Agilent Technologies E6459A Enhanced Time Offset Measurement System

Used with Agilent E6380A Option 012 CDMA Base Station Test Set

User's Guide

Software Version: A.01.00 and later

Part Number E6459-90001

Revision A

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Agilent Technologies

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Preface

In this Manual

This manual consists of the following parts:

Conventions Used

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

Menu – A Test Set front panel key.

Pause/Continue (**Reset**) – A Test Set front panel *shift* function key. The key name in parentheses is the title of the shift function. Press the **Shift** key then the specified key to access the *shift* function.

`Procedure`: – Characters that appear on the Test Set display.

k1 (**`Run Test`**) – A USER key in the key column next to the display. The words in parentheses are displayed on the screen.

Title – Titles of documentation are printed in italics.

Test Set – Refers to the Agilent Technologies 8935 Series E6380A CDMA Base Station Test Set.

Test Software – Refers to the Agilent Technologies E6459A Enhanced Time Offset Measurement System.

TEST – Refers to the actual testing procedure.

PC card – Refers to either the Flash Memory card on which the Test Software is shipped or the SRAM card that is shipped with the Test Software for storing procedures.

PC card is an industry standard term that refers to two types of information storage cards. One meets the specifications of the Personal Computer Memory Card International Association (PCMCIA). The other meets the specifications of the Epson Corporation PC card standard. Agilent Technologies E6380A Series Test Sets use only the PCMCIA type card.

Flash Memory card – Refers to the type of PC card that is used to store the Test Software.

SRAM card – Refers to the type of PC card that is shipped with the Test Software for storing procedures.

BTS – Refers to a Base Transceiver Station.

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

- Select – refers any of three possible actions:
  - — Positioning the cursor at the appropriate field (**`inverse video`** area) and pressing the knob.
  - — Making an entry using the DATA ENTRY keys and pressing the knob.
  - — Making an entry using the DATA ENTRY keys and pressing the **Enter** key.
- Enter – means to use the numeric keypad, and the **Enter** key or measurement units keys to make entries to fields. In some procedures, the word “enter” is used to describe the action of entering characters into a field.

1 Product Description

The E6459A Enhanced Time Offset Measurement System is comprised of two separate test programs for testing the time offset of the CDMA base stations and Mobile Test Sets. Base Station Test (BASE_STA) is the program for testing and calibrating Base Stations, and MOBIL_TS is the program for testing and calibrating Mobile and Base Station Test Sets. Refer to the appropriate sections of the manual for each of the Test Programs.

Tests Overview

There are two test programs. The following information can be found in this chapter.

Base Station Test

Mobile and Base Station Test Sets

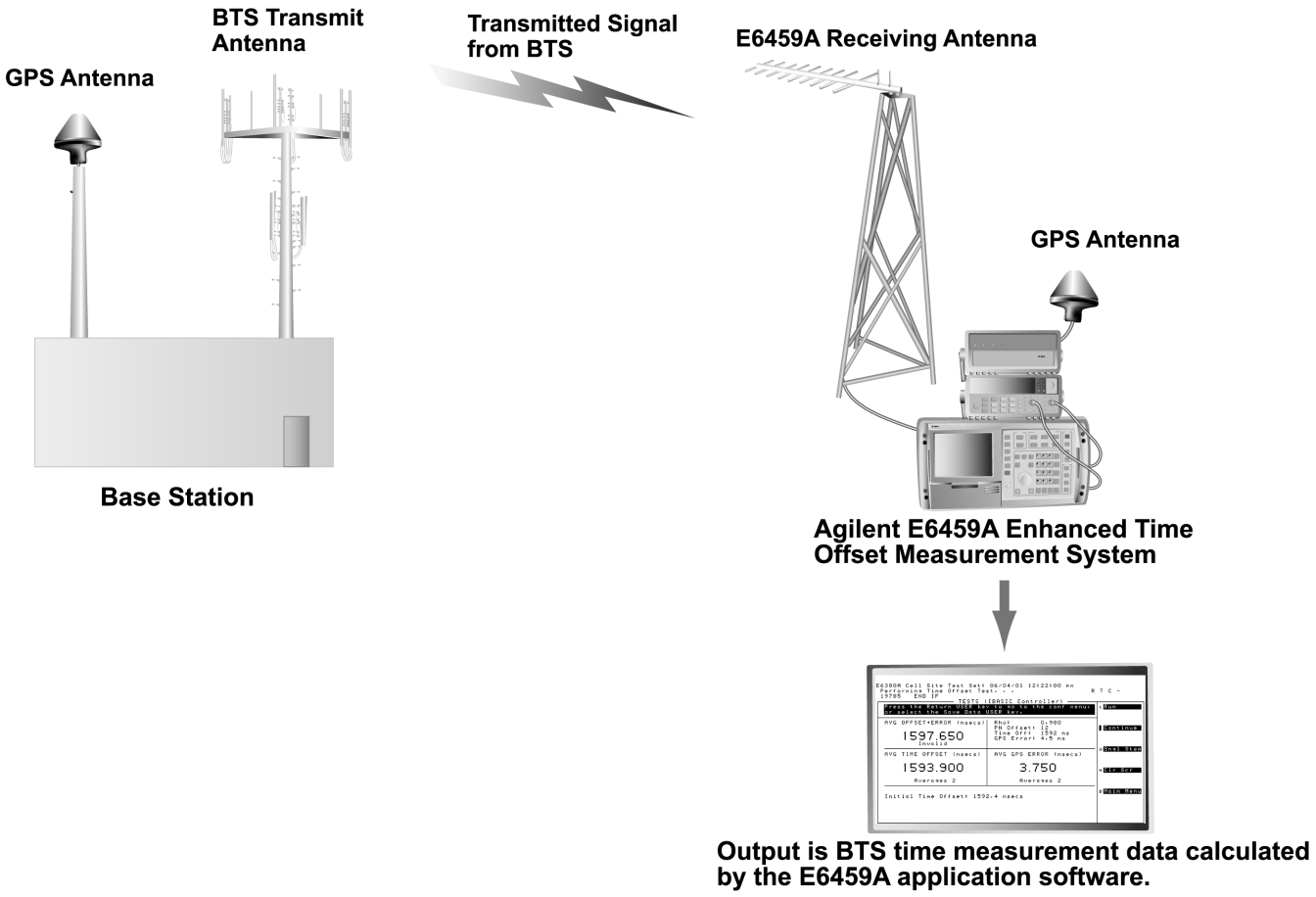
Base Station Test - Test Overview

The E6459A Enhanced Time Offset Measurement System analyzes the transmitted signal from a cellular or PCS network. It calculates the time difference between the correct value of the GPS even-second clock and the start of the PN Sequence embedded in the transmitted waveform.

The E6459A monitors the signal from several GPS satellites and derives a very accurate even-second clock from these signals. It finds the start of the PN sequence in the BTS waveform and compares it with the rising edge of the even-second clock. The result is a timing correction factor that is used by a position location service to accurately determine the location of callers.

In general, the system works as shown below and more information is provided in subsequent chapters.

Figure 1-1 **Typical Operation of the Agilent E6459A Enhanced Time Offset Measurement System.**

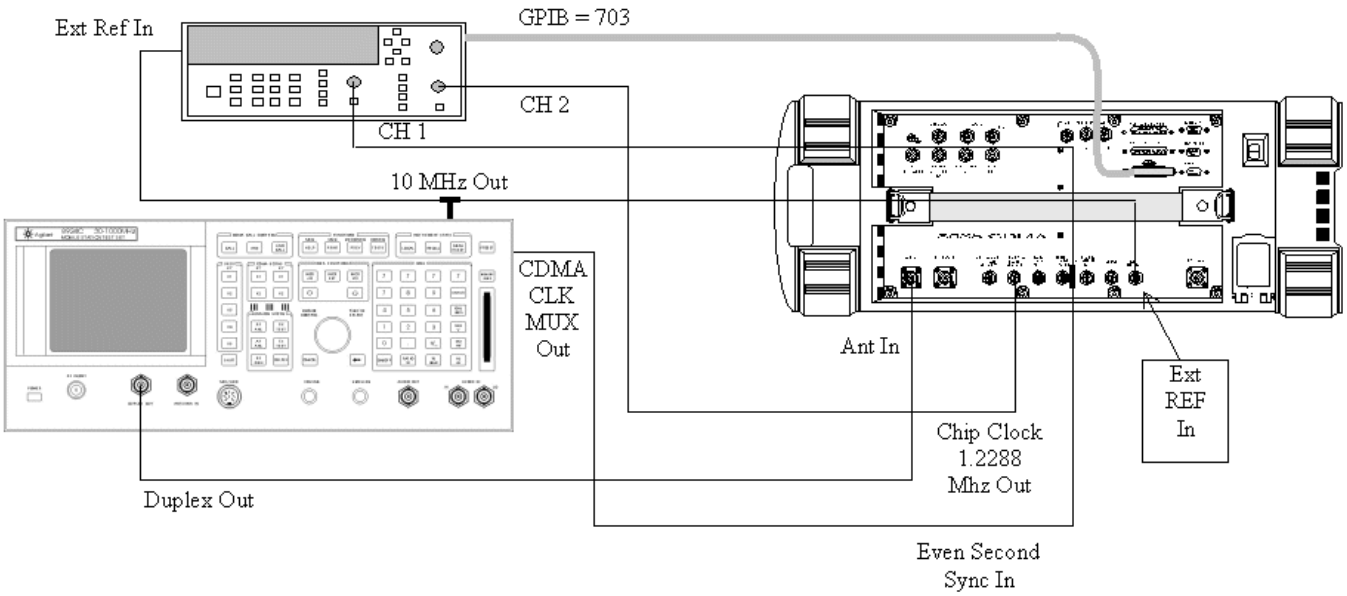


Mobile and Base Station Test Set - Test Overview

The Mobile and Base Station Test Set Test and Calibration procedure is one of the two programs which comprise the E6459A Enhanced Time Offset Measurement System. The Mobile/Base Station Test Set program is used to measure and calibrate the Time Offset of a CDMA Mobile/Base Station Test Set relative to the even second clock. The Enhanced Time Offset Measurement System uses the E6380A to measure the time offset from the even second clock to the start of the PN Sequence on the RF waveform produced by a CDMA Source. By measuring the RF path propagation and accurately calibrating the CDMA Mobile Test Set's transmitted PN offset to the Even Second signal, calibration of the mobile phone's GPS receiver to that of the CDMA receiver will provide the specified requirements for position-location. The calibrated CDMA test set then provides the reference for a mobile phone's calibration process.

In general, the system works as shown below, more detailed information is provided in subsequent chapters.

Figure 1-2 **Typical Operation of the Agilent E6459A Enhanced Timing Offset Mobile/Base Station Test Set Program.**



Base Station Test - Test Software Overview

The Test Software is contained on a Flash Memory PC card. It is designed to run on an Agilent Technologies E6380A CDMA Base Station Test Set, with the Enhanced Time Offset, option 012, and to test all CDMA Base Station types.

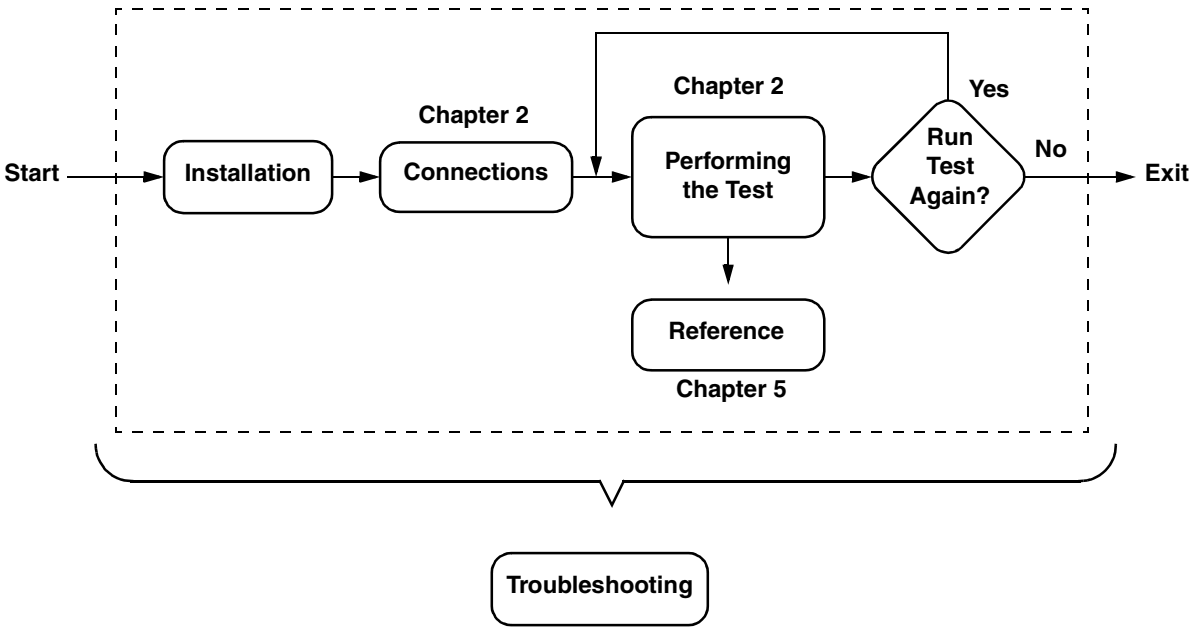
The Test Software is an Agilent Technologies Instrument BASIC (IBASIC) application that runs on the Test Set internal IBASIC controller to run one test only. It is the Time Offset Test. This Test is used to set up and operate the Test Set to measure the time offset between the even-second pulse received from a GPS receiver and the start of the PN sequence in the Base Station RF output waveform.

If you are installing, commissioning, or maintaining CDMA cell site Base Stations, this Test Software will allow you to perform tests to verify the basic Base Station timing for purposes of fine-tuning the E911 emergency system.

Figure 1-3 illustrates the basic steps for Test Software operation. After running the Test Software, you may repeat the test if necessary.

Chapter 4, “Test and Parameter Descriptions,” on page 83 provides a description of the Time Offset Test. If you have general questions about Test Set and Test Software operations, refer to Chapter 5, “Reference,” on page 89 for more information.

Figure 1-3 Using the Test Software



Mobile and Base Station Test Set - Test Software Overview

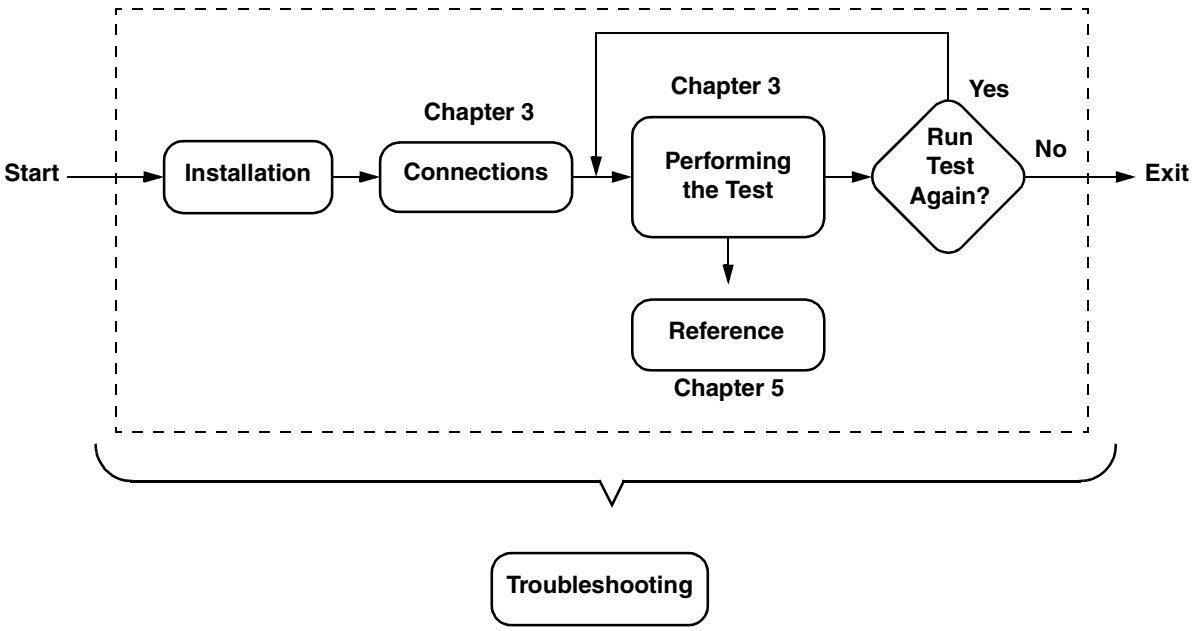
The test software is contained on a Flash Memory PC card. It is designed to run on an Agilent Technologies E6380A CDMA Base Station Test Set with the Enhanced Time Offset, option 012. This program is used to measure and calibrate the following Test Sets:

- E5515C CDMA Mobile Test Set
- E6380A CDMA Base Station Test Set
- E8285A CDMA Mobile Test Set
- 8924C CDMA Mobile Test Set

Figure 1-4 on page 16 illustrates the basic steps for Test Software operation. After running the test software, you may repeat the test if necessary.

"Test and Parameter Descriptions" on page 83 provides a description of the Time Offset Test. If you have general questions about Test Set and Test Software operations, refer to "Reference" on page 89 for more information.

Figure 1-4 Using the Test Software



Base Station Test - Items Supplied

The following table lists the items supplied with the E6459A Enhanced Time Offset Measurement System Kit.

Table 1-1 E6459A Enhanced Time Offset Measurement System Contents

Part Name	Part Number	Quantity	Use
GPIB Cable, 1-meter	10833A	1	Used to connect the Test Set and the Counter.
Counter	53131A	1	Used to increase the sampling accuracy of the Time Offset Test to within 10 ns.
Adapter, BNC(F) to BNC(F)	1250-0080	1	Used to connect BNC cables.
BNC Tee	1250-0781	2	Used to split 10-MHz and EVEN SECOND SYNC signals.
Null Modem Cable, 5-ft.	5182-4794	1	Used to connect the Test Set to the PC.
BNC Cable, 2-ft.	8120-1839	5	Used to connect timing and EVEN SECOND SYNC signals.
BNC Cable, 15-ft.	08921-61007	1	For adjusting even-second timing.
PC Card	E6459-10001	1	E6459A Enhanced Time Offset Measurement System
Case	E6459-60001	1	Used to store and transport the above items.
User Guide	E6459-90001	1	This Guide. Supplied on a CD in PDF format. PDF reader software supplied.

Base Station Test - Items Required for Running the Test

The test software requires that the Agilent E6380A CDMA Test Set be running firmware revision B.04.00 or later. Also Agilent E6380A Option 012 must be installed. Option 012 can be purchased with the Test Set or as an upgrade.

Additional required equipment

As well as the parts supplied in the E6459A Enhanced Time Offset Measurement System, the following equipment is also required.

Table 1-2 Additional equipment

Description	Manufacturers Part Number[a]	Manufacturer	Qty.	Purpose of Item
GPS Receiver	58503B Opt. 003	Symmetricom	1	Determines the supply timing and position information for the test software.
Cable, 15m GPS Antenna N(f) to N(f)	58521A Option 015	Symmetricom	1	Connects the antenna to the GPS Receiver.
GPS Antenna	58532A	Symmetricom	1	Receives GPS signals from satellites.
Serial Cable DB9F to DB25M	24542G	Hewlett-Packard	1	Connects the 58503B to serial port of the E6380A Test Set
Antenna Tripod - EZ Raze 18 Foot Mast System	None	Old Stone Inc.	1	Helps positions the antenna

a. Part numbers listed here may differ from those supplied. Contact manufacturer for more details.

The 58503A GPS Receiver from Symmetricom synchronizes with the GPS timing to supply the Even-Second Sync signal that is compared with the transmit signal from the Base Station equipment.

This GPS Receiver acquires time transfer information (time, date, and position) from GPS satellites and synchronizes the timing of Receiver operations to GPS time. It acquires precise time and date by tracking at least one satellite. It then determines the precise location of the antenna by tracking at least four satellites. Using this information, the GPS Receiver can produce a high-precision Even-Second Clock signal that is exactly synchronous with Universal Time Coordinates (UTC) as determined by the GPS.

NOTE For proper operation, the antenna must be mounted on an adjustable height tripod, such as the Mast System from Old Stone, Inc.

Additional optional equipment

Depending on the system configuration to be used, additional equipment may be required. The following table lists some recommended equipment that can be used as part of the test.

Table 1-3 Equipment required for the Over-the-Air Measurement.

Description	Manufactures Part Number[a]	Manufacturer	Qty.	Purpose of Item
PTX Cellular Antenna, with N female connector	MP8068PTNF	Maxrad	1	For the Test Set to receive cellular band signal.
PTX PCS Antenna, with N female connector	MP19011PTNF	Maxrad	1	For the Test Set to receive PCS band signals
Antenna cable, 50 Ohm impedance, N male connector, both ends.	User Select	As required	1	Any acceptable cable can be used
Antenna Tripod, 18-ft. mast	None	Old Stone, Inc.	1	Helps position the antenna

a. Part numbers listed here may differ from those supplied. Contact manufacturer for more details.

NOTE For proper operation, the Test Set Antenna must be mounted on an adjustable height tripod, such as the Mast System from Old Stone, Inc.

Base Station Test - Additional items recommended for running Tests

The following equipment is optional. The list provides details of recommended equipment and suppliers.

These parts are not supplied by Agilent Technologies and must be ordered from the manufacturers.

Antenna Location Equipment

It is necessary to measure the antenna position with one-meter accuracy. If the exact location is unknown, the laser positioning equipment listed below can be used to determine the antenna position.

Table 1-4 Recommended positioning equipment

Description	Manf. Part Number[a]	Manufacturer	Qty.	Purpose of item
Laser Distance Meter - Impulse 200LR Laser Sight with 1-4x Hakko Scope	7003284	Laser Technology Inc.[b]	1	Measures the distance between the GPS Receiver Antenna and the Base Station transmit antenna, and the distance between the Test Set Antenna and the Base Station transmit antenna.
Mounting Bracket	7022876	Laser Technology Inc.	1	Mounts the Compass Module to the Laser Distance Meter.
MapStar Compass Module	7004100	Laser Technology Inc.	1	Determines the bearing of the Base Station transmit antenna relative to the GPS Receiver Antenna.
Laser Distance Meter/Compass Module Case	7034475	Laser Technology Inc.	1	Store and transport the Laser Distance Meter/Compass Module.
Serial Cable	30236	Trimble[c]	1	Connects the GPS Receiver and Laser Distance Meter/Compass Module.
Pro XR GPS Receiver	29756-85-ENG	Trimble	1	Helps GPS Receiver Antenna acquire position information.

a. Part numbers listed here may differ from those supplied. Contact manufacturer for more details.
b. For more details on Laser Technologies Inc., refer to www.lasertech.com
c. For more details on Trimble Inc., refer to www.trimble.com

Mobile and Base Station Test Set - Items Supplied

The following table lists the items supplied with the E6459A Enhanced Time Offset Measurement System.

Table 1-5 E6459A Enhanced Time Offset Measurement System Contents

Part Name	Part Number	Quantity	Use
GPIB Cable, 1-meter	10833A	1	Used to connect the Test Set and the Counter.
Counter	53131A	1	Used to increase the sampling accuracy of the Time Offset Test to within 10 ns.
Adapter, BNC(F) to BNC(F)	1250-0080	1	Used to connect BNC cables.
BNC Tee	1250-0781	2	Used to split 10-MHz and EVEN SECOND SYNC signals.
Null Modem Cable, 5-ft.	5182-4794	1	Used to connect the Test Set to the PC.
BNC Cable, 2-ft.	8120-1839	5	Used to connect timing and EVEN SECOND SYNC signals.
BNC Cable, 15-ft.	08921-61007	1	For adjusting even-second timing.
PC Card	E6459-10001	1	E6459A Enhanced Time Offset Measurement System
Case	E6459-60001	1	Used to store and transport the above items.
User Guide	E6459-90001	1	This Guide. Supplied on a CD in PDF format. PDF reader software supplied.

Mobile and Base Station Test Set - Items required for running the test

- E6380A Base Station Test Set with Option 012 (Enhanced Time Offset)
  - — The test software requires that the Agilent E6380A CDMA Base Station Test Set be running firmware revision B.04.00 or later
  - — Option 012 (Enhanced Time Offset) must be installed on the E6380A. Option 012 can be ordered with the Test Set or upgraded after purchase by ordering an option 012 Retrofit kit.
- E6459A Enhanced Time Offset Measurement System Kit
- E53131A Counter (part of the E6459A Measurement Kit)

Additional required equipment

When Calibrating the E6380A CDMA Base Station Test Set, the following additional equipment is required:

- E4433B ESG-D Series RF Digital Signal Generator with known Pilot Time Offset delay with front panel connections.

All other cables, connectors, equipment and software needed to calibrate Agilent Technologies Test Sets are supplied in the E6459A Enhanced Time Offset Measurement System.

Getting Help, Test Software Upgrades, and Training

For instrument servicing, see the *Agilent Technologies E6380A CDMA Test Set Assembly Level Repair Guide*.

For application assistance, call the Application Hotline (1-800-922-8920, USA and Canada only). Refer to the E6380A User's Guide for numbers for other locations.

For information about Test Software upgrades and hands-on training, contact the local Agilent Technologies sales engineer.

2 Base Station Test - Selecting and Running the Test

This chapter provides information on test equipment and Base Station (BTS) connections.

Summary of Tests

You must choose a calibration method that suits the BTS you are testing. There are three configurations.

Study each of the following configurations, take into consideration the configuration of the BTS you are calibrating, and select the best method.

1. "Using Over The Air Testing" on page 31

   This requires the most equipment. Use this method the first time to characterize the time offset associated with the RF signal at the transmit antenna face.

   This method requires the technician to locate a test location that provides:

   - Line of sight access to the main transmit beam.
   - High pilot dominance for the sector under test.
   - Low multipath.
   - The ability to view GPS satellites for test timing.

   If you are close to the BTS this method is effective. For a test with a long over-the-air RF path, the signal may have interference, unacceptable signal-to-noise or multipath effects, and all these can cause unusable measurements.

2. "Using the BTS coupled port" on page 27

   This is easiest to set up, has the highest accuracy and does not interfere with service. Use this setup when you can.

3. "Using the Antenna port" on page 29

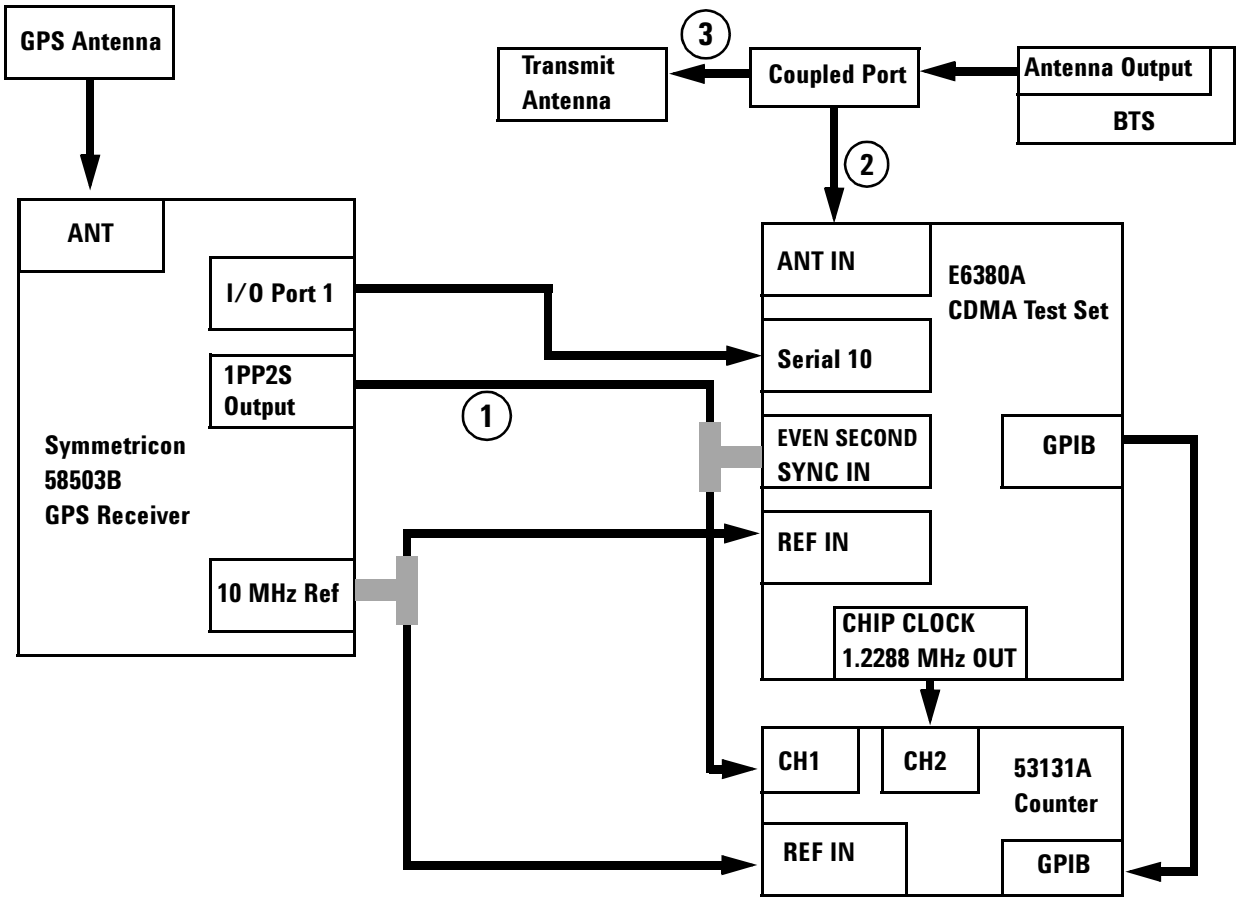
NOTE The accuracy and ease of setup is the same as the coupled port, but you must take the BTS out of service to perform the test.

Use Table 1-1 on page 17, through to Table 1-4 on page 20 as references for selecting equipment.

Using the BTS coupled port

If the BTS has a coupled port and it is possible to locate the GPS antenna within 10 meters of the test equipment, this is the best configuration to use.

Figure 2-1 System Block Diagram Using BTS Coupled Port



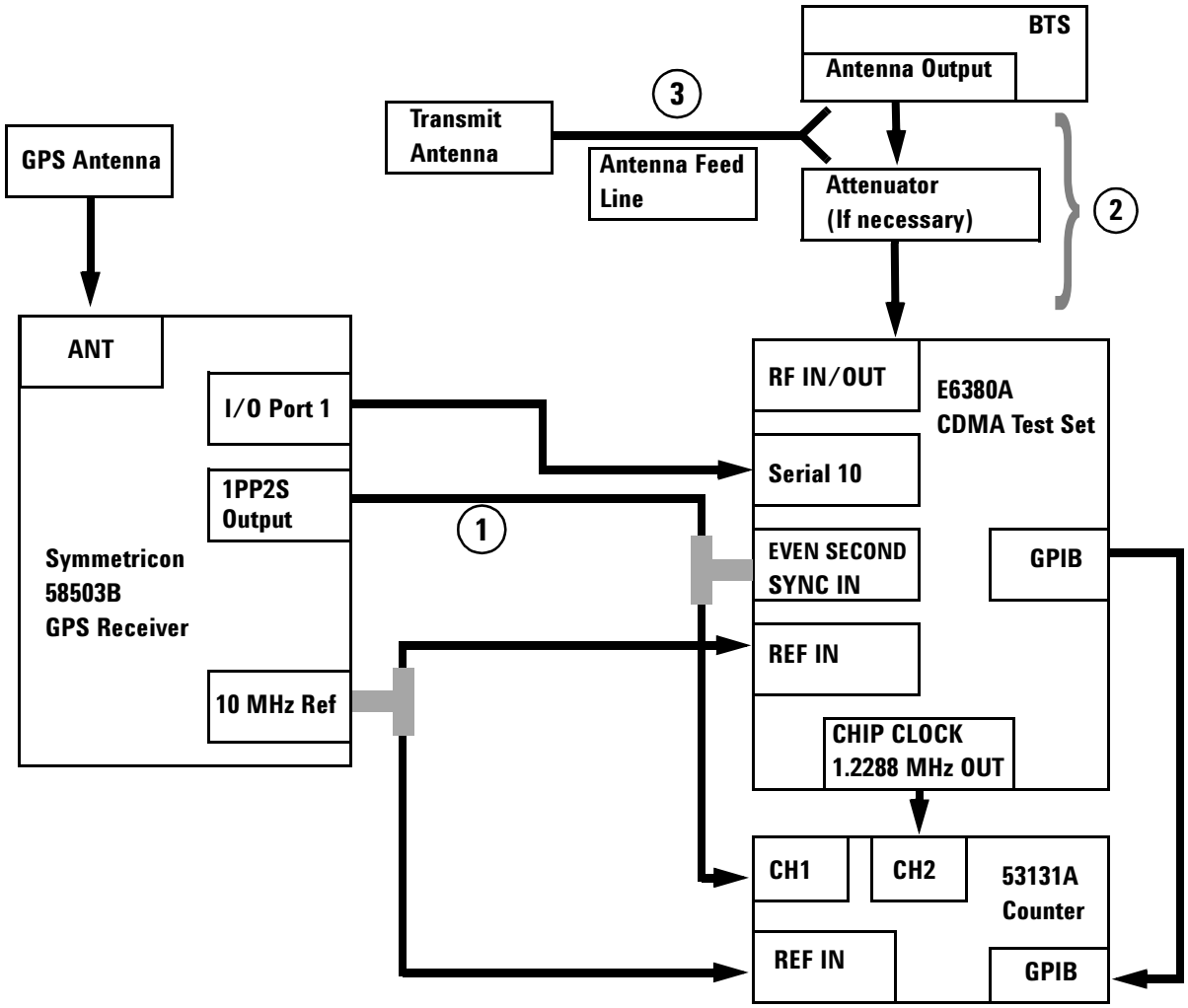
Required Information

- The RF channel number or frequency.
- The channel standard, such as North American PCS.
- The PN offset of the channel tested.
- The RF cable delay, the delay of the cable (2) connecting the coupled port to the E6380A CDMA Test Set ANT IN Connector.
- The transmit antenna to coupled port delay. This is the delay of the antenna feed line (3) connecting the coupled port to the BTS transmit antenna.
- The even second delay. This is the delay on the cable (1) running from the 1PP2S output on the Symmetricom 58503B to the BNC T-connector on the EVEN SECOND SYNC IN connection on the E6380A. It is normally 2.9 nanoseconds for a two-foot (0.6m) cable.

Using the Antenna port

If the BTS has no coupled port, and it is still possible to locate the GPS antenna within 10 meters of the test equipment, you can connect the system as shown in Figure 2-2 on page 29. The drawback with this connection is that the BTS must be disconnected from the antenna during the test, taking it off the air. If the peak RF power level is greater than 15 watts, use an attenuator in series with the RF/IN OUT connection.

Figure 2-2 **System Block Diagram using connection to BTS antenna output**



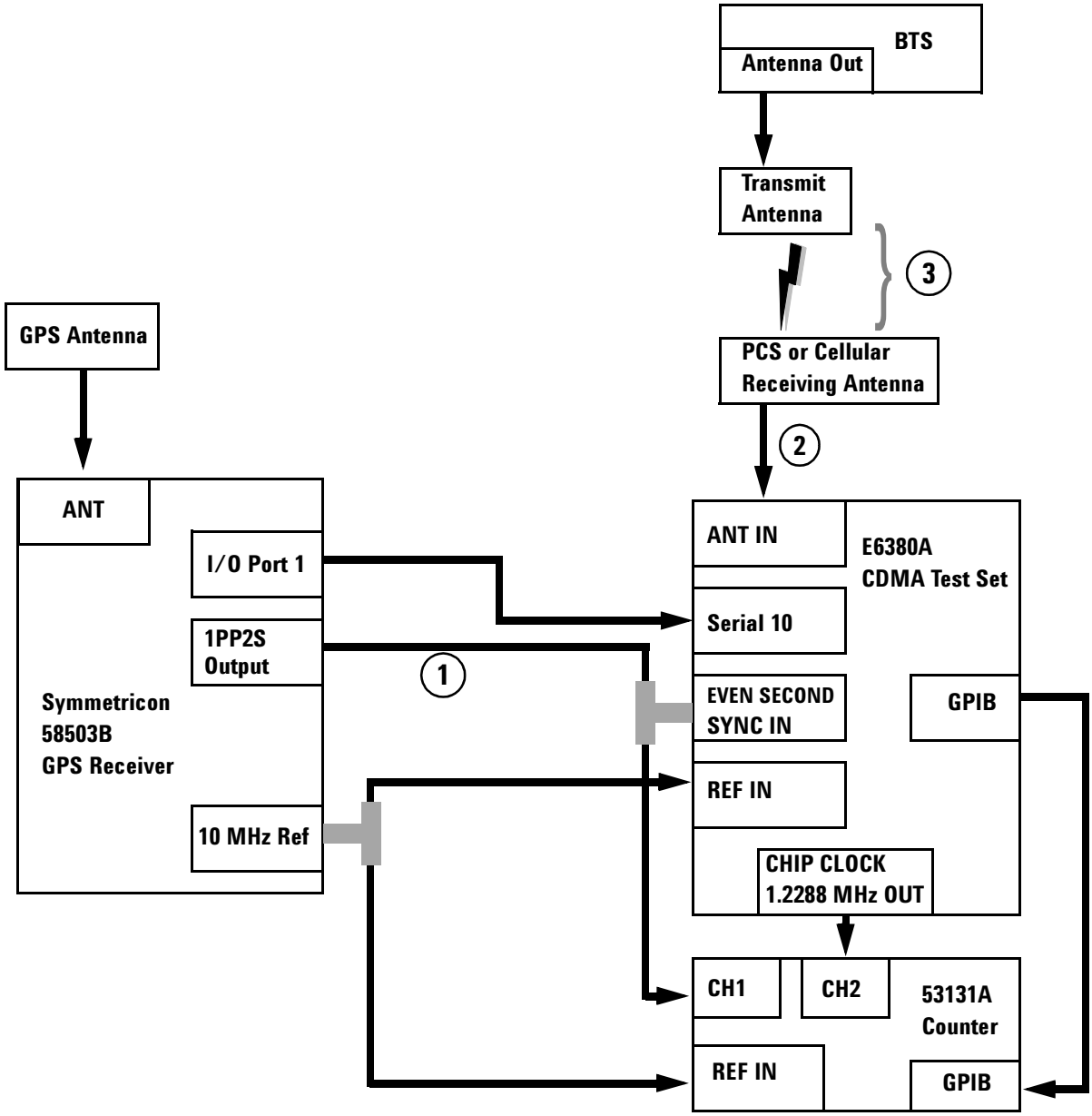
Required Information

- The RF channel number or frequency.
- The channel standard, such as North American PCS.
- The PN offset of the channel tested.
- The RF cable delay, the delay of the cable (2) connecting the BTS antenna output to the RF IN/OUT Port. If an attenuator is used, the entry is the sum of the delays of both cables.
- The transmit antenna to antenna port delay. This is the delay of the antenna feed line (3).
- The even second delay. This is the delay on the cable running from the 1PP2S output on the Symmetricom 58503B to the BNC T-connector on the SYNC IN EVEN SECOND connection on the E6380A. It is normally 2.9 nanoseconds for a two-foot (0.6m) cable.

Using Over The Air Testing

The setup is the most versatile, but usually requires additional equipment.

Figure 2-3 **System Block Diagram using antenna to pick up BTS RF signal**



Required Information

- The RF channel number or frequency.
- The channel standard, such as North American PCS.

- The PN offset of the channel tested.
- The RF cable delay, the delay of the cable (2) connecting the receiving port to the E6380A test set ANT IN port.
- The transmit antenna to receiving antenna delay (3). Use the recommended positioning equipment listed in Table 1-4 on page 20
- The even second delay. This is the delay on the cable running from the 1PP2S output on the Symmetricom 58503B to the BNC T-connector on the EVEN SECOND SYNC IN connection on the E6380A. It is normally 2.9 nanoseconds for a two-foot (0.6m) cable.

Proper Cables

The cables supplied in the E6459A connecting to Channel 1 and Channel 2 of the 53131A counter, are selected to eliminate timing errors due to cable length imbalance. Do not substitute cables of a different length.

The importance of Accurate Distance and Delay Information

The accuracy of the distances and delays in the Required Information are very important. A one-meter error in a distance measurement will result in a 3.3-nanosecond error in timing. Errors in the delay parameters directly contribute to system errors. Be sure the accuracy of these parameters is acceptable to the position location service using this calibration. Use appropriate measuring equipment such as laser sight for measuring distances not measurable with a tape measure. See the “Calculating cable and antenna delay” on page 90 for a discussion on calculating cable and over-the-air delays.

For more details on recommended laser postioning equipment, refer to “Recommended positioning equipment” on page 20.

Overview of tests

The test software is designed for both ease of use and comprehensive testing. Operating the test equipment and the test software consists of a multiple-part procedure, listed below:

- Test Setup.
- Setting up antennas.
- Determining antenna position.
- Setting up the equipment for testing.
- Loading and running the software.
- Testing multiple sectors.

Setting up the equipment for testing

Set up and connect the Test Set and other equipment for testing, prepare the various equipment for testing, and initiate the Test as described in the following sections.

Test Setup

Connect the equipment as shown in either Figure 2-1 on page 27 or Figure 2-2 on page 29 or Figure 2-3 on page 31. Details of which set up to use refer to "Summary of Tests" on page 26.

Setting up the GPS antenna

The placement of the GPS antenna should be such that it can receive signals from GPS satellites. This placement should be such that the antenna does not need to be moved and is sited on a firm location. If possible, do not move the antenna until the tests are complete.

Set up the GPS Receiver antenna in a position that offers an unobstructed view of the sky from 10 to 90 degrees above the horizon and from 0 to 360 degrees from true North.

If an unobstructed view of the sky is not possible, the default GPS receiver elevation mask of 10 degrees, must be changed to an elevation that offers an unobstructed view of the sky from 0 to 360 degrees from true North. Refer to the Symmetricom 58503B documentation for more information.

NOTE The initial setup and testing is faster if the exact location of the GPS receiver antenna is known.

Setting up the receiving antenna

If you have elected to use over-the-air reception shown in Figure 2-3 on page 31, you use a receiving Antenna. Set up the receiving antenna in a position that offers an unobstructed view of the Base Station transmit antenna and that is within 30 degrees of the center of the sector orientation. Make certain that the antenna is sitting firmly and do not move it again.

Determining the Base Station antenna position

The Base Station transmitter antenna position must be accurate within 1 meter. A portable GPS Receiver can be used to calculate the position.

If the Portable GPS Receiver can be held near to the Base Station transmit antenna, then you can use the receiver to determine the antenna position. Record this information for entry into the position location service database.

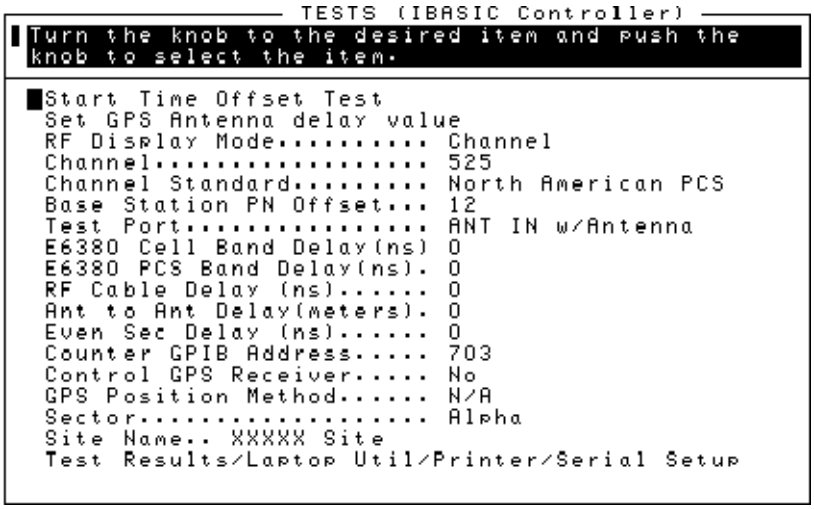
If the Base Station transmit antenna is not immediately accessible, use a range finder/compass combination. This is accurate and automates the measurement process.

If you do not have this type of equipment, you can use any other method, providing the results are accurate to within 1 meter. Record the location information. The position location service will need this information for their database.

Loading the test software

Load the test software BASE_STA as described in "Loading the Test Software" on page 113. Press the **k1** (**Run Test**) key. The Test Software will display the Configuration Menu screen.

Figure 2-4 Configuration menu screen



Configuring the software

Select each item on the configuration screen and enter appropriate values.

Set GPS antenna delay value

If the **Control GPS Receiver** menu option has been set to **No**, then this menu option will be bypassed.

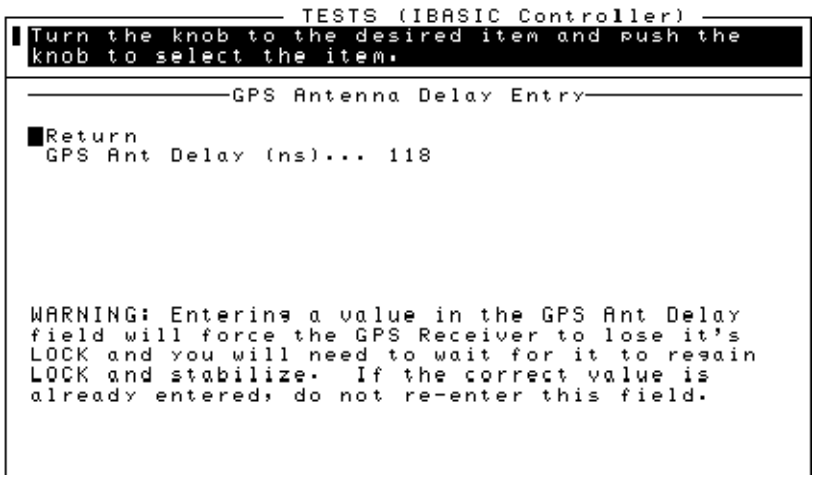
If the **Control GPS Receiver** menu option has been set to **Yes**, this selection will only need to be configured once for a particular GPS receiver-cable combination.

After configuration, the GPS receiver will store the value in EPROM. This value is retained even during power off.

If the correct value has been entered in the past, skip this entry.

If you are using a different cable or want to check or enter the delay of the GPS antenna cable, select the field. The following menu will appear.

Figure 2-5 **GPS antenna delay entry screen**



Do not enter a number if the one displayed is correct. This will cause the GPS receiver to exit lock status and the entire process of acquiring satellites and locking onto them will be re-initiated.

NOTE The delay of the GPS antenna cable supplied with the GPS Special is 59 ns. If you use a different cable, you must obtain the delay from the manufacturer or calculate it. For more information about delay calculations refer to "Calculating cable and antenna delay" on page 90.

Enter the correct delay if it differs from the number displayed. When a new value is entered it causes the GPS receiver to exit lock status and the process of acquiring satellites and locking to them will be repeated.

If you wish to continue select **`Return`**.

RF Display Mode

Select the RF Display Mode field. The choices are:

- Channel
- Frequency

Channel/Frequency

Depending on the previous selection, enter the frequency or channel number you will be testing.

Channel Standard

Select the channel standard that is used by your base station. Supported standards are North American Cellular, North American PCS, Japanese Cellular, and Korean PCS band.

Base Station PN Offset

Enter the PN offset.

Test Port Connection

Select the test port method you have configured your system to use.

- Select **`BTS Coupled Port`** if you are using the BTS Coupled Port configuration (Figure 2-1 on page 27).
- Select **`BTS TX Ant. Ouput`** if you are using the BTS direct configuration (Figure 2-2 on page 29)
- Select **`Over the Air`** if you are using the over-the-air configuration (Figure 2-3 on page 31)

E6380 Cell and PCS Band Delay

The next two entries, E6380 Cell Band Delay, (ns) and E6380 PCS Band Delay (ns) are retrieved by the software from the factory calibration values stored in the instrument firmware. They are displayed for information only and cannot be changed.

RF Cable Delay

Select the RF Cable Delay (ns) field and enter the delay of the RF cable that connects the input signal to the selected E6380A test port.

BTS Coupled Port, BTS TX Ant, or Over the Air

Depending on the test port selection, choose one of the following options:

- If **`BTS Coupled Port`** was selected, the menu selection will be **`Ant to coupler delay (ns)`**. Enter the delay between the BTS transmit output and the coupled port on the BTS.
- If **`BTS TX Ant. Ouput`** was selected, the menu selection will be **`Ant to TX port delay (ns)`**. Enter the delay between the Transmit antenna and the transmit output on the BTS.
- If **`Over the Air`** was selected, the menu selection will be **`Ant to Ant Dist. (meters)`**. Enter the distance between the BTS transmit antenna and the E6459A receiving antenna.

Even Sec Delay

This is the delay of the cable that connects the 1PP2S output of the 58503B GPS Receiver and the BNC T-connector on the E6380A CDMA Test Set EVEN SECOND SYNC IN connector. Using the cables supplied in the E6459A Measurement Kit, the delay is 2.9 nanoseconds.

NOTE

If you are prompted by an error message to add the Timing Adjustment Cable to this cable length, the delay becomes 24.3 nanoseconds. For more information about delay calculations refer to “Calculating cable and antenna delay” on page 90.

Counter GPIB Address

This should normally be set to 703, the default value for a 53131B counter. If the counter you are using has a different address, change this menu option.

Control GPS Receiver

Yes This allows the E6380A CDMA Test Set, running the E6459A software, to control the 58503B GPS Receiver during testing. This is the fastest and most accurate way to conduct the test. The status of the 58503B is monitored, and appropriate commands are sent to the GPS receiver as required. The software prevents inaccurate or incorrect operation.

No This option is for specialized use beyond the scope of this manual. If you set this entry to **No**, the GPS receiver is operating independently of the E6380A CDMA Test Set. Tests will take longer, and there will be no checks to the data coming from the GPS receiver.

It is strongly recommended that this option be set to **YES**.

GPS Position Method

The selection GPS Position Method depends on the accuracy of the GPS coordinates information you have for GPS antenna. If the GPS coordinate information you have for the antenna is accurate within one meter, select **User Entry**. Otherwise, select **Site Survey**.

If you select **Site Survey**, the 58503B GPS Receiver will go through a procedure of acquiring GPS satellites, estimating the antenna location and then refining the data until the GPS location is acceptable for the test. This typically adds ten minutes to the duration of the test. If **User Entry** is selected, the test will go faster, but the user must be able to provide GPS position information that is accurate within one meter.

Sector

Use this field to select the identification of the sector to be tested. The available choices are:

- Alpha
- Beta
- Gamma.

This identification will be used in the header of the log file when data logging to a PC.

Site Name

Use this field to enter the name of the Base Station site.

Enter this information from the characters available in the **Choices: list** in the lower right-hand corner of the screen. Select **Done** when finished.

This identification will be used in the header of the log file when data logging to a PC.

Test Results/Laptop Util/Printer/Serial Setup

Use this field to display the Test Results/Laptop Util/Printer/Serial Setup menu. The menu fields are described in “Handling Test Results” on page 97.

Starting the Test

When all the configuration information has been entered correctly, press **k1 (Start)**. The following flowchart outlines the process that the software follows. Depending on whether **User Entry Mode** or **Site Survey** was selected for the GPS position method, the process is slightly different.

"User Entry Mode flowchart" on page 40

"Site Survey flowchart" on page 41

Both flowcharts start with the same procedures. The first procedure shows hardware connections that need to be made. Ensure all connections are made before proceeding with the test measurements.

At the end of each procedure both GPS position methods continue with the same process. The process is "Verifying the CDMA signal" on page 50.

Figure 2-6 User Entry Mode flowchart

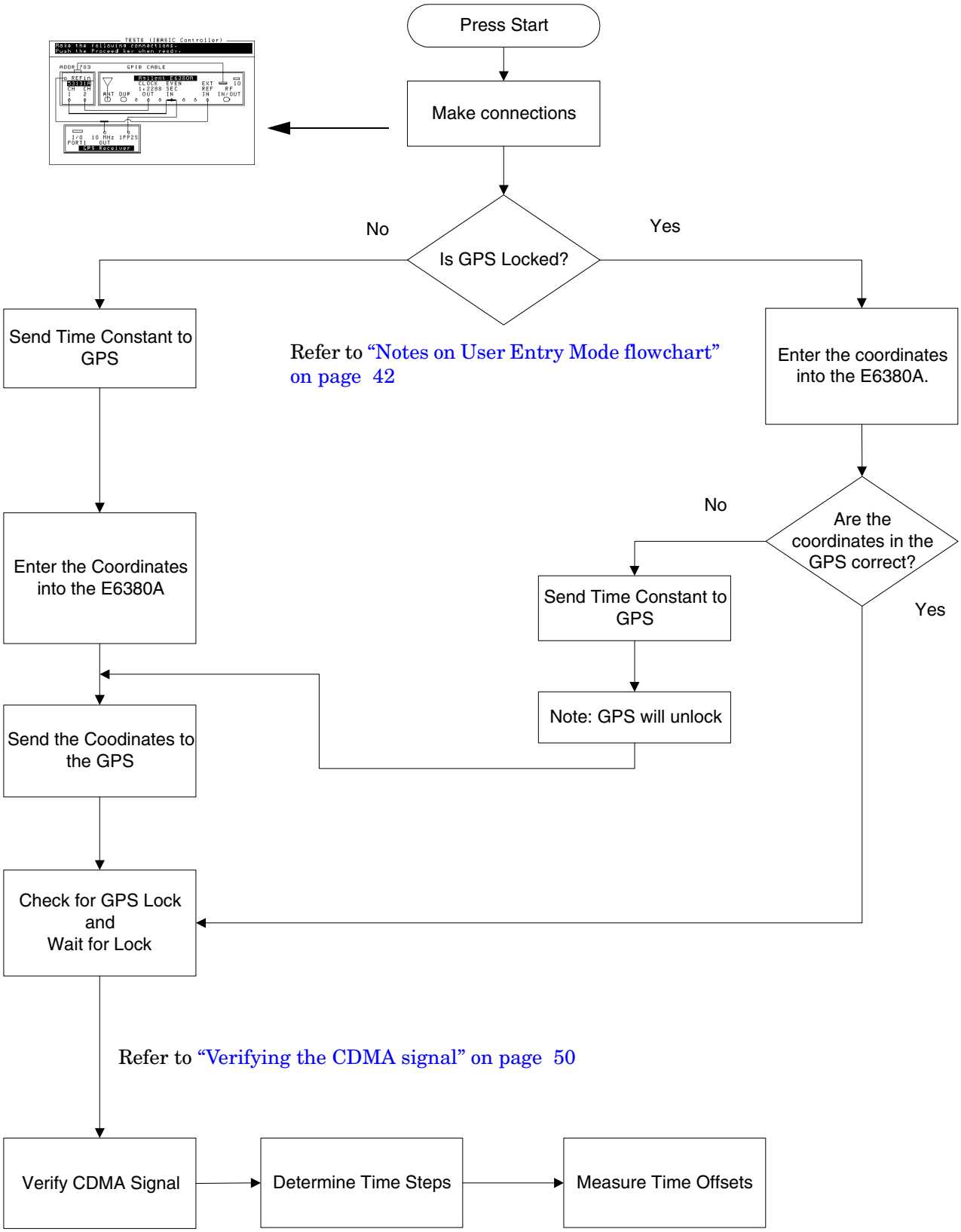
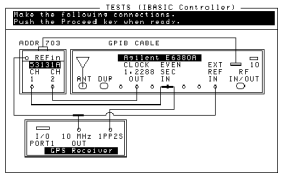


Figure 2-7 Site Survey flowchart



Press Start

Make connections

Is GPS Locked

No

Yes

Send Time Constant to GPS

Refer to "Notes on Site Survey flowchart" on page 46

Check the Time Constant in the GPS receiver

Do you know the GPS Coordinates

No

Yes

Is the Time Constant in the GPS correct

No

Yes

Enter the Coordinates into the E6380A.

Send Time Constant to GPS

Send the Coodinates to the GPS

Note: GPS will unlock

Check for GPS Lock and Wait for Lock

Check for GPS for Site Survey and Wait for % complete

Refer to "Verifying the CDMA signal" on page 50

Verify CDMA Signal

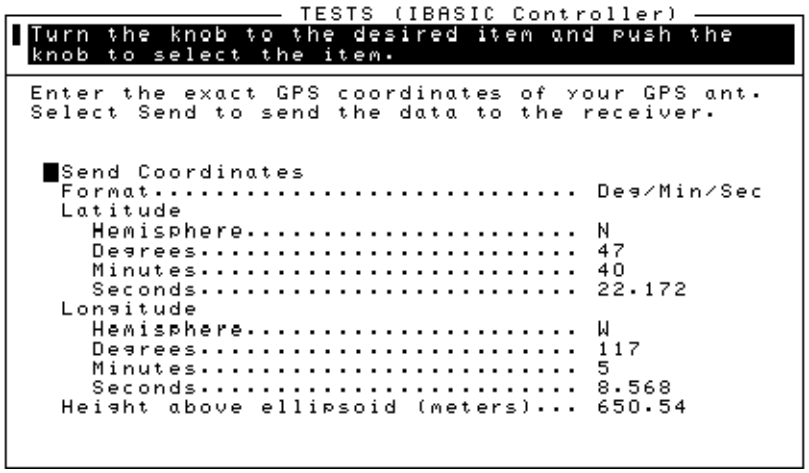
Determine Time Steps

Measure Time Offsets

Notes on User Entry Mode flowchart

If the GPS receiver is locked, The following menu will come up.

Figure 2-8 **GPS receiver lock screen**



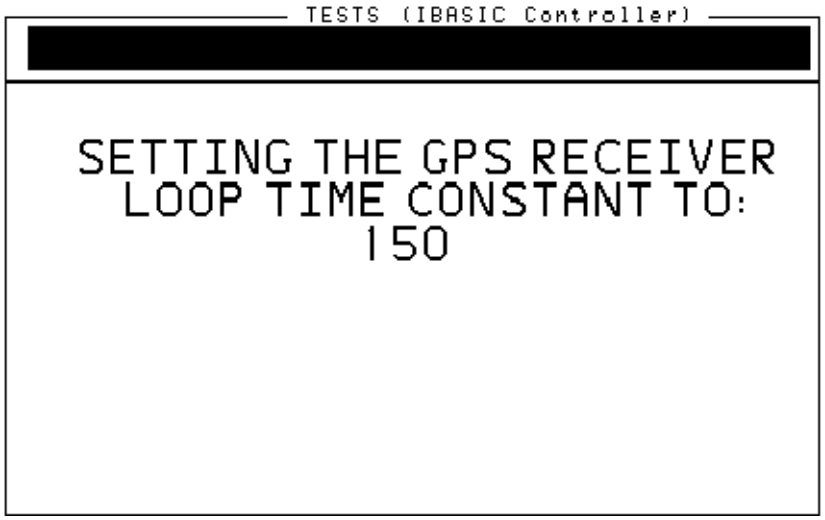
If the data displayed is correct, select **k1 (Send)** without changing any data. If the data is not correct, enter the correct data and select **k1 (Send)**.

If the data does not match the coordinates stored in the GPS receiver, the software will send the coordinates to the receiver, causing it to unlock. The software will then proceed by verifying lock as shown on the flowchart.

If the data matches the coordinates already stored in the GPS receiver, it will not be downloaded to the GPS receiver. This prevents unnecessarily unlocking the GPS receiver. The software will quickly verify lock and proceed "To verify the CDMA signal" on page 50.

If the GPS receiver is unlocked, the following screen will be displayed.

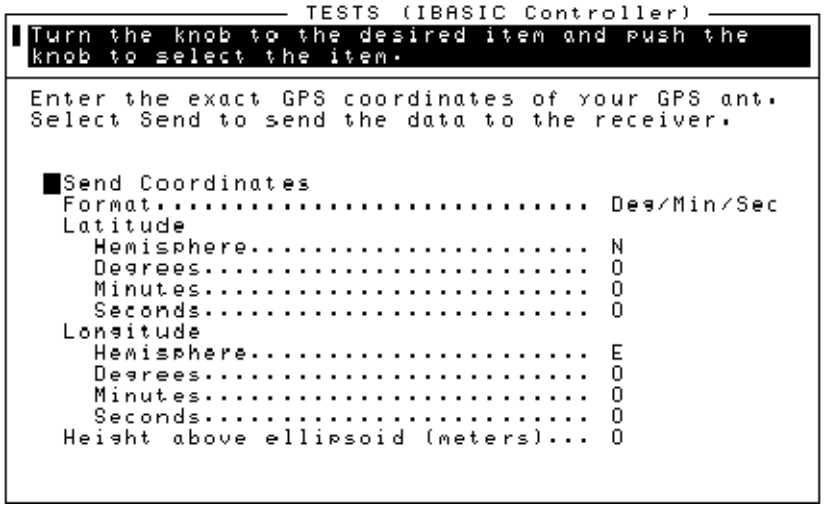
Figure 2-9 **Setting Time Constant**



The value of the time constant for the GPS receiver is entered via the **`Test Parameters`** menu.

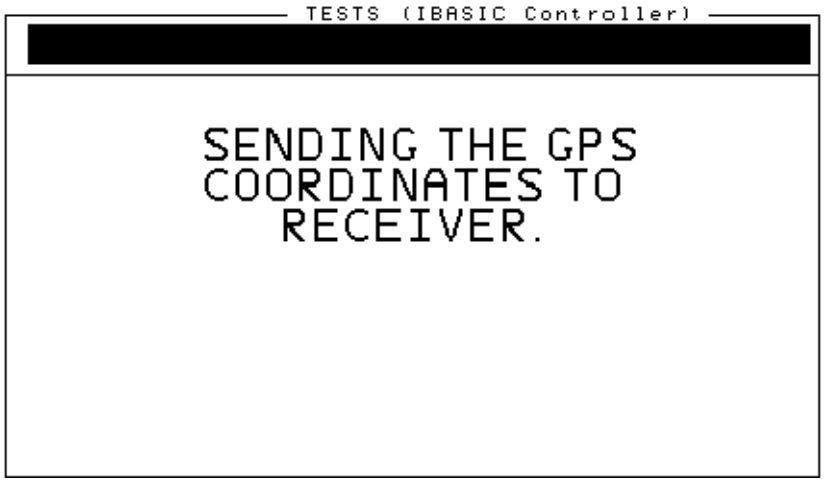
The next screen will appear automatically.

Figure 2-10 **GPS Coordinate Entry**



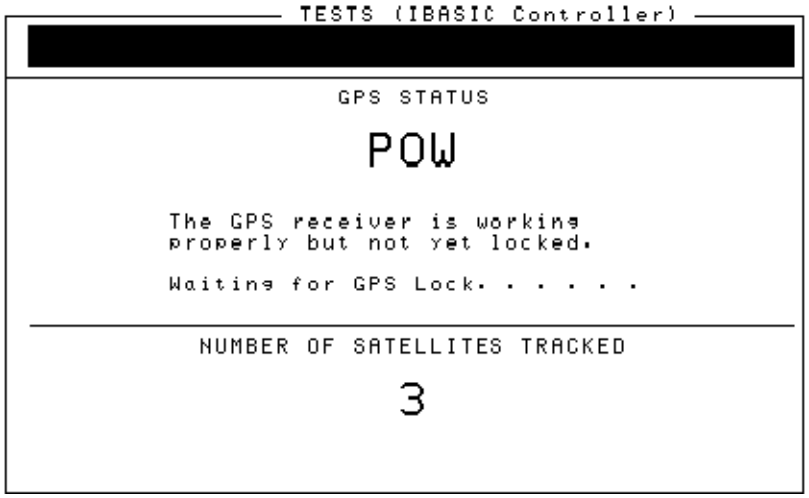
- Enter the GPS coordinates and the height above ellipsoid in meters. Press **`k1 (Send)`** when finished.
- If the coordinates that came up in the menu are correct, Press **`k1 (Send)`** without changing anything.
- The following screen will confirm sending data to the GPS receiver.

Figure 2-11 Sending GPS Coordinates



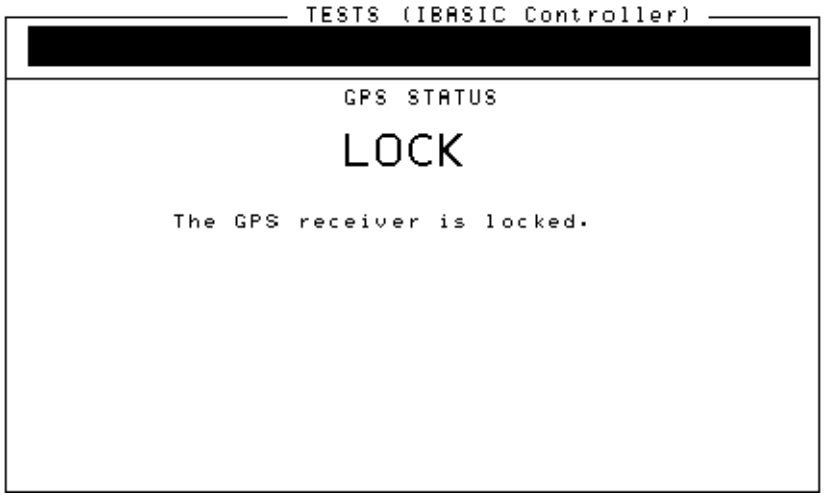
A screen similar to the following will appear. The main function of this screen and the one that succeeds it are to give the user GPS Status. There could be a long wait while the GPS receiver acquires lock.

Figure 2-12 GPS Status, 1 of 2



The following screen will appear for a short period of time.

Figure 2-13 GPS Status, 2 of 2



The software will now proceed to "To verify the CDMA signal" on page 50.

Notes on Site Survey flowchart

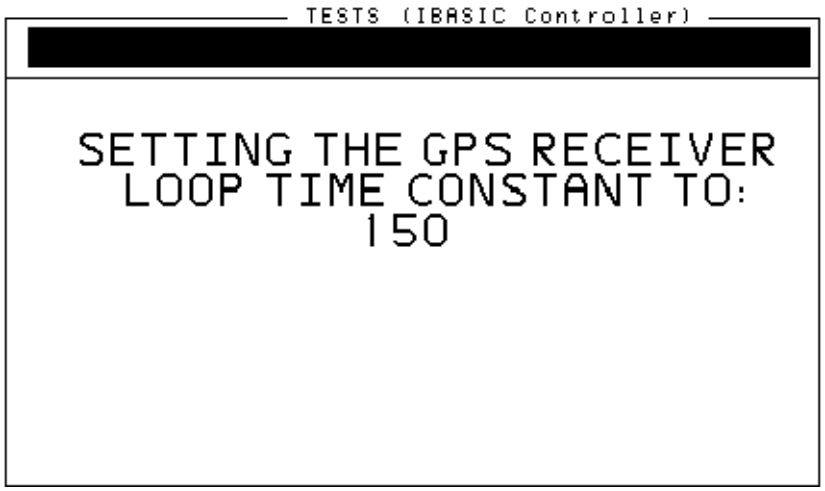
If the GPS receiver is locked, the software will check the receiver and verify that the time constant in the receiver matches the time constant in the software parameter menu.

If the time constant matches, the software will quickly verify lock and proceed to "Verifying the CDMA signal" on page 50.

If the time constant does not match, the software will download the correct time constant to the receiver. This will cause the receiver to unlock. The software will then proceed by verifying lock as shown on the flow chart.

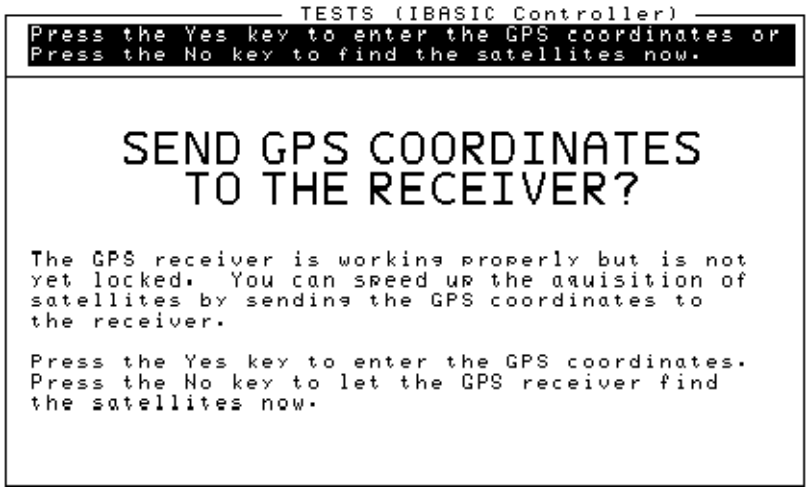
If the GPS Receiver is unlocked, the following menu will appear.

Figure 2-14 GPS Time Constant



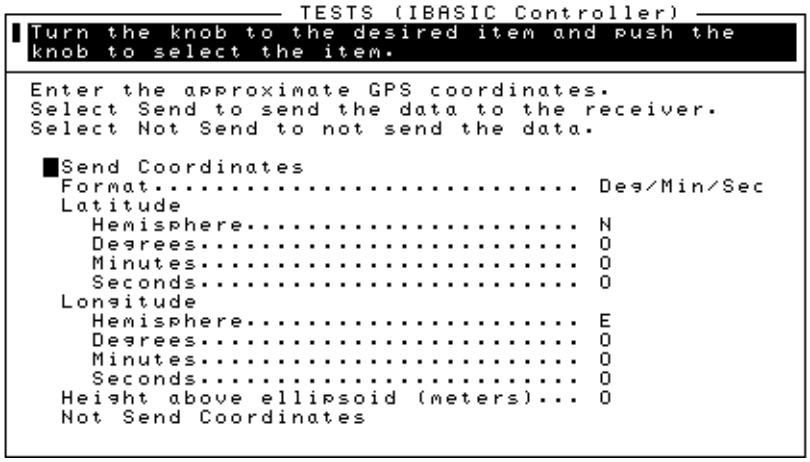
Next the following menu will appear.

Figure 2-15 Option for Entering GPS Coordinates



If you know even the approximate coordinates of the GPS antenna, select **k1 (Yes)**. It will speed acquisition of the GPS satellites by the GPS receiver. The following screen will appear. If you select **k2 (No)**, the following screen will be skipped and the screen in Figure 2-17 will appear.

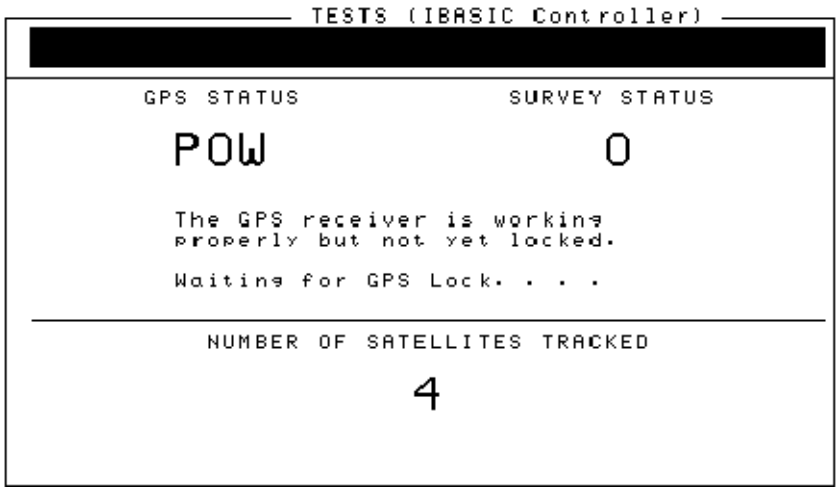
Figure 2-16 GPS Data Entry Screen



- Enter the GPS coordinates and the height above ellipsoid in meters. Press **k1 (Send)** when finished.
- If the coordinates that came up in the menu are correct, select **Not Send Coordinates (k5)**.
- Select **Not Send Coordinates (k5)** if you selected this screen in error.
- If the GPS receiver has not achieved lock, a screen similar to Figure 2-17 will appear. The main function of this screen is to give the user GPS Status. In the survey mode, the GPS receiver must acquire at least four satellites, lock and apply corrections to its internal clock. This can be a lengthy process. The screen will tell you whether the GPS is working correctly or malfunctioning. As long as no error messages appear,

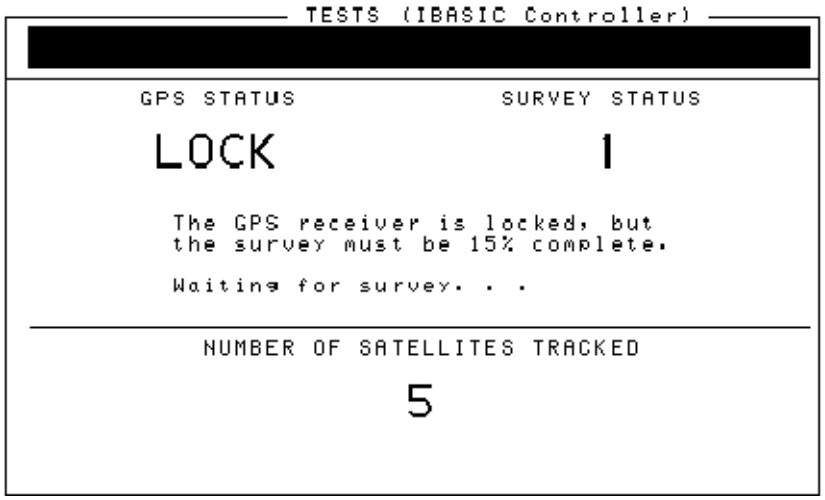
allow the process to go on. GPS status messages other than POW may appear. They are explained in the Symmetricom 58503B documentation.

Figure 2-17 GPS Status



When the GPS receiver locks, the following will appear.

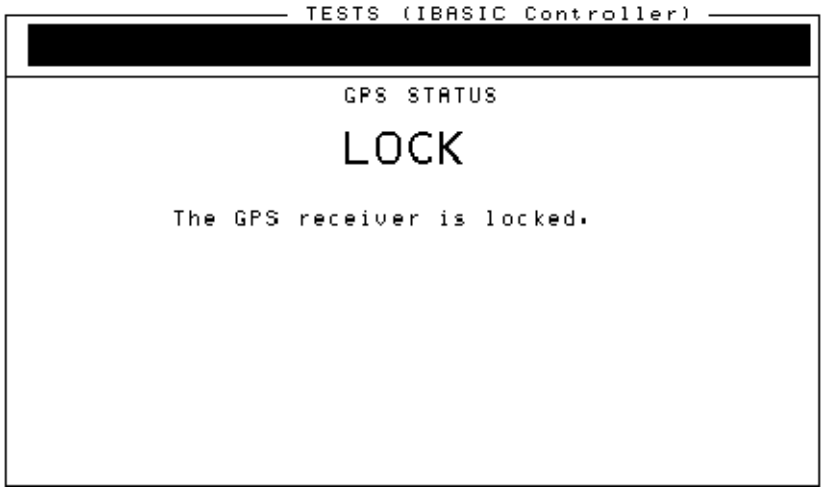
Figure 2-18 Initial Lock - GPS Status Screen



During the Site Survey mode, the GPS receiver uses data averaging techniques to improve the accuracy of the GPS position calculation. Survey Status gives the completion percentage of the site survey. The default value is 15%. The completion percentage can be changed in Parameter 7 of the Test Parameters screen. It may be necessary to increase the site survey completion percentage if the GPS error is large or still drifting at the start of the test.

When the survey is complete, the following screen will appear.

Figure 2-19 Final Lock - GPS Status Screen



The software will next proceed "To verify the CDMA signal" on page 50

Verifying the CDMA signal

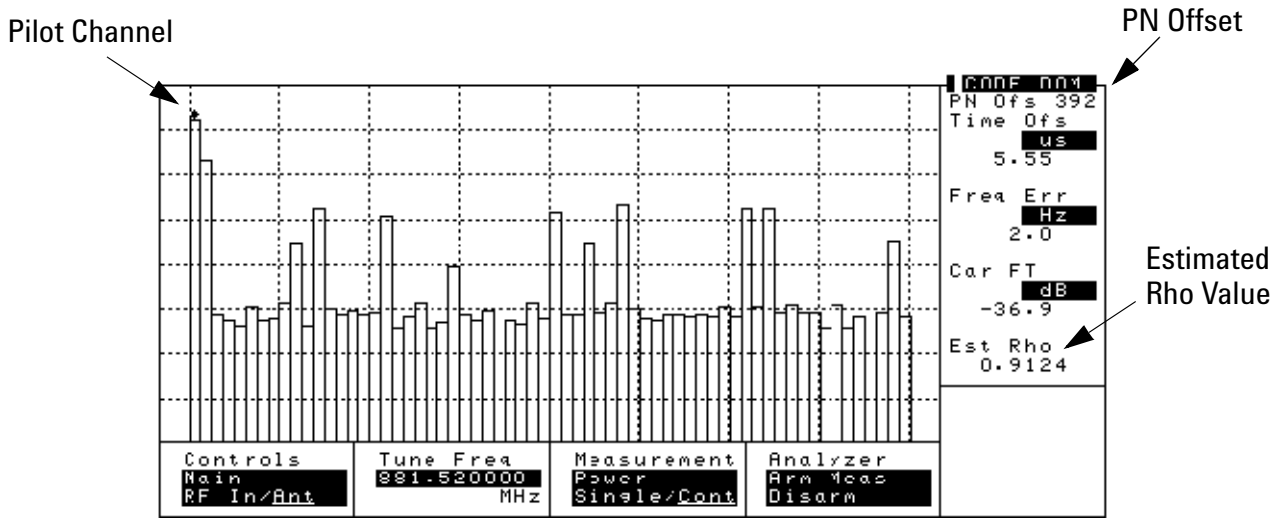
Once the timing offset has been confirmed and a GPS lock verified, the CDMA verification screen is displayed.

At this stage you can either continue with the test by choosing the **`Start Tst (k2)`** key, or verify the CDMA signal received by the E6380A CDMA Test Set.

To verify the CDMA signal

1. Choose **`Code Dom (k1)`** key
2. Check that the signal meets the following criteria;
   - The signal is present with at least one pilot channel.
   - The PN Offset is correct for the sector you are testing.
   - The estimated rho is at least 0.9

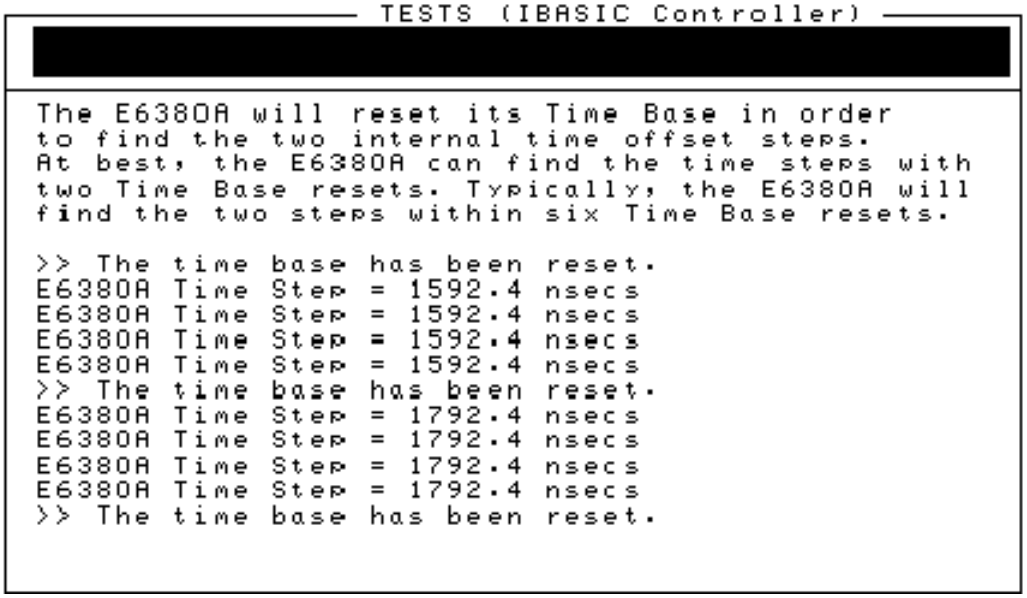
Figure 2-20 Code Domain Screen



Determining internal time offset

The following screen will appear until the E6380A is in the proper operating mode and the time offset readings are usable in the software calculations.

Figure 2-21 Determining internal time offset



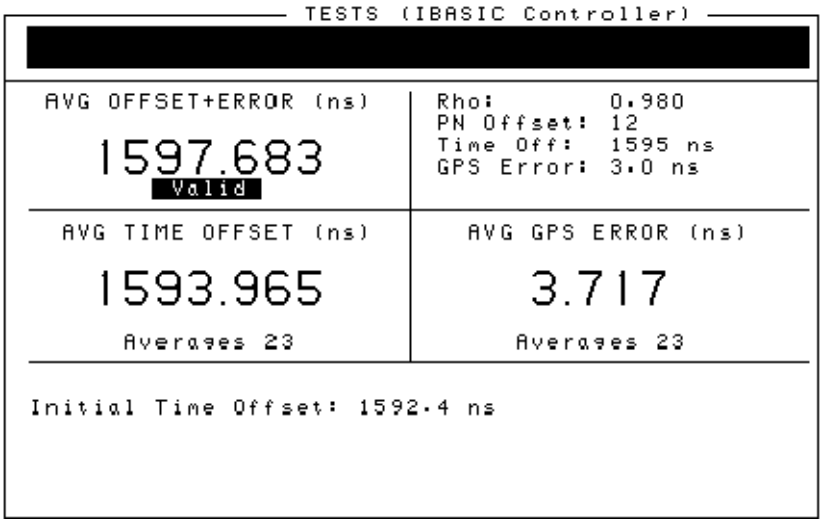
Test results

Once the test has been started, the E6380A Test Set displays the offset timing screen until the software calculations can be used.

Once the offset timing has stabilized the Test Set will make a Time Offset measurement. On this screen various measurement results are displayed. These are as follows:

- The parameter **AVG TIME OFFSET (ns)** is the average of the Time offset readings taken by the E6380A Test Set.
- The **AVG GPS ERROR (ns)** is the average of the difference between the compensated and uncompensated even second clock in the Symmetricom 58503B GPS Receiver.
- **AVG OFFSET + ERROR (ns)** is the sum of the two numbers listed above. At the start of the test the results displayed will be invalid as GPS receiver is required to settle. Once valid measurements are produced the valid label is displayed.

Figure 2-22 **Test results screen**



The **AVG OFFSET + ERROR (ns)** field is the time offset value of record for the sector and carrier you are testing. It is used in calculations by the position location service. Record this value and have it available for the system administrator of the location service.

When this screen first appears, the value of **AVG OFFSET + ERROR (ns)** is probably not valid, because some settling of the GPS receiver is required before the data can be assumed to be accurate. A Valid/Invalid indicator that takes into account the settling requirement. After approximately 20 GPS error averages, the reading is stable.

However, the final determination is up to the user. A good indication of stability of the error average is the absence of slewing of the data average, with the data average remaining constant. The data points will vary randomly, but their average should not show a continual drift in one direction. Test Parameter #11, **Number of Averages for Valid meas.** can be changed to reflect the experience of the user. If more GPS error averages are necessary, the number should be increased.

Estimated Rho and the **PN offset** are displayed to verify that the proper channel is being displayed and the signal is acceptable.

In the small type in the upper right-hand corner of the display, **Time Off** and **GPS Error** show the current values of the time offset reading and the timing error of the GPS receiver. Every new value is added into the averages.

The **Save Data Key (k3)** saves the test results to the destination selected by the user.

The **Reset Ave Key (k4)** resets all the averages such as **AVG TIME OFFSET** to zero.

Return key (k5) stops the test and returns to the first menu.

Error messages appear at the bottom of the screen.

Refer to "Reference" on page 89 for a discussion of time delay equations and error messages.

Testing additional sectors

It is possible to test other sectors as long as there are no major changes to the equipment setup.

Do not move the 58503B GPS antenna and have the GPS receiver powered on. The GPS position data should remain unchanged when the next test begins.

NOTE If you power down the 58530B GPS receiver or move the GPS antenna, you must repeat the test from the beginning.

If the 58503B GPS Receiver has not been disturbed, and its GPS LOCK front-panel indicator is on, follow these steps to choose another sector:

1. Press the **Menu** key on the E6380A Test Set

   Press **Run Test (k1)**

2. In the Configuration Menu, enter the new Channel, Base Station PN Offset, and Sector information.
3. Press **Start**
4. From the Connections menu, check connections and press **Proceed**.
5. If the GPS Position Menu comes up, press **Send** without changing the data.
6. Two GPS status menus will briefly appear.
7. The test will resume with the "Verifying the CDMA signal" on page 50 screen, and the test continues as before.

3 Mobile and Base Station Test Set - Selecting and Running the Test

This chapter provides information on connecting and setting up the equipment for a measurement, loading the test software, choosing the test conditions in the configuration menu, and running the test.

Test Overview

The test software is designed for both ease of use and comprehensive testing. Operating the test equipment and the test software consists of a multiple-part procedure as listed below. This procedure should be repeated for all RF output ports and frequency bands that the Device Under Test (DUT) will be using.

Refer to "Mobile and Base Station Test Set - Test flowchart" on page 57

- Loading the Test Software.
- Running the E6459A Software
  - — Configuring the Software for each Test Set and measurement.
  - — Connecting the Test Equipment.
  - — Setting up the Test Conditions on the Configuration Menu screen.
  - — Verify CDMA Signal
- Determine Time Steps
- Measure Time Offsets
- Recording/Storing the Test Set Calibration Factors.

The Mobile/Base Station Test Set program is designed to test and calibrate the following Test Sets:

- "Testing the E6380A CDMA Base Station Test Set" on page 59
- "Testing the 8924C CDMA Mobile Test Set" on page 62
- "Testing the E8285A CDMA Mobile Test Set" on page 67
- "Testing the E5515C CDMA Mobile Test Set" on page 71

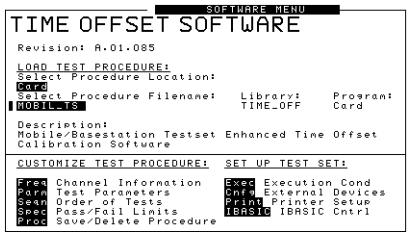
NOTE This selection is chosen on the "Device Under Test" field found on the Configure Screen. (Refer to "Device under test" on page 75)

Testing for each of the Test Sets is similar with the exception of:

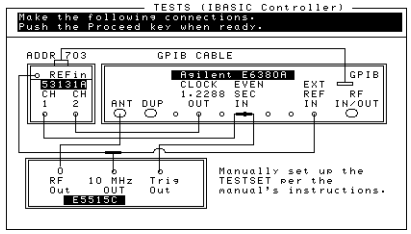
- Configuring the Software for each Test Set and Measurement
- Connecting the Test Equipment.
- Setting up the Test Conditions on the Configuration Menu screen.

These steps will be covered under the test procedure for each of the Test Sets. Once the unique Configuration, Connections, and Test Setups are completed for the Test Set, the remainder of the testing is the same for all Test Sets.

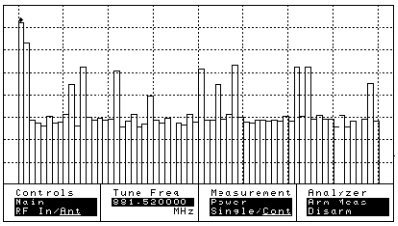
Figure 3-1 Mobile and Base Station Test Set - Test flowchart



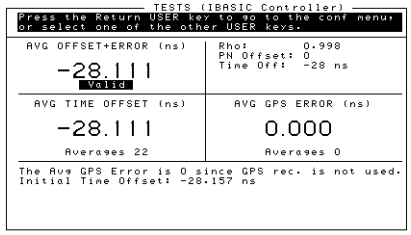
Refer to "Loading the Test Software" on page 58



Refer to "Connecting the Test Equipment" on page 60



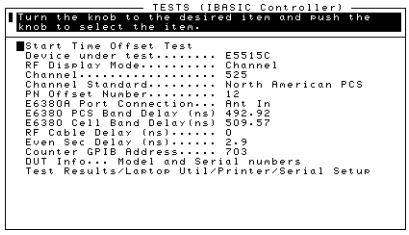
Refer to "Verifying the CDMA signal" on page 78



Refer to "Test results" on page 80

Press Run Testr

Configuring the Software



Refer to "Configuring the Software" on page 75

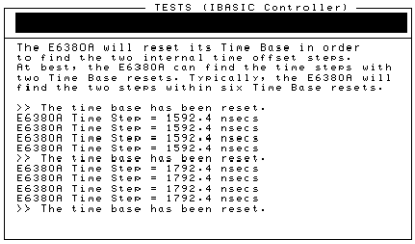
Connecting the Test Equipment

Setup Test conditions

Refer to "Setting up the Test Conditions" on page 61

Verify CDMA signal

Determine Time Steps



Refer to "Determining internal time offset" on page 79

Measure Time Offsets

Record and Store Measurements

Refer to "Recording/Storing the Test Set Calibration Factors" on page 80

Measurement complete

Loading the Test Software

Load the test software as described in "Loading the Test Software" on page 113. For Calibrating Mobile and Base Station Test Sets, select the **MOBIL_TS** procedure and then Press the **k1 (Run Test)** key.

Testing the E6380A CDMA Base Station Test Set

Equipment Required:

- E6380A Base Station Test Set with Option 12 (Enhanced Time Offset)
- E6459A Enhanced Time Offset Measurement Kit
- E53131A Counter (part of the E6459A Measurement Kit)
- E4433B ESG-D Series RF Digital Signal Generator with known Pilot Time Offset delay and front panel connections.

Configuring the Software

The Configuration Menu allows you to change the test conditions of the E6459A Measurement System to the settings and conditions required for testing the E6380A. See Configuring the Software and Test Parameter sections of this Manual for more detailed information

Setting up the E6459A test point condition on the E6380A

Step 1. Choose **E6380A** as the product being calibrated in the **Device Under Test** field

Step 2. Set the **RF Display Mode** to **Channel**

Step 3. Set the **Channel** to **500**.

Step 4. Set the **Channel Standard** to **North American Cellular** or **North American PCS**

Step 5. Set the **PN Offset Number** to **0**

Step 6. Set the **E6380A PCS Band Delay (ns)** to the delay of the E4433B (typically -25 to -30 ns)

Step 7. Set the **E6380A Cell Band Delay (ns)** to the delay of the E4433B (typically -25 to -30 ns)

Step 8. Enter the **RF Cable Delay** value.

To determine the delay of the RF Path cable being used, refer to "Calculating cable and antenna delay" on page 90

Step 9. Set **Even Second Delay** to **2.9 ns**. If you are not using the cables in the E6459A Measurement Kit, refer to "Calculating cable and antenna delay" on page 90 to determine the delay values for the cables being used

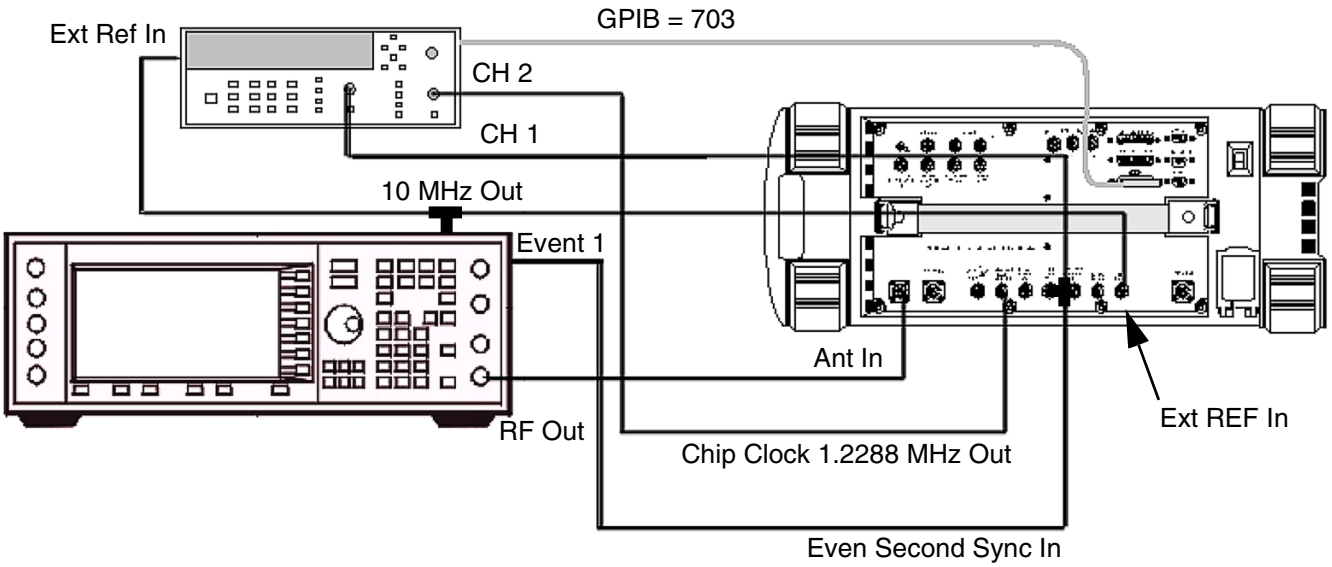
Step 10. Set the **Counter GPIB address** to **703**

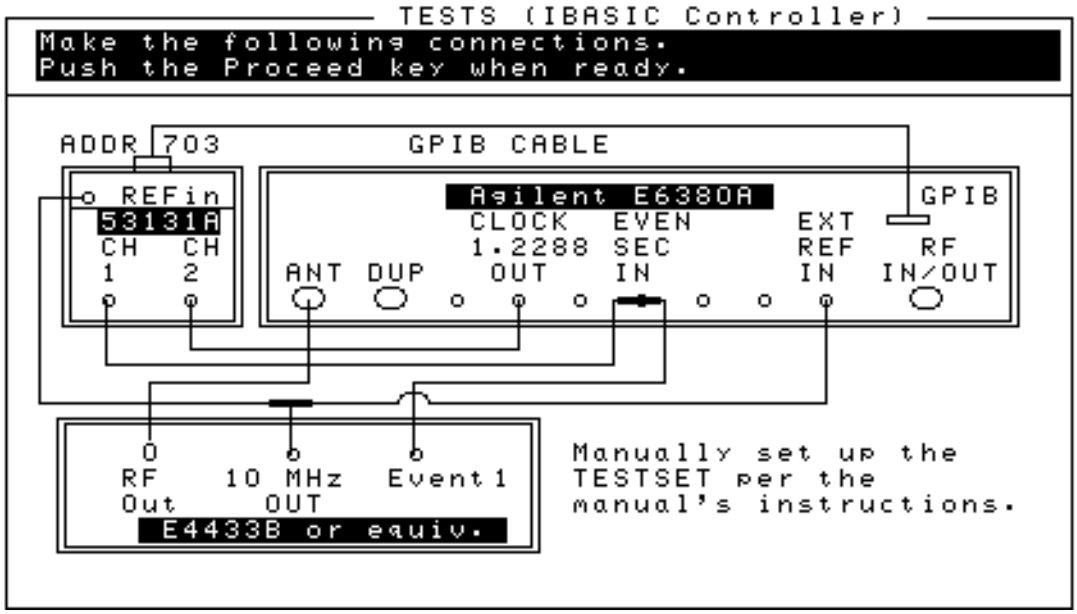
Step 11. Enter DUT information if desired

Step 12. Select **Start (k1)**

Connecting the Test Equipment

Figure 3-2 Connections for testing the E6380A CDMA Base Station Test Set





Setting up the Test Conditions

This section outlines setting up the test equipment in preparation for test operations. The Mobile/Base Station Test Set program will setup and control the test functions for the E6380A Test Set and E53131A Counter, however the settings for the E4433B must be set manually. Make the E4433B instrument settings necessary as documented in the following procedure.

E4433B ESG-D Series RF Digital Signal Generator Setups

Step 1. Press Preset.

Step 2. Press Mode key

Step 3. Press Arb Waveform Generator / CDMA Formats / IS-95A / Setup Select / Pilot

Step 4. Press CDMA / ON

Step 5. Press Frequency 885 MHz (Cellular Band Channel 500)

Step 6. Press Amplitude -10 dBm to set output power

Step 7. Press RF On/Off to turn RF on.

Table 3-1 Instrument settings for the E6380A Base Station Test Set E4433B ESG-D Series RF Digital Signal Generator Settings

Step	Setting	Result	Note
1	Preset	Presets the E4433B to a known State	
2	Mode	Allows Mode Selections on the display	
3	Arb Waveform Generator	Allow Arbitrary waveform selection	
3	CDMA Formats	Allows CDMA Format selection	
3	IS-95A	Selects IS-95A Format	
3	Setup Select	Allow IS 95A Feature Selection	
3	Pilot	Turns on the Pilot Signal only	
4	CDMA/ON	Turns on the CDMA Modulation	
5	Frequency 885 MHz	Sets frequency for Cellular Band Ch 500	
6	Amplitude -10 dBm	Sets output power level	
7	RF On/Off	Turns RF Output Power On	

End of E6380A Test Setups

After all connections and setups have been complete, proceed to "Verifying the CDMA signal" on page 78 to complete the testing process.

Testing the 8924C CDMA Mobile Test Set

Equipment Required:

- E6380A Base Station Test Set with Option 12 (Enhanced Time Offset)
- E6459A Enhanced Time Offset Measurement Kit
- E53131A Counter (part of the E6459A Measurement Kit)
- 8924C CDMA Mobile Test Set

Optional Equipment

- 83236B PCS Interface

The 83236B PCS Interface extends the frequency range of the 8924C for PCS Band Testing. If the 8924C is configured with an 8323B PCS Interface, additional testing of the 83236B's RF Output ports is recommended. Consult the 8924C Users Guide for operation of the 8924C and 83236B.

Configuring the Software

The Configuration Menu allows you to change the test conditions of the E6459A Measurement System to the settings and conditions required for testing the 8924C. See Configuring the Software and Test Parameter sections of this Manual for more detailed information.

Setting up the E6459A Test Point Condition on the E6380A

Step 1. On the **`Main Menu`** select **`Test Parameters`** to change the test condition for the E53131A Input impedance between the 8924C and the counter.

- Select **`Parameter #3`** and set this value to **`1`** for Hi Z input counter Chan 1.

Step 2. Configuration Menu Settings

a. Choose **`8924C`** as the product being calibrated in the **`Device Under Test`** field.

b. Set the **`RF Display Mode`** to **`Channel`**

c. Set the **`Channel`** to **`500`**

d. Set the **`Channel Standard`** to **`North American Cellular`** or **`North American PCS`**

e. Set the **`PN Offset Number`** to **`12`**

f. Do not change the E6380A PCS Band Delay (ns)

g. Do not change the E6380A Cell Band Delay (ns)

h. Enter the **`RF Cable Delay`** value.

To determine the delay of the RF Path cable being used, refer to “Calculating cable and antenna delay” on page 90

i. Set **`Even Second Delay`** to **`2.9 ns`**. If you are not using the cables in the E6459A

Measurement Kit, refer to "Calculating cable and antenna delay" on page 90 to determine the delay values for the cables being used.

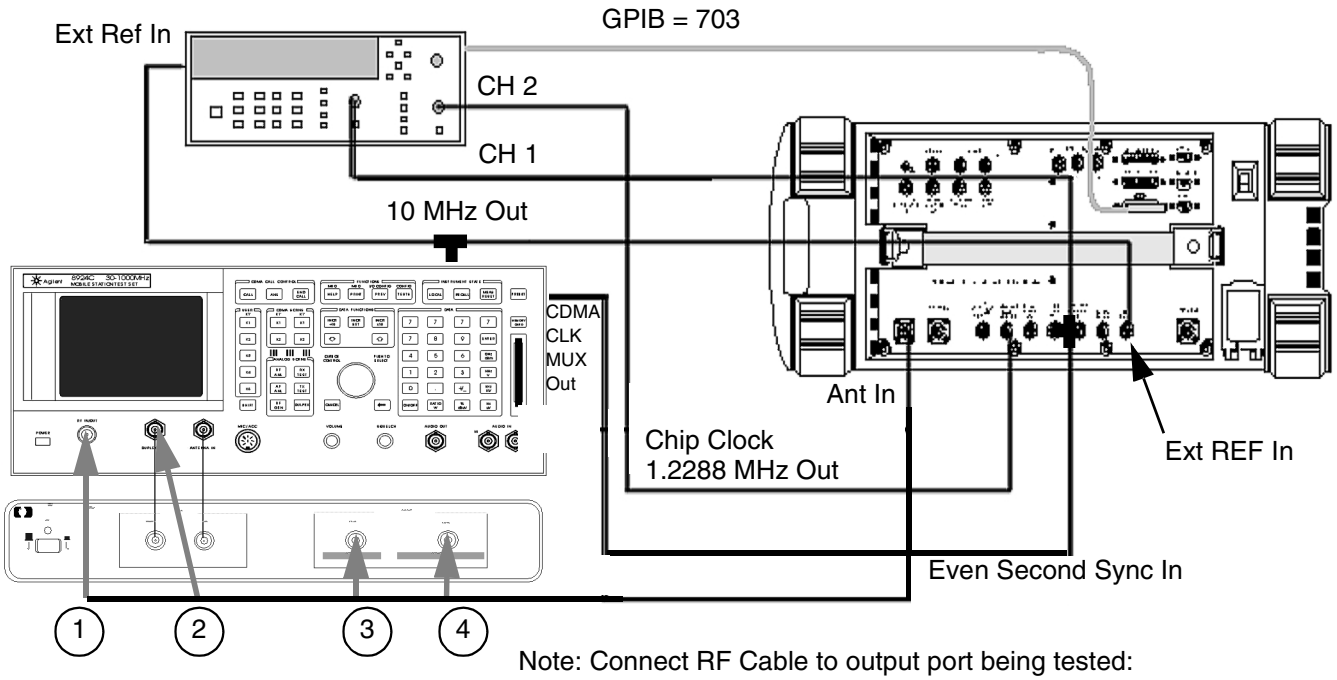
j. Set the **`Counter GPIB address`** to **`703`**

k. Enter DUT Information if desired

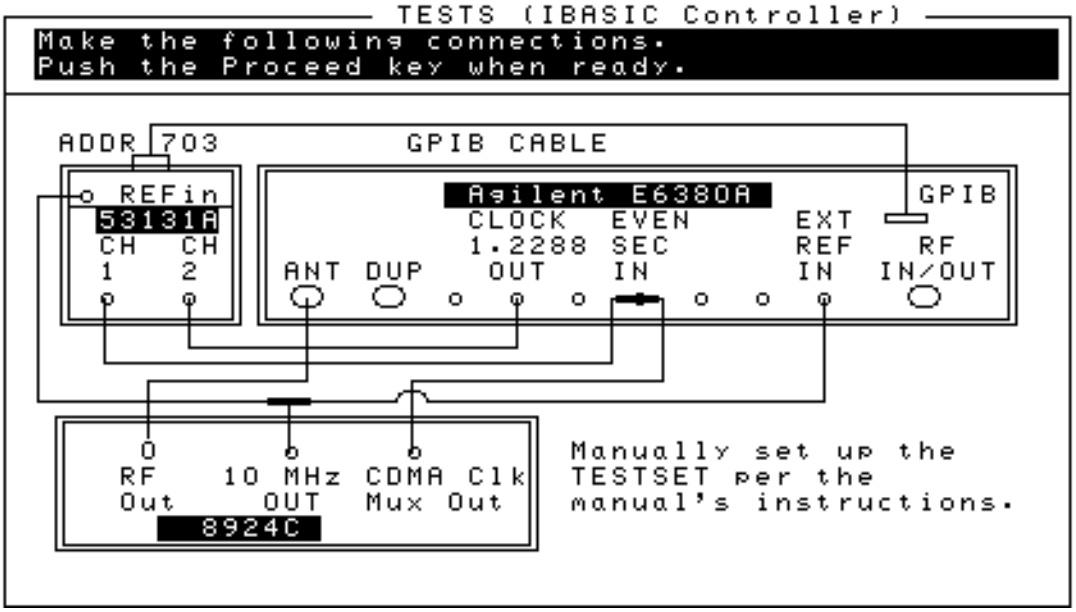
l. Select **`Start (k1)`**

Connecting the Test Equipment

Figure 3-3 Connections for testing the 8924C Mobile Test Set



Note: Connect RF Cable to output port being tested:
1. 8924C RF IN/OUT
2. 8924C Duplex OUT
3. 83236 RF IN/OUT
4. 83236 RF OUT only



Setting up the Test Conditions

This section outlines setting up the test equipment in preparation for test operations. The Mobile/Base Station Test Set program will setup and control the test functions for the E6380A Test Set and E53131A Counter, however the settings for the 8924C must be set manually. Make the 8924C Instrument Settings necessary as documented in the following procedure. For further information on setting up the 8924C consult the 8924C Users Manual

8924C CDMA Mobile Test Set Setups

Step 1. Press **Preset**.

Step 2. **Select Test Port** - Select the correct Test Port on the Analog RF Generator Screen

Step 3. Under Analog, Press the **RF Gen** Key and select **RF OUT** or **DUPLEX** in the Output Port field.

Setup the CDMA Source using the CDMA Call Control Screen.

Step 4. Set **Protocol** to either **TSB-74** for MS Amps or **J-STD-800** for US PSC

Step 5. Set **RF Channel Standard** to either **MS Amps** or **US PCS**

Step 6. Set **RF Channel** to **500**

Additional Setups on the CDMA Generator Control Screen

Step 7. Set **Sector A Power** to **-20 dBm**

Step 8. Turn the **Sync, Paging, and Traffic** channels to **Off**

Step 9. Set **Pilot** level to **0 dBm**

Step 10. Set **PN Offset** to **12**

Table 3-2 Instrument settings for the 8924C Mobile Test Set

Step	Setting	Result	Note
1	Preset	Presets the 8924C to a known State and defaults to the CDMA Call Control Screen	
2	RF Gen Output Port	Selects the 8924C output port	1. RF Out 2. Duplex
4	Protocol	TSB-74 for Amps, J-STD-800 for PCS	1. TSB-74 2. J-STD-008
5	RF Channel Standard	Selects either MS Amps or US PCS	1. MS AMPS 2. US PCS
6	RF Channel	Selects the test channel 500 for both Amps and PCS settings	1. 500 2. 500

Table 3-2 Instrument settings for the 8924C Mobile Test Set

Step	Setting	Result	Note
7	Sector A Power -20 dBm	Sets output power level to -20 dBm	
8	Sync OFF	Turns off the Sync Channel	
8	Paging OFF	Turns off the Paging Channel	
8	Traffic OFF	Turns off the Traffic Channel	
9	Pilot = 0 dBm	Turns on the Pilot Channel and sets the output level to 0 dBm	
10	PN Offset = 12	Sets the PN offset to 12	

End of 8924C Test Setups

After all connections and setups have been complete, proceed to "Verifying the CDMA signal" on page 78 to complete the testing process.

Testing the E8285A CDMA Mobile Test Set

Equipment Required:

- E6380A Base Station Test Set with Option 12 (Enhanced Time Offset)
- E6459A Enhanced Time Offset Measurement Kit
- E53131A Counter (part of the E6459A Measurement Kit)
- E8285A CDMA Mobile Test Set

Configuring the Software

The Configuration Menu allows you to change the test conditions of the E6459A Measurement System to the settings and conditions required for testing the E8285A. See Configuring the Software and Test Parameter sections of this Manual for more detailed information.

Setting up the E6459A Test Point Condition on the E6380A

Step 1. On the **`Main Menu`** select **`Test Parameters`** to change the test condition for the E53131A Input impedance between the E8285A and the counter.

- Select **`Parameter #3`** and set this value to **`1`** for Hi Z input counter Chan 1.

Step 2. Configuration Menu Settings

a. Choose **`E8285A`** as the product being calibrated in the **`Device Under Test`** field.

b. Set the **`RF Display Mode`** to **`Channel`**

c. Set the **`Channel`** to **`500`**

d. Set the **`Channel Standard`** to **`North American Cellular`** or **`North American PCS`**

e. Set the **`PN Offset Number`** to **`12`**

f. Do not change the E6380A PCS Band Delay (ns)

g. Do not change the E6380A Cell Band Delay (ns)

h. Enter the **`RF Cable Delay`** value.

To determine the delay of the RF Path cable being used, refer to "Calculating cable and antenna delay" on page 90

i. Set **`Even Second Delay`** to **`2.9 ns`**. If you are not using the cables in the E6459A Measurement Kit, refer to "Calculating cable and antenna delay" on page 90 to determine the delay values for the cables being used.

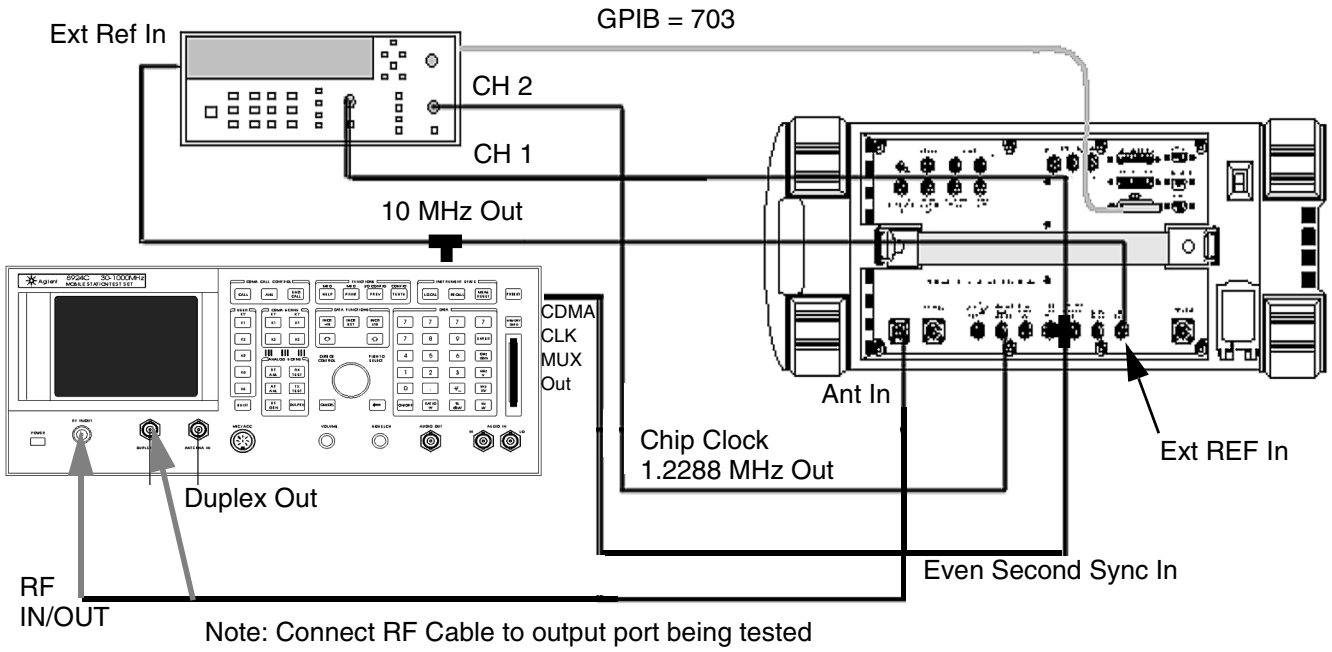
j. Set the **`Counter GPIB address`** to **`703`**

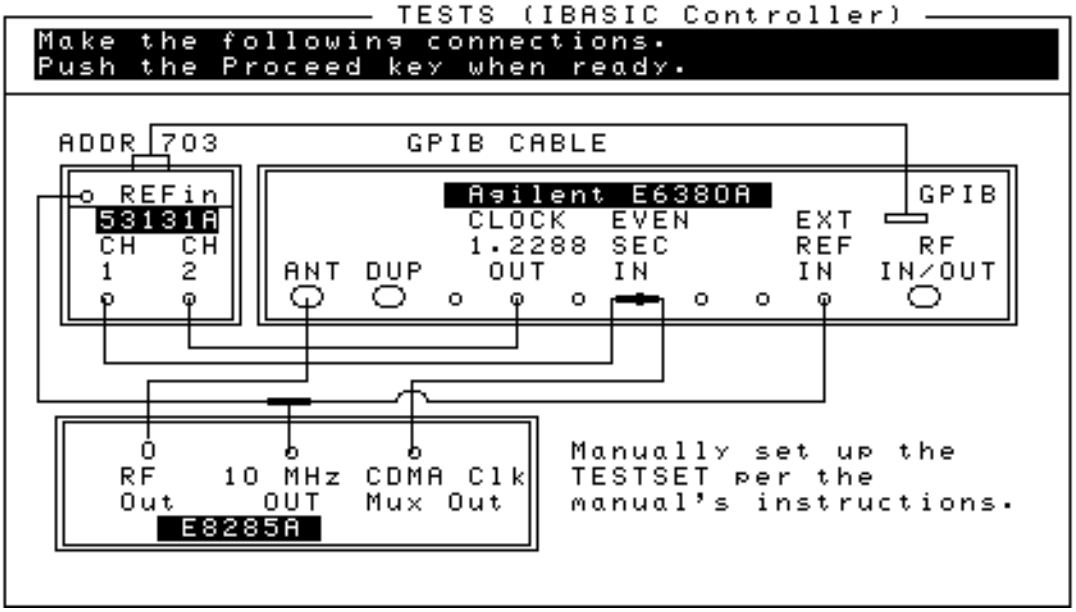
k. Enter DUT Information if desired

l. Select **`Start (k1)`**

Connecting the Test Equipment

Figure 3-4 Connections for testing the E8285A CDMA Mobile Test Set





Setting up the Test Conditions

This section outlines setting up the test equipment in preparation for test operations. The Mobile/Base Station Test Set program will setup and control the test functions for the E6380A Test Set and E53131A Counter, however the settings for the E8285A must be set manually. Make the E8285A Instrument Settings necessary as documented in the following procedure. For further information on setting up the E8285A consult the E8285A Users Manual.

E8285A CDMA Mobile Test Set Setups

Step 1. Press **Preset**.

Step 2. **Select Test Port** - Select the correct Test Port on the Analog RF Generator Screen

Step 3. Under Analog, Press the **RF Gen** Key and select **RF OUT** or **DUPLEX** in the Output Port field.

Setup the CDMA Source using the CDMA Call Control Screen.

Step 4. Set **Protocol** to either **TSB-74** for MS Amps or **J-STD-800** for US PSC

Step 5. Set **RF Channel Standard** to either **MS Amps** or **US PCS**

Step 6. Set **RF Channel** to **500**

Additional Setups on the CDMA Generator Control Screen

Step 7. Set **Sector A Power** to **-20 dBm**

Step 8. Turn the **Sync, Paging, and Traffic** channels to **Off**

Step 9. Set **Pilot** level to **0 dBm**

Step 10. Set **PN Offset** to **12**

Table 3-3 Instrument settings for the 8924C Mobile Test Set

Step	Setting	Result	Note
1	Preset	Presets the E8285A to a known State	
2	RF Gen Output Port	Selects the E8285A output port	1. RF Out 2. Duplex
4	Protocol	TSB-74 for Amps, J-STD-800 for PCS	1. TSB-74 2. J-STD-008
5	RF Channel Standard	Selects either MS Amps or US PCS	1. MS AMPS 2. US PCS
6	RF Channel	Selects the test channel 500 for both Amps and PCS settings	1. 500 2. 500
7	Sector A Power -20 dBm	Sets output power level to -20 dBm	

Table 3-3 Instrument settings for the 8924C Mobile Test Set

Step	Setting	Result	Note
8	Sync OFF	Turns off the Sync Channel	
8	Paging OFF	Turns off the Paging Channel	
8	Traffic OFF	Turns off the Traffic Channel	
9	Pilot = 0 dBm	Turns on the Pilot Channel and sets the output level to 0 dBm	
10	PN Offset = 12	Sets the PN offset to 12	

End of E8285A Test Setups

After all connections and setups have been complete, proceed to "Verifying the CDMA signal" on page 78 to complete the testing process.

Testing the E5515C CDMA Mobile Test Set

Equipment Required:

- E6380A Base Station Test Set with Option 12 (Enhanced Time Offset)
- E6459A Enhanced Time Offset Measurement Kit
- E53131A Counter (part of the E6459A Measurement Kit)
- E5515C CDMA Mobile Test Set

Configuring the Software

The Configuration Menu allows you to change the test conditions of the E6459A Measurement System to the settings and conditions required for testing the E5515C. See Configuring the Software and Test Parameter sections of this Manual for more detailed information.

Setting up the E6459A Test Point Condition on the E6380A

Step 1. Configuration Menu Settings

a. Choose **`E5515C`** as the product being calibrated in the **`Device Under Test`** field.

b. Set the **`RF Display Mode`** to **`Channel`**

c. Set the **`Channel`** to **`500`**

d. Set the **`Channel Standard`** to **`North American Cellular`** or **`North American PCS`**

e. Set the **`PN Offset Number`** to **`12`**

f. Do not change the E6380A PCS Band Delay (ns)

g. Do not change the E6380A Cell Band Delay (ns)

h. Enter the **`RF Cable Delay`** value.

To determine the delay of the RF Path cable being used, refer to "Calculating cable and antenna delay" on page 90

i. Set **`Even Second Delay`** to **`2.9 ns + 407.17 nS (1/2 chip delay) = 410.07 ns`**. If you are not using the cables in the E6459A Measurement Kit, refer to "Calculating cable and antenna delay" on page 90 to determine the delay values for the cables being used.

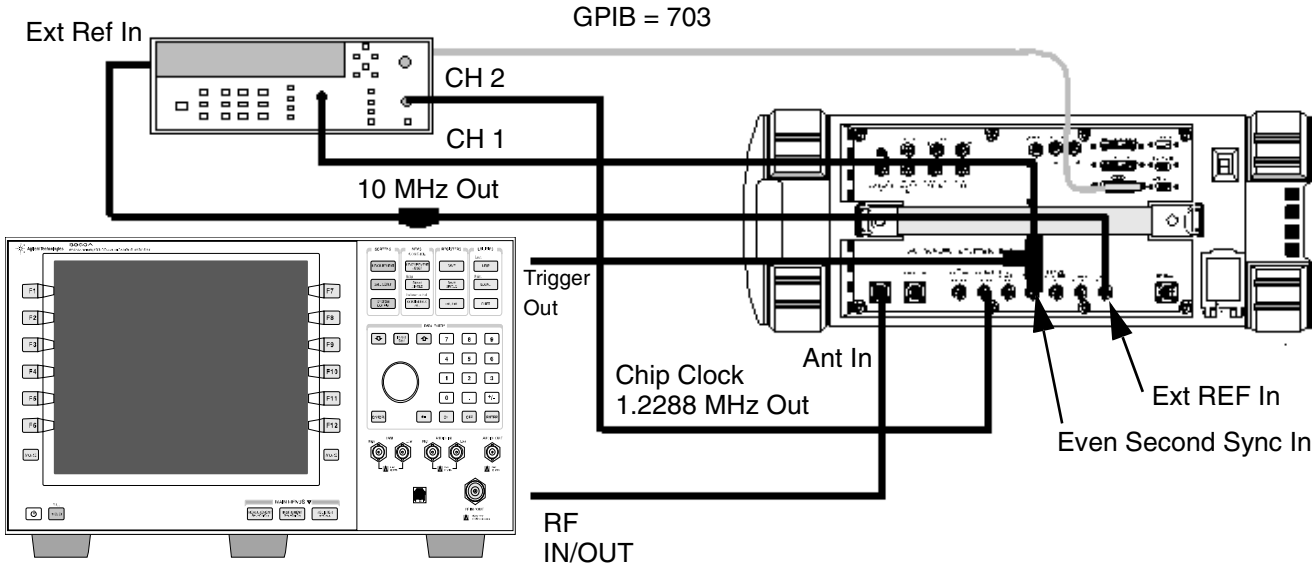
j. Set the **`Counter GPIB address`** to **`703`**

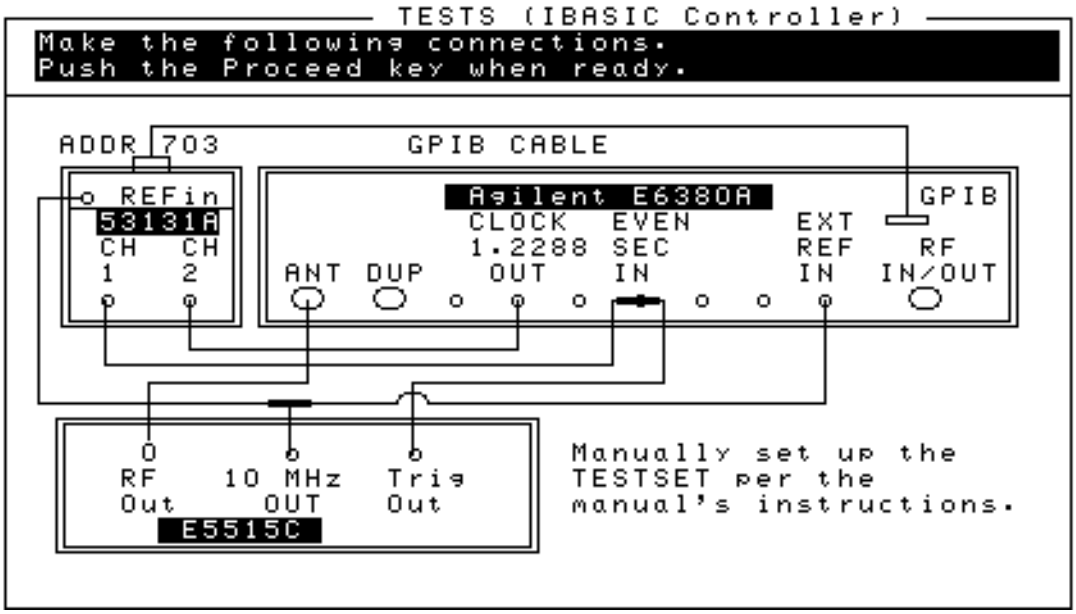
k. Enter DUT Information if desired

l. Select **`Start (k1)`**

Connecting the Test Equipment

Figure 3-5 Connections for testing the E5515C CDMA Mobile Test Set





Setting up the Test Conditions

This section outlines setting up the test equipment in preparation for test operations. The Mobile/Base Station Test Set program will setup and control the test functions for the E6380A Test Set and E53131A Counter, however the settings for the E5515C must be set manually. Make the E5515C Instrument Settings necessary as documented in the following procedure. For further information on setting up the E5515C consult the E5515C Users Manual

E5515C CDMA Mobile Test Set Setups

Step 1. Press **`Preset`**.

Step 2. Set **`System Type`** to **`IS-2000`** or **`IS-95`**

Step 3. Set **`Operating Mode`** to (Active Cell)

Step 4. For IS-95 set **`Protocol Rev`** to (1. TSPB-74 2. J-STD-008)

or

For IS-2000 set **`Protocol Rev`** to 6 (IS-2000).

Step 5. Set **`Cell Band`** to (1. US Cellular 2. US PCS)

Step 6. Set **`RF Channel`** (500)

Step 7. Set **`Cell Power`** to -20 dBm

Step 8. General Control Screen

Call Setup: Press More 1 of 2 soft key on the left side menu:

Generator Info: Code Channel Parameters

a. Set PN Offset to 12

b. F-SCH Level = OFF (in IS-2000 only)

c. Paging Level = OFF

d. Traffic Level = OFF

e. Sync Level = OFF

f. Pilot Level = 0 dB

Table 3-4 Instrument settings for the 5515C CDMA Mobile Test Set

Step	Setting	Result	Note
1	Preset	Presets the E5515C to a known State	
2	System Type	Selects the instrument operating format output port	1. IS95 2. IS2000
3	Operating Mode	Selects Call PRocessing or Test Mode	Select Active Cell for Call Processing Mode

Table 3-4 Instrument settings for the 5515C CDMA Mobile Test Set

Step	Setting	Result	Note
4	Protocol	If Step 2 is IS95, select 1 or 2 If Step 2 is IS2000, select 6	1. TSPB-74 2. J-STD-008 3. IS2000
5	Cell Band	Selects 800 or 1900 frequency band	1. US Cellular 2. UP PCS
6	RF Channel	Sets the test channel for Cell or PCS settings	500
7	Cell Power	Sets the Cell Power level to -20 dBm	
8	PN Offset = 12	Sets the PN Offset to 12	
8	F-SCH Level	Sets the F-SCH to Off	IS2000 only
8	Paging Level	Turns off the Paging Channel	
8	Traffic Level	Turns off the Traffic Channel	
8	Sync Level	Turns off the Sync Level	
8	Pilot Level	Sets Pilot Level to 0 dBm	

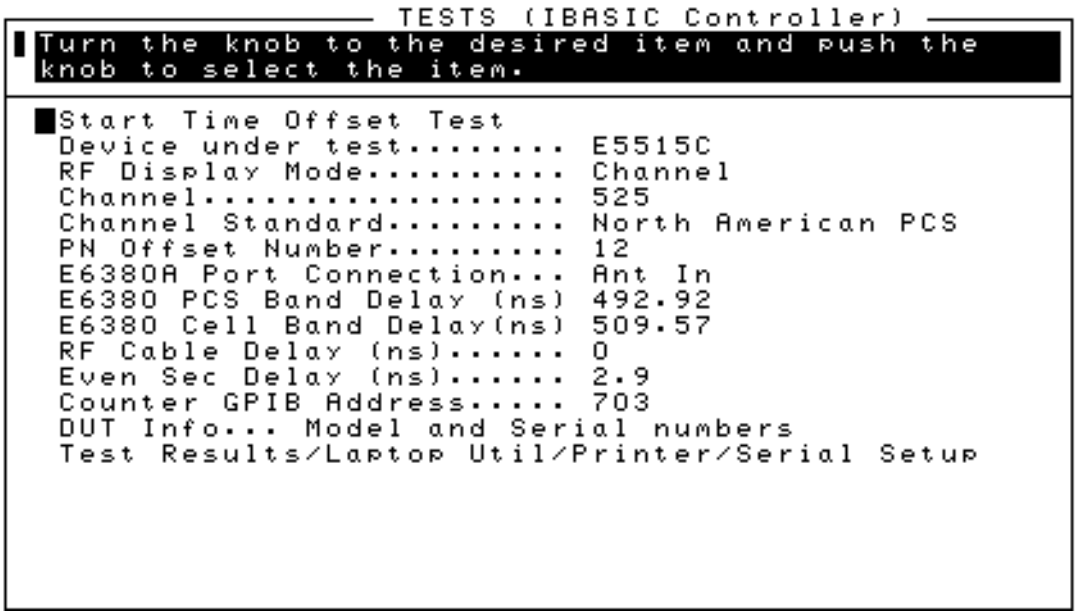
End of E5515C Test Setups

After all connections and setups have been complete, proceed to "Verifying the CDMA signal" on page 78 to complete the testing process.

Configuring the Software

Select each item on the configuration screen and enter appropriate values.

Figure 3-6



Device under test

Selecting this field brings up a drop down list giving you a choice of the Test Set to be tested. The list includes the following Test Sets:

- E5515C CDMA Mobile Test Set
- E6380A CDMA Base Station Test Set
- E8285A CDMA Mobile Test Set
- 8924C CDMA Mobile Test Set

This selection will determine which connection diagram will be displayed.

RF Display Mode

Select the RF Display Mode field. The choices are:

- Channel
- Frequency

Channel/Frequency

Depending on the previous selection, enter the frequency or channel number you will be testing.

Channel Standard

Selects the channel standard available for testing,. Choosing this field brings up a drop down list giving you a choice of the following standards:

- North American PCS Band
- Korean PCS
- North American Cellular Band
- Japanese Cellular

PN Offset Number

Select the PN Offset of the CDMA source being used. The default PN offset number for the E5515C, E8285A, and 8924C is “12” and “0” for the E4433B.

E6380A Port Connection

The default setting for this field is “Ant IN”. All testing for the Mobile/Base Station Test Sets is performed with the Ant IN ports so the users is not able to change this selection.

E6380 PCS Band Delay (ns)

The PCS Band Delay value is retrieved by the software from the factory calibration values stored in the E6380A's Calibration ROM. When Testing an E6380A, the PCS band delay of the E4433B should be entered in this field. When testing a Mobile Test Set (E5515C, E8285A, 8924C) do not change the default values.

E6380 Cell Band Delay (ns)

The Cell Band Delay value is retrieved by the software from the factory calibration values stored in the E6380A's Calibration ROM. When Testing an E6380A, the Cell band delay of the E4433B should be entered in this field. When testing a Mobile Test Set (E5515C, E8285A, 8924C) do not change the default values.

RF Cable Delay

Enter the RF Cable Delay of the RF cable that connects the input signal to the E6380A test port. To determine the delay of the RF Path cable being used, refer to “Calculating cable and antenna delay” on page 90.

Even Sec Delay

Enter the delay value for the cable connecting the Even Second Signal from the CDMA source to the BNC T-connector on the E6380A CDMA Test Set EVEN SECOND SYNC IN connector. Using the cables supplied in the E6459A Measurement Kit, the delay is 2.9 nanoseconds.

If you are prompted by an error message to add the Timing Adjustment Cable to this cable length, the delay value becomes 24.3 nanoseconds.

Counter GPIB Address

This should normally be set to 703, the default value for a 53131B counter. If the counter you are using has a different address, change this menu option.

DUT Info

Use this field to enter Model Number and Serial number of the Test Set being calibrated. This identification will be used in the header of the log file when data logging to a PC.

Test Results/Laptop Util/Printer/Serial Setup

Use this field to display the Test Results/Laptop Util/Printer/Serial Setup menu. The menu fields are described in "Handling Test Results" on page 97.

Verifying the CDMA signal

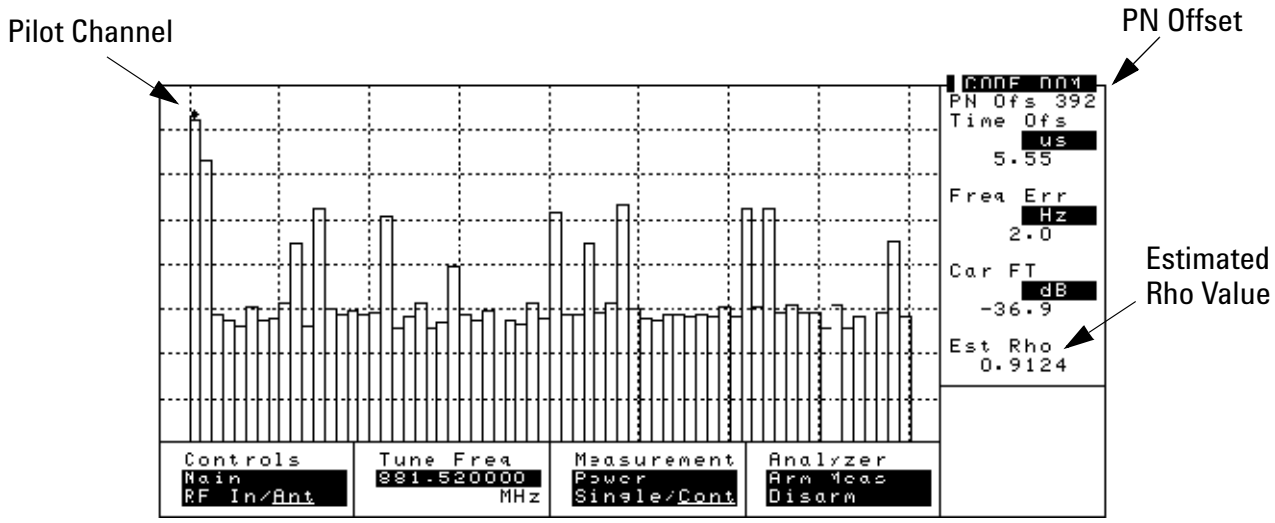
Once the timing offset has been confirmed and a GPS lock verified, the CDMA verification screen is displayed.

At this stage you can either continue with the test by choosing the **`Start Tst (k2)`** key, or verify the CDMA signal received by the E6380A CDMA Test Set.

To verify the CDMA signal

1. Choose **`Code Dom (k1)`** key
2. Check that the signal meets the following criteria;
   - The signal is present with at least one pilot channel.
   - The PN Offset is correct for the sector you are testing.
   - The estimated rho is at least 0.9

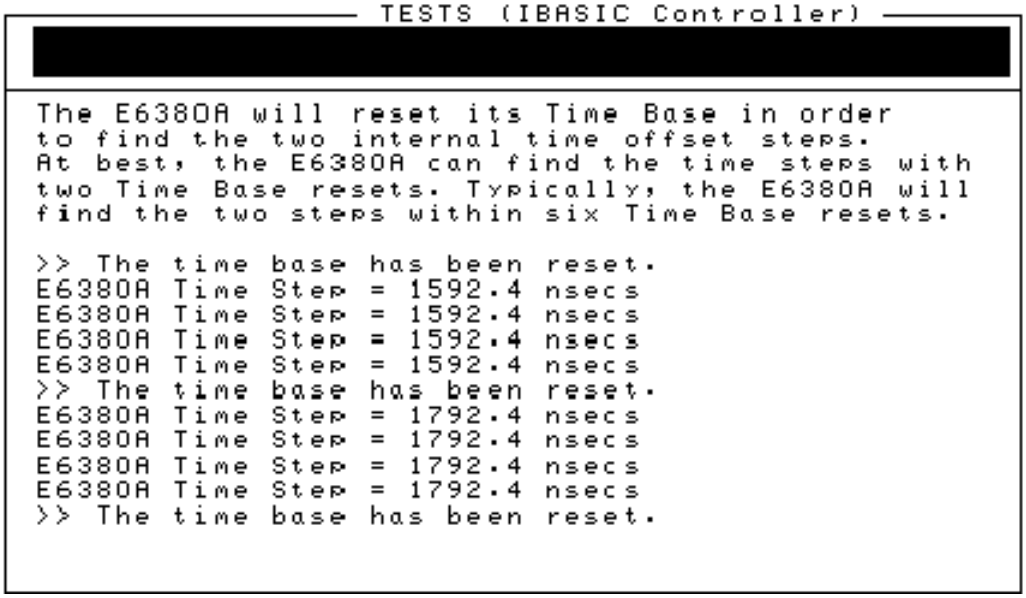
Figure 3-7 Code Domain Screen



Determining internal time offset

The following screen will appear until the E6380A is in the proper operating mode and the time offset readings are usable in the software calculations.

Figure 3-8 **Determining internal time offset**



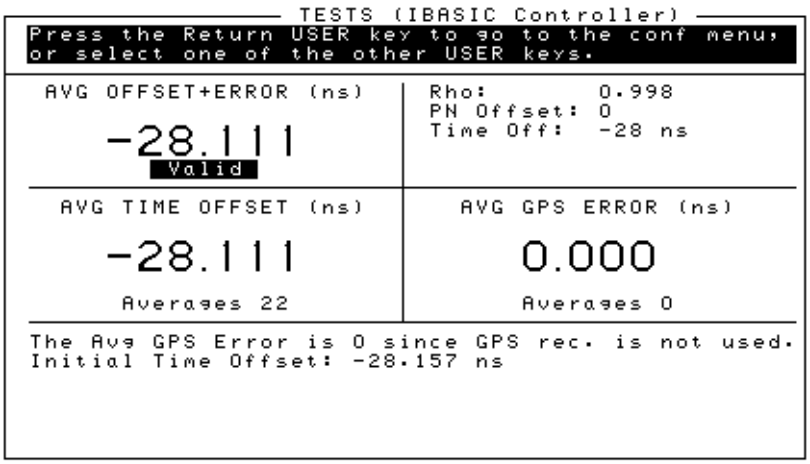
Test results

Once the test has been started, the E6380A Test Set displays the offset timing screen while the E6380A determines the correct Time Offset steps. The E6380A will reset the Time Base and display the measurements until the correct Time Offset step has been determined.

Once the offset timing has stabilized the Test Set will make a Time Offset measurement. On this screen various measurement results are displayed. These are as follows:

- The parameter **AVG TIME OFFSET (ns)** is the average of the Time offset readings taken by the E6380A Test Set.
- The **AVG GPS ERROR (ns)** This field is not used and will be zero as this test does not use the GPS Receiver
- **AVG OFFSET + ERROR (ns)** is the sum of the two numbers listed above. At the start of the test the results displayed will be invalid until the test has taken the number of measurements specified in the Test Parameter Screen. Twenty (20) averages is the default value for this setting and is the recommended number of averages.

Figure 3-9 Test results screen



Once valid measurements are produced the Valid label is displayed. The valid label is dependent on the number of averages selected in the test parameter screen.

Recording/Storing the Test Set Calibration Factors

After the Valid label is displayed, you can either select (**k5 Return**) or (**k4 reset AVG**). Resetting the measurement will turn off the Valid label and reset the averages to zero. The valid label is dependent on the number of averages selected in the test parameter screen. Twenty (20) averages is the default value and is the minimum recommended number of averages

E6380A Test Procedure only

If you selected the E6380A as the Device Under Test on the Configuration Menu, (**`K1 Store CF`**) will be show up on the soft key menu only after the Valid label. Selecting this option will allow you to store the new calibration factors for the E6380A Test Set. Follow the instructions on the screen to store the new calibration factors.

NOTE Any large deviation from the original stored calibration values should be investigated.

The readings should not change more than +/-25 ns. Variations beyond +/-25 ns can occur if repairs have been made to the Test Set where modules have been replaced in the E6380A. Consult the E6380A Users Guide for repair and Calibration information.

Example Calibration Reports

Table 3-5 E8285A RF PN Rollover to Even Second Trigger Delay values

Date 06/19/01 Serial Number	PORTS	Cell Band Trigger Delay	PCS Band PN to Even Second Trigger Delay
E8285A	RF IN/OUT	9747.4 ns	9760.6 ns
US40081971	Duplex Out	9747.4 ns	9760.6 ns

Table 3-6 E6380A RF PN Rollover to Even Second Trigger Delay values

Date 06/19/01 Serial Number	PORTS	Cell Band Trigger Delay	PCS Band PN to Even Second Trigger Delay
E6380A	RF IN/OUT	500.4 ns	500.6 ns
US40081971	Antenna In	500.4 ns	500.6 ns

Table 3-7 8924C RF PN Rollover to Even Second Trigger Delay values

Date 06/19/01 Serial Number	PORTS	Cell Band Trigger Delay	PCS Band PN to Even Second Trigger Delay
8924C US39224504	8924C RF IN/OUT	-37 ns	N/A
	8924C Duplex Out	-40 ns	N/A
89236B N/A	8924C/83236B RF IN/OUT	N/A	N/A
	8924C/83236B RF Out Only	N/A	N/A

4 Test and Parameter Descriptions

This chapter includes a description of the test and of each parameter.

Procedure Supplied

The test software is supplied on a PC card. On the card are two test procedures, BASE_STA and MOBIL_TS. The procedure BASE_STA is described in the next section.

Parameter Descriptions

Parameters are used to define the conditions under which a TEST will run. You may edit the parameters to change the default values, and to meet specific testing requirements and conditions.

PARAMETER_01 Control GPS Receiver default [0=no 1=yes]

Enter the selection as to whether the GPS Receiver will be controlled by the Test Software. Select 0 to control the receiver manually; select 1 to have the Test Software control the receiver.

PARAMETER_02 GPS Receive Loop Time Constant [10-10000]

Enter the desired value for the loop time constant. The default is 150.

PARAMETER_03 Hi Z Input Counter Chan 1 [0=no 1=yes]

Enter the selection as to whether to use a high-impedance input for Counter Channel 1. Select 0 to use a 50-ohm input; select 1 to use a 1-megohm input.

PARAMETER_04 Show All Measurement Detail [0=no 1=yes]

Enter the selection as to whether the Test Software will display all measurement detail in the test results screen in the BTS Laptop Utility program. Select 0 to display no details; select 1 to display all details.

PARAMETER_05 Show All Test Results [0=no 1=yes]

Enter the selection as to whether the Test Software will display all test results in the test results screen in the BTS Laptop Utility program. Select 0 to display no test results; select 1 to display all results.

PARAMETER_06 Show GPS Commands [0=no 1=yes]

Enter the selection as to whether the Test Software will display GPS commands in the test results screen in the BTS Laptop Utility program. Select 0 to display no commands; select 1 to display all commands.

PARAMETER_07 Site Survey Percentage Before Test [0-100]

Enter the percentage to determine how much of the site survey will be performed by the GPS Receiver during the process of deriving the 1 PP2S (GPS clock) signal.

PARAMETER_08 Time Off Stability Threshold (10 to 100)

Enter the desired value for the time offset stability threshold.

PARAMETER_09 Time Stamp Test Results [0=no xxx=minute]

Enter the selection as to whether the test results will be time stamped. Enter 0 if no time stamp is to be used; enter three digits for the time, in minutes, if a time stamp is to be used.

PARAMETER_10 Use Second Counter [0=no 7xx=address]

Enter the desired control choice to determine whether the test setup will include a second counter. Enter 0 for no use of a second counter; enter the GPIB address if a second counter is to be used.

PARAMETER_11 Number of Averages for Valid meas. (>1)

Selecting a value of zero disables the valid/invalid function.

PARAMETER_12 Test Mode (0=Base Station 1=Testset)

Selects whether a BTS or test set is being measured.

PARAMETER_13 ZZ Demo Mode [0=no 1=yes]

Enter the desired control choice to specify the Test Software operating mode. Select 0 to cause the Test Software to operate in normal mode. Select 1 to cause the Test Software to operate in demonstration (demo) mode. The demo mode will allow you to run the tests without really testing or connecting to a Base Station. This allows you to become familiar with Test Software operation.

Pass/Fail Limit Specification Descriptions

Pass/fail limits define the values with which measurement results are compared to determine if the system under test meets specified standards.

There are no user modifiable pass/fail limit specifications in the Test Software.

5 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.

Calculating cable and antenna delay

The following section provide some guidelines on how to calculate the cable and antenna delays that are used during testing. It is important that correct delay values are used.

Cable Delay

The equation defining delay in a coaxial cable is:

Equation 5-1 Cable delay calculation formula

$$d = \frac{l}{(vp \times c)}$$

Where:

d = delay of the cable in seconds

l = length of the cable in meters

vp = velocity of propagation of the cable (expressed as a percentage)

c = speed of light, $3x10^8$ meters/second.

Example

For a two-meter cable with a velocity factor of 70%, the delay is:

Equation 5-2 Example calculation

$$\frac{2}{(0.7 \times 3 \times 10^8)} = 9.52 nano\,\mathrm{sec}onds$$

Antenna to antenna Delay

The equation describing delay of a signal travelling through the air is:

Equation 5-3 Antenna to antenna calculation formula

$$d = \frac{l}{c}$$

Where:

d = antenna-to-antenna delay

c = speed of light.

l = antenna-to-antenna distance in meters

Delay Equations for the Various Configurations

The delay calculated by the E6459A test system is as follows:

Equation 5-4 System delay calculation

$$Td = Toff - Trfc + Tesec - Tv$$

Where:

Td = calculated delay

Toff = the time offset measurement made by the E6459A test system

Trfc = the delay or the RF input cable

Tesec = the delay of the cable connecting the Symmetricom 58503B 1pp2s output to the BNC T-connector on the EVEN SECOND SYNC IN input on the E6380A Test Set.

From the connections shown in “System Block Diagram Using BTS Coupled Port” on page 21.

Tv= - (The delay between the transmitting antenna and the coupled port)

From the connections shown in “System Block Diagram using connection to BTS antenna output” on page 23

Tv= - (The delay between the transmitting antenna and the BTS antenna output)

From the connections shown in “System Block Diagram using antenna to pick up BTS RF signal” on page 25

Tv= + (The delay between the transmitting antenna and the receiving antenna)

This is the basis of the time offset measurement. The configuration menu gathers the necessary user data to apply the equation. The software returns the corrected delay value of the measurement using this equation.

Cables supplied with the E6459A Measurement Kit must be used, otherwise unknown errors may be introduced into the test setup.

Error Messages, Explanations and Suggested Resolutions

- **The PN Offset has changed from XX to YY.**
  You may be getting a signal from another sector.

  This message indicates that another signal has replaced the signal you were originally monitoring. Check the aim of your antenna. If it has moved since the start of the test, this could be your problem. You may be receiving a signal from another sector or base station.

- **The Time Offset is much larger than normal.**
  If this persists, there may be a BTS problem.

  In this case, the time offset has recently changed by at least 1.1 microseconds, indicating a BTS malfunction or possible an interference problem. Check the receiving antenna and the BTS.

- **The Time Offset is crossing the chip boundary.**
  Add the timing adjustment cable and restart test.

  In rare cases, the time offset measurement made by the E6380A approaches zero. When it does, it can report either zero or 815 nanoseconds for time offset. Adding the fifteen-foot timing cable moves the arrival of the even second pulse 24.3 nanoseconds back in time relative to the start of the PN sequence. Now when the even second is compared to the 1.2288 MHz chip clock, the ambiguity is eliminated.

  Add the Timing Adjustment Cable to the cable that connects the 1PP2S output of the 58503B GPS Receiver and the BNC T-connector on the E6380 EVEN SECOND SYNC IN connector. The Even Sec Delay (ns) in the configuration menu must be changed to 24.3 nanoseconds to compensate for the change.

- **The Internal Time Offset Step has changed.**
  If this persists, restart the Time Offset Test.

  The E6380A is operating in an incorrect mode; the measurements will be off by approximately 200 nanoseconds. The test data will not be valid. Check the connection of the 10Mhz reference to the REF IN port on the E6380A.

- **The Time Offset changed by more than 100 ns.**
  If this persists, there may be a BTS problem.

  Successive time offset measurements have varied by more than 100 nanoseconds. There may be a signal-to-noise problem with the input signal, or there could be a problem with the BTS. Note: this parameter is defined in the parameters menu.

- **The E6380A is temporarily unable to measure the Time Offset. The Offset is invalid.**

  The PN offset measured by the E6549A has changed radically. The data is no longer valid. If this occurs only once, there is no reason to worry. If the problem continues, there may be a problem with the BTS or the test set.

- **The Time Offset is crossing the chip boundary.**
  Previous Offset: 5 ns
  Present Offset: 203 ns
  Stop the test, add the 15 foot Timing Adjustment cable running from the

1PP2S output on the 58503B GPS Receiver to the EVEN SECOND SYNC IN Increase the value of the Even Second delay by 18 ns.

In rare cases, the time offset measurement made by the E6380A approaches zero. When it does, it can report either zero or 815 nanoseconds for time offset. Adding the fifteen-foot timing cable moves the arrival of the even second pulse 18 nanoseconds back in time relative to the start of the PN sequence. Now when the even second is compared to the 1.2288 MHz chip clock, the ambiguity is eliminated.

Add the Timing Adjustment Cable to the cable that connects the 1PP2S output of the 58503B GPS Receiver and the BNC T-connector on the E6380 EVEN SECOND SYNC IN connector. The Even Sec Delay (ns) in the configuration menu must be changed to 24.3 nanoseconds to compensate for the change.

- **The E6380A is unable to get the Time Offset to switch between the two steps.**
  Test Aborted.

  The operating mode of the test set is incorrect. Cycle the power on the test set and rerun the test.

- **The test set is unable to find the signal.**
  Test Aborted.

  Check all connections to the counter. Restart the test.

- **The test set is unable to measure three stable time offset readings.**
  Test Aborted.

  The input signal may be noisy. Check the positioning of the antenna and the antenna connections. Check the BTS. Rerun the test.

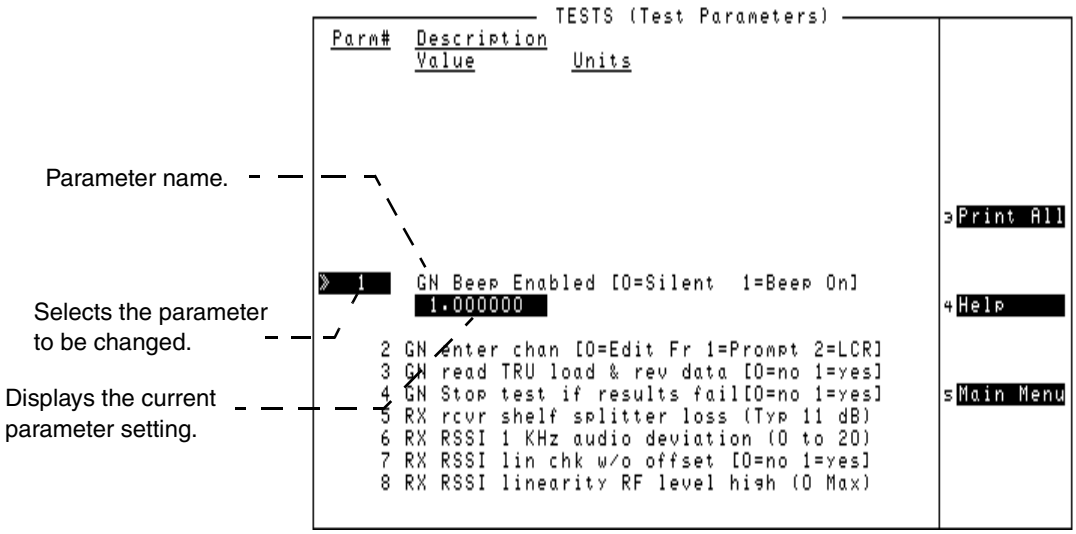
- **The Time Offset measurements are unstable.**
  Test Aborted.

  The input signal may be noisy or weak. Check the positioning of the receiving antenna and the antenna connections. Check the BTS. Rerun the test.

Changing Test Parameters

Changing test parameters is accomplished from the TESTS (Test Parameters) screen (see Figure 5-1 for a typical screen).

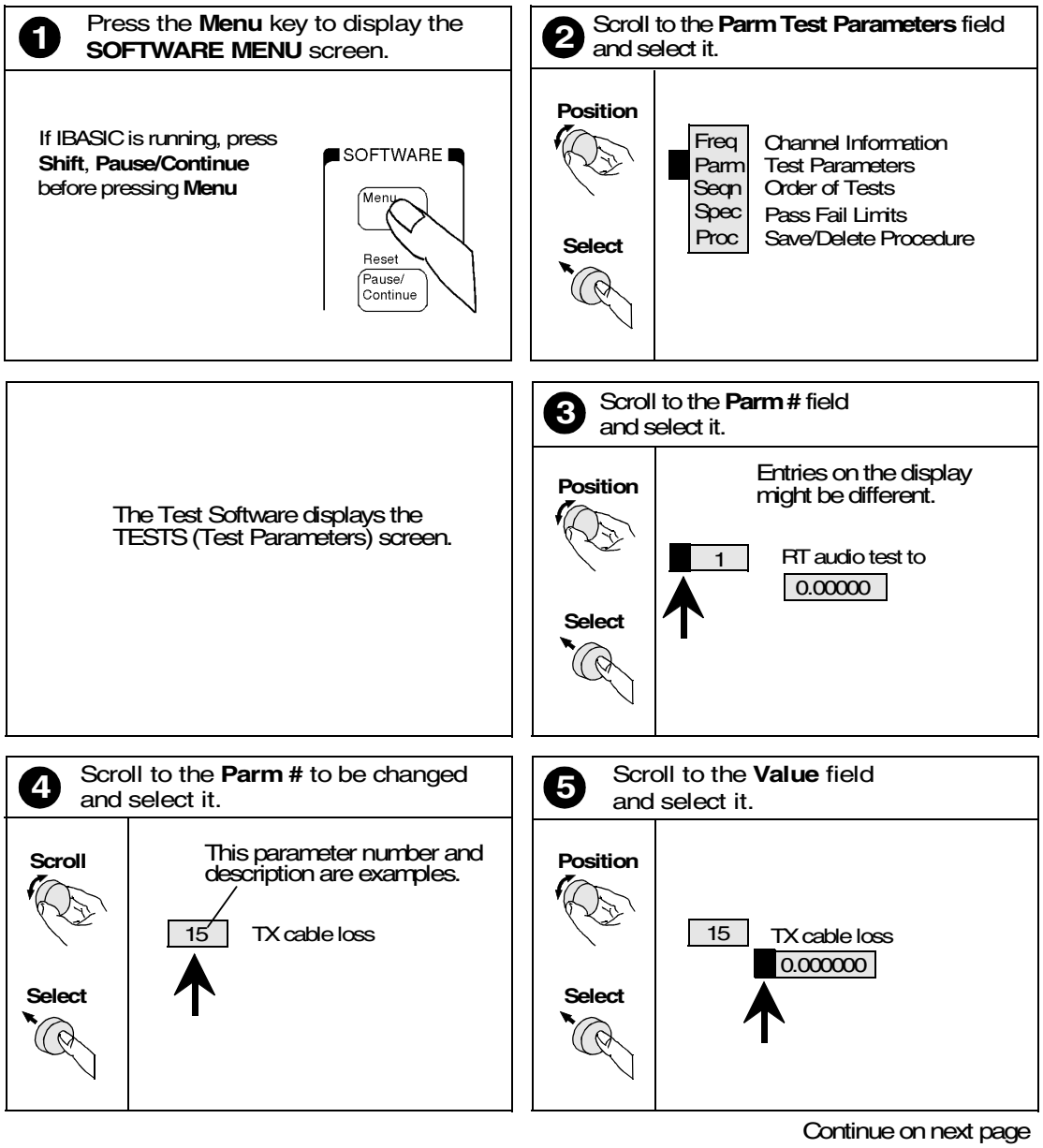
Figure 5-1 Typical TESTS (Test Parameters) Screen



The Software uses parameters to optimize the test environment and conditions for the testing application. The default test parameters were determined by examining test requirements and specifications from the equipment manufacturer. The Test Software comes with default settings for all test parameters.

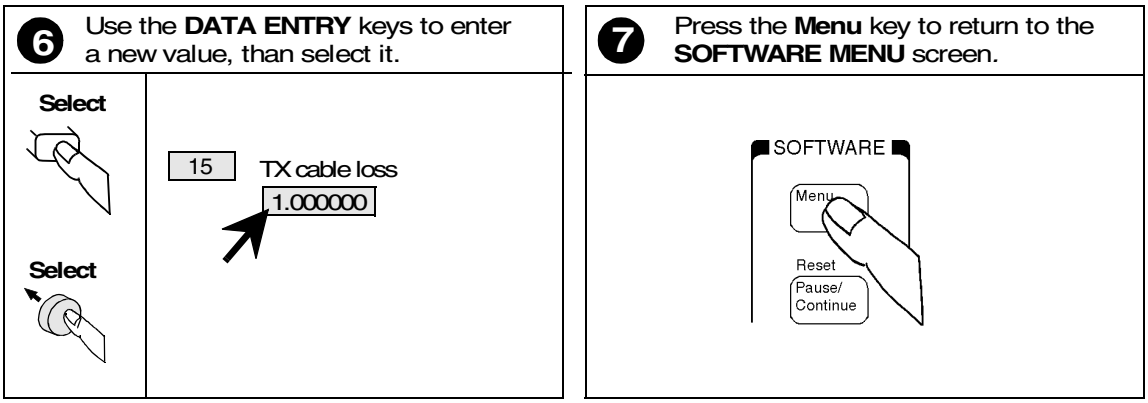
The procedure shown in Figure 5-2 and Figure 5-3 describes the process for changing test parameters through the TESTS (Test Parameters) screen to optimize the testing conditions. For information on saving customized test parameters, refer to the User's Guide for the E6380A CDMA Test Set.

Figure 5-2 Changing Test Parameters



Continue on next page

Figure 5-3 Changing Test Parameters (continued)



Handling 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 a variety of destination devices. These are:

- A personal computer (PC), usually a laptop PC
- An SRAM card
- A serial printer
- A parallel printer
- An HP-IB printer

The capability to save test results remains on until you turn it off.

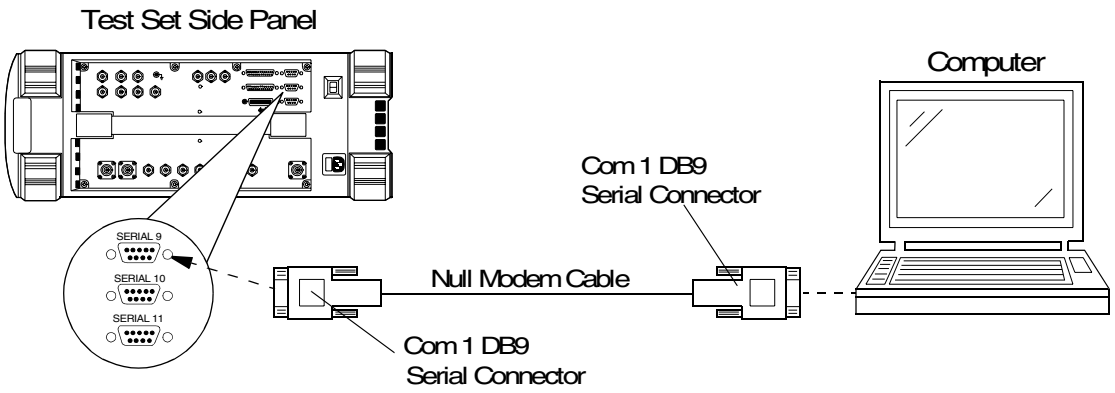
The following printers are supported by the Test Software:

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

Sending Test Results to a PC Using the BTS Laptop Utility Program

Test results may be supplied directly to a PC through the Test Set SERIAL 9 port (see Figure 5-4) if the PC is running the Agilent Technologies BTS Laptop Utility.

Figure 5-4 Test Set to PC Serial Connection



The requirements to save test results to a PC are as follows:

- The Test Set SERIAL 9 port must be connected to the PC using a null modem cable.
- The configured BTS Laptop Utility must be running on the PC.
- The **`Use BTS Laptop Utility`** field in the Test Results/Laptop Util/Printer/Serial Setup menu must be set to **`Yes`**.
- The Test Set SERIAL 9 port communications parameters must be configured to match the communications parameters of the PC.

Configuring the PC BTS Laptop Utility Program.

Sending test results to a PC requires starting the BTS Laptop Utility on the PC, then setting the Test Software to use the utility.

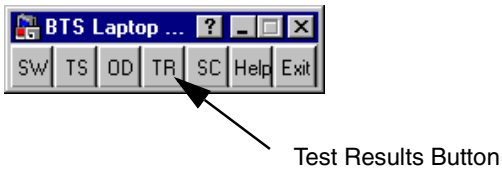
Perform the setup as follows:

Step 1. From the PC, start the BTS Laptop Utility program (see Figure 5-5).

Figure 5-5 Starting the BTS Laptop Utility Program

Step 2. On the PC screen, click on the **`TR`** button to display the window in which the test results will be displayed (see Figure 5-6).

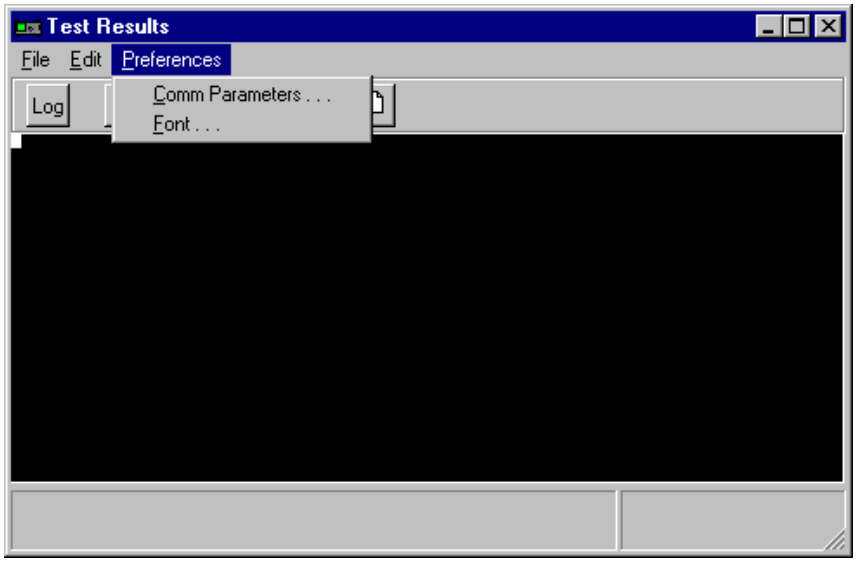
Figure 5-6 Selecting the Test Results Window



NOTE The Test Software does not use communications with the Switch for testing purposes. Thus, you might find it advantageous to turn off the SW button in the BTS Laptop Utility tool bar. To do this, select the File Properties window in the BTS Utility, then add -NoSwitch at the end of the Shortcut Tab in the Target field.

Step 3. On the PC screen, click on the **`Preferences`** field, then click on the **`Comm Parameters`** field to display the Comm Port Setup screen (see Figure 5-7).

Figure 5-7 Comm Port Setup Screen



Step 4. On the Comm Port Screen, set the Test Set port to the serial port to which the null modem cable is connected on the Test Set (SERIAL 9).

Step 5. On the Comm Port Setup screen, set the Test Set baud rate to match the baud rate of the PC.

NOTE If the rate is higher than 19200 baud, the Test Set SERIAL 9 port flow control must be set to **`Hardware`**.

Step 6. On the Comm Port Setup screen, set the Switch Port to **`No Port`**.

NOTE The Test Software does not use communications with the Switch for testing. If you have already set the Shortcut Tab as shown in the note in step 2, step 6 will not be required. The **`No Port`** selection will not appear.

Step 7. On the Comm Port screen, click on the **`OK`** button.

Sending the Results

To send test results to a PC, you must enable sending test results within the software. Do this as follows:

Step 1. Connect the PC to the Test Set SERIAL 9 port using a null modem cable.

Step 2. On the Test Set, press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 3. On the Test Set, press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 4. On the Test Set, select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 5. On the Test Set, select the **`BTS Laptop Utility`** field so that the choice field toggles to **`Yes`**.

NOTE If the Test Software does not change the field to **`Yes`**, see the BTS Laptop Utility help tool for hardware flow control. Also, make certain that you have completed all steps of this procedure correctly.

Step 6. On the PC, start the BTS Laptop Utility program.

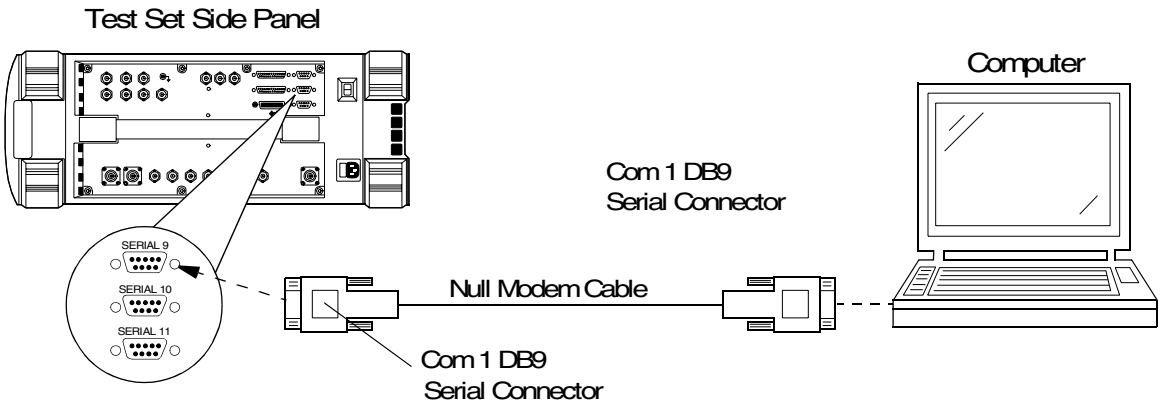
Step 7. On the Test Set, select the **`Serial 9 Port Settings`** field. Verify that the communications parameters match those of the BTS Laptop Utility program.

The Test Set will send test results to the PC using the BTS Laptop Utility program until you set the **`Use BTS Laptop Utility`** field to **`No`** in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to a PC Using Another Program

Test results may be supplied directly to a PC (with a communications program) through the Test Set SERIAL 9 port (see Figure 5-8). A variety of devices may be used to receive the data. An HP Palmtop computer, PC, laptop PC, or terminal may be used. A terminal emulator may be used to write the test results directly to a file. Examples of terminal emulator programs are HyperTerminal© and ProComm.

Figure 5-8 Test Set to PC Serial Connection



The requirements to save test results to a PC are as follows:

- The Test Set SERIAL 9 port must be connected to the PC.
- A configured terminal program must be running on the PC.
- The Send Test Results to Serial 9 function must be activated in the Software.
- The Test Set SERIAL 9 port communications parameters must be configured to match the communications parameters of the PC.

Configuring the PC Terminal Program

Sending test results to a PC requires that a configured terminal emulator be running while sending test results is enabled. See Figure 5-9 and Figure 5-10 for the detailed procedures required to configure a terminal program for saving test results to a PC.

Figure 5-9 Configuring a Terminal Program for Sending Test Results to a PC

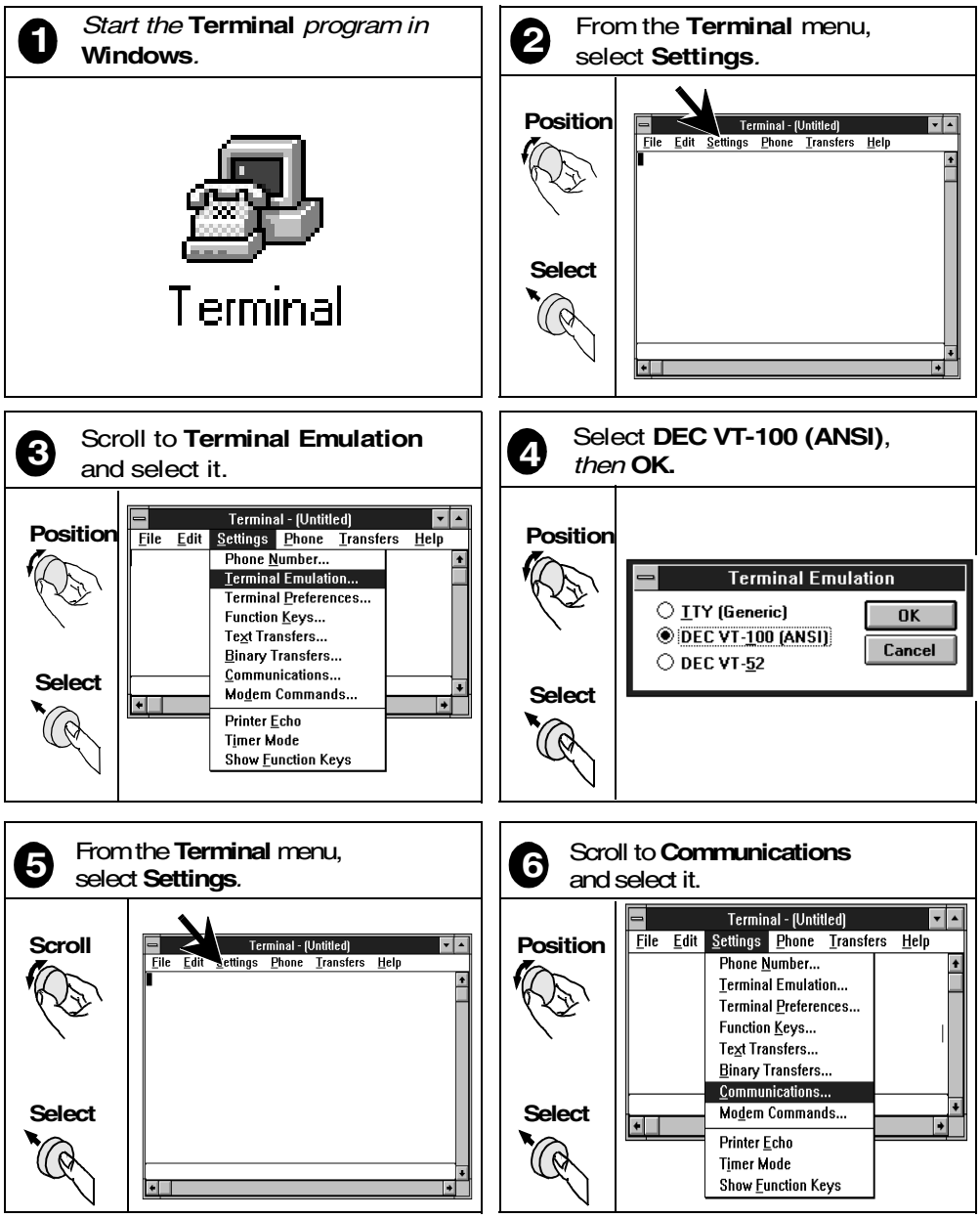
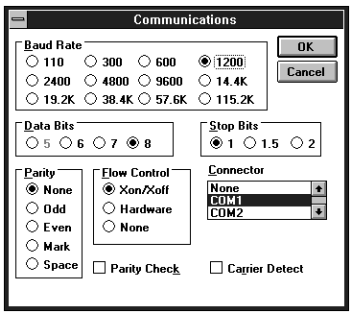


Figure 5-10 Configuring a Terminal Program for Sending Test Results to a PC (continued)

7 Edit the menu to match the settings on the **IO CONFIGURE** screen.

Enter

Select



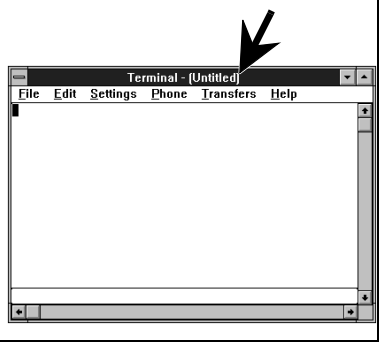
Example Communications Setup:

Connector: COM1 (remember to use your own settings!)
Baud Rate: 9600
Data Bits: 8
Parity: None
Flow Control: Xon/Xoff
Stop Bits: 1
Parity Check and Carrier Detect: both unchecked

8 From the Terminal menu, select **Transfers**.

Enter

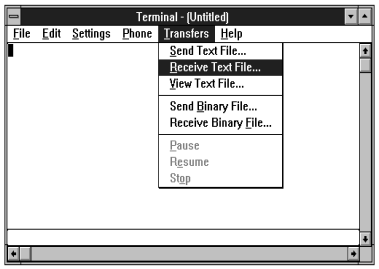
Select



9 Scroll to **Receive text file...** and select it.

Enter

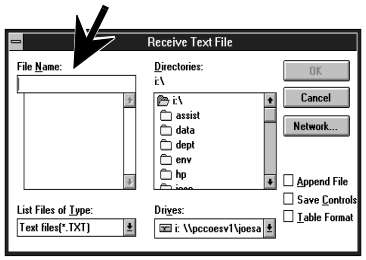
Select



10 Enter the path and filename of the file that you wish to save.

Enter

Select



After configuring the personal computer to receive the measured data, you must turn on Test Results in the Test Set and verify that the I/O Configuration screen communications parameters match those of the terminal emulator.

Sending the Results

To send test results to a PC, you must enable sending test results within the software. Do this as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Press the **k1** (`Run Test`) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the `Test Results/Laptop Util/Printer/Serial Setup` field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Verify that the `Use BTS Laptop Utility` field is toggled to `No`.

Step 5. Select the `Send Test Results to` field, then select `Serial 9` from the `Choices:` list.

Step 6. Start the terminal program.

Step 7. Select the `Serial 9 Port Settings` field. Verify that the communications parameters match those of the terminal program.

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.

The Test Set will send test results to the PC until you turn off the `Send Test Results to` field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Sending Test Results to an SRAM Card

To send test results to an SRAM card, you must enable the Sending Test Results to a PC Card function within the software. The Test Set will create test result files on the SRAM card automatically, based on the name that you enter at the start of testing. The Test Software will append ".txt" to the file name so that the files will be recognized on the SRAM card.

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

Once testing is complete and the test results are in files on the SRAM card, perform the procedure outlined in "Retrieving Data from an SRAM Card" on page 104 to transfer the data to a PC or printer.

NOTE Before attempting to send test results to an SRAM card, verify that the card is not write-protected. The write-protect switch should not be set toward the near edge of the card.

Send test results to an SRAM card as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **Test Results/Laptop Util/Printer/Serial Setup** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Insert an SRAM card into the front panel card slot. If the card is un-initialized, see "Initializing a PC Card" on page 112.

Step 5. Select the **Send Test Results to** field, then select **PC Card** from the **Choices:** list.

Step 6. The Test Set will display a message asking for a file name under which to store the test results. Enter a name using the characters from the **Choices:** list. Select **Done** when finished.

The Test Set will send test results to the SRAM card until you turn off the **Send Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

When the test is completed, the Test Set will close the file on the SRAM card and will change the **Send Test Results to** field in the Test Results/Laptop Util/Printer/Serial Setup menu screen from **PC Card** to **Off**. Thus, each time you run the test and wish to record the results to the SRAM card, you must open the Test Results/Laptop Util/Printer/Serial Setup menu and enter a new file name as outlined above.

Retrieving Data from an SRAM Card

Use the software utility (FILE_XFER), which is included in the Test Set to transfer data files from the SRAM card to a serial printer, an HP-IB printer, or a PC.

NOTE Loading and running the utility to perform these procedures will replace any software and procedures in the Test Set internal RAM. Thus, the Test Software must be reloaded when this procedure is complete. This requires that you have the Test Software PC card with you on-site.

Transferring Data to a Printer Via the SERIAL 9 Port or the HP-IB Port

Transfer data to a printer via the SERIAL 9 port or HP-IB port as follows:

Step 1. If the Test Software is running, exit it from the Configuration Menu screen by pressing the **Shift** and **Pause/Continue** (**Reset**) keys, then the **k5** (**Main Menu**) key.

Step 2. Make certain that the printer is turned on and set up to print when the data is sent to the Test Set SERIAL 9 port or HP-IB port.

Step 3. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 4. Select the **Select Procedure Location:** field. The Test Set will display a **Choices:** list containing the following items: **Card**, **ROM**, and **RAM**.

Step 5. Select **ROM**. This allows the loading of various utility programs resident in the Test Set.

NOTE In the following step, the items in the **Choices:** list are as shown on the printing date of this manual. However, this list could change in later versions of the Test Software.

Step 6. Select the **Select Procedure Filename:** field. The Test Set will display a **Choices:** list containing the following items: **SERVICE4**, **RFTOOLS**, **IB_UTIL**, **LISTOPTS**, **ST_PLT**, and **DEMO**.

Step 7. Select **IB_UTIL**.

Step 8. Press the **k1** (**Run Test**) key to run the utility software. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.

Step 9. Select the **FILE_XFER** field. The Test Set will prompt you to insert the SRAM card that contains the test result files.

Step 10. Insert the card and select the **Continue** field. The Test Set will display the file transfer menu.

Step 11. If using a serial printer, select the **Output Port** field and press the knob to select **Serial Port, 9600 baud**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

If using an HP_IB printer, select the **Output Port** field and press the knob to select **HPIB, Addr 7xx**. This configures the Test Set to send the data via the HP_IB port.

Step 12. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files might result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates test result files.

Step 13. When all files to be transferred have been selected, select the **Start Transfer** field. The data will be sent to the printer via the SERIAL 9 or HP-IB port.

Step 14. When printing is complete, you may select other files to transfer or exit the software utility by selecting the **Exit Data-Collection-File-Transfer** field.

Step 15. To return to the Test Software again, press the **k1** (**Run Test**) key from the SOFTWARE MENU screen.

Transferring Data to a PC Via the SERIAL 9 Port

Transfer data to a PC via the SERIAL 9 port as follows:

Step 1. If the Test Software is running, exit it from the Configuration Menu screen by pressing the **Shift** and **Pause/Continue** (**Reset**) keys, then the **k5** (**Main Menu**) key.

Step 2. Connect the Test Set to the PC using the SERIAL 9 port and a null modem cable.

Step 3. Load a PC software utility for communicating on the PC serial port, such as HyperTerminal.

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

Step 5. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 6. Select the **Select Procedure Location:** field. The Test Set will display a **Choices:** list containing the following items: **Card**, **ROM**, and **RAM**.

Step 7. Select **ROM**. This allows the loading of various utility programs resident in the Test Set.

Step 8. Select the **Select Procedure Filename:** field. The Test Set will display a **Choices:** list containing the following items: **SERVICE4**, **RFTOOLS**, **IB_UTIL**, **LISTOPTS**, **ST_PLT**, and **DEMO**.

Step 9. Select **IB_UTIL**.

Step 10. Press the **k1** (**Run Test**) key to run the utility software. The Test Set will display a the IB_UTIL menu on the TESTS (IBASIC Controller) screen.

Step 11. Select the **FILE_XFER** field. The Test Set will display a prompt to insert the SRAM card that contains the test result files.

Step 12. Insert the card and select the **Continue** field. The Test Set will display the file transfer menu.

Step 13. Select the **Output Port** field and press the knob to select **Serial Port, 9600 baud**. This configures the Test Set to send the data via the SERIAL 9 port at 9600 baud.

Step 14. Scroll down the list of file names to the file that you wish to transfer and select it. An asterisk (*) will appear next to the name. You may send more than one file at a time. Scroll to and select any other files that you wish to transfer.

NOTE All files on the SRAM card are displayed, not just the test result files. If you attempt to transfer files that are not test result data, unexpected results at the printer might occur. Also, transferring code files might result in many pages of code being printed. Look for files with ".txt" appended to the name, which indicates test result files.

Step 15. When all files to be transferred have been selected, select the **Start Transfer** field. The data will be sent to the PC via the serial port.

Step 16. When data transfer is complete, you may select other files to transfer or exit the software utility by selecting the **Exit Data-Collection-File-Transfer** field.

Step 17. To return to the Test Software again, press the **k1** (**Run Test**) key from the SOFTWARE MENU screen.

Stop Sending Test Results to a PC or an SRAM Card

Stop sending test results to a PC or SRAM card as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Press the **k1** (**Run Test**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **`Send Test Results to`** field, then select **`Off`** from the **`Choices:`** list.

Sending Test Results to a Serial Printer

Test results may be sent directly to a printer through the Test Set SERIAL 9 port. To do so, you must enable sending test results to the printer within the software.

Send test results to a serial printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

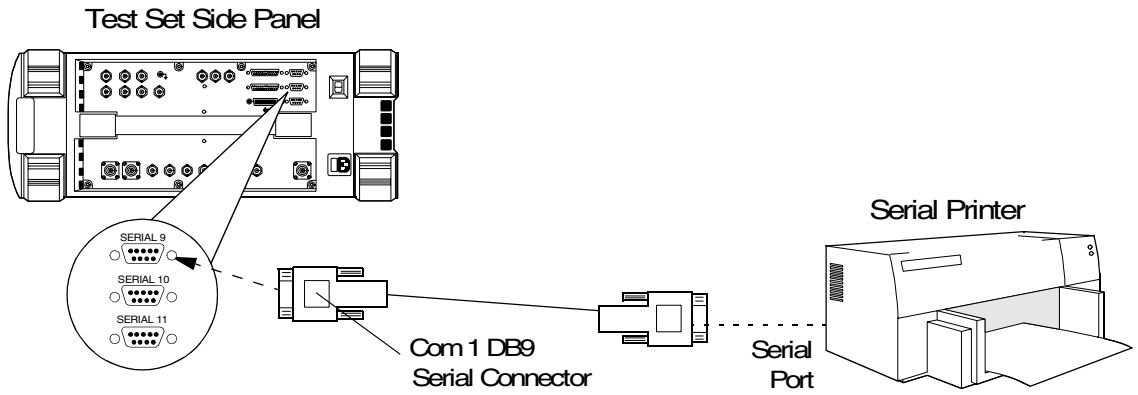
Step 2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **`Send Test Results to Printer at`** field, then select **`Serial 9`** from the **`Choices:`** list.

Step 5. Connect the serial printer to the Test Set SERIAL 9 port (see Figure 5-11).

Figure 5-11 Test Set to Serial Printer Connection



Step 6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/Page
- Form Feed (Start and End)
- Printer Model

The Test Set will send test results to the serial printer connected to the SERIAL 9 port until you turn off the **`Send Test Results to Printer at`** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to a Parallel Printer

Test results may be sent to a parallel printer through the Test Set PARALLEL 15 port. To do so, you must enable sending test results to the printer within the software.

NOTE Because a parallel printer and an Agilent Technologies 83202A Switch Matrix both receive information from the Test Set via the PARALLEL 15 port, it is not possible to use the two devices at the same time. If the test plan requires both the Switch Matrix and printed test results data, you might use either a serial or an HP-IB printer, or collect the data to a PC for later printing.

Send test results to a parallel printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

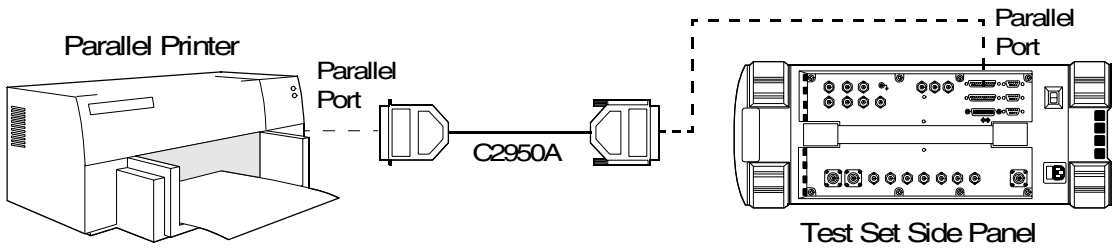
Step 2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **`Send Test Results to Printer at`** field, then select **`Parallel 15`** from the **`Choices:`** list.

Step 5. Connect the parallel printer to the Test Set PARALLEL 15 port (see Figure 5-12).

Figure 5-12 Test Set to Parallel Printer Connection



Step 6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/Page
- Form Feed (Start and End)
- Printer Model

The Test Set will send test results to the parallel printer connected to the PARALLEL 15 port until you turn off the **`Send Test Results to Printer at`** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Sending Test Results to an HP-IB Printer

Test results may be sent to an HP-IB printer through the Test Set HP-IB port. To do so, you must enable sending test results to the printer within the software.

Send test results to an HP-IB printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

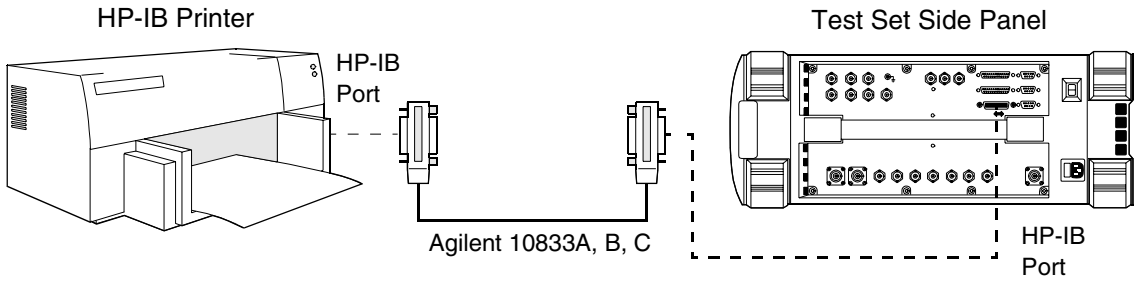
Step 2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **`Send Test Results to Printer at`** field, then select **`HP-IB 701`** from the **`Choices:`** list. Edit the three-digit HP-IB address (the default is 701) in the address field at the right of **`HP-IB`**.

Step 5. Connect the HP-IB printer to the Test Set HP-IB port (see Figure 5-13).

Figure 5-13 Test Set to an HP-IB Printer Connection



Step 6. Select the **`Print Setup`** field. The Test Software will display the Print Setup menu on the TESTS (IBASIC Controller) screen.

Step 7. Set the following parameters:

- Lines/Page
- Form Feed (Start and End)
- Printer Model

The Test Set will send test results to the HP-IB printer connected to the HP-IB port until you turn off the **`Send Test Results to Printer at`** field in the Test Results/Laptop Util/Printer/Serial Setup menu of the TESTS (IBASIC Controller) screen.

Stop Sending Test Results to a Printer

Stop sending test results to a printer as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Press the **k1** (**`Run Test`**) key to start the Test Software. The Test Software will display the Configuration Menu screen.

Step 3. Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu on the TESTS (IBASIC Controller) screen.

Step 4. Select the **`Send Test Results to Printer at`** field, then select **`Off`** from the **`Choices:`** list.

Initializing a RAM Disk

RAM disk is a section of Test Set internal memory that acts much like a flexible disk. Programs in this area of memory may be stored, re-stored, erased, and retrieved.

The RAM disk is partitioned into four separate volumes; 0-3. Each volume is treated as a separate 'disk'. You may also specify the size of each disk in 256-byte increments.

The four RAM disk volumes are designated **`:MEMORY,0,0`** to **`:MEMORY,0,3`**. For example, to catalogue the contents of RAM disk volume '0' from the TESTS (IBASIC Controller) screen, enter the following:

CAT ":MEMORY,0,0"

NOTE Any existing programs or formatting on RAM is erased if you use the **`RAM_MANAGER`** program to initialize a RAM disk. Therefore, you should use RAM disks only for short-term storage of files.

Each RAM disk volume must be initialized before it may be used. Volume 0 may be initialized using the RAM_MANAGER program from the **`IB_UTIL`** menu. Volumes 1, 2, and 3 must be initialized from the TESTS (IBASIC Controller) screen.

NOTE Use only Volume 0 for storing procedures.

The optional 'volume size' in the following procedure allows you specify the memory area to be set aside for each disk in 256 byte blocks.

Initialize volumes 1, 2, or 3 as follows:

Step 1. Press the **Menu** key. The Test Set will display the SOFTWARE MENU screen.

Step 2. Select the **`IBASIC IBASIC Cntrl`** field from the **`SET UP TEST SET:`** list.

Step 3. Position the cursor to the data entry field at the top of the screen and select it.

Step 4. From the list of characters in the **`Choices:`** list, enter the following command:

INITIALIZE ":MEMORY,0,<volume number 1-3>",<volume size>
or
INITIALIZE ":MEMORY,0,1",50

Select **`Done`** when finished.

Step 5. Press the **k1** (**`Run`**) key.

Initializing a PC Card

A new PC card or a card from which the battery has been removed and replaced must be initialized before it may be used. This section provides information on the initialization procedure.

Initialize a card as follows:

Step 1. Insert the card into the Test Set card slot.

Step 2. Press the **Shift** key then the **Inst Config** (**I/O Config**) key. The Test Software will display the I/O CONFIGURE screen.

Step 3. Select the **`Format Card`** field. The Test Software will display the message: **`Erase and format the PCMCIA Card? (YES/NO)`**.

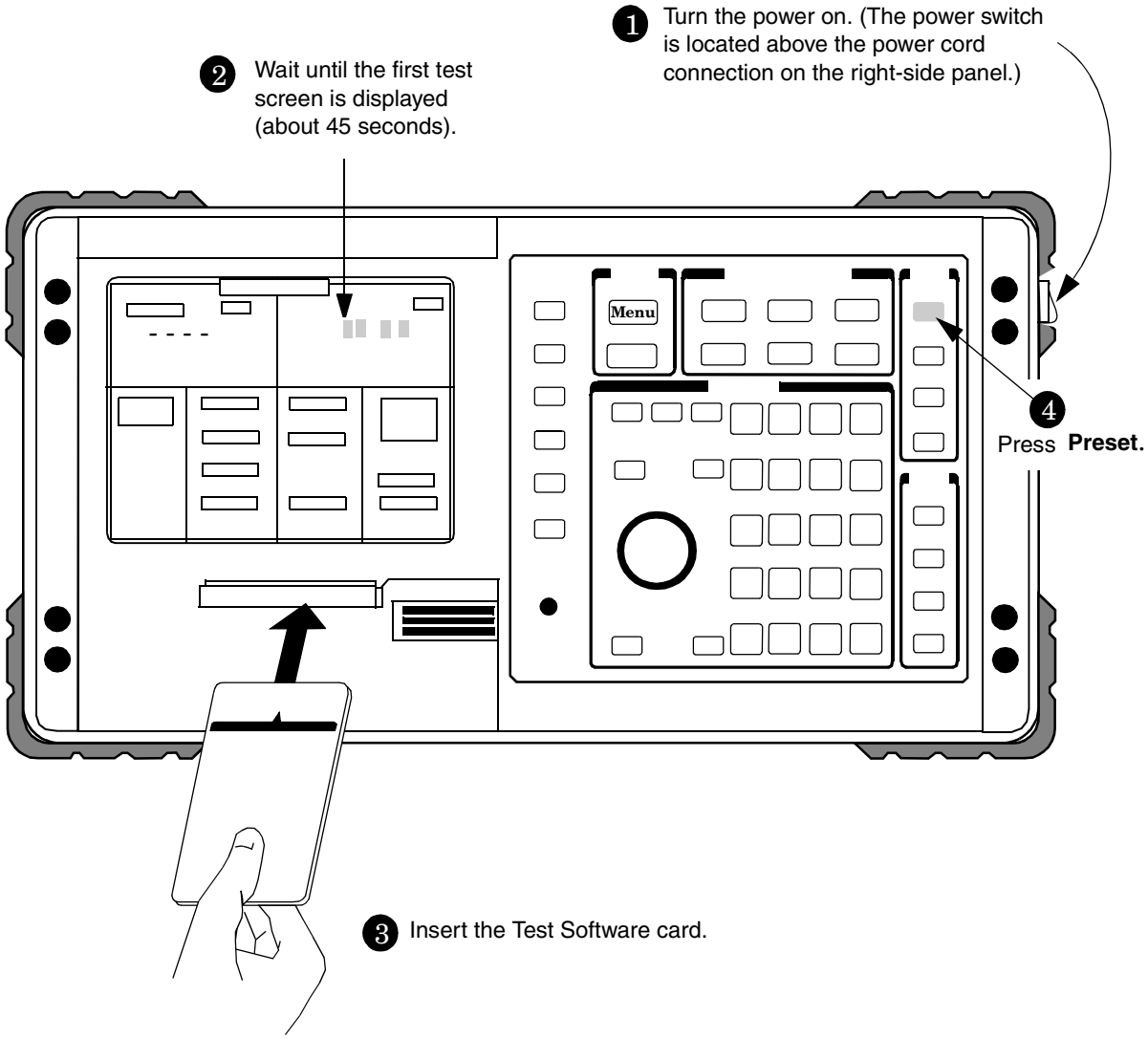
Step 4. If you wish to format the card, press the DATA ENTRY **Yes On/Off** key. The Test Set will format the card. Formatting is complete when the cursor stops blinking.

If you do not wish to format the card, press the DATA ENTRY **No ppm W** key.

Loading the Test Software

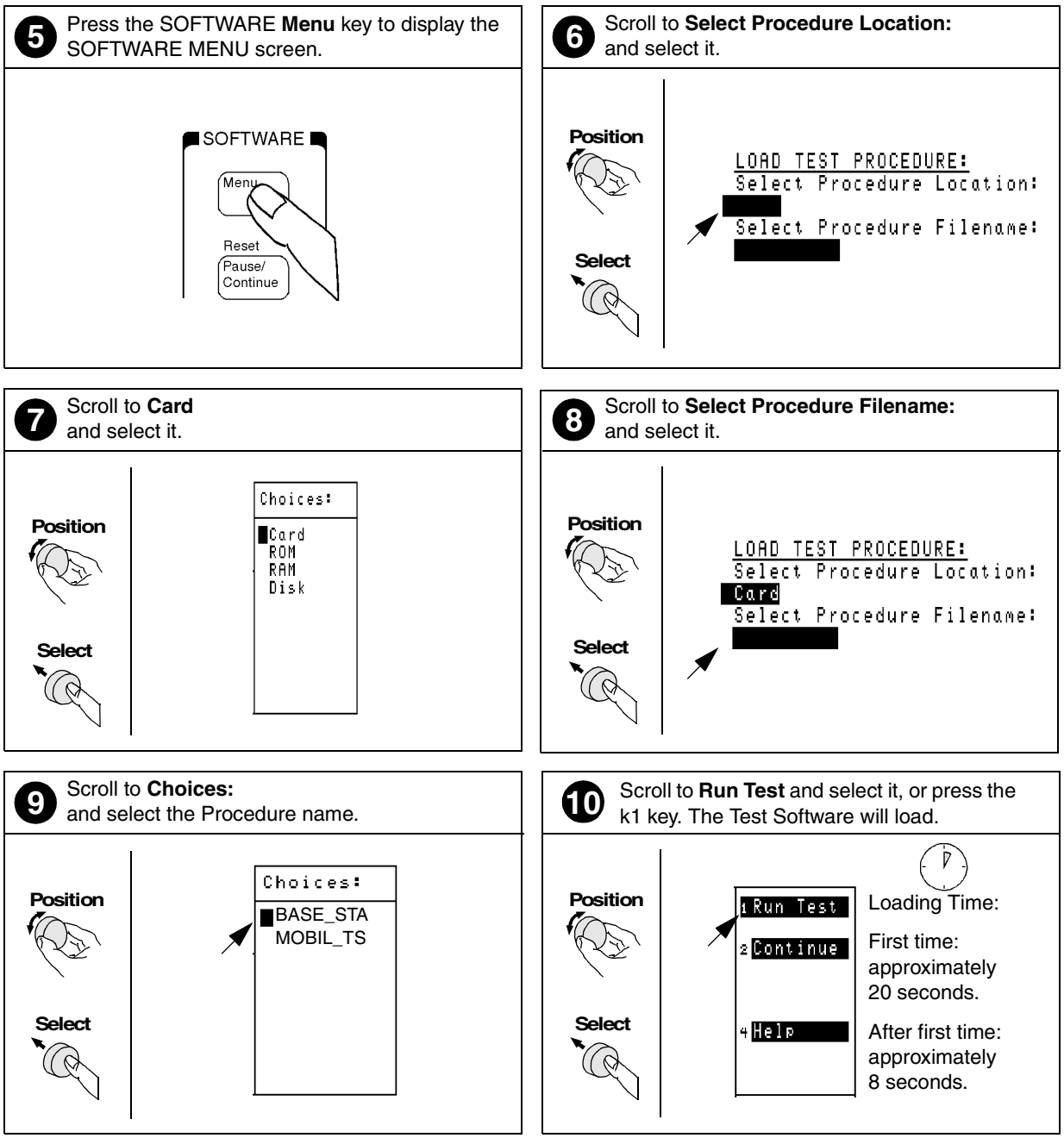
Locate the PC card labeled “Agilent Technologies Enhanced Time Offset Calibration Measurement System” and follow the steps outlined in Figure 5-14 and Figure 5-15.

Figure 5-14 Preparing for Loading the Test Software



NOTE When you insert the Test Software PC card and select a procedure for the first time, the Test Software is not actually loaded into the Test Set memory until you select the **Run Test** field or press the **k1** (**Run Test**) key. Loading the Test Software for the first time will require approximately 20 seconds. The Test Software will remain in the Test Set 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 program is loaded.

Figure 5-15 Loading the Test Software



If the Test Software did not load properly, check the following:

- Is the Test Set power on?
  Is there a display?
- Check the AC power connection. Refer to the *Agilent Technologies E6380A CDMA Base Station Test Set Reference Guide*.
- Is the Test Software PC card inserted properly?
- Is the Test Software PC card firmly seated in the slot?
  It should slide in loosely, then require a firm push to seat properly.
- Was the SOFTWARE MENU screen displayed?
  Pressing the **Menu** key should display the SOFTWARE MENU screen.

NOTE

If the Test Set displayed an error message that stated, "**`One or more self-tests failed.`**", there is a hardware problem. In such case, refer to the *Agilent Technologies E6380A CDMA Base Station Test Set Assembly Level Repair Guide*. If the problem persists, call the Agilent Technologies Factory Hotline from anywhere in the USA or Canada (1-800-922-8920), 8:30 AM to 5:00 PM, Pacific time.

Operating the BTS Laptop Utility Program

The BTS Laptop Utility program supplied with the Test Software allows the use of a PC to perform certain utility functions and also, under some circumstances, to control certain operations of a Base Station. In the case of the E6459A CDMA Base Station Timing Test Software, the Base Station control functions are not used.

The BTS Laptop Utility program is shipped with the Test Software on two separate 3.5-inch diskettes. You must install the BTS Laptop Utility program on the PC to capture test data or Test Set displays.

The BTS Laptop Utility program provides the following window functions:

- **Switch Terminal –** A window that: 1) works with the PC internal modem to dial into an MSC, or with the PC and a telnet connection to an MSC, and 2) displays the information sent to and from an MSC.

  The **Switch Terminal** window is not used with the E6459A CDMA Base Station Timing Test Software.

- **Test Set Terminal –** A window in which you may view commands sent by the Test Set to an MSC.

  The **Test Set Terminal** window is not used with the E6459A CDMA Base Station Timing Test Software.

- **Other Data –** A window from which to download frequency plans to the Test Set and in which short-form test results are displayed

  The **Other Data** window is not used with the E6459A CDMA Base Station Timing Test Software.

- **Test Results –** A window in which automated test results are displayed and may be saved for later use.

- **Test Set Screen Capture –** A window in which to capture screen images and save each as a bit mapped image. This is very helpful when using the Test Set spectrum analyzer or when you wish to capture some other screen. Note that IBASIC program operation must be paused first, by pressing the **Pause/Continue** key, to print any of the TESTS screens used for automated testing.

For more information on sending test results to a PC, see "Sending Test Results to a PC Using the BTS Laptop Utility Program" on page 97. For additional information on using the BTS Laptop Utility program after installation, refer to the online Help topics included with that program.

System Requirements for Using the BTS Laptop Utility Program

If the PC does not meet the following minimum system requirements, this could cause erratic operation and longer test times.

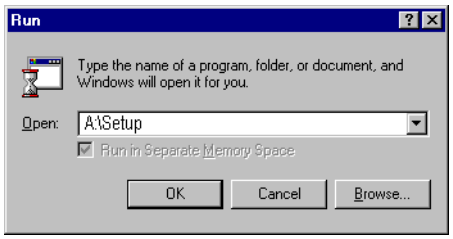
- 166-MHz Pentium® Processor
- 16 megabytes of RAM
- Windows® 95, Windows 98, or Windows NT 4.0 (Intel based)
- Available RS-232 serial port

- Internal modem

Installing the BTS Laptop Utility Program

The BTS Laptop Utility program comes compressed on two install diskettes for easy setup on the PC. Simply insert the first diskette into the drive, select **`Start`** then **`Run`**, then type **`A:\Setup`**. The install shield will lead you through the installation process (see Figure 5-16).

Figure 5-16 Installing the BTS Laptop Utility Program



Configuring the Test Set and PC Serial Ports for Communication with the Test Set

After installing the BTS Laptop Utility program, you must configure the Test Set and PC serial ports to communicate with the Test Set.

Configure the serial ports as follows:

Step 1. On the Test Set, determine and record the Test Set SERIAL 9 port data transfer (baud) rate as follows:

- Load and run the Test Software (see "Loading the Test Software" on page 113). The Test Software will display the Configuration Menu screen.
- Select the **`Test Results/Laptop Util/Printer/Serial Setup`** field. The Test Software will display the Test Results/Laptop Util/Printer/Serial Setup menu screen.
- Select the **`Serial 9 Port Settings`** field. The Test Software will display the Serial 9 Port Settings menu screen.
- Select and set the following Serial 9 Port Configuration Menu fields as appropriate for operation with the BTS Laptop Utility program.

NOTE

IMPORTANT: In the following item, if you select a baud rate greater than 19200, the PC must remain connected to the Test Set or the Test Set will not operate properly, and might appear to be locked up.

— **`Serial Baud`** – Select the field and then select a value from the drop-down **`Choices:`** list to match the Baud Rate setting in the BTS Laptop Utility program **Preferences**, **Comm Port Setup** drop-down window. The default value is 9600. However, the Test Software will operate more quickly at 19200, so it is recommended that you change the value to 19200.

— **`Parity`** – Select the field and select **`None`** from the drop-down **`Choices:`** list.

— **`Data Length`** – Select the field and select **`8`** from the drop-down **`Choices:`** list.

— **`Stop Length`** – Select the field and select **`1 bit`** from the drop-down **`Choices:`** list.

— **`Flow Control`** – The default is **`None`**. If it is not set to the default, select the field and select **`None`** from the drop-down **`Choices:`** list.

NOTE

For optimum performance, use the following settings for **`Flow Control`**:

Baud rates ≤ 19200 — **`None`**.

Baud rates >19200 — **`Hardware`**.

Step 2. On the PC, determine and record the PC serial COM port designation (for example, COM1) from the Windows Device Manager Ports (COM & LPT) selection.

Step 3. On the PC, invoke the BTS Laptop Utility program. The BTS Laptop Utility program tool bar will appear on the PC display.

Step 4. Select **SW**, **TS**, **OD**, or **TR** (any one will do) from the BTS Laptop Utility program tool bar.

Step 5. Select **Preferences**, then **Comm Port Setup**.

Step 6. On the **Comm Port Setup** drop-down window, in the **Test Set - Port** list, select the port that the PC will use to communicate with the Test Set, as determined in Step 2.

Step 7. On the **Comm Port Setup** drop-down menu, in the **Test Set - Baud Rate** list, select the data transfer rate at which the PC will communicate with the Test Set, as determined in Step 1. This value will not automatically adjust during the session. The recommended baud rate for the Test Set is 19200.

Operating the Test Set

This section provides information that will help you to operate the Test Set easily and efficiently. It includes a basic overview of the functions of groups of the more commonly used functions. It does not include detailed operation information on those functions. For detailed information on the operation of the display and the various keys and other controls, see the *Agilent Technologies E6381A TDMA Base Station Test Set Reference Guide* or the *Agilent Technologies E6380A CDMA Base Station Test Set Reference Guide*, as appropriate.

NOTE

Some Test Set keys include a second title printed in blue above the key. This indicates a *shift* function. Press the blue **Shift** key, then the subject key to activate the title function. For instance, the title "**Reset**" appears above the **Pause/Continue** key. To reset the Test Software, press the **Shift** key, then the **Pause/Continue** (**Reset**) key.

Screens

The various operation screens of the Test Software are accessible through several methods, as described in the following paragraphs.

Access the screens to modify test procedures from the **CUSTOMIZE TEST PROCEDURE:** list in the lower section of the SOFTWARE MENU screen. These screens are:

- TESTS (Channel Information) – Access this screen to verify or change the information in the frequency table. **This screen is not used with the subject Test Software.**
- TESTS (Test Parameters) – Access this screen to verify or change the values of parameters used in the TESTs.
- TESTS (Order of Tests) – Access this screen to verify or change the TESTs complement or order in which TESTs will be performed. **This screen is not used with the subject Test Software.**
- TESTS (Pass/Fail Limits) – Access this screen to verify or change the values of pass/fail limits used in the TESTs. **This screen is not used with the subject Test Software.**
- TESTS (Save/Delete Procedure) – Access this screen to save procedures to the Test Set internal RAM or an SRAM card, or delete procedures from those same locations.

NOTE Three additional screens are ordinarily used to configure and set up the Test Set for operation from the **SET UP TEST SET:** list in the lower section of the SOFTWARE MENU screen. These screens are:

TESTS (Execution Conditions)
TESTS (External Devices)
and
TESTS (Printer Setup)

These screens are not used with the subject Test Software. All relevant functions in these screens are set by other means, such as parameters, in the Test Software.

Step 8. Access the Configuration Menu screen (from which all operations inside the Test Software are invoked) from the SOFTWARE MENU screen by selecting the **Run Test** field or pressing the **k1** (**Run Test**) key.

NOTE If you select the screen title bar at the top of the SOFTWARE MENU screen the Test Software will display a menu listing the ancillary operation screens. These screens are not used by the subject Test Software.

SOFTWARE Keys

The SOFTWARE keys (see Figure 5-17), **Menu** and **Pause/Continue** (**Reset**), control the basic start/pause/stop functions of the Test Set and Test Software.

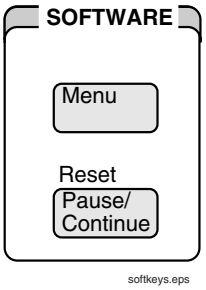
Press the **Menu** key to display the SOFTWARE MENU screen, which is the screen from which all Test Set operations start.

Press the **Pause/Continue** key to pause the Test Set or Test Software operation, then press it again to re-start the operation at the same place.

Press the **Shift** key, then the **Pause/Continue** (**Reset**) key to reset the Test Set or Test Software.

The Test Software cannot be “continued” after the **Shift** and **Pause/Continue** (**Reset**) keys have been pressed. Press these keys only if the Test Software must be stopped and pressing the **Pause/Continue** key does not do so.

Figure 5-17 SOFTWARE Keys

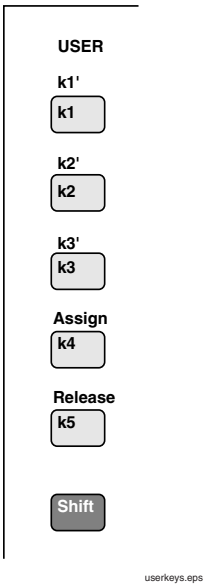


USER Keys

The five USER keys, **k1** through **k5** (see Figure 5-18), are programmable and control various functions according to current activities in the Test Software. The keys are listed along with the programmed functions in the right-hand section of appropriate screens. Only appropriate keys are shown in each screen instance. You may use these keys for more efficient operation instead of positioning the cursor to an item and pressing the knob.

NOTE Each USER key includes a second title printed in blue above the key. This *shifted* function is part of the key programmability. However, currently, no USER key *shifted* functions are used in the Test Software.

Figure 5-18 USER Keys

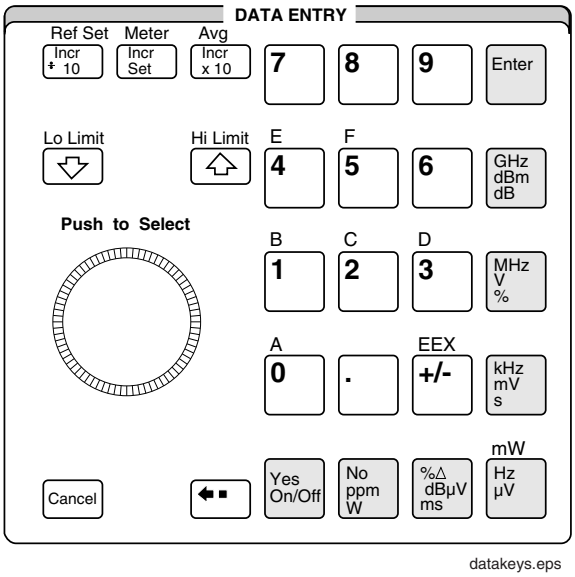


DATA ENTRY Keys

The DATA ENTRY keys include the **0** through **9** number keys plus the associated keys required for entering number values and the various characteristics of those values (see Figure 5-19). (Note that a number of the DATA ENTRY keys are *shifted* keys.)

Although it is obviously not a key, the cursor control/entry knob is also located in the DATA ENTRY section of the Test Set front panel for convenience. Turn the knob to position the cursor, then press the knob to select the item indicated by the cursor.

Figure 5-19 **DATA ENTRY Keys**



GENERATOR/ANALYZER Keys

The GENERATOR/ANALYZER keys invoke the various testing tools, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results might occur.

STATE Keys

The STATE keys allow user control over certain Test Set operational states, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results might occur.

UTILS Keys

The UTILS keys provide the means to reach certain functions that control utilitarian aspects of Test Set operation, and are not used by the Test Software.

NOTE Make certain that you do not inadvertently press one of these keys while the Test Software is running. Unpredictable test results might occur.

A Acronyms

There are numerous acronyms used throughout the wireless communications field. Many of those are used in this manual. The following list provides the meanings for the more significant acronyms for purposes of operating the Test Software.

Acronyms and Meanings

ACU – Analog Conversion Unit

AIF – Antenna Interface Frame

AWGN – Added White Gaussian Noise

BBA – BIU/BCR/ACU combination

BCR – Baseband Combiner and Radio

BIU – Bus Interface Unit

BTS – Base Transceiver Station

CAT – Catalog

CBR – CDMA Baseband Radio

CCC – CDMA Cluster Controller

CCU – CDMA Channel Unit

CDM – CDMA Digital Module

CDMA – Code Division Multiple Access

CE – Channel Element

CP – Call Processing

CS – Cell Site

CR – Carriage Return

CRT – Cathode Ray Tube

CRTU – CDMA Radio Test Unit

dB – deciBel

dBm – deciBels with respect to 1 milliwatt

dBt – deciBels with respect to total channel power

DTMF – Dual Tone Multi Frequency

DUT – Device Under Test

Eb/No – Ratio of Energy-per-bit to Noise spectral density

ECP – Executive Cellular Processor

ERP – Effective Radiated Power

EVM – Error Vector Magnitude

GPS – Global Positioning System

LAP – Laptop PC

LED – Light Emitting Diode

MHz – MegaHertz

MSC – Mobile Switching Center (also, MTSO)

OMP – Operations Management Platform

OOS – Out-Of-Service

OP – Output Process

OTP – One-Time Programmable

PC – Personal Computer

PCS – Personal Communications Services

PN – Pseudo-Noise

RAM – Random-Access Memory

RF – Radio Frequency

RMP – Remote Maintenance Panel (Flexent Modcell Base Station)

RX – Receiver

SCT – Synchronized Clock and Tone

TX – Transmitter

VSWR – Voltage Standing Wave Ratio

UCL – UnConditionaL

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