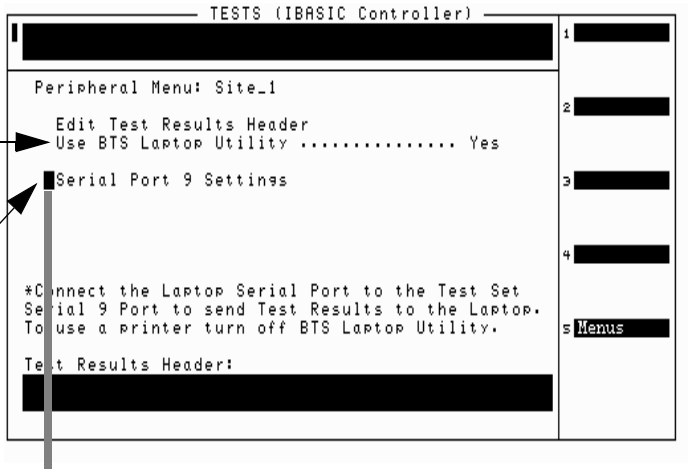
After installing and configuring the BTS Laptop Utility program on your laptop, you need to configure the Test Set 's Software to send data to the laptop PC. This is accomplished both by telling the Software to use the BTS Laptop Utility and by setting the SERIAL 9 port communication parameters.

To select BTS Laptop Utility operation in the Software, follow these steps:

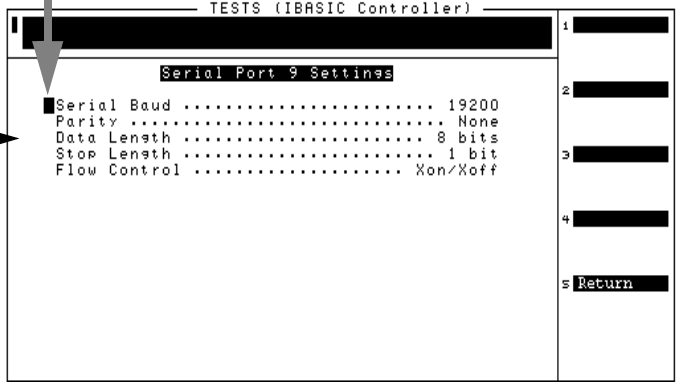
1. Load and run the Software (see **"Load and Run the LGIC CDMA PCS BTS Test Software" on page 33**.). The Software's main menu is displayed.
2. Select `Print/Data Collection` from the list of `Menus:`. (To ''select'', turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Set the `Use BTS Laptop Utility` field to `Yes`.
4. Select `Serial Port 9 Settings` and set the Test Set's SERIAL 9 port settings to work with the BTS laptop utility program.
   - Set `Serial Baud` field to match the baud rate setting on the ''Comm Port Setup'' window of the BTS laptop utility program (19200 is recommended).
   - Set `Parity` to `None`.
   - Set `Data Length` to `8`.
   - Set `Stop Length` to `1`.
   - For baud rates ≤19200, set `Flow Control` to `Xon/Xoff`. For baud rates >19200, set `Flow Control` to `Hardware`.

Set to ‘‘Yes’’ to use the BTS laptop utility program.

Select this parameter to access the SERIAL 9 port Settings menu.



Set the SERIAL 9 port settings to match the ‘‘Com Port Setup’’ settings in the BTS laptop utility program.



You should now be able to record test results with the Software, transfer the data from a PC card to view on the laptop PC, and capture Test Set screens through the BTS laptop utility program screens.

Test Set Screen Capture with the Laptop Utility Program

The BTS Laptop Utility program provides the capability to capture the Test Set's screen images. You can save them as a bit mapped files for your illustrations. Follow these steps to capture screen images.

- If the Software is running in the Test Set, press k1 (`Print`) or the **Pause/Continue** key to pause the Software before printing
- Press the Test Set's **Print** UTILS key to send the screen images to the laptop PC. The screen image will be printed on the ''Test Set Screen Capture'' screen of the BTS laptop utility program.

Sending Test Results to a Printer

The test results can be sent directly to a printer through the Test Set's SERIAL 9, PARALLEL 15, or HP-IB port.

To send test results to a printer, you will need to activate `Send Results to Printer at` parameter within the Software after connecting a printer. See **"Making Printer Connections" on page 163** on how to connect printers to the Test Set.

NOTE: You have to set the `Use BTS Laptop Utility` parameter to `No` in the `Print/Data Collection` menu before activating `Send Results to Printer at` parameter.

After connecting a printer to a Test Set's port, follow these steps:

1. Select `Print/Data Collection` from the list of `Menus:`. (To ''select'', turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Send Results to Printer at` field, then select the port you have connected the printer in the `Printer:` menu.

   If you select the HP-IB port, you need to match the Test Set's HP-IB address with your printer's address. Turn the knob or use the DATA keys to change the address when the HP-IB field is highlighted in the `Printer:` *menu.*

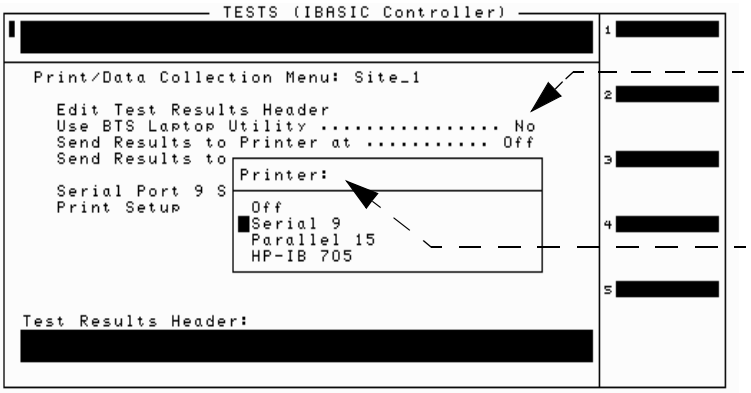


Figure 51 Sending Test Results to a Printer

3. If you have selected the `Serial 9` in step 2, you have to check that the Test Set's communication settings match those of the printer you are connecting. *If you have selected the* `Parallel 15` *or* `HP-IB`*, skip to the next step.*

   To change the serial port settings, follow these steps:

   a Select `Serial Port 9 Settings` in the `Print/Data Collection Menu` screen.

   b Set the Test Set's communication settings to match your printer's settings.

   c Press k5 (`Return`) to return to the previous menu.

4. Select `Printer Setup` field. Set the following parameters if required:

   - `Lines/Page` : This field is used to specify how many lines are printed per page.
   - `Form Feed at Start of Page` : This field is used to specify if you want the printer to make a form feed (blank page) at the start of printing.
   - `Form Feed at End of Page` : This field is used to specify if you want the printer to make a form feed (blank page) at the end of printing.

5. If you would like to add a title to be printed at the top of the printout, follow these steps:

   a Select `Edit Test Results Header` in the `Print/Data Collection Menu` screen.

   b Enter the title for the test result header using the characters in the `Choices:` menu. Position the cursor in front of the desired characters and press the knob to enter each character. Then select `Done` (at the top of the choices list) to finish entering.

The Test Set is now ready to send test results to the printer you have selected. Results will be printed until you set the `Send Results to Printer at` to `Off` on the `Print/Data Collection Menu`.

NOTE: When you press k1 (`Print`) key during testing, the images of the Test Set's current screen will be printed out to the printer connected.

Sending Test Results to a PC or PC Card

Sometimes it is preferable to record (save) the test results for future reference or evaluation. The Software package provides the capability to save test results to a PC card installed in the Test Set's front-panel card slot or to an external PC connected to the Test Set's SERIAL 9 port.

The ability to save test results stays "on" once you have performed the steps in **"Sending Test Results to a PC" on page 156** or **"Sending Test Results to a PC Card" on page 159**.

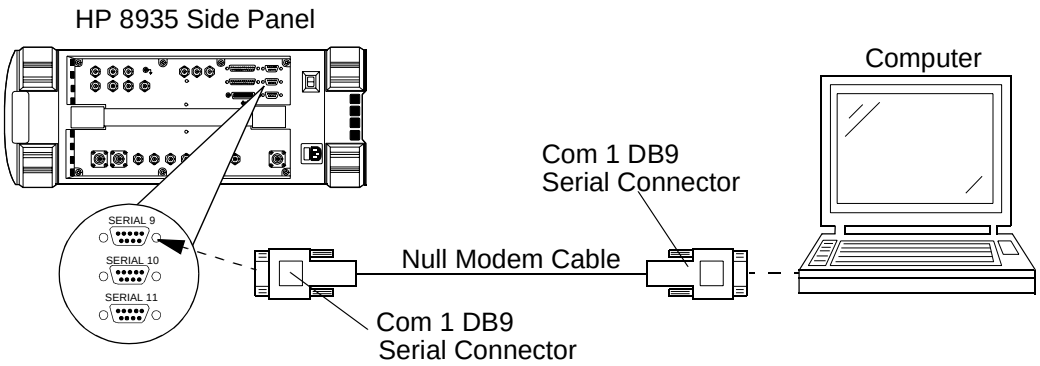
Sending Test Results to a PC

Test results can be sent to a PC communication program through the Test Set's SERIAL 9 port. A variety of devices can receive the data. An HP Palmtop computer, PC, laptop, or terminal can be used. A terminal emulator can write the test results directly to a file. Examples of terminal emulator programs are the Hyper terminal®[1] in Windows 95 and the BTS Laptop Utility program supplied with HP E6388A Software.

To save test results to a PC, you must meet the requirements listed below.

- Connect the Test Set's SERIAL 9 to a PC
- Activate and configure the Software for sending test results to a PC
- Configure a terminal program to run on a PC

Test Set Connection to a PC



1. Hyper terminal is a U.S registered trademark of Microsoft Corp.

Activating the Software for Sending Test Results to a PC

To save test results to a PC, you will need to activate the `Send Test Results to` parameter within the Software.

NOTE: You have to set the `Use BTS Laptop Utility` parameter to `No` in the `Print/Data Collection` menu before activating the `Send Results to` parameter.

After connecting a PC to the Test Set's SERIAL 9 port, follow these steps:

1. Select `Print/Data Collection` from the list of `Menus:`. (To ''select'', turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
2. Select `Send Results to`, then select `Serial 9` from the `Results:` choices.

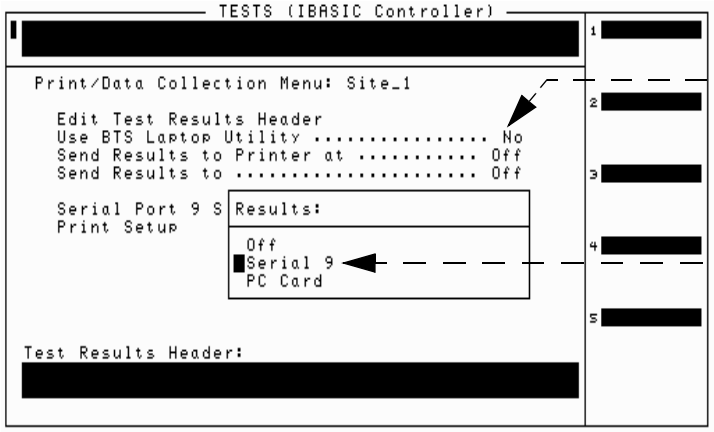


Figure 52 **Sending Test Results to a PC**

3. Select `Serial Port 9 Settings` on the `Print/Data Collection Menu` screen.
4. Set the Test Set's communication settings to match your PC's settings.
5. Press k5 (`Return`) to return to the previous menu.

The Test Set is now ready to send the test results to a PC terminal program.

Set `Send Results to` to `Off` on the `Print/Data Menu` to stop sending test results to a PC.

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

Configuring PC Terminal Programs

Saving test results to a PC requires a configured terminal emulator. The following steps describe how to set up the Hyper Terminal program in Windows 95. You may need to refer to the documentation of the Windows 95 to configure the Hyper terminal program.

1. Start the `Hyper Terminal` program in the `Accessories` group in Windows 95.
2. Select the `Hypertrm` icon.
3. Enter a name and choose an icon for your new connection. Select `Ok`.
4. Choose the serial port you have connected in the `Connecting Using` field and select `Ok`.
5. Set the port settings to match the Test Set's SERIAL 9 Port Settings and press `Ok`.

Now, the test results can be displayed on the Hyper terminal emulator when you run tests. After receiving the test results, you should save the test results in the terminal emulator for later use. When you access the Hyper terminal program next time, select your icon which has been made before in the Hyper terminal screen.

NOTE: See **"BTS Laptop Utility Program" on page 148** if you want to use the BTS Laptop Utility program as a terminal emulator.

Sending Test Results to a PC Card

To send test results to a PC card you will need to set `Send Results to` to `PC Card` within the Software. The Test Set automatically creates data files on the PC card based on the name you enter at the start of testing. The Software appends ".TXT" to your file name so that the files are easily recognized on the PC card.

NOTE: Once you have finished with your testing and have the test results in files on the PC card, follow the steps in **"How to Transfer a Data Collection File from a PC Card" on page 66** to transfer the data file to a printer or PC.

NOTE: You have to set the `Use BTS Laptop Utility` parameter to `No` on the `Print/Data Collection` menu before activating the `Send Results to` parameter.

To send test results to a PC card, follow these steps:

1. Insert a PC card into the Test Set's front panel card slot. If the card is uninitialized, see **"Initializing a PC Card" on page 164**
2. Select `Print/Data Collection` from the list of `Menus:`. (To ''select'', turn the knob to move the cursor to your choice, and press the knob to activate your choice.)
3. Select `Send Results to`, then select `PC Card` in the `Results:` menu.

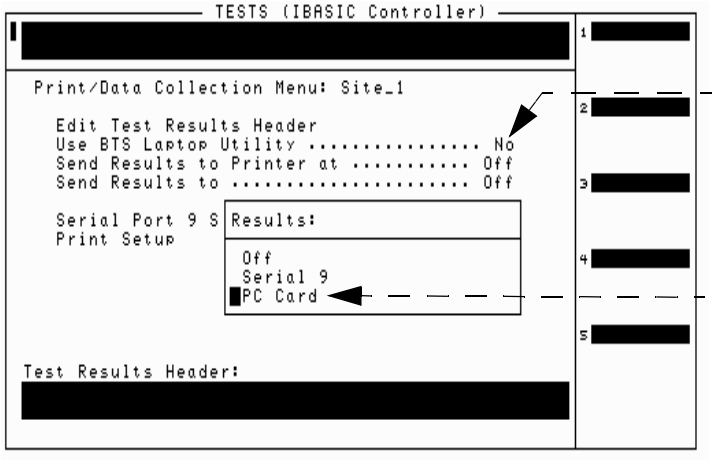


Figure 53 **Sending Test Results to a PC Card**

4. The Test Set will display a message asking for a file name to store the test results. Enter the file name using the characters in the `Choices:` menu. Position the cursor in front of the desired characters and press the knob to enter each character. Then select `Done` (at the top of the choices list) to finish entering.

The Test Set is now ready to send the test results to a PC Card when you run tests.

NOTE: When saving test results to a PC card after running a test, the `Send Test Results to` parameter will be automatically turned off. To send more test results to the PC card, you should reactivate the `Send Results to` parameter.

When you press k2 (`Save`) key during testing, the images of the Test Set's current screen will be saved on the PC card.

How to Configure a Printer

Configuring the Test Set's SERIAL 9 Port

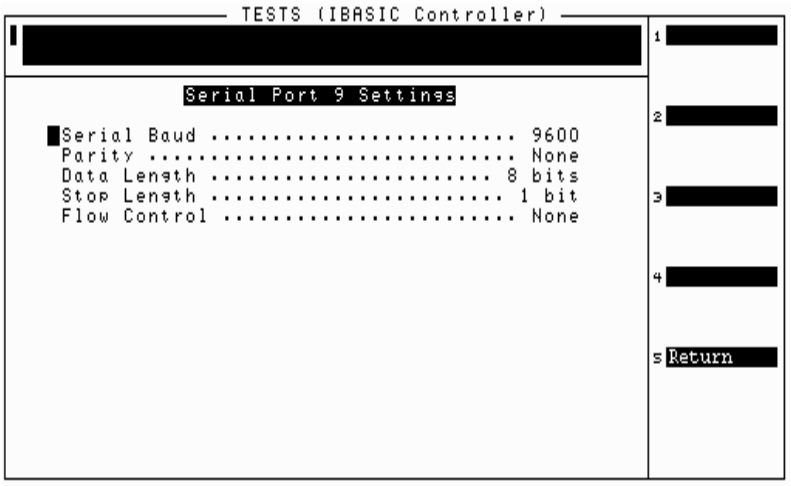


Figure 54 **Serial Port 9 Settings Menu**

The `Serial Port 9 Settings` menu allows the user to configure the Test Set's SERIAL 9 port.

Follow the steps below to configure the Test Set's SERIAL 9 port.

- `Serial Baud` : This field selects the baud rate.
- `Parity` : This field specifies the serial communication parity setting.
- `Data Length` : This field specifies the number of bits used for each word of serial data.
- `Stop Length` : This field specifies the number of stop bits (1 or 2).
- For baud rates ≤19200, set `Flow Control` to `Xon/Xoff`. For baud rates >19200, set `Flow Control` to `Hardware`.

Printer Setup

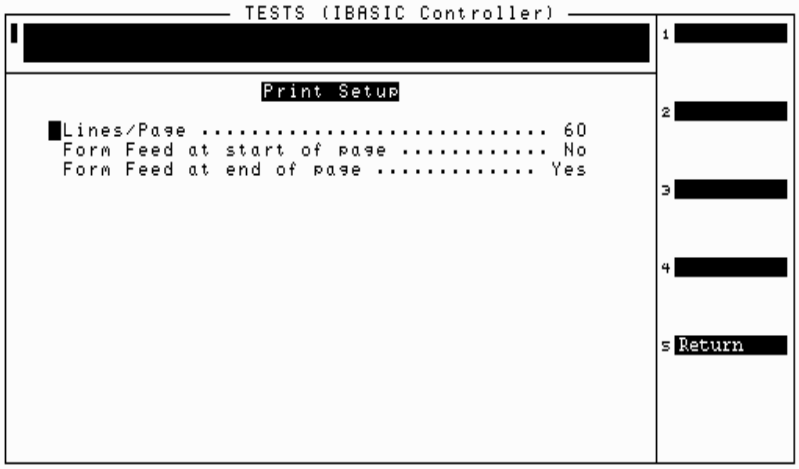


Figure 55 **Printer Setup Screen**

The `Printer Setup` menu allows the user to configure the Test Set printer format. The user can select the number of lines to a page, the form feed location, and any output headings.

1. `Lines/Page` : This field is used to specify how may lines are printed per page.
2. `Form Feed at Start of Page` : This field is used to specify if you want the printer to make a form feed (blank page) at the start of printing.
3. `Form Feed at End of Page` : This field is used to specify if you want the printer to make a form feed (blank page) at the end of printing.
4. If you would like to add comments to the beginning of the test results printout, enter your comments after pressing the `Edit Test Results Header` parameter. 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.

Making Printer Connections

To connect the Test Set to a printer, follow the connection diagram for the type of printer your are using.

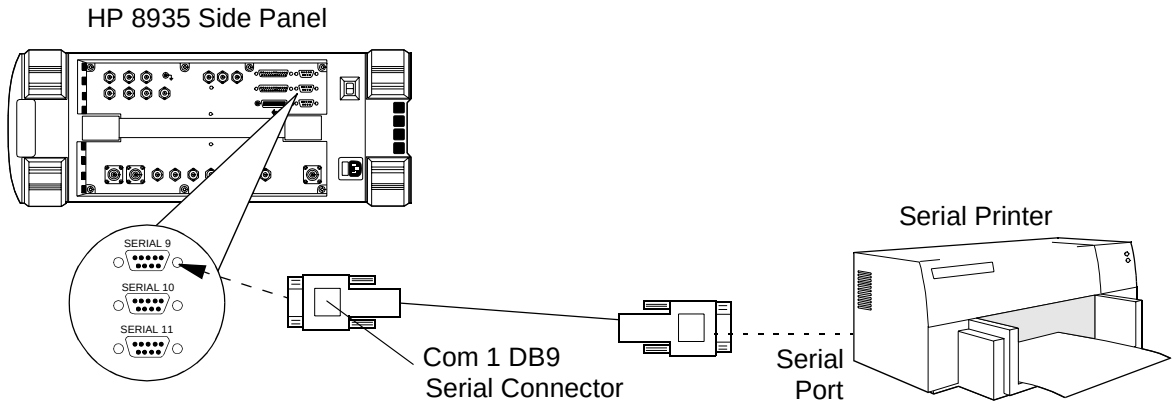


Figure 56 **Connections for the Test Set and Serial Printer**

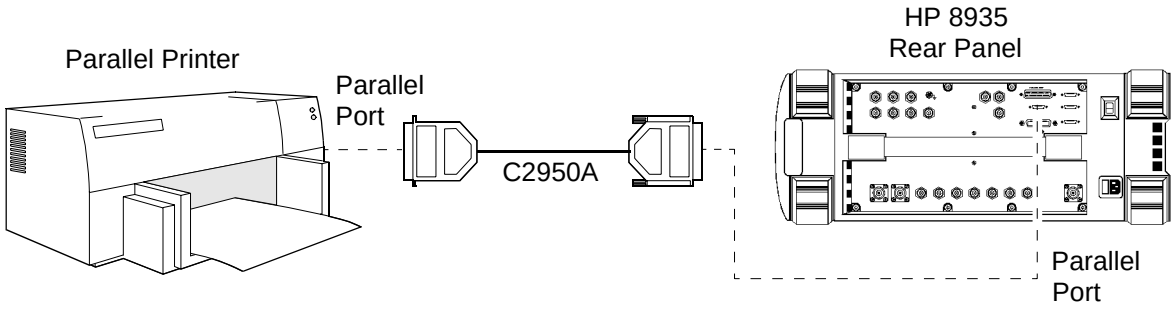


Figure 57 **Connections for the Test Set and Parallel Printer**

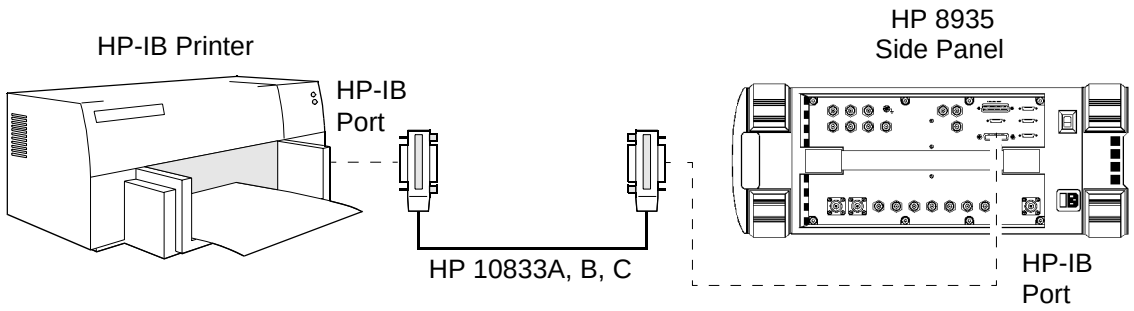


Figure 58 **Connections for the Test Set and HP-IB Printer**

Using a PC Card

Initializing a PC Card

When a PC card is new or the battery has been removed, then the card must be initialized to store data. To initialize a PC card, follow these steps:

1. Insert PC card into the front-panel card slot.
2. From the `SOFTWARE MENU` screen, press the **Shift** key, then I/O CONFIGURE key. The I/O CONFIGURE screen should be displayed.
3. Select `Format Card`.

   The Test Set will display a message asking “Erase and format the PCMCIA Card?” (YES/NO)
4. Press the **Yes On/Off** key, located below the knob, to format the card.

The card is formatted when the cursor stops blinking.

Troubleshooting PC Card usage

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

`Directory Overflow.`

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

`Medium uninitialized. Do you want to initialize?`

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

`Write protected.`

- This card has been write protected (the switch in the “SAFE” position). Slide the write protect switch into the up position before writing.

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

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

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

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

7

Troubleshooting

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

Error Summary

Overview

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

"Errors When Loading and Running the Software" on page 167

"Errors While Attempting Measurements" on page 168

Errors When Loading and Running the Software

This group of errors would most often be encountered before you get to the Software's Main Menu. They would be most likely to appear the first time you load and run the Software, as outlined in **"Installation" on page 25**. The errors are presented with the error text, followed by a description of the cause and followed by some possible solutions.

- Symptom: Memory Overflow Errors

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

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

NOTE: Clearing the registers, whether selectively or globally, is *permanent*. *You cannot retrieve the registers once they are deleted*. You have an option to save registers to a RAM memory card, as well. Consult the *HP 8935 Reference Guide* for instructions on this procedure.

To delete a single register:

1. Press the Recall key from the CDMA ANALYZER screen.
2. Scroll the cursor to the register to be deleted.
3. Press the Yes On/Off key to indicate you want to clear the register.
4. Press the Yes On/Off key again to confirm.
5. The register is cleared.

To delete all saved registers:

1. Press the Recall key.
2. Scroll to **`*Clr All*`** and press the knob.
3. Press the Yes On/Off key to confirm.
4. All save registers are now cleared.

Errors While Attempting Measurements

The following error messages or measurement results can be shown once a test mode has begun making CDMA measurements:

- Can not correlate to input signal. Check setup.

  If the Test Set is unable to correlate the Rho/Pilot Only, Rho/Traffic and Code Domain power measurements, this error will result. Check the following items and re-run the tests:

  - Selection for **`Test Channel`** in the **`Test Selections`** menu. If you select the wrong channel number, the Test Set will be tuned to the wrong frequency. You can use the spectrum analyzer mode to verify the presence of a signal.
  - No input signal. If you do not connect the input signal to the Test Set's ANT IN or RF IN/OUT port, the Test Set can not correlate to the input signal. Check that you have connected the input signal to one of these ports.

- The time offset measurement fails during Rho/Pilot Only or Rho/Traffic test when you assume that the GPSR of the base station is correctly time-aligned to the GPS time.

  - If you have entered an incorrect PN offset value in the **`Test Parameters/ Specs`** menu, the Test Set will not be able to measure the time offset. You may use the **`PN Offset Search`** in the **`Utilities`** menu. See **"PN Offset Search" on page 119**.

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