

User's Guide

Agilent Technologies E7495A/B Option 330 Nortel CDMA Base Station Test Software

Base Station Test Set

E7495A/B Firmware Version: A.03.20 and later
Option 330 Software Version: A.01.00 and later



Manufacturing Part Number: E7495-90037

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Conventions Used

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

Procedure: – This font is used to indicate characters displayed on the Test Set screen.

Title – Titles of documentation are printed in italics.

Test Set – Refers to the Agilent Technologies E7495A/B Base Station Test Set.

Test Software – Refers to the Agilent Technologies Nortel CDMA Base Station Test Software.

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

Procedure – A test procedure is a collection of channel information, test parameters (configuration information), and pass/fail limits saved in a file. This file might be one of the default procedures that is supplied with the Test Software, or it might be an application specific procedure that customizes the Test Software to a specific application.

PC card / SRAM Card – Refers to the type of PC card that is shipped with the Test Set for storing screen captures and data files. This card is a PCMCIA 64 MB Flash memory card. The PC card is an industry standard term that refers to one type of information storage card. Which meets the specifications of the Personal Computer Memory Card International Association (PCMCIA).

BTS – Refers to the Base Transceiver Station.

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

- **Select** refers to scrolling the cursor to a field and pressing the [select] key.
- **Enter** means to use the numeric keypad, and the **Enter** key or measurement units keys to make entries to fields. In some procedures, **enter** is used to describe the action of entering characters into a field.

In This Manual

This manual consists of the following chapters:

- **Chapter 1** – Product Description

This chapter provides a description of the Agilent Technologies E7495A/B Option 330 Nortel Base Station Test Software.

- **Chapter 2** – Introduction to Testing

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

- **Chapter 3** – Connections

This chapter provides information on equipment required for Base Station testing, and connections for cell site equipment.

- **Chapter 4** – Reference

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

- **Chapter 5** – Tests and Specifications

This chapter describes each test and related pass/fail limit.

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1 **Product Description**

This chapter provides a description of the Agilent Technologies E7495A/B Option 330 Nortel CDMA Base Station Test Software.

Agilent Technologies Nortel CDMA Base Station Test Software

The Test Software performs automated tests to verify CDMA base station RF performance.

Specifically, this test software may be used for the installation, maintenance, and/or repair of the following Base Stations:

- Nortel Metro Cell SFRM 800 MHz = CDMA 800 SFRM = 800 MetroCell (Classic)
- Nortel Metro Cell MFRM 800 MHz = CDMA 800 MFRM/MFRM-2 = 800 MetroCell
- Nortel Metro Cell MFRM 800 MHz - High Power = CDMA 800 MFRM/MFRM-2 High Power = 800 High Power MetroCell
- Nortel Compact Cell MFRM 800 MHz = CDMA 800 cBTS/CMO RM = 800 Compact
- Nortel Compact Cell MFRM 800 MHz - High Power = CDMA 800 cBTS/CMO RM High Power
- Nortel Metro Cell SFRM 1900 MHz = CDMA 1900 SFRM = 1900 MetroCell (Classic)
- Nortel Metro Cell MFRM 1900 MHz = CDMA 1900 MFRM/MFRM-2 = 1900 MetroCell
- Nortel Metro Cell MFRM 1900 MHz - High Power = CDMA 1900 MFRM/MFRM-2 High Power = 1900 High Power MetroCell
- Nortel Compact Cell MFRM 1900 MHz = CDMA 1900 CMO RM = 1900 Compact Metrocell Outdoor
- Nortel Cell MFRM 450 MHz = CDMA 450 MFRM-2 = 450 MetroCell
- Nortel Cell MFRM 450 MHz - High Power = CDMA 450 MFRM-2 High Power = 450 High Power MetroCell
- CDMA 450 MFRM-2 = 450 MetroCell
- CDMA 450 MFRM-2 High Power = 450 High Power MetroCell

NOTE

The acronym MFRM stands for Multi-carrier Flexible Radio Module.

The acronym SFRM stands for Single-carrier Flexible Radio Module.

In this manual, the term Metro Cell refers to both MFRM and SFRM Base Station types.

This document is best used in conjunction with the Nortel CDMA Metro Cell or Compact Metro Cell BTS Commissioning document dated August 20, 2004.

Power settings based on Nortel's Vortex software Version 3.2 or higher and NBSS 11.0. software.

Items Required

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

- Agilent Technologies E7495A/B Base Station Test Set
- Agilent Technologies E7495A/B firmware revision A.03.20 or later.
- Options required:
 - E7495A/B Options:
 - Option 200 - cdmaOne/CDMA 2000 analyzer
 - Option 330 - Nortel CDMA base station test software
 - Option 510 - CW and CDMA source
 - Option 600 - Power Meter
 - Option 800 - Accessory package
 - 8482A Power sensor

Contacting Agilent Technologies

For help with product selection and configuration, technical and application assistance, consulting and integration services, rental and leasing options, refurbished equipment, product purchases, repair, calibration, education and training please go to <http://www.agilent.com/find/assist>

If you do not have access to the Internet, call the appropriate number shown in below or contact your local Agilent Technologies Sales and Service Office.

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More Information from Agilent

For more information about Agilent's E7495A/B Base Station Test Set, go to <http://www.agilent.com/find/e7495b>

For more information about Agilent's solutions for the communications industry, visit our web site at <http://www.agilent.com/comms/industry>

E7495A/B Base Station Test Set Product Updates

For information about E7495A/B Base Station Test Set updates, go to <http://www.agilent.com/find/e7495b>

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Introduction to Testing

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

Overview

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

1. Selecting the Test Software, which consists of turning on the Test Set, inserting the Test Software card (if this is the first time software is installed), and selecting a procedure.
2. Setting up the Test Software for test operations.
3. Initiating the tests.
4. Responding to Test Set and Test Software actions.

This process is described in detail in the following sections.

Loading and Running the Test Software

Loading the Test Software

(Field Upgrade Only)

Before you begin testing, Option 330 needs to be installed into the test set. You can load the Test Software into the Test Set internal memory and run it from the internal memory, or run the software directly from the PCMCIA or CF card. The software package can be acquired at the following URL: http://www.agilent.com/find/e7495_software, there is no charge to download the software.

To load the Test Software into the Test Set's internal Memory:

1. Insert the compact flash or PCMCIA flash memory card containing the unzipped Test Software into the compact flash or PCMCIA card slot of the E7495A/B.
2. Press **Mode**, select [**Test Software**], [**Software Utilities**], [**Install Test Software**]; and then choose either [**from PCMCIA**] or [**from CF**]; depending on which memory card you are using.

NOTE

When you insert the PC card with the Test Software on it and install the Software for the first time, the install could require several minutes. The Test Software will remain in the Test Set Flash memory (power for which is backed up by a battery) after a power-off/power-on cycle unless it is deleted manually or a new revision of the program is loaded.

Running the Test Software

1. From the Mode screen select [**Test Software**].

When pressed, it will bring up a menu on the right side that contains all the available software packages. These buttons are enabled or disabled according to whether the corresponding option has been licensed on the Test Set.

2. Select the desired software option.

When a button on the right menu is selected, the test set will look for the correct Test Software File on the Media Card(s) or internal memory. The Test Set will try the Media Cards first and then the internal memory. After locating the correct Test Software File, it will load the program into internal ram, run the software and indicate on the screen if the program is running from Internal Storage or one of the Media Cards. If the correct Test Software File is not found on either the Test Set's Internal Memory or the Media Cards, a message will be displayed telling you that the Test Software File was not found.

NOTE

The test set will always look to the card slots first to run the software. If the software is not on a card, the test set will then look to the internal memory to run the software.

Using the Main Software Menu Screen

If you select Test Software then the Nortel CDMA Tests, the Test Software will display the Main Software Menu screen upon initiation of the software and prior to running any procedure. All Test Software operations are started from this screen.

This screen will display the Software Option number and revision number of the software package currently running.

The Main Software Menu Screen displays the following information:

- Name of the Test Software Package
- Software Id (option) number
- Revision of the Software package
- Where the Test Software is running from, Internal Memory, or the PCMCIA or CF media cards

The functions of the menu keys on the Main Software Menu screen are as follows:

- (**Select**) – Select to choose the menu screen highlighted
- (**Cancel**) – Select to return to the E7495 Main Screen (same as pressing the Mode key).

Configuration Menu

Select the **Configuration Menu** field to display the Configuration Menu screen. For more information on the configuration menu, refer to [“Using the Configuration Menu Screen” on page 19](#).

Calibration Menu

Select the **Calibration Menu** field to display the Calibration Menu screen. For more information on the Calibration menu, refer to [“Calibration Menu Screen” on page 38](#) and [“Calibration Menu” on page 63](#).

Test Menu

Select the **Test Menu** field to display the Test Menu screen. For more information on the test menu, refer to [“Test Menu” on page 48](#).

Utilities Menu

Select the **Utilities Menu** field to display the Utilities Menu screen. For more information on the Utilities menu, refer to [“Utilities Menu Screen” on page 40](#) and [“Utilities Menu” on page 64](#).

Using the Configuration Menu Screen

The Configuration Menu allows you to change the parameters in the default configuration file to customize it to an individual Base Station. Once the proper changes have been made, the configuration file can be stored so that you can load it later. This feature allows you to customize a test software configuration for each of the Base Stations you maintain, and save it in memory so that it can be quickly loaded when needed.

The functions of the menu keys on the Configuration Menu screen are as follows:

- **(Load Config)** – Select to load a user saved configuration.
- **(Save Config)** – Select to save user defined configurations.
- **(Delete Config)** – Select to delete user saved configurations.
- **(Select)** – Select to enter values and/or make selections within the configuration menu screen.
- **(FR/Time Ref)** – Select to choose your time base reference signal.
- **(Digital Gains)** – Select to go to Digital Gains screen to view and set recommended Base Station digital gains and OCNS channels.
- **(Test Menu)** – Select to go to the Test Menu Screen.
- **(Main Menu)** – Select to return to the Main Software Screen.

Digital Gains

Selecting this menu key displays the Digital Gains screen. This screen shows the recommended Base Station digital gains and OCNS channels and the resulting Base Station power output. The screen also includes a calculator that allows you to input alternate digital gains and OCNS channels and derive the resulting output power.

NOTE

The Base Station power output is dependent on the digital gain settings of the pilot channel, paging channel, sync channel, and OCNS channel. It is also dependent upon the number of OCNS channels that are active, if using OCNS Channels. Once a Base Station is in service, the gains will be set to optimize the wireless network performance. During testing, there are recommended gain settings that are more than likely different than the in-service gain settings. These recommended settings result in a desired Base Station power output for testing. Ideally, you should change the Base Station gain settings when you test the Base Station. However, this might not always be practical. Therefore, you may use the Digital Gain screen to determine the new Base Station power output based on the gain settings in the Base Station.

You may use the Vortex PC Power Palette Window to set the digital gains in the Base Station.

The function of the Configuration setting fields on the Configuration Screen are as follows:

Channel

Select the **Channel** field to enter the channel number to be tested.

Channel STD (Channel Standard)

Select the **Channel STD** field to enter the choice for band from the **Choices:** list.

If the Test Suite selected in the **Base Station Type** field is that of a 1900-MHz type Base Station, the choices available are **North American PCS** and **Korean PCS**.

If the Test Suite selected in the **Base Station Type** field is that of an 800-MHz type Base Station, the choice available is **North American Cell**.

If the Test Suite selected in the **Base Station Type** field is that of an 450-MHz type Base Station, the choice available is **NMT-450**.

Base Station PN Offset

Select the **Base Station PN Offset** field to enter the PN offset for the Base Station to be tested.

Sector

Select the **Sector** field to enter the choice for the sector to be tested from the **Choices:** list.

Base Station Power Out

Select the **Base Station Power Out** field to enter in dBm the value to be used in the Base Station power output testing. In the instance of an MFRM Base Station, enter the total power output of all three MFRM carriers.

NOTE

The Base Station power out is dependent on the digital gain settings and the number of active OCNS channels. If you wish to determine the power output based on the digital gain settings in the Base Station, select (**Dig Gains**) in the Configuration Menu Screen. This will display a screen on which you may calculate the power output.

Carrier Power Out

This field is applicable only to MFRM Base Stations. Select the **Carrier Power Out** field to enter in dBm the value (of the power output of each individual carrier) to be used in testing the absolute power value in the MFRM Total Power Test.

RF IN Path Loss

Select the **RF IN Path Loss** field to enter in dB the measured value of the loss through the input path to the test set.

The “RF In Path Loss” value is typically measured using the calibration routines found on the Calibration Menu. After the Path Loss measurement is

made, the RF In Path Loss Value is automatically updated on the configuration menu.

NOTE

Changing the RF In Loss value on any of the Measurement screens such as Spectrum Analyzer or the Tx Analyzer will be reflected on the RF In Path Loss value on the Configuration Screen. Anytime you run the software, make sure you verify the RF In Path Loss value on the Configuration Screen or reload the desired Configuration File.

RF Out Path Loss

Select the **RF Out Path Loss** field to enter in dB the measured value of the loss through the output path from the test set.

The “RF Out Path Loss” value is typically measured using the calibration routines found on the Calibration Menu. After the Path Loss measurement is made, the RF Out Path Loss Value is automatically updated on the configuration menu.

NOTE

Changing the RF Out Loss value on any of the Measurement screens such as Signal Generator or Spectrum Analyzer, will change the RF Out Path Loss value on the Configuration Screen. Anytime you run the software, make sure you verify the RF Out Path Loss value on the Configuration Screen or reload the desired Configuration File.

Power Meter Path Loss

Select the **Power Meter Path Loss** field to enter in dB the measured value of the loss through the through the input path to the power meter sensor.

The “Power Meter Path Loss” value is typically measured using the calibration routines found on the Calibration Menu. After the Path Loss measurement is made, the Power Meter Path Loss Value is automatically updated on the configuration menu.

NOTE

Changing the PM Loss value on the Power Meter screen will change the Power Meter Path Loss value on the Configuration Screen. Anytime you run the software, make sure you verify the Power Meter Path Loss value on the Configuration Screen or reload the desired Configuration File.

CAUTION

The external attenuator is used for testing Base Stations. Tests on Metro Cell Base Stations are performed at > 20 dBm (100 mW), which does exceed the maximum level. Thus, the attenuator is required for testing.

Base Station Type

Select the **Base Station Type** field to enter the choice for the type of Base Station you will be testing from the **Choices:** list. The Channel STD and Carrier Configuration available selections are dependant upon the Base Station Type selected.

Cabinet

Select the **Cabinet** field to enter the choice for the cabinet style (indoor or outdoor) from the **Choices:** list. You can make this selection for any Base Station Type selected, however, the Compact 1900 is Outdoor only.

Carrier Configuration

Select the **Carrier Configuration** field to enter the choice for the carrier configuration of the Base Station from the **Choices:** list. The field selection is applicable to Metro Cell Base Stations only.

NOTE

Metro Cell Base Stations (except MFRM types) are of four basic configurations: 1-carrier, 2-carrier, 3-carrier, and 4-carrier. For example, the carriers in a 4-carrier configuration in the **Choices:** list are identified as 1st, 2nd, 3rd, and 4th.

Metro Cell MFRM Base Stations occur in a broader variety of configurations in the **Choices:** list.

RX Configuration

Select the **RX Configuration** field to enter the choice for configuration regarding a receiver splitter from the **Choices:** list. The field selection is applicable to 800-MHz SFRM Metro Cell, and MFRM Metro Cell Base Stations only.

NOTE

If only one splitter is listed, it is the splitter for both the RX0 and RX1 paths.

If two splitters are listed, the first is for the RX0 (main) path, and the second is for the RX1 (diversity) path.

TX Configuration

Select the **TX Configuration** field to enter the choice for configuration regarding an IMF or Combiner from the **Choices:** list. The field selection is applicable for Metro Cell 800-MHz Base Stations.

Site Name

Select the **Site Name** field to enter the name of the cell site. Enter the characters in the cell site name from those available in the list. Select **OK** when finished. The text entered in this field will be displayed on the test report and the Stored Test Data file.

Show Drawings with Test

Select the **Show Drawings with Tests** field to select whether connection diagrams will be displayed during the testing process.

RX Receive Power Upper Limit

Select the **RX Receive Power Upper Limit** field to enter the maximum upper

power limit used for receiver testing, typically 25 dB. Enter the pass/fail limits in dB.

RX Receive Power Lower Limit

Select the **RX Receive Power Lower Limit** field to enter the minimum lower power limit used for receiver testing, typically 15 dB. Enter the pass/fail limits in dB.

RX Receive FER Upper Limit

Select the **RX Receive FER Upper Limit** field to enter the maximum upper FER limit used for receiver testing, typically 1%. Enter the pass/fail limits in percentage for the acceptable rates.

RX Receive FER Lower Limit

Select the **RX Receive FER Lower Limit** field to enter the minimum lower FER limit used for receiver testing, typically 0%. Enter the pass/fail limits in percentage for the acceptable rates.

NOTE

Select and enter the Power Sensors Cal Factor for each of the following Cal Factor fields. This value will be automatically entered and used as the Cal Factor for the power sensor anytime a measurement is made using the Power Meter. These values should be updated anytime a new power sensor is used on the Test Set or after the sensor has been returned from being calibrated. This will ensure the power meter is using the correct cal factor to maintain the required power meter accuracy.

To determine the Cal Factor value to enter, a list of cal factors is printed on the label of the power sensor. Select a Cal Factor that is within the operating frequency range for each of the bands. Depending on the power sensor, you may have to interpolate the Cal Factor from the frequency range provided on the power sensor. For example, for the North American Cellular CDMA Band (824-895 MHz): If your power sensor's calibration table shows a calibration factor of 98.0 for 300 MHz, and 98.7 for 1000 MHz, you would use 98.6 for the frequency range of 824 to 895 MHz. See the *Making a Basic Average Power Measurement* Help Topic in the Online Help Screen or the *E7495A/B Measurement Guide* for more information.

Power Meter Reference Cal Factor

Select the Power Meter Reference Cal Factor field to enter the Ref CF % listed at the top of the list on the power sensor. The value you enter here will automatically be entered into the Ref CF field on the Power Meter screen. This is the cal factor used for the power sensor when performing a zero or calibration of the power meter. See the *Making a Basic Average Power Measurement* Help Topic in the online help screen or the *E7495A/B Measurement Guide* for more information.

Power Meter Cal Factor for Americas Cellular Band (824 – 895 MHz)

Select and enter the Power Sensors Cal Factor for North American Cellular CDMA Band. This value will be used as the Cal Factor for the power sensor anytime a measurement is made using the Power Meter for the 824-895 MHz band.

Power Meter Cal Factor for Americas PCS Band (1.85 – 1.9 GHz)

Select and enter the Power Sensors Cal Factor for North American Cellular CDMA Band. This value will be used as the Cal Factor for the power sensor anytime a measurement is made using the Power Meter for the 1.85 – 1.9 GHz band.

Power Meter Cal Factor for Korean PCS Band (1.75 – 1.9 GHz)

Select and enter the Power Sensors Cal Factor for North American Cellular CDMA Band. This value will be used as the Cal Factor for the power sensor anytime a measurement is made using the Power Meter for the 1.75 – 1.9 GHz band.

Power Meter Cal Factor for NMT-450 Band (450 – 500 MHz)

Select and enter the Power Sensors Cal Factor for North American Cellular CDMA Band. This value will be used as the Cal Factor for the power sensor anytime a measurement is made using the Power Meter for the 450 – 500 MHz band.

Using the Test Menu Screen

If you select Test Menu, the Test Software will display a Test Menu screen. The content of that screen will depend upon the particular Base Station Test Suite selected, but it will include all of the TESTs required for that particular Base Station type. For test procedures for this test software, refer to [“Test Menu” on page 48](#).

Initiating Testing

After setting all relevant fields on the Configuration Menu screen to appropriate values and settings, prepare to select the TESTs by selecting the **Test Menu** field. Select the desired TEST from the Test Menu screen. For test procedures for this test software, refer to [“Test Menu” on page 48](#).

3 **Connections**

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

Equipment Required

The following equipment is required for testing:

- Nortel CDMA Base station
- Agilent Technologies E7495A/B Base Station Test Set.
- Agilent Technologies E7495A/B standard/optional accessories.

Accessory Kit Cables, Connectors, and Small Accessories

CAUTION

The Test Set and other equipment in this test system are susceptible to damage by transient RF power, continuous RF power, high voltage, electrostatic discharge from cables and other sources, and transients caused by lightning. Connections to equipment, switch settings, and power-on conditions must be selected and accomplished carefully to reduce the risk of damage to the equipment.

Some of the cables, connectors, and small accessories listed in [Table 3-1](#) are standard items shipped with an E7495, some are necessary options, refer to the table for descriptions. Some of the parts may also be purchased separately through a local vendor.

Table 3-1 **Accessory Kit Contents**

Description	Purpose	Quantity	Part Number
Standard Coax Accessories shipped with each E7495			
Open, 50 ohm, N-type male	Accessory, Return Loss Calibration	1	1250-3421
Short, 50 ohm, N-type male	Accessory, Return Loss Calibration	1	1250-3424
Load, 50 ohm, N-type male	Accessory, Return Loss Calibration	1	1250-3423
Attenuator, fixed 6 GHz max 10 dB N type	Accessory, cable loss test	2	0955-1534
Adapter, 50 ohm, N-type F-F	Accessory	2	1250-3422
Cable, 2 ft N (m) - N (m)	Accessory	2	8120-8862
GPS antenna, SMA M	Used for Timing source	1	1150-2085
High power attenuator (E7495A Only), 40 dB 100 W	Used in High Power Testing	1	0955-1458
PCMCIA 64 MB Flash memory card	Media used for saving test results	1	0950-4409
Optioned Coax/Test Accessories			

Table 3-1 Accessory Kit Contents

Description	Purpose	Quantity	Part Number
E7495B, option 800 BSTS accessories: 40 dB attenuator	Used in High Power Testing	1	0955-1599
E7495A/B, option 200, includes: CA-ASSY RF 50 ohm, BNC, male to male cable 10 ft	Connects Test Set RF IN or RF OUT connector to Base Station TX output connector.	1	8121-1230
8482A (requires E7495A/B, option 600)	Power Sensor for setting power levels	1	8482A

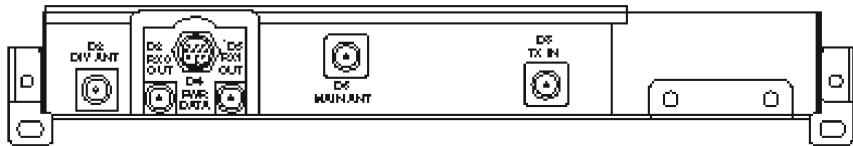
Base Station to Test Set Connections

Since many combinations of test equipment and base stations exist, it is important to understand that you must calibrate some system components before initiating testing. More specifically, after calibration, tests must be performed with the equipment connected in the same way that it was connected when calibrated.

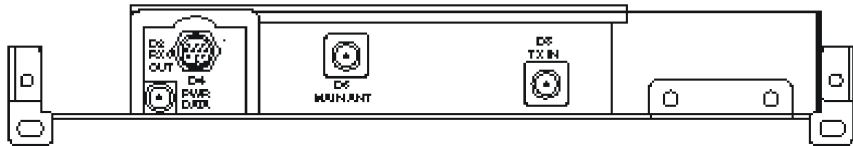
Note, due to the many configurations of Nortel Metro Cell Base Stations, no full connection diagram is provided in the test software. Instead, [Figure 3-1](#) assists in illustrating different Metro Cell connection locations.

Figure 3-1 1900/800-MHz Metro Cell Base Station Connection Locations

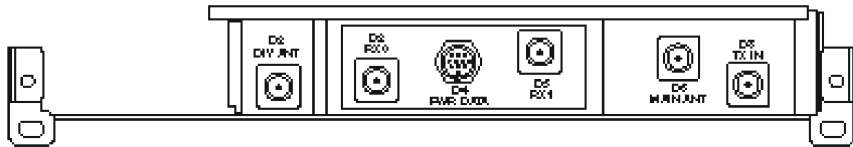
Mod 1
800MHz DPM



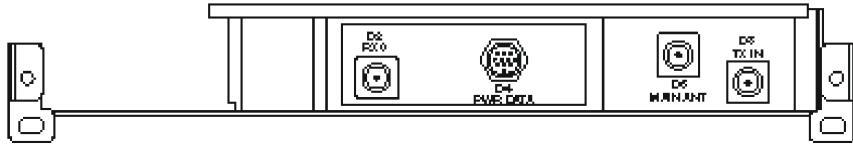
Mod 2
800MHz DPM



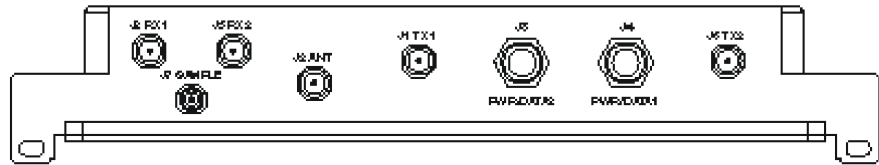
Mod 1
1900MHz DPM



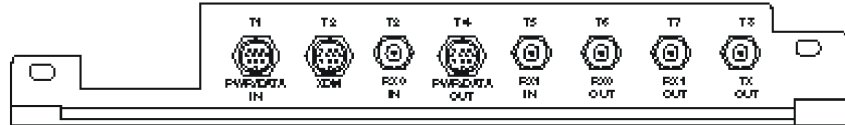
Mod 2
1900MHz DPM



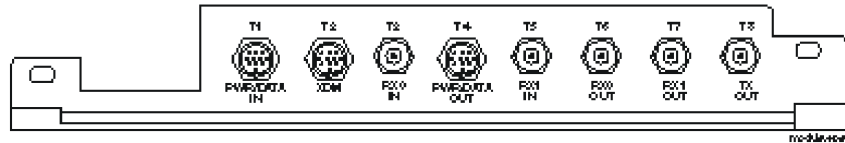
FRMTM
(Triplexer)



1900 TRM



800 TRM



Newest
800 TRM



4 Reference

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

Customizing Test Procedures

Changing Pass/Fail Limits

Pass/Fail limits define the values with which a measurement result is compared to determine if the system under test meets specified standards. Default values are set in the Test Software. These default values may be changed to meet the requirements of the particular application. Changing pass/fail limits is accomplished from each measurement screen, with the exception of the RX Power and RX FER limits found on the main Configuration Screen.

While running the software package these limits can be changed in the measurement screen used for a specific automated test. Then once all limits are adjusted to new user set levels, the user needs to select **Save Configuration**, in the main Configuration Screen, see [Saving/Deleting/Loading User Configurations](#).

NOTE

Only measurement failures are flagged in the far right hand column on the test record.

Saving/Deleting/Loading User Configurations

A test procedure is a collection of channel information, test parameters, and pass/fail limits saved in a saved in a **User Configuration** file. This file might be one of the default procedures that is supplied with the Test Software, or it might be an application specific procedure that customizes the Test Software to a specific application. When you save a custom procedure, it consists of channel information, configuration information, pass/fail limits.

Custom procedures can be saved on a PCMCIA card, CF media card, or if running the software without a PC Card, saved in internal memory. Selecting Output Media for PC Card-PCMCIA Card or Compact Flash Card: Press **System** key, then [**Save Data Setup**], then select the File Location, (**[CF]** or **[PCMCIA]**)

To save or delete Procedures from a PCMCIA Card or a CF media card requires a that a Media Card be inserted into the test set with the Nortel Test Package on it, see [“Loading the Test Software” on page 17](#).

- To save a user procedure, select the [**Save Config**] key in the Configuration Screen.
- To delete a user procedure, select the [**Delete Config**] key in the Configuration Screen.
- To load a user procedure, select the [**Load Config**] key in the Configuration Screen.

To save or delete Procedures from internal memory requires the Nortel Software package be installed into the Test Set, see [“Loading the Test Software” on page 17](#).

- To save a user procedure, select the [**Save Config**] key in the Configuration Screen.

- To delete a user procedure, select the [**Delete Config**] key in the Configuration Screen.
- To load a user procedure, select the [**Load Config**] key in the Configuration Screen.

Importing and Exporting User Configuration Files

If running the software from internal memory, User Configuration files will be loaded/saved to internal memory in the E7495. If running the software from a PCMCIA/CF memory card, User Configuration files will be loaded/saved to the card media in the E7495. To share saved configuration files between test sets, the user can import/export saved files into and from the internal memory.

To Export all user procedures from the test set to a **memory card**:

1. Select the [Mode] key, [Test Software] key
2. Select the [Software Utilities] key
3. Select [Export Config Files]
4. Choose the location from which the Config files will be exported to (PCMCIA or Compact Flash).

To Import all user procedures from the a memory card to the test set **internal memory**:

1. Select the [Mode] key, [Test Software] key
2. Select the [Software Utilities] key
3. Select [Import Config Files]
4. Choose the location from which the Config files will be imported from (PCMCIA or Compact Flash).

Storing Test Results

It is often desirable to record test results for future reference or evaluation. The Test Software provides the capability to save test results. To save the results you will need:

- A PCMCIA or CF Card

Sending Test Results to a Card

To send test results to a card, you must select PCMCIA or CF (Compact Flash) from the Save Data Setup menu key under the System key. The Test Software will create test result files on the card automatically, based on the name that you enter at the start of testing. The Test Software will append .html to the file name so that the files will be recognized on the card and can be viewed on a PC with a PCMCIA card slot.

NOTE

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

Once testing is completed for each selected test, the user must select the **Save Data** key in the measurement screen the test is using. When all testing is completed, from the main Test Screen, the user can select the **View Test Data** key prior to saving or just select the **Save Test Data** key to save all the test results currently saved in a temporary file to a PC Card.

Operating the Test Set

For detailed information on the operation of the display and the various keys and other controls, see the *Agilent Technologies E7495A/B Base Station Test Set Measurement Guide*, as appropriate.

Access the Main Software Menu screen, from which all operations inside the Test Software are invoked, from the Test Software Key screen by selecting the Nortel Software Option key. For detailed information on this screen, see [“Using the Main Software Menu Screen” on page 18](#).

Calibration Menu Screen

Select the **Calibration Menu** field to display the Calibration Menu screen. The Calibration Menu screen fields are described in the paragraphs below. For calibration procedures for this test software, refer to “[Calibration Menu](#)” on [page 63](#).

The functions of the menu keys on the Calibration & Utilities Menu screen are as follows:

- (**Select**) – Select to enter values and/or make selections within the calibration and utilities menu screen.
- (**View Test Data**) – When all testing is completed, from the main Test Screen, you view the test results by selecting the **View Test Data** prior to saving.
- (**Store Test Data**) – Once testing is completed for each selected test, you must select the **Save Data** in the measurement screen the test is using. When all testing is completed, from the main Test Screen, you can select the **Save Test Data** to save all the test results currently saved in a temporary file to a PC Card.
- (**Config Menu**) – Select to go to the Configuration Menu Screen.
- (**Main Menu**) – Select to return to the Main Software Screen.

RF IN Path Loss Calibration

Select the **RF In Path Loss Calibration** field to initiate the measurement. The Test Software will display instructions and calibration the Path Loss on the 2-port Insertion Loss measurement screen. The Software will automatically enter the proper Start and Stop Frequencies based upon the Channel Standard setting on the Configuration Screen. It will then display the cable / device connection diagrams for normalization and measurement of the RF In Cable setup. Make the necessary connections as displayed and press **Proceed** when prompted. At the end of the measurement the RF In Path loss value will be displayed. Press the **Proceed** key to save the value for the **RF In Path Loss Calibration** field on the Configuration Screen. The software will then return to the Calibration menu. Once all of your Calibrations are complete you must save the configuration file so that the Path Loss Calibration values are retained.

RF OUT Path Loss Calibration

Select the **RF OUT Path Loss Calibration** field to initiate the measurement. The Test Software will display instructions and calibration the Path Loss on the 2-port Insertion Loss measurement screen. The Software will automatically enter the proper Start and Stop Frequencies based upon the Channel Standard setting on the Configuration Screen. It will then display the cable / device connection diagrams for normalization and measurement of the RF In Cable setup. Make the necessary connections as displayed and press **Proceed** when prompted. At the end of the measurement the RF In Path loss value will be displayed. Press the **Proceed** key to save the value for the **RF In Path Loss Calibration** field on the Configuration Screen. The software will then return to the Calibration menu. Once all of your Calibrations are

complete you must save the configuration file so that the Path Loss Calibration values are retained.

Power Meter Path Loss Calibration

Select the **Power Meter Path Loss Calibration** field to initiate the measurement. The Test Software will display instructions and calibration the Path Loss on the 2-port Insertion Loss measurement screen. The Software will automatically enter the proper Start and Stop Frequencies based upon the Channel Standard setting on the Configuration Screen. It will then display the cable / device connection diagrams for normalization and measurement of the RF In Cable setup. Make the necessary connections as displayed and press **Proceed** when prompted. At the end of the measurement the RF In Path loss value will be displayed. Press the **Proceed** key to save the value for the **RF In Path Loss Calibration** field on the Configuration Screen. The software will then return to the Calibration menu. Once all of your Calibrations are complete you must save the configuration file so that the Path Loss Calibration values are retained.

Utilities Menu Screen

Select the **Utilities Menu** field to display the Utilities Menu screen. The Utilities Menu screen fields are described in the paragraphs below. For utilities procedures for this test software, refer to “[Utilities Menu](#)” on page 64.

The functions of the menu keys on the Utilities Menu screen are as follows:

- **(Select)** – Select to enter values and/or make selections within the calibration and utilities menu screen.
- **(View Test Data)** – When all testing is completed, from the main Test Screen, you view the test results by selecting the **View Test Data** prior to saving.
- **(Store Test Data)** – Once testing is completed for each selected test, you must select the **Save Data** in the measurement screen the test is using. When all testing is completed, from the main Test Screen, you can select the **Save Test Data** to save all the test results currently saved in a temporary file to a PC Card.
- **(Config Menu)** – Select to go to the Configuration Menu Screen.
- **(Main Menu)** – Select to return to the Main Software Screen.

Measure Device Loss 1 (2, 3, 4)

Select the appropriate **Measure Device Loss** field to initiate the measurement. The Test Software will display instructions and measure the loss or gain of the device on the 2-port Insertion Loss measurement screen. The Software will automatically enter the proper Start and Stop Frequencies based upon the Channel Standard setting on the Configuration Screen. It will then display the connection diagrams for normalization and measurement of the Device. Make the necessary connections as displayed and press **Proceed** when prompted. At the end of the measurement, the Device loss value will be displayed. Press the **Proceed** key to save the value for the Device Loss on the Test Report. The software will then return to the **Utilities Menu** screen. You can view the measured value of the device on the Test Report by pressing the **View Test Data** menu key on the **Utilities Menu** screen.

RX0/RX1 Receive Path Gain Troubleshooting

Select the **RX0 Receive Path Gain Troubleshooting** or **RX1 Receive Path Gain Troubleshooting** field to initiate the measurement. The Test Software will display instructions and an example connection picture. Pressing **Proceed** will take you to a TEST that verifies that all components in the receive path are operating within prescribed limits for amplification and attenuation. To save the measurement result, press the **Proceed** key. The software will save the results to the Test Report and return the to the **Utilities Menu** screen. You can view the measured value of the device on the Test Report by pressing the **View Test Data** menu key on the **Utilities Menu** screen.

Spectral Interference Evaluation

Select the **Spectral Interference Evaluation** field to initiate the measurement. The Test Software will display instructions for this test.

Pressing **Proceed** will take you to a TEST that verifies there are no interfering signals on either the forward or reverse link channels. You can then select the Proceed key, the software will then return the to the **Utilities** menu.

Reference
Utilities Menu Screen

5 Test Descriptions

This chapter provides descriptions of each of the procedures, tests, parameters, and pass/fail limits contained in the Test Software.

Test Descriptions

Each TEST consists of one measurement or more. In most instances, you may change the values of the specifications (pass/fail limits) that are used in a TEST, but you may not change the measurements that the TEST will perform.

Generally, the order in which you perform the TESTs is not important. However, for the greatest efficiency, you should perform the TESTs in the order shown on the Test Menu screen. For instance, the transmit TESTs are listed together on the screen. This provides for blossoming the Base Station at the start of the transmit test sequence, then not wilting the Base Station until after all of the transmit TESTs have been performed. This prevents wasting time in needlessly blossoming and wilting the Base Station.

The TESTs are derived from the Nortel Cellular Handbook and include the following:

- “Test Menu” on page 48
 - “Power Sensor Verification (HIP-D or MCPA)” on page 48
 - “OCNS Channels Code Domain Measurements” on page 51
 - “Adjacent Channel Power Test” on page 52
 - “Spectral Regrowth Test” on page 53
 - “RX0 Receive Power Test” on page 54
 - “RX0 Receive FER Test” on page 55
 - “RX1 Receive Power Test” on page 56
 - “RX1 Receive FER Test” on page 57
 - “MFRM Multi Carrier Total Output Power Test” on page 58
 - “MFRM Multi Carrier Spectral Regrowth Test” on page 61
 - “MFRM Multi Carrier OCNS Channels Under Test Code Domain Measurements” on page 62
- “Calibration Menu” on page 63
 - “Power Meter Path Loss Calibration, RF In Path Loss Calibration, RF Out Path Loss Calibration” on page 63
- “Utilities Menu” on page 64
 - “Measure Device Loss (1 through 4)” on page 64
 - “RX0 Receive Path Gain Troubleshooting, RX1 Receive Path Gain Troubleshooting” on page 65
 - “Spectral Interference Evaluation” on page 69

These TESTs are described on succeeding pages.

NOTE

It is important to remember that, of the specifications listed in each TEST description, not all are necessarily used for each Base Station type.

Blossoming the Base Station

When you are prompted to blossom the Base Station, dependent upon the Base Station type, configure the Base Station code channels and gain as listed in the following paragraphs. For information on configuring the channels and gains for particular Base Stations, refer to the appropriate Nortel CDMA Testing Installation Method.

For Metro Cell IS-95 Base Stations:

- Pilot Channel – 254
- Sync Channel – 123
- Paging Channel – 245
- 6 OCNS Channels – 174

For Metro Cell IS-2000 1xRTT Base Stations:

- Pilot Channel – 254
- Sync Channel – 123
- Paging Channel – 245
- 5 OCNS Radio Configuration 3 (RC3) Fundamental Channels – 174
- 1 OCNS Radio Configuration 3 (RC3) 16x Supplemental Channels – 174

Testing MFRM Metro Cell Base Stations

It is also important to remember that the MFRM Metro Cell Base Station can transmit as many as three carriers or more. In order to test this Base Station properly, all carriers must be checked. Following is the recommended test sequence for a three carrier MFRM Metro Cell Base Stations. The MFRM Test Menu is arranged so as to repeat the sequence on the menu three times, one for each carrier in this example. If testing a two carrier Compact MFRM then the sequence is repeated only twice.

Test the three carriers on the Base Station on adjacent CDMA channels. For instance, in the cellular band, the channels might be 384, 425, and 466. In the PCS band, the channels might be 500, 525, and 550. You must use three adjacent channels appropriate to the frequency band. Start the sequence of TESTs on the lowest carrier channel selected. Set up the Base Station and the Test Software to perform TESTs on the lower carrier channel. Perform the following TESTs:

Test Set Calibration; calibrate the path loss for the cables to be used (**Under the Calibration Menu**: measure the Power Meter Path Loss, RF In Path Loss, and RF Out Path Loss

Run the following Tests (Under the Test Menu):

- Power Sensor Verification
- OCNS Channels Code Domain
- Spectral Regrowth Test
- Adjacent Channel Power Test

- • MFRM Multi Carrier Total Output Power Test – (Blossom all three carriers during this test)
- MFRM Multi Carrier OCNS Channel Under Test Code Domain Measurement – (All three carriers blossom during this test)
- MFRM Multi Carrier Spectral Regrowth Test – (All three carriers blossom during this test)
(Wilt all three carriers in the Base Station.)
- RX0 Receive Power Test
- RX0 Receive FER Test
(Wilt the Base Station.)
- RX1 Receive Power Test – (Change connections and blossom the Base Station.)
- RX1 Receive FER Test
(Wilt the Base Station.)

Change the Base Station and the Test Software to perform TESTs on the middle carrier channel. Perform the following TESTs:

- Power Sensor Verification
- OCNS Channels Code Domain
- Spectral Regrowth Test
- Adjacent Channel Power Test
- • MFRM Multi Carrier Total Output Power Test – (Blossom all three carriers during this test)
- MFRM Multi Carrier OCNS Channel Under Test Code Domain Measurement – (All three carriers blossom during this test)
- MFRM Multi Carrier Spectral Regrowth Test – (All three carriers blossom during this test)
(Wilt all three carriers in the Base Station.)
- RX0 Receive Power Test
- RX0 Receive FER Test
(Wilt the Base Station.)
- RX1 Receive Power Test – (Change connections and blossom the Base Station.)
- RX1 Receive FER Test
(Wilt the Base Station.)

Change the Base Station and the Test Software to perform TESTs on the upper carrier channel. Perform the following TESTs:

- Power Sensor Verification
- OCNS Channels Code Domain Measurements
- Spectral Regrowth Test
- Adjacent Channel Power Test
- • MFRM Multi Carrier Total Output Power Test – (Blossom all three carriers during this test)
- MFRM Multi Carrier OCNS Channel Under Test Code Domain Measurement – (All three carriers blossom during this test)
- MFRM Multi Carrier Spectral Regrowth Test – (All three carriers blossom during this test)
(Wilt all three carriers in the Base Station.)
- RX0 Receive Power Test
- RX0 Receive FER Test
(Wilt the Base Station.)
- RX1 Receive Power Test – (Change connections and blossom the Base Station.)
- RX1 Receive FER Test
(Wilt the Base Station.)

Test Menu

Power Sensor Verification (HIP-D or MCPA)

NOTE

When testing MFRM Base Stations, this test should be used only for testing a single carrier. If you wish to test all three carriers, use the MFRM Multi Carrier Total Output Power Test.

This TEST verifies that the accuracy of the Base Station RF power sensor is within specified limits.

The Base Station power output Carrier Output Power are dependent on the digital gain settings of the pilot channel, paging channel, sync channel, and OCNS channel. It is also dependent upon the number of OCNS channels that are active. Once a Base Station is in service, the gains will be set to optimize the wireless network performance. During testing, there are recommended gain settings that are more than likely different than the in-service gain settings. These recommended settings result in a desired Base Station or carrier power output, and are as shown in [Table 5-1](#).

Ideally, you should change the Base Station gain settings when you test the Base Station. However, this might not always be practical. Therefore, you may use the Digital Gain screen to determine the new Base Station power output based on the gain settings in the Base Station.

You may access the Digital Gains screen from the Configuration Menu by selecting the Digital Gains menu key. If you wish to use different settings, change the **Alternate** fields in this screen (which will cause the Test Software to calculate a new output power value and change the **Base Station Power Out** setting automatically), then select the **Use Alt Values** to have the new Base Station Power Output value updated on the configuration screen. The Digital Gains screen adjust the Carrier output power for MFRM stations and Base Station Power Out for Non MFRM stations.

You may use the Vortex PC Power Palette Window to set the digital gains in the Base Station.

Table 5-1

Recommended Settings for Base Stations

Item	Base Station
Pilot Gain	254
Sync Gain	254
Paging Gain	245
OCNS RC3 Fundamental Gain	0
Number of OCNS RC3 Fundamental Channels	0

The digital gain settings reflect the power output of each individual carrier. If each carrier is set as shown in [Table 5-1](#), the output power is as follows:

- For Metro Cell 1900-MHz Base Stations, the power is 38.50 dBm with pilot, paging, and sync only.
- For Metro Cell 800-MHz Base Stations, the power is 41.12 dBm with pilot,

paging, and sync only.

- For 800 MHz High Power Base Station, the power is 41.56 dBm with pilot, paging, and sync only.

NOTE

The Test Set is also affected by temperature. If the Test Set is moved from a sheltered environment to an exposed one, it must be allowed to reach thermal equilibrium (even if it has not been unplugged from the power source). This will require 15 minutes.

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

Step 1. Select the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.

Step 2. Select the **Test Menu** and then the **Power Sensor Verification** field.

Step 3. Follow the on-screen directions.

The following paragraphs provide the upper and lower limit equations for the various types of Base Stations. The definitions for terms used in those equations are as follows:

- UL – Upper pass/fail limit.
- LL – Lower pass/fail limit.
- Power – The setting of the **Carrier Power Out** field on the Configuration Menu screen. This is the basic figure shown on the power meter. It is always present in the equation.
- Limits:
 - For Metro Cell 1900-MHz Base Stations, the carrier power is 38.50 dBm with pilot, paging, and sync only.
 - For Metro Cell 1900-MHz High Power Base Stations, the carrier power is 43.0 dBm with pilot, paging, and sync only.
 - For Metro Cell 800-MHz Base Stations, the power is 41.125 dBm with pilot, paging, and sync only.
 - For Metro Cell 800-MHz High Power Base Stations, the power is 45.625 dBm with pilot, paging, and sync only.
 - For Metro Cell 450-MHz Base Stations, the power is 41.5625 dBm with pilot, paging, and sync only.
 - For Metro Cell 450-MHz High Power Base Stations, the power is 46.0625 dBm with pilot, paging, and sync only.

The upper and lower limits are always present in the equation for these Base Stations:

- 1.3 dB - The basic upper or lower limit for Metro Cell MFRM.
- 1.27 dB is the limits for MRFM 800, compact MFRM 800, MFRM 1900, MFRM 1900 high power, compact MFRM 1900, Metro Cell SRFM 1900, MFRM 450

Test Menu

- 1.0 dB is the limits for MRFM 800 high power, MFRM 800 high power, MFRM 450 High Power
- 1.5 dB is the limits for Metro Cell SRFM 800

The specifications shown in italics are optional.

Indoor: $LL = \text{Power} - \text{Limit} - \textit{IMF} - \textit{Combiner}$

$UL = \text{Power} + \text{Limit} - \textit{IMF} - \textit{Combiner}$

Outdoor: $LL = \text{Power} - \text{Limit} - \textit{LPP} - \textit{IMF} - \textit{Combiner}$

$UL = \text{Power} + \text{Limit} - \textit{LPP} - \textit{IMF} - \textit{Combiner}$

NOTE

The next two items allow for four combinations of Combiner and IMF: both, IMF, Combiner, neither. Dependent upon the setting of the Configuration Menu screen **TX Conf** field, these items will appear singly, in combination, or not at all.

The last item is the loss through a Lightning Protector Plate used only with Outdoor Cabinets.

- 0.505 dB - The loss associated with a Base Station with a Combiner. It is present for that configuration only. Its presence is determined by the setting of the **TX Conf** field on the Configuration Menu screen.
- 0.80 dB - The loss associated with a Base Station with an IMF. It is present for that configuration only. Its presence is determined by the setting of the **TX Conf** field on the Configuration Menu screen.
- 0.25 dB - The loss associated with an LPP and the cables for Metro Cell. It is present in the equation only if the Base Station is an outdoor type. Its presence is determined by the setting of the **Cabinet** field on the Configuration Menu screen.

OCNS Channels Code Domain Measurements

This TEST verifies that the estimated rho, frequency error, time offset, and carrier feedthrough values of the transmitted RF signal from the Base Station are within the prescribed limits. All measured Channel levels in the Test Report are relative to the Channel Power.

The Pass/Fail Limits used in this TEST are:

- Pilot Power Delta Limit - Delta Limit: -30 dBm

NOTE

Pilot Power is recorded as a Delta Power measurement relative to Channel Power in the test report

- Delta Sync Power Limit - Delta Limit: -30 dB
- Delta Page Limit - Delta Limit: -30 dB

NOTE

The above three level checks are just to verify these channels are up and active.

- Frequency Error Limits - High Limit: 25 Hz, Low Limit: -25 Hz
- Time Offset Limits - High Limit: 3.5 us; Low Limit: -3.5 us
- Est Rho Limit - Low Limit: 0.96
- Carrier Feedthru - High Limit: -20 dBc
- Noise Floor - High Limit: -33 dB

CAUTION

Before disconnecting any Base Station cables, verify that the site is wiled and is not producing RF power.

- Step 1.** Press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **OCNS Channels Code Domain Measurements** field.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

Adjacent Channel Power Test

This TEST verifies power in a 30-kHz adjacent channel relative to the 1.23-MHz channel of the carrier. The offset is 885 kHz for 1900-MHz Base Stations and 750 kHz for 800-MHz Base Stations. The Test Software examines the 30-kHz channels at 885 (or 750) kHz above and below the center frequency.

In more detail, it verifies that the 1.23-MHz transmit signal is adequately filtered (reduced) at the adjacent channel frequencies.

The Pass/Fail Limits used in this TEST are:

- -45 dBc

CAUTION

Before disconnecting any Base Station cables, verify that the site is wiled and is not producing RF power.

- Step 1.** Press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **Adjacent Channel Power Test** field from the Configuration Menu screen.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

Spectral Regrowth Test

This TEST verifies that the Base Station is within its 1.23-MHz bandwidth and is not generating any undesired out-of-channel power.

The Pass/Fail Limits used in this TEST are:

- Cellular band: 750 kHz offset to 1.98 MHz, –45 dBc; 1.98 MHz to 2.5 MHz, –60 dBc
- Cellular band & NMT450 band:
 - Center Segment: Span 1.50 MHz, Level 50 dBm
 - 1st Segment: Span 1.23 MHz, Level –45 dB (both upper and lower segments)
 - 2nd Segment: Span N/A, Level –60 dB (both upper and lower segments)
- PCS Bands: 885 kHz offset to 1.98 MHz, –45 dBc; 1.98 MHz to 2.25 MHz, –55 dBc.
- PCS Band
 - Center Segment: Span 1.77 MHz, Level 50 dBm
 - 1st Segment: Span 1.095 MHz, Level –45 dB (both upper and lower segments)
 - 2nd Segment: Span N/A, Level –55 dB (both upper and lower segments)

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** Press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **Spectral Regrowth Test** field from the Test Menu screen.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

RX0 Receive Power Test

This TEST verifies the difference between the receive power reported by the Base Station Maintenance Unit (BMU) or the Vortex with no signal present and receive power reported when a -90-dBm signal is injected into the RX0 receiver. The measurement, which is a measure of the increase in receive power, is compared with the pass/fail limit.

Pass/Fail Limits is used in this TEST are:

- Lower Limit 15 dB Gain
- Upper Limit 25 dB Gain

CAUTION

Before disconnecting any Base Station cables, verify that the site is wiled and is not producing RF power.

- Step 1.** From the Configuration Menu screen, press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **RX0 Receive Power Test** field.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

RX0 Receive FER Test

NOTE

This TEST does not operate with all versions of Vortex. Contact Nortel to determine the required version.

This TEST is used in conjunction with the Vortex to measure the reverse channel frame (FER) of the Base Station. The TEST injects a CDMA reverse link signal into the Base Station receiver. The Vortex then reports the percentage of frame error rate of the CDMA signal. The initial RF level of the CDMA signal is -119 dBm.

The RF level may be adjusted in the TEST for troubleshooting. Increasing the level will improve the FER; decreasing the level will degrade the FER.

The Test Software will prompt you to enter the %FER from the Vortex in order to compare the value with the set pass/fail limit shown on the Configuration screen.

NOTE

Setting up the Vortex to report FER is somewhat complicated. The Test Software will supply prompts for the setup. If you require further assistance, refer to the Installation Method from Nortel.

- Upper Limit 1% FER
- Lower Limit 0% FER

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** From the Configuration Menu screen, press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **RX0 Receive FER Test** field.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

RX1 Receive Power Test

This TEST is the same as the RX0 Receive Power Test, except that it applies to the RX1 receiver.

In this Test, select the **RX1 Receive Power Test** field in step 2.

RX1 Receive FER Test

This TEST is the same as the RX0 Receive FER Test, except that it applies to the RX1 receiver.

In this Test, select the **RX1 Receive FER Test** field in step 2.

MFRM Multi Carrier Total Output Power Test

CAUTION

The Test Set will be damaged if an external attenuator is not used in this TEST. The total output power of the MFRM Base Station exceeds the power input rating of the Test Set. You must use an external attenuator (such as the 100-watt 40-dB device shown in [Table 3-1 on page 28](#)) to reduce the power applied to the Test Set.

NOTE

This TEST is applicable to MFRM Base Stations only.

This TEST verifies the total output power of all three carriers of the MFRM Base Station. You must use the Vortex to blossom all three carriers to perform this TEST. The digital gain settings of all three carriers should be set to the same required value. (The required settings are explained later in this section.) Note, for Compact MFRM testing, only 2 carriers can be blossomed coincidentally.

This TEST may be initiated from the **MFRM Multi Carrier Total Output Power Test Menu** field on the Test Menu screen.

The Base Station power output is dependent on the digital gain settings of the pilot channel, paging channel, sync channel, and OCNS channel for each of the Carriers active. It is also dependent upon the number of OCNS channels that are active. Once a Base Station is in service, the gains will be set to optimize the wireless network performance. During testing, there are required gain settings that are more than likely different from the in-service gain settings. These required settings for the Carrier Power Output result in a desired Base Station power output, and areas shown in [Table 5-2](#).

These values are default commissioning values as of August 20, 2004. Ideally, you should change the Base Station gain settings when you test the Base Station. However, this might not always be practical. Therefore, you may use the Digital Gain screen to determine the new Carrier Power output based on the gain settings in the Base Station.

You may select (**Dig Gains**) key to access the Digital Gains screen. If you wish to use different settings, change the **Alternate** fields in this screen (which will cause the Test Software to calculate a new output power value and change the **Carrier Power Out** setting automatically), then select the **Use Alternate Values for Testing** field.

Table 5-2

Recommended Settings for MFRM Base Stations

Item	MFRM Base Station
Pilot Gain	254
Sync Gain	254
Paging Gain	245
OCNS RC3 Fundamental Gain	0
Number of OCNS RC3 Fundamental Channels	0

You may use the Vortex PC Power Palette Window to set the digital gains in the Base Station. The digital gain settings reflect the power output of each individual carrier. The total power is the combination of all three individual carriers. If each carrier is set as shown in [Table 5-2](#), the total output power is

as follows:

- For Metro Cell MFRM 1900-MHz Base Stations, the power is 43.312 dBm with pilot, paging, and sync only.
- For Metro Cell MFRM 800-MHz Base Stations, the power is 45.937 dBm with pilot, paging, and sync only.
- For Metro Cell MFRM 450-MHz Base Stations, the power is 46.312 dBm with pilot, paging, and sync only.

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** In the **Base Station Type** field on the Configuration Menu screen, select **Nortel Metro Cell MFRM 1900 MHZ**, **Nortel Metro Cell MFRM 800 MHZ**, or **Nortel Metro Cell MFRM 450 MHZ** as appropriate.
- Step 2.** Select the (**Test Software** and **Nortel CDMA Tests**) key. The Test Software will display the Main Software Menu screen.
- Step 3.** Select the **MFRM Total Output Power Test** field.
- Step 4.** Follow the on-screen directions.

The following paragraphs provide the upper and lower limit equations for the various types of Base Stations. The definitions for terms used in those equations are as follows:

- UL – Upper pass/fail limit.
- LL – Lower pass/fail limit.
- Power – The setting of the **Base Station Power Out** field on the Configuration Menu screen. This is the basic figure shown on the power meter. It is always present in the equation.
- Limits:
 - 1.3 dB - The basic upper or lower limit for Metro Cell MFRM. It is always present in the equation for those Base Stations.
 - 1.27 dB is the limits for MRFM 800, compact MFRM 800, MFRM 1900, MFRM 1900 high power, compact MFRM 1900, Metro Cell SRFM 1900, MFRM 450
 - 1.0 dB is the limits for MRFM 800 high power, MFRM 800 high power. MFRM 450 High Power
 - 1.5 dB is the limits for Meto Cell SRFM 800

The specifications shown in italics are optional.

Indoor: LL = Power – Limit – *IMF* – *Combiner*
 UL = Power + Limit – *IMF* – *Combiner*

Outdoor: LL = Power - Limit – LPP – *IMF* – *Combiner*
 UL = Power + Limit – LPP – *IMF* – *Combiner*

NOTE

The next two items allow for four combinations of Combiner and IMF: both, IMF, Combiner, neither. Dependent upon the setting of the Configuration

Menu screen **TX Conf** field, these items will appear singly, in combination, or not at all.

The last item is the loss through a Lighting Protector Plate used only with Outdoor Cabinets.

- 0.505 dB - The loss associated with a Base Station with a Combiner. It is present for that configuration only. Its presence is determined by the setting of the **TX Conf** field on the Configuration Menu screen.
- 0.80 dB - The loss associated with a Base Station with an IMF. It is present for that configuration only. Its presence is determined by the setting of the **TX Conf** field on the Configuration Menu screen.
- 0.25 dB - The loss associated with an LPP and the cables for Metro Cell. It is present in the equation only if the Base Station is an outdoor type. Its presence is determined by the setting of the **Cabinet** field on the Configuration Menu screen.

MFRM Multi Carrier Spectral Regrowth Test

This TEST verifies that a Multi Carrier outputs from the MFRM Base Station are within their bandwidth and are not generating any undesired out-of-channel power. Cellular band channels need to have a 41 channel spacing and PCS band channels need to have a 25 channel spacing. For example Cellular channels 384, 425, and 466; PCS channels 500, 525, and 550.

The Pass/Fail Limits used in this TEST are:

- • Cellular band: 750 kHz offset to 1.98 MHz, -45 dBc; 1.98 MHz to 4.0 MHz, -60 dBc
- • Cellular band & NMT450 band:
 - Center Segment: Span 4.02 MHz, Level 50 dBm
 - 1st Segment: Span 1.23 MHz, Level -45 dB (both upper and lower segments)
 - 2nd Segment: Span N/A, Level -60 dB (both upper and lower segments)
- • PCS Bands: 885 kHz offset to 1.98 MHz, -45 dBc; 1.98 MHz to 3 MHz, -55 dBc.
- • PCS Band
 - Center Segment: Span 4.27 MHz, Level 50 dBm
 - 1st Segment: Span 1.74 MHz, Level -45 dB (both upper and lower segments)
 - 2nd Segment: Span N/A, Level -55 dB (both upper and lower segments)

CAUTION

Before disconnecting any Base Station cables, verify that the site is wiled and is not producing RF power.

- Step 1.** Press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **MFRM Multi Carrier Spectral Regrowth Test** field from the Test Menu screen.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

MFRM Multi Carrier OCNS Channels Under Test Code Domain Measurements

NOTE

This TEST is applicable to MFRM Base Stations only.

This test is performed with multiple adjacent carriers blossomed.

Multiple Cellular band channels need to have a 41 channel spacing and PCS band channels need to have a 25 channel spacing. For example Cellular channels 384, 425, and 466; PCS channels 500, 525, and 550.

The below measurements are performed on the channel under test.

- The TEST checks the channel power level of the CDMA carrier under test in dBm.
- The TEST checks the relative power level in dB as compared with the channel power of the pilot, paging, and sync channels.
- The TEST checks the relative power level and spread factor of the fundamental traffic channels.
- The TEST checks the relative power level and spread factor of the supplemental channels.
- The TEST reports the noise level in dB as compared with the channel power of the highest unused Walsh code.
- This TEST verifies that the estimated rho, frequency error, time offset, and carrier feedthrough values of the transmitted RF signal from the Base Station are within the prescribed limits.

The Pass/Fail Limits used in this TEST are:

- Frequency Error Limits - High Limit: 25 Hz, Low Limit: -25 Hz
- Time Offset Limits - High Limit: 3.5 us; Low Limit: -3.5 us
- Est Rho Limit - Low Limit: 0.96
- Carrier Feedthru - High Limit: -20 dBc

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** Press the (**Test Software** and **Nortel CDMA Tests**) keys. The Test Software will display the Main Software Menu screen.
- Step 2.** Select the **Test Menu** and then the **MFRM OCNS Channels Under Test Code Domain Measurements** field from the Test Menu screen.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station”](#) on page 45 for detailed information on channels and gains.)

Calibration Menu

The functions of the menu keys on the Calibration Menu screen are as follows:

- **(View Test Data)** – When all testing is completed, from the main Test Screen, you view the test results by selecting the **View Test Data** prior to saving.
- **(Store Test Data)** – Once testing is completed for each selected test, you must select the **Save Data** in the measurement screen the test is using. When all testing is completed, from the main Test Screen, you can select the **Save Test Data** to save all the test results currently saved in a temporary file to a PC Card.
- **(Select)** – Select to enter values and/or make selections within the calibration and utilities menu screen.
- **(Config Menu)** – Select to go to the Configuration Menu Screen.
- **(Main Menu)** – Select to return to the Main Software Screen.

Power Meter Path Loss Calibration, RF In Path Loss Calibration, RF Out Path Loss Calibration

These tests verify that no cable damage or attenuator damage has occurred since the last testing procedure. (Test cable loss factors must be determined each time testing is started.) These values allow the Test Software to provide accurate, repeatable measurements for installing and maintaining a Base Station. Measuring cable loss also allows you to determine when it is necessary to replace worn or faulty cables that could be damaged internally but show no signs of wear or damage.

NOTE All losses must be saved after each measurement is completed. To enter the loss automatically on the Configuration Menu screen follow the below steps.

NOTE The Path Loss calibrations are performed across the frequency band determined by the setting of the Channel Standard setting. Anytime the Base Station Type is changed to where a different Channel Standard is used, the Path Loss calibrations need to be re-run and stored. (i.e., changing to or from the following bands; Cellular band, NA PCS Band, Korean PCS, or NMT-450).

No Pass/Fail Limits are used in this TEST.

- Step 1.** Select the **Calibration Menu** field from the Main Software Menu.
- Step 2.** Select the proper calibration routine field from the **Calibration Menu** screen.
Choices are: **RF In Path Loss**, **RF Out Path Loss**, and **Power Meter Path Loss**.
- Step 3.** Follow the on-screen directions for the test selected.
- Step 4.** At the end of the measurement press Proceed to store the measured loss value in the related Loss Field: **RF IN Loss**, **RF Out Loss**, or **PM Loss**.
- Step 5.** Repeat step 3 through 5 for each related measured loss value.

Utilities Menu

The functions of the menu keys on the Utilities Menu screen are as follows:

- **(View Test Data)** – When all testing is completed, from the main Test Screen, you view the test results by selecting the **View Test Data** prior to saving.
- **(Store Test Data)** – Once testing is completed for each selected test, you must select the **Save Data** in the measurement screen the test is using. When all testing is completed, from the main Test Screen, you can select the **Save Test Data** to save all the test results currently saved in a temporary file to a PC Card.
- **(Config Menu)** – Select to go to the Configuration Menu Screen.
- **(Main Menu)** – Select to return to the Main Software Screen.

Measure Device Loss (1 through 4)

This TEST measures the insertion loss of the TX IMF filter and the RX splitter. Because the IMF filter and the splitter are passive devices that do not report either presence or losses, the Base Station neither recognizes nor compensate for the losses through these devices. Thus, the losses must be measured and supplied to the Base Station for compensation to take place.

NOTE

As many as four losses may be saved by selecting the appropriate test key.

No Pass/Fail Limits are used in this TEST.

- Step 1.** Select the **Utilities Menu** field from the Main Software Menu. The Test Software will display the Utilities Menu screen.
- Step 2.** Select the **Measure Device Loss Loss 1 - 4** field from the Calibration Utilities Menu screen.
- Step 3.** Follow the on-screen directions.

RX0 Receive Path Gain Troubleshooting, RX1 Receive Path Gain Troubleshooting

NOTE

The RX0 Receive Path Gain Test checks the gain through only receiver RX0. The RX1 Receive Path Gain Test checks the gain through only receiver RX1. The RX0 and RX1 Tests are applicable to Metro Cell and 800 MHz High Power Base Station.

This TEST verifies that all components in the receive path are operating within prescribed limits for amplification and attenuation.

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** Select the **Utilities Menu** field from the Main Software Menu.
The Test Software will display the Calibration & Utilities Menu screen.
- Step 2.** Select the **RX0 Receive Path Gain Troubleshooting** field or **RX1 Receive Path Gain Troubleshooting** field, as applicable to the TEST, from the Test Menu screen.
- Step 3.** Follow the on-screen directions. (See [“Blossoming the Base Station” on page 45](#) for detailed information on channels and gains.)

The following paragraphs provide the upper and lower limit equations for the various types of Base Stations. The definitions for terms used in those equations are as follows:

- UL - Upper pass/fail limit
- LL - Lower pass/fail limit.
- UL: 36.8/LL: 31.8 Spec (6) - The upper or lower limit for Metro Cell 1900-MHz Base Station gain from the DPM input to the cable connected to the RX0/RX1 input of the TRM.
- UL: 31.5/LL: 25.5 Spec (7) - The upper or lower limit for Metro Cell 1900-MHz Base Station gain from the DPM input through one TRM to the RX0/RX1 output of the TRM.
- UL: 20.5/LL: 14.5 Spec (8) - The upper or lower limit for Metro Cell 1900-MHz Base Station gain from the DPM input through three TRMs to the RX0/RX1 output of the third TRM.
- UL: 26.0/LL: 20.0 Spec (9) - The upper or lower limit for Metro Cell 1900-MHz Base Station gain from the DPM input through two TRMs to the RX0/RX1 output of the second TRM.
- UL: 29.4/LL: 23.4 Spec (10) - The upper or lower limit for Metro Cell 800-MHz or Rural Cell Base Station gain from the DPM input thorough one TRM to the RX0/RX1 output of the TRM.
- UL: 36.2/LL: 30.2 Spec (11) - The upper or lower limit for Metro Cell 800-MHz or Rural Cell Base Station gain from the DPM input through the cable connected to the RX0/RX1 input of the TRM.
- UL: 3.8/LL: 3.5 Spec (12) - The upper or lower limit for the external 1:2 splitter in the Metro Cell 1900-MHz Base Station.

- UL: 3.8/LL: 3.5 Spec (13) - The upper or lower limit for the external 1:2 splitter in the Metro Cell 800-MHz Base Station.
- UL: 6.8/LL: 6.5 Spec (14) - The upper or lower limit for losses through the 1:4 external splitter for Metro Cell 800-MHz or 800 MHz High Power Base Station.
- UL: 8.8/LL: 8.5 Spec (15) - The upper or lower limit for losses through the 1:6 external splitter for Metro Cell 800-MHz or 800 MHz High Power Base Station.
- UL: 0.30/LL: 0.30 Spec (16) - The upper or lower limit for losses of the LPP and cables for 800-MHz and Metro Cell 1900-MHz Base Stations.
- UL: 5.30/LL: 5.30 Spec (17) - The upper or lower limit for the TRM splitter in the Metro Cell 1900-MHz Base Station.

For indoor Metro Cell 800-MHz or 800 MHz High Power Base Station, the upper and lower limit equations for gain in dB from the DPM to the cable connected to the TRM RX0/RX1 input are as follows:

- No External Splitter (1 Carrier):
 - UL = UL Spec (11)
 - LL = LL Spec (11)
- No External Splitter (2 Carriers):
 - UL = UL Spec (10)
 - LL = LL Spec (10)
- 1:4 External Splitter (All Carriers):
 - UL = UL Spec (11) – LL Spec (14)
 - LL = LL Spec (11) – UL Spec (14)
- 1:6 External Splitter (All Carriers):
 - UL = UL Spec (11) – LL spec (15)
 - LL = LL Spec (11) – UL spec (15)

For outdoor Metro Cell 800-MHz or 800 MHz High Power Base Station, the upper and lower limit equations for gain in dB from the LPP to the cable connected to the TRM RX0/RX1 input are as follows

- No External Splitter (1 Carrier):
 - UL = UL Spec (11) – LL Spec (16)
 - LL = LL Spec (11) – UL Spec (16)
- No External Splitter (2 Carriers):
 - UL = UL Spec (10) – LL Spec (16)
 - LL = LL Spec (10) – UL Spec (16)
- 1:4 External Splitter (All Carriers):
 - UL = UL Spec (11) – LL spec (15) - LL Spec (16)
 - LL = LL Spec (11) – UL Spec (14) - UL Spec (16)
- 1:6 External Splitter (All Carriers):

$$UL = UL \text{ Spec (11)} - LL \text{ spec (15)} - LL \text{ Spec (16)}$$

$$LL = LL \text{ Spec (11)} - UL \text{ spec (15)} - UL \text{ Spec (16)}$$

For indoor Metro Cell 1900-MHz Base Stations, the upper and lower limit equations for RX0 gain in dB from the DPM to the TRM splitter RX0 output are as follows:

- All Carriers:

$$UL = UL \text{ Spec (7)}$$

$$LL = LL \text{ Spec (7)}$$

For outdoor Metro Cell 1900-MHz Base Stations, the upper and lower limit equations for RX0 gain in dB from the LPP to the TRM splitter RX0 output are as follows:

- All Carriers:

$$UL = UL \text{ Spec (7)} - LL \text{ Spec (16)}$$

$$LL = LL \text{ Spec (7)} - UL \text{ Spec (16)}$$

For indoor Metro Cell 1900-MHz Base Stations, the upper and lower limit equations for RX1 gain in dB from the DPM to the TRM splitter RX1 output are as follows:

- 1 Carrier:

$$UL = UL \text{ Spec (7)}$$

$$LL = LL \text{ Spec (7)}$$

- 2 Carriers, 3 Carriers (1st and 2nd), or 4 Carriers (1st and 2nd):

$$UL = UL \text{ Spec (9)}$$

$$LL = LL \text{ Spec (9)}$$

- 3 Carriers (3rd), or 4 Carriers (3rd and 4th):

$$UL = UL \text{ Spec (8)}$$

$$LL = LL \text{ Spec (8)}$$

For outdoor Metro Cell 1900-MHz Base Stations, the upper and lower limit equations for RX1 gain in dB from the LPP to the TRM splitter RX1 output are as follows:

- 1 Carrier:

$$UL = UL \text{ Spec (7)} - LL \text{ Spec (16)}$$

$$LL = LL \text{ Spec (7)} - UL \text{ Spec (16)}$$

- 2 Carriers, 3 Carriers (1st and 2nd), or 4 Carriers (1st and 2nd):

$$UL = UL \text{ Spec (9)} - LL \text{ Spec (16)}$$

$$LL = LL \text{ Spec (9)} - UL \text{ Spec (16)}$$

- 3 Carriers (3rd), or 4 Carriers (3rd and 4th):

$$UL = UL \text{ Spec (8)} - LL \text{ Spec (16)}$$

$$LL = LL \text{ Spec (8)} - UL \text{ Spec (16)}$$

For indoor MFRM Metro Cell 1900-MHz Base Stations, the upper and lower limit equations are as follows:

$$UL = UL \text{ Spec (6)} - LL \text{ Spec (12)} \text{ and/or } LL \text{ Spec (17)}$$

$$LL = LL \text{ Spec (6)} - UL \text{ Spec (12)} \text{ and/or } UL \text{ Spec (17)}$$

For outdoor MFRM Metro Cell 1900-MHz Base Stations, the upper and lower limit equations are as follows:

$$UL = UL \text{ Spec (6)} - LL \text{ Spec (16)} - LL \text{ Spec (12)} \text{ and/or } LL \text{ Spec (17)}$$

$$LL = LL \text{ Spec (6)} - UL \text{ Spec (16)} - UL \text{ Spec (12)} \text{ and/or } UL \text{ Spec (17)}$$

For indoor MFRM Metro Cell 800-MHz Base Stations, the upper and lower limit equations are as follows:

$$UL = UL \text{ Spec (11)} - LL \text{ Spec (13)}, \text{ or } LL \text{ Spec (14)}, \text{ or } LL \text{ Spec (15)}$$

(Use of Spec 13, 14, or 15 is dependent upon the setting of the **RX Conf** field on the Configuration screen.)

$$LL = LL \text{ Spec (11)} - UL \text{ Spec (13)}, \text{ or } UL \text{ Spec (14)}, \text{ or } UL \text{ Spec (15)}$$

(Use of Spec 13, 14, or 15 is dependent upon the setting of the **RX Conf** field on the Configuration screen.)

For outdoor MFRM Metro Cell 800-MHz Base Stations, the upper and lower limit equations are as follows:

$$UL = UL \text{ Spec (11)} - LL \text{ Spec (16)} - LL \text{ Spec (13)}, \text{ or } LL \text{ Spec (14)}, \text{ or } LL \text{ Spec (15)}$$

(Use of Spec 13, 14, or 15 is dependent upon the setting of the **RX Conf** field on the Configuration screen.)

$$LL = LL \text{ Spec (11)} - UL \text{ Spec (16)} - UL \text{ Spec (13)}, \text{ or } UL \text{ Spec (14)}, \text{ or } UL \text{ Spec (15)}$$

(Use of Spec 13, 14, or 15 is dependent upon the setting of the **RX Conf** field on the Configuration screen.)

Spectral Interference Evaluation

This TEST verifies that there are no interfering signals on either the forward or reverse link channels.

No Pass/Fail Limits are used in this TEST.

CAUTION

Before disconnecting any Base Station cables, verify that the site is wilted and is not producing RF power.

- Step 1.** Select the **Utilities Menu** field from the Main Software Menu.
- Step 2.** Select the **Spectral Interference Evaluation** field from the Test Menu screen. The Test Software will display the Spectral Interference Evaluation Menu screen.
- Step 3.** Select the **Analyze Forward Link Channel** field, the **Analyze Reverse Link Channel** field, or the **Analyze Diversity Reverse Link Channel** field, as appropriate.
- Step 4.** Follow the on-screen directions.

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