HP 11807E, Option 024
AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software
User's Guide

Software Version B.02.00 and above

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Organization of this Manual

This manual describes the set up and use of the HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software with the HP 8920B RF Communications Test Set. The manual is arranged in chapters as follows:

Chapter 1 - Getting Started

Provides procedures for connecting the equipment for a typical application, turning on the equipment, loading the software, connecting the equipment for testing, and running a set of basic performance tests.

Chapter 2 - Product Description

Provides general and detailed descriptions of the Test Software; a description of associated hardware considerations; descriptions of all connectors, keys, and knobs; and detailed descriptions of the Test Software display screens.

Chapter 3 - Using the Test Software

Provides descriptions of and procedures for using the features and functions of the Test Software in a typical application, and procedures for customizing the Test Software for a particular application.

Chapter 4 - Operation Descriptions

Provides descriptions of all setup and test operations that can be performed on cellular telephones using the Test Software.

Chapter 5 - Problem Solving

Provides information on solving common problems.

Chapter 6 - Reference

Provides descriptions and procedures for performing the less common or more sophisticated functions of the Test Software.

Glossary

Provides definitions for unusual and special terms used in the Test Software and in this manual.

Index

Provides a listing of topics and the location of information about these topics in this manual.

Conventions

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

TESTS

A key on the Test Set front panel.

`Procedure:`

Characters shown on the Test Set display.

`k1` **`(Run Test)`**

A USER key in the key column next to the Test Set display. (The words **`Run Test`** are shown on the Test Set display.)

`0.000000`

A field on the Test Set display in which entries may be made.

Titles of documentation and references to other sections of this user's guide are printed in italics.

The term Test Set refers to the HP 8920B RF Communications Test Set.

The term Test System refers to the HP 8920B RF Communications Test Set, the HP 83206 TDMA Cellular Adapter, the HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH Mobile Test Software, and any ancillary equipment required for testing.

The term Test Software refers to the HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH Mobile Test Software.

The term Operation refers to any of the primary testing functions of the Test Software.

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

- **select** refers to positioning the cursor to the left of the desired field (**`inverse video`** area), then pressing the cursor control knob.
- **enter** means to use the numeric keypad and the ENTER key or measurement units keys to make entries to fields. In some procedures, **enter** is used to describe the action of entering characters into a field.

Additional Services Available

Consult the HP 8920B Users Guide or call the HP 8920 Hotline 1-800-922-8920 (In USA and Canada only) and give your software model number.

Contact your local HP Sales Representative for information about the Software Upgrade Service and the Start Up Assistance Training Course.

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1

Getting Started

What You Will Test

Getting Started will acquaint you quickly with the operation of the Test Set and the Test Software. You will do the following:

1. Register a cellular telephone.
2. Test the transmitter frequency error.
3. Test the transmitter wideband data deviation.
4. Test the transmitter power on power levels 2-7.
5. Release the cellular telephone to an analog control channel.

These Operations will do the following:

Establish that the Test Software has been loaded properly.

Verify that the Test Set and the Test Software function together properly as a Test System.

Verify that the Test System functions with the cellular telephone.

Test System Components

The Test System includes the following components:

- HP 8920B, Option 800, RF Communications Test Set, which consists of the following:

  HP 8920B RF Communications Test Set
  HP 83206 TDMA Cellular Adapter

- HP 83236B PCS Interface
- HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software

These components are shown in **figure 1** .

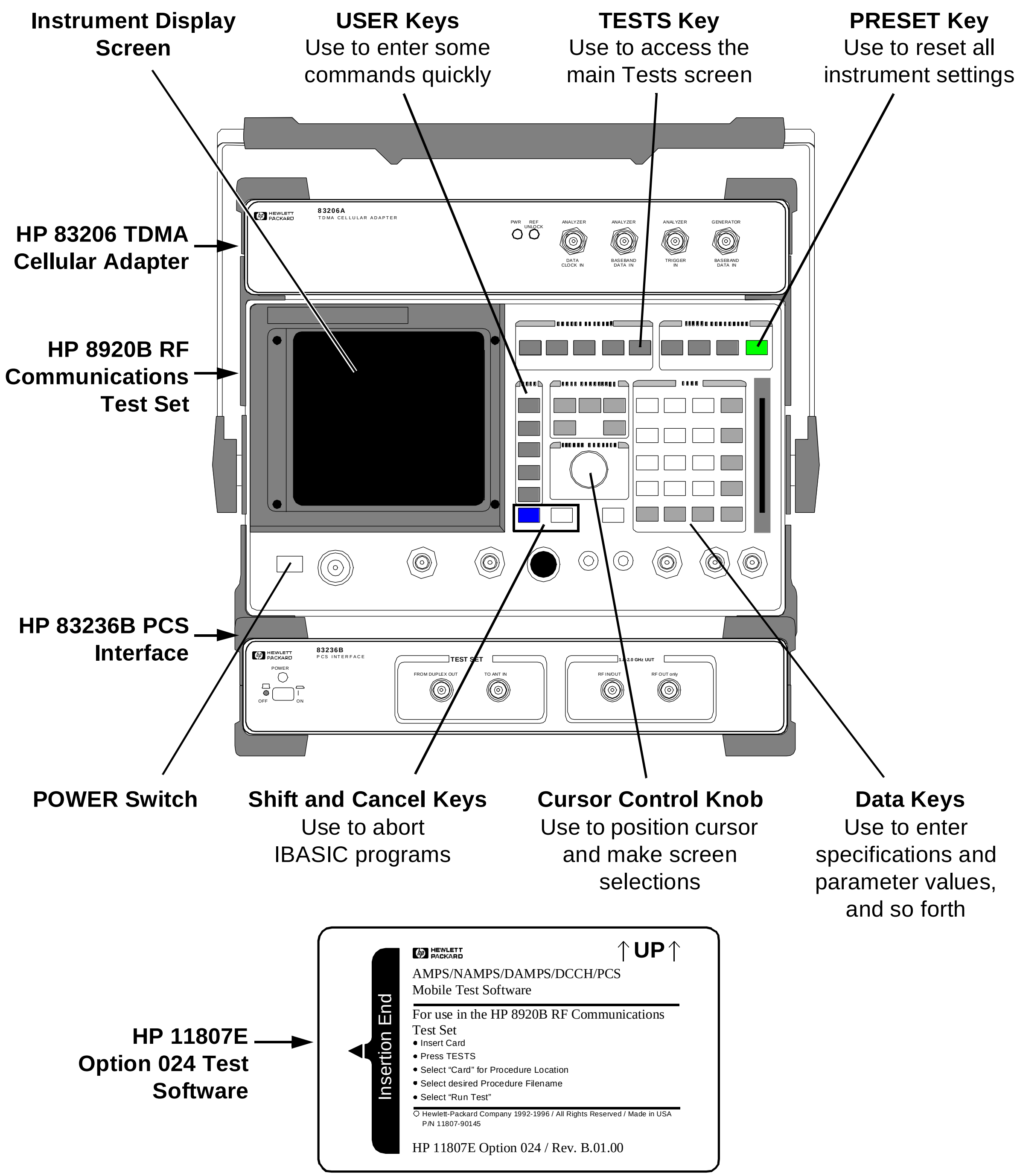

Figure 1 **Test System**

Equipment Required to Get Started

You will use the following equipment to complete the procedures in Getting Started:

- HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software, which is supplied on a one-time programmable PC card (OTP card).
- HP 8920B, Option 800, RF Communications Test Set.
- HP 83236B PCS Interface
- A hand-held, transportable, or mobile cellular telephone.
- If required, a suitable power supply and a cable appropriate to connect the power supply to the cellular telephone.
- Suitable cabling and connectors to connect the Test Set to the cellular telephone antenna connector. The following connectors and cabling may be used.
  - A Type N(m) to BNC(f) adapter.
  - A 4-foot BNC(m) to BNC(m) cable.

If you are testing a transportable or mobile cellular telephone, you will use the following item:

- Typically, a BNC (f) to TNC (m) adapter to connect the 4-foot BNC cable to the cellular telephone antenna connector.

If you are testing a hand-held (self-contained) cellular telephone, you will use the following item:

- An adapter suitable to connect the 4-foot BNC cable to the cellular telephone antenna connector.

In addition to the equipment required, you must have knowledge of the cellular telephone control channels to complete these procedures.

Getting Started

Set Up the Test Equipment and Make Connections

Follow these steps to prepare the test equipment for use:

NOTE: It is assumed that all connections between the Test Set and Cellular Adapter are made at this point. Refer to the *User's Guide* for your particular Cellular Adapter for instructions on connecting it to the Test Set. Verify these connections before continuing with these steps.

1. Make the front and rear panel connections shown in **figure 3 on page 26**.
2. Ensure the HP-IB address selector is set to serial port.
3. Turn on the HP 83236B PCS Interface and wait for two audio beeps. Then turn on the HP 8920B Test Set.
4. Running the connectivity software is recommended at this time. This connectivity software is provided with the HP 83236B PCS Interface.

NOTE: Some of the connections you make for running the connectivity software will be changed once you begin testing of your type of UUT. These are primarily connections that carry timebase signals between the UUT and Test System. On successfully running the connectivity software you can use the specific connection diagrams later in this chapter to set up your type of UUT.

NOTE: Refer to the *HP 83236B PCS Interface Operating Manual* for more details regarding the connection for running the connectivity software.

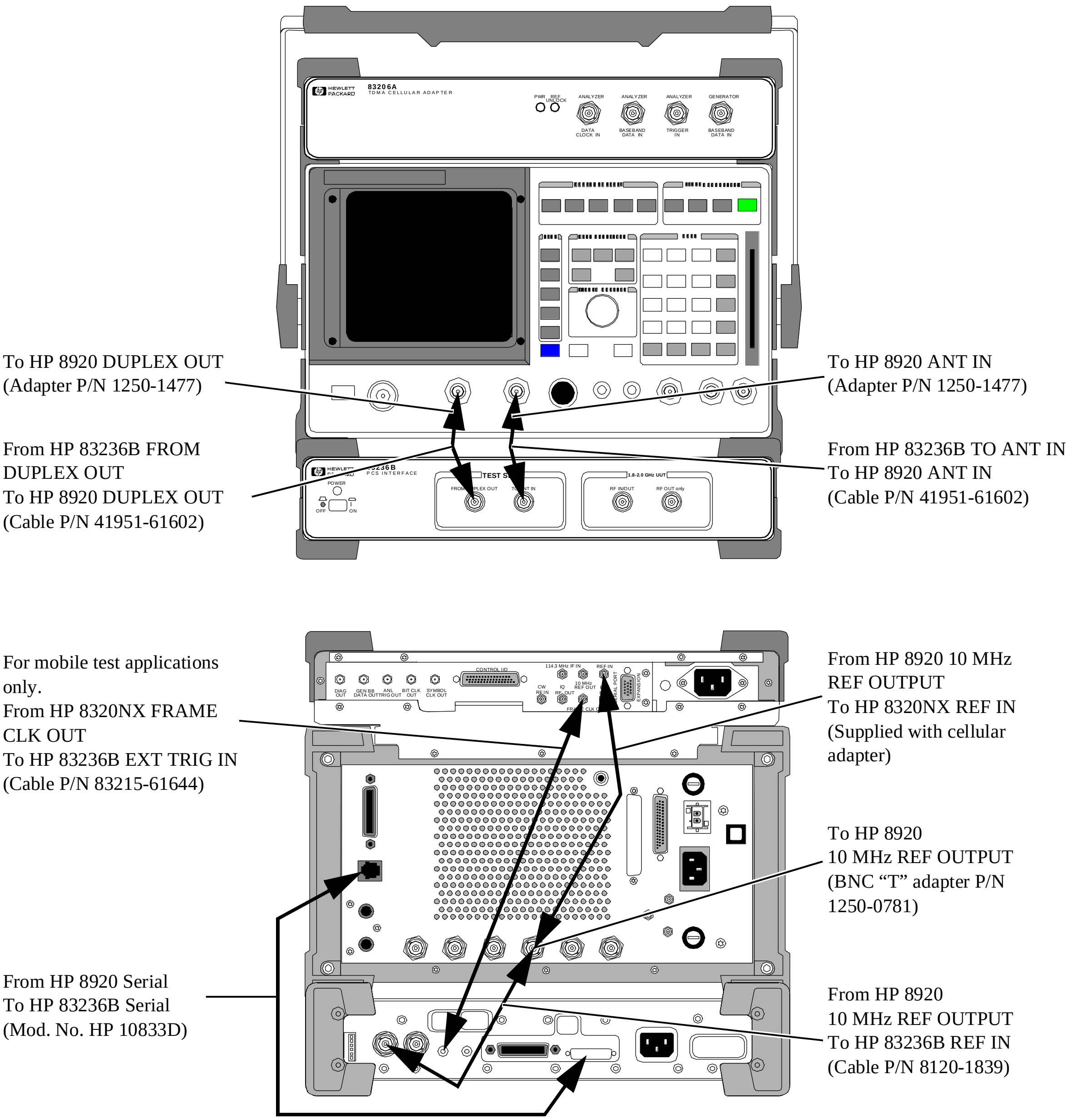

Figure 2 **Connection Diagrams for Connectivity Software Use**

Making Cellular Telephone Connection

Connect the Test Set to the cellular telephone as shown in **figure 3** .

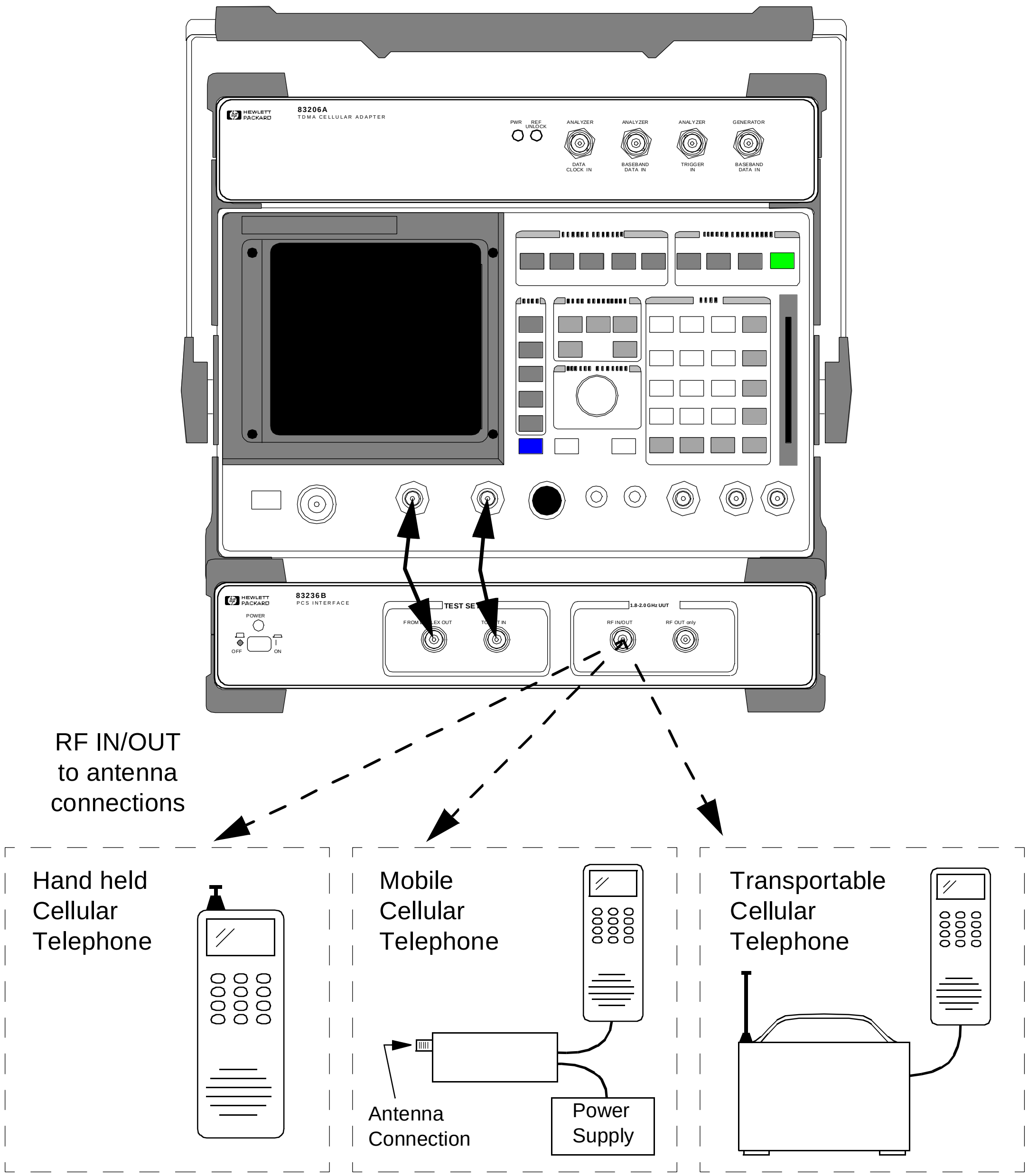

Figure 3 **Equipment Connections**

Setup and Software Card Loading

Set up the Test Set and insert the Test Software card as shown in **figure 4** . The first screen to appear during the power-up sequence is shown in **figure 5 on page 28**. The screen that appears when you press the TESTS key is shown in **figure 6 on page 28**.

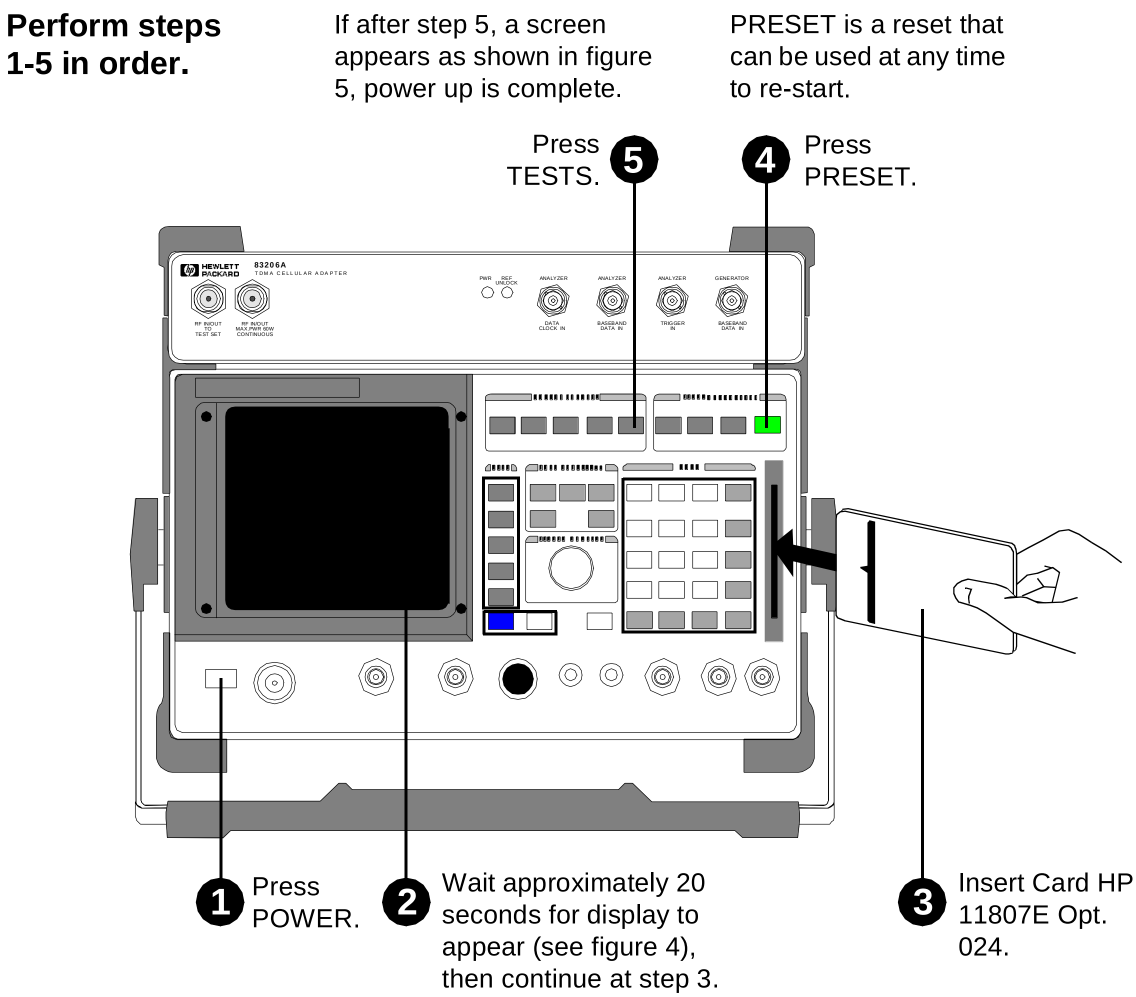

Figure 4 **Setup and Software Loading Process**

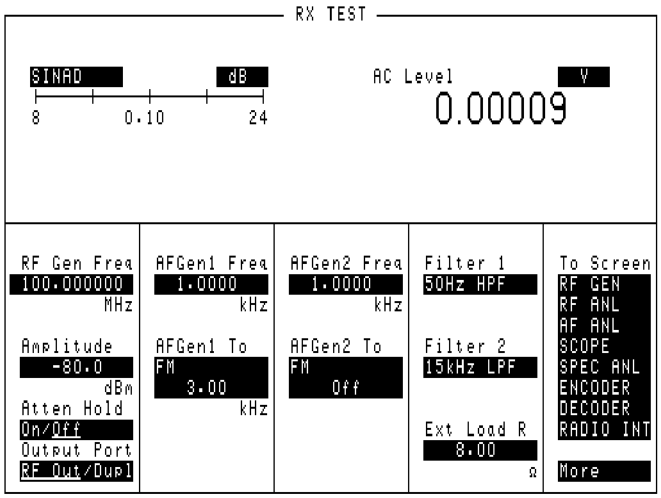

Figure 5 **RX TEST Screen**

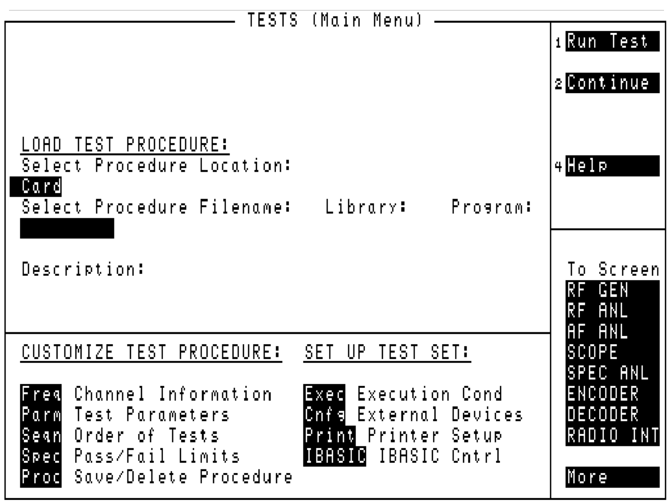

Figure 6 **TESTS (Main Menu) Screen**

Selecting and Running the Initial Tests

Perform the procedure for selecting and running the initial tests as shown in **figure 7** . The screen that results from this procedure is shown in **figure 8** .

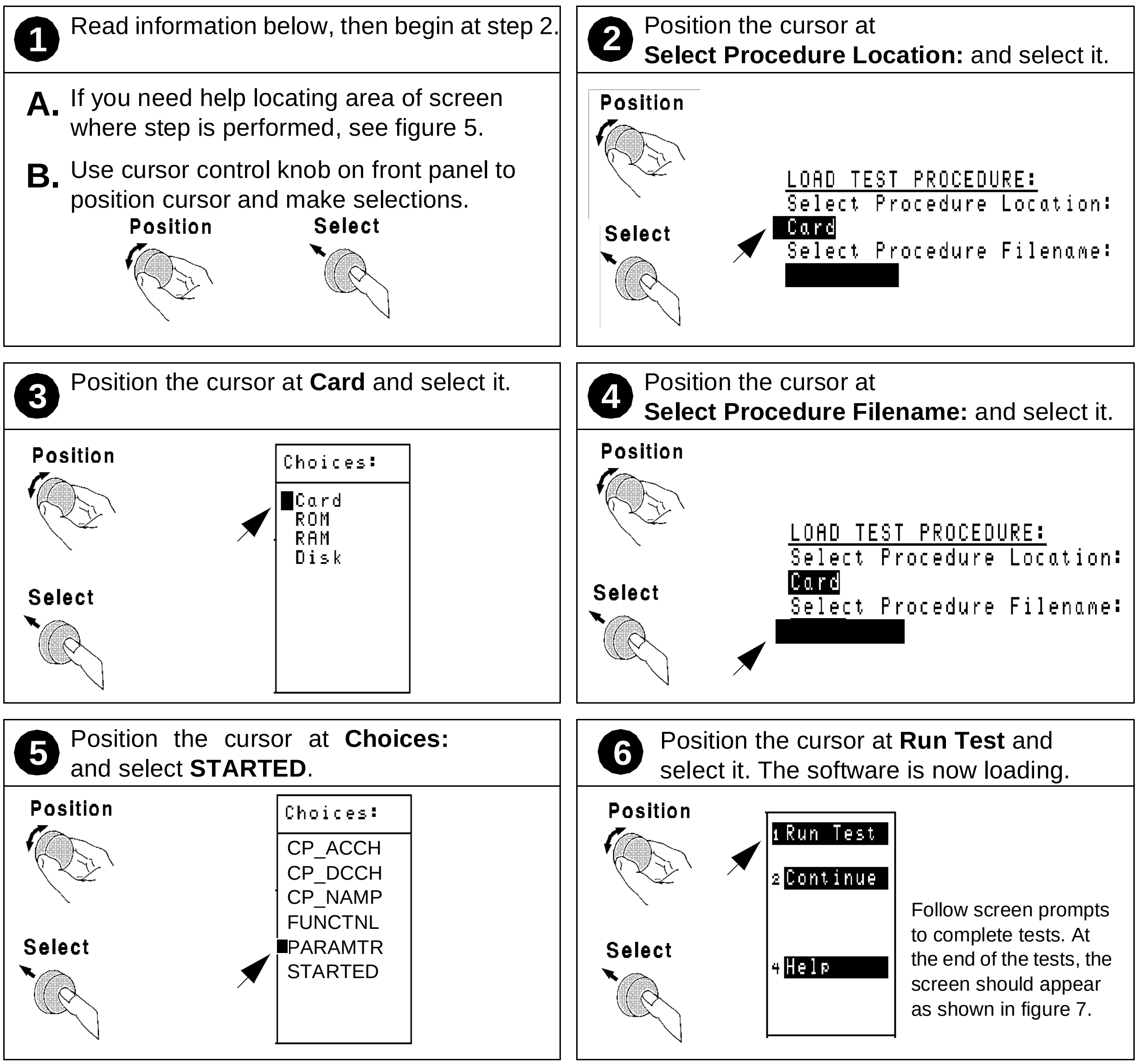

Figure 7 **Selecting the Test**

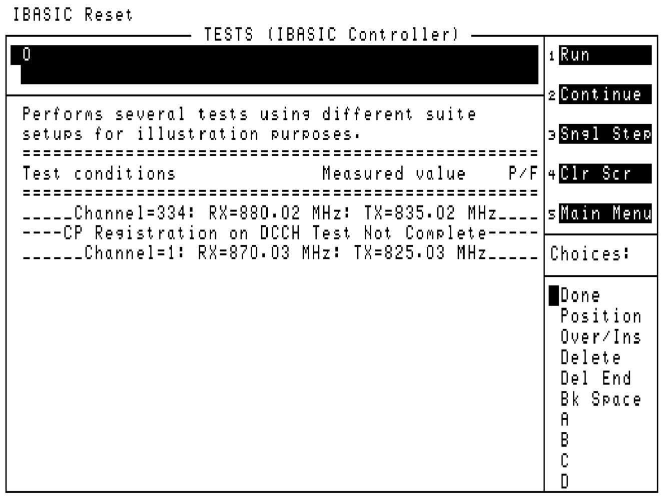

Figure 8 **TESTS Screen at End of Initial Tests**

2

Product Description

Test Software

The HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software, in combination with the HP 8920B, Option 800, RF Communications Test Set, forms the Test System. This system provides full functional test capability for cellular telephones.

The Test Software can be used to test quickly the functionality of a cellular telephone, or to test fully the parametric performance of a cellular telephone. The Test Software is useful for cellular service providers in verifying telephone problems, for repair centers in diagnosing problems, and for manufacturers in fully testing telephone performance. For a complete description of each of the Operations included in the Test Software, **see chapter 4, "Operation Descriptions"**.

Items Included in the Test Software Package

The Test Software package includes the following items:

- HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Test Software One-Time Programmable (OTP) Card -- part number 11807-10045.
- Uninitialized Static Random-Access Memory (SRAM) Card, 64-kilobyte -- part number HP 83230A.
- HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Software User's Guide -- part number 11807-90157.

Software Functions

The Test Software performs the following functions:

- Call Processing; including such items as page, origination, handoff, and release; and involving analog and digital control channels, analog voice channels, narrow analog voice channels, and digital traffic channels.
- Functional Testing.
- Parametric Testing.

Software Features

The following features simplify testing:

- Test results and pass/fail indications are shown on the Test Set's display.
- Test results may be collected in a disk drive, SRAM card, PC, or HP Palmtop computer.
- Test results may be printed.
- Test order, parameters, pass/fail limits, testing conditions, and equipment configurations may be changed easily by the operator.
- RF path losses may be determined and corrected.

Hardware Considerations

This section addresses the hardware issues relevant to operating the Test Software in a typical application.

Applicable Hardware

The HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software requires the following items for operation:

- HP 8920B, Option 800, RF Communications Test Set (see **figure 9**), which consists of the following:

  HP 8920B RF Communications Test Set
  HP 83206 TDMA Cellular Adapter

- HP 83236B PCS Interface
- A cellular telephone.
- Various adapters, cables, and other connection items (**see "Equipment Required to Get Started," in chapter 1, on page 22**).
- A power supply, if appropriate.

Connectors, Keys, and Knobs

The following paragraphs are included here for your convenience and briefly describe the connectors, keys, and knobs on the Test Set front and rear panels (see **figure 9**). Information on these items, in much greater detail, is included in the *HP 8920B RF Communications Test Set User's Guide*. For more detailed information on any of the items, refer to that manual.

NOTE: Unless stated otherwise, all items are located on the Test Set's front panel.

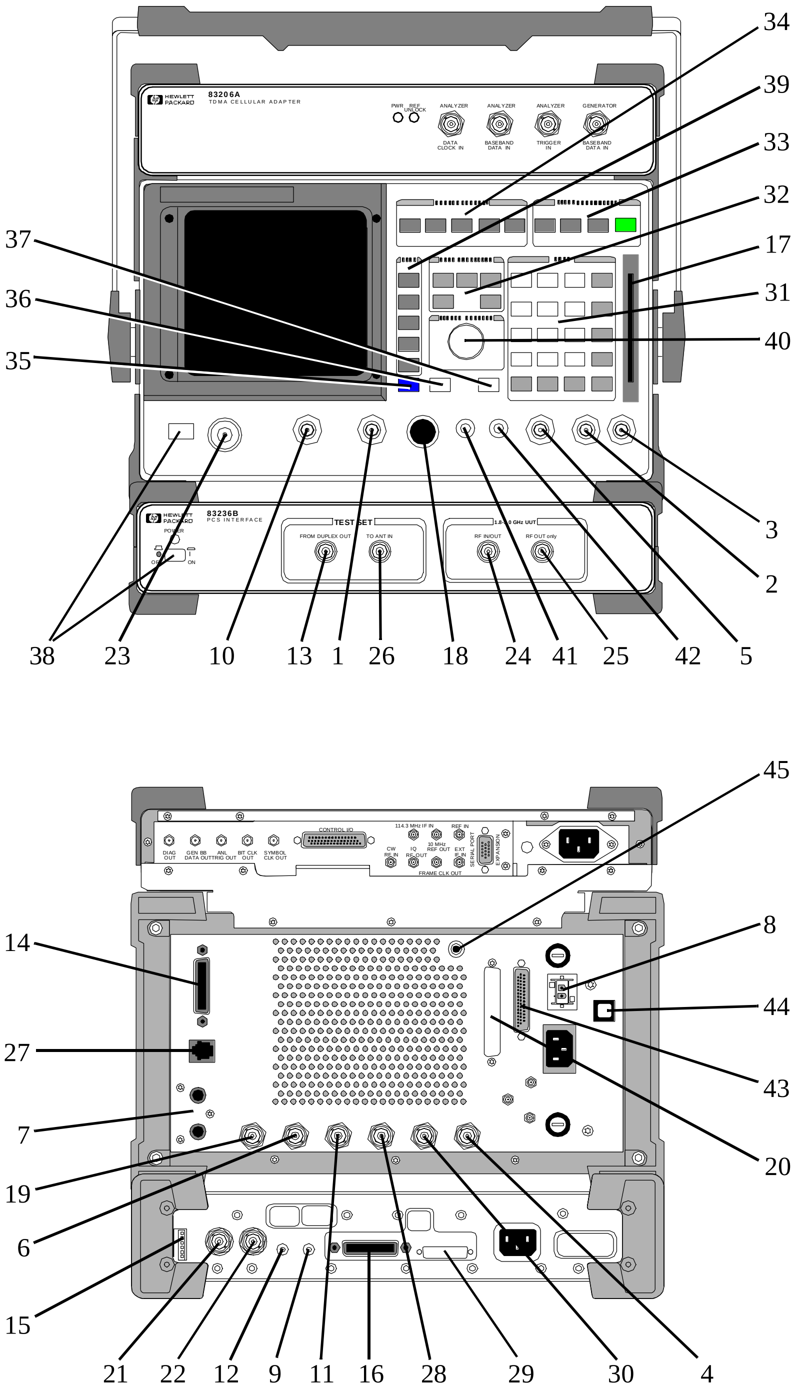

Figure 9 **Test Set Connector, Keys, and Knobs**

NOTE: The number shown in parentheses after each item in the following paragraphs is associated with the like-numbered pointer in **figure 9**.

ANT IN Connector (1)

The antenna input connector is used for analyzing low-power RF signals (200 mW or less), typically in off-the-air measurements.

AUDIO IN HI Connector (2)

The audio high input connector is used for the audio input signal that is supplied from the cellular telephone.

AUDIO IN LO Connector (3)

The audio low input connector is not used with the HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software.

AUDIO MONITOR OUTPUT Connector (On Rear Panel) (4)

The audio monitor output connector is used to obtain an output from various tap points in the Audio Frequency Analyzer of the Test Set. The output level is not affected by the Test Set's front-panel VOLUME control.

AUDIO OUT Connector (5)

The audio output connector is used for providing an audio signal to the microphone input of a cellular telephone. The output level is not affected by the Test Set's front-panel VOLUME control.

CRT VIDEO OUTPUT Connector (On Rear Panel) (6)

The CRT video output connector is used to supply a signal to an external video monitor. The signal produces a duplicate of the Test Set's screen.

DC CURRENT MEASUREMENT Connectors (On Rear Panel) (7)

The dc current measurement connectors are used in series with an external dc power supply and an external load to function as a 10-ampere current meter.

DC INPUT Connector (On Rear Panel) (8)

The dc input connector is used to connect power from a dc supply to the Test Set.

DET OUT (On Rear Panel) (9)

Detector output. DET OUT can be used for power measurements of CDMA mobile radios. (Connector type: SMC (M))

DUPLEX OUT Connector (10)

The duplex output connector is used to supply the signal output from the Test Set's RF Generator and Tracking Generator.

EXT SCOPE TRIGGER INPUT Connector (On Rear Panel) (11)

The external scope trigger input connector is used to supply a trigger to the internal oscilloscope.

EXT TRIG IN (On Rear Panel) (12)

External trigger input. EXT TRIG IN is used to trigger power measurements of TDMA bursted signals. It connects to the FRAME CLK OUT port of the Cellular Adapter when the UUT is the TDMA type. (Connector type: SMC (M))

FROM DUPLEX OUT (13)

Connects to the DUPLEX OUT port of a Test Set . (Connector type: Type N (F))

HP-IB Connector on the HP 8920B RF Test Set (On Rear Panel) (14)

The HP-IB connector is used to provide an interface between the Test Set and external equipment that uses the Hewlett-Packard Interface Bus (HP-IB).

HP-IB Address Selector (On Rear Panel) (15)

The HP-IB address selector specifies the HP-IB interface address (switches A1 to A5). The **`HP-IB/Ser`** switch sets whether the HP-IB port or SERIAL PORT is used to control the PCS Interface.

HP-IB Interface on the HP 83236B PCS Interface (On Rear Panel) (16)

The HP-IB interface connects to an external controller to enable the control of the PCS Interface. In most cases, this control is provided by a Test Set.

NOTE: To enable this SERIAL PORT, set the **`HP-IB/Ser`** switch of the HP-IB Address Selector to the “SER” side (right side as viewed from the rear panel.)

This interface conforms to IEEE 488.2 and has the following functions:

Table 1

Codes	Functions
SH1	Full source handshake capability
AH1	Full accepter handshake capability
T8	Basic talker. No serial poll. No talk only mode. Unaddressed if MLA.
L4	Basic listener. No listen only mode. Unaddressed if MTA
SR0	No service request capability
RL1	Complete remote/local capability
PP0	No parallel poll capability
DC1	Full device clear capability
DT0	No device trigger capability
E2	Tri-state driver electronics
C0	No controller capability

PCMCIA Card Slot (17)

The card slot is used to accept and insert a PCMCIA card to the Test Set.

MIC/ACC Connector (18)

The microphone/accessory DIN connector is used for the following functions.

- The Mic In connection is summed with the MODULATION INPUT connector signal to modulate the RF Generator of the Test Set when the Key In connection is grounded.
- The Key In connection is used to control the RF Generator output state and to control switching between certain screens.
- The Key Out 1 and Key Out 2 connections are used to provide a switch path for external equipment.

MODULATION INPUT Connector (On Rear Panel) (19)

The modulation input connector is used to supply an external modulation signal to the RF Generator of the Test Set. This signal is summed with the Mic In signal from the MIC/ACC connector.

RADIO INTERFACE Connector (On Rear Panel) (20)

The radio interface connector is used to provide a 16-line parallel interface between the Test Set and external radio equipment. The 16 lines may be configured as inputs, outputs, or a combination of inputs and outputs.

REF IN (On Rear Panel) (21)

Reference frequency input port. The REF IN port connects to the 10 MHz reference source. (Connector type: BNC (F))

REF OUT (On Rear Panel) (22)

Reference frequency output port. The REF OUT port may be used as a 10 MHz source for other equipment. (Connector type: BNC (F))

RF IN/OUT Connector on the HP 8920B (23)

The RF input/output connector is used to accept input RF signals to the Test Set and to supply the output signal from the RF Generator of the Test Set.

RF IN/OUT Connector of the HP 83236B PCS Interface (24)

Connects to the transmit/receive antenna port of a radio (Connector type: Type N (F))

CAUTION: The maximum allowable average power to the RF IN/OUT port depends on the unit-under-test as follows: Use an external attenuator if you are uncertain.

Subscriber Unit Test

Single carrier TDMA and FM: 10 Watts

CAUTION: Peak instantaneous signals greater than 30 volts will damage internal circuitry.

RF OUT only (25)

Connects to the receive antenna port of a radio. (Connector type: Type N (F))

CAUTION: Do not input a continuous signal greater than +23 dBm (200 mW). Doing so may damage internal circuits.

TO ANT IN (26)

Connects to the ANT IN port of a Test Set. (Connector type: Type N (F))

SERIAL PORT Connector on the HP 8920B RF Test Set (On Rear Panel) (27)

The serial port connector is used for serial data input and output in such functions as entering programs, printing test results and screen images, and sending test results to external equipment.

SERIAL PORT Connector on the HP 83236B PCS Interface (28)

This port is connected to the SERIAL PORT of the HP 8920B RF Test Set. The Test Set controls the PCS Interface.

NOTE: To enable this SERIAL PORT, set the **`HP-IB/Ser`** switch of the HP-IB Address Selector to the “SER” side (right side as viewed from the rear panel.)

10 MHz REF INPUT Connector (On Rear Panel) (29)

The 10-MHz reference input connector is used to supply an external reference input to the Test Set. When a valid signal is supplied through this connector, the Test Set automatically switches from the internal to the external reference.

10 MHz REF OUTPUT Connector (On Rear Panel) (30)

The 10-MHz reference output connector is used to supply the reference signal generated by the Test Set to external equipment.

DATA Keys (31)

The data keys are used for the following functions:

- The following keys are used for entering and changing values.

  0 through 9
  .
  +/-
  A through F

- The ENTER key is used to select a field or screen, and to enter numbers when the unit of measure is not specified. (Pressing this key causes the same effect as pressing the CURSOR CONTROL knob.
- The ON/OFF key is used to enable and disable measurements, and to turn numeric fields on and off.
- The YES and NO keys are used to approve or disapprove selected functions or Operations before execution.
- EEX (SHIFT, +/-) is used for entering numbers using scientific notation.
- The other DATA keys are used for entering and changing the unit of measure for measurements of field entries.

DATA FUNCTIONS Keys (32)

The data functions keys are used for the following functions:

- The INCR ÷ 10, INCR SET, and INCR × 10 keys are used to increment or decrement a number when changing field values.
- The up-arrow and down-arrow keys are used to increment or decrement field values, to select alternate field entries, and to move the cursor in string entry fields.
- The LO LIMIT (SHIFT, down-arrow) and the HI LIMIT (SHIFT, up-arrow) keys are used to set measurement end points.
- The REF SET (SHIFT, INCR ÷ 10) key is used to enter or remove a measurement reference for relative audio-frequency and radio-frequency measurements.
- The METER (SHIFT, INCR SET) key is used to enable or disable the analog bar-graph meter function.

  If the bar graph is enabled, the display consists of a bar graph section and a numeric section that uses small digits.

  If the bar graph is disabled, the display consists of only a numeric section that uses large digits.
- The AVG (SHIFT, INCR × 10) key is used to enable or disable measurement averaging.

INSTRUMENT STATE Keys (33)

The instrument state keys are used for the following functions:

- The LOCAL key is used to return the Test Set to manual control after HP-IB control is used.
- The RECALL key is used to list any Test Set setups that were saved.
- The MEAS RESET key is used to clear the measurement “history” for all of the Test Set measurement algorithms. This restarts all measurements in progress.
- The PRESET key is used to restore most Test Set settings to the default states. This does not cause the Test Set’s self-diagnostics to run.
- The ADRS (SHIFT, LOCAL) key is used to display the Test Set HP-IB address.
- The SAVE (SHIFT, RECALL) key is used to store Test Set setups.

SCREEN CONTROL Keys (34)

The screen control keys are used for the following functions:

- The RX, TX, DUPLEX, TESTS, MSSG (SHIFT, RX), HELP (SHIFT, TX), and CONFIG (SHIFT, DUPLEX) keys are used to access several Test Set control and information screens.
- The PREV key is used to change the display back to the previous screen.
- The HOLD (SHIFT, PREV) key is used to stop all measurements in progress. Pressing the key again resumes the measurements.
- The PRINT (SHIFT, TESTS) key is used to print the entire contents of the displayed screen, the time and date, and any defined print title.

SHIFT Key (35)

The SHIFT key is used to select the blue-labeled functions listed above some keys (for instance, PRINT). Pressing and holding the SHIFT key while also pressing A second key activates the blue-labeled function.

CANCEL Key (36)

The CANCEL key is used to terminate an entry in progress, or to stop a running IBASIC program.

Left-Arrow (Backspace) Key (37)

The left-arrow key is used to move the cursor to the left when entering numbers in a field. Each key press moves the cursor one space to the left, erasing the previous character.

POWER switch (38)

There are two power switches. The POWER switch is used to turn the Test Set's power on or off and the PCS Interface's power on or off. Both must be turned on.

NOTE: Some settings and functions are retained by power from the Test Set's back-up battery when external power is turned off.

USER Keys (39)

The USER keys (k1 through k5) are assigned specific functions by the Test Software and are used to access immediately the assigned functions without using the CURSOR CONTROL knob or changing screens. Note that keys can be assigned several functions, and the specific key function is dependent upon the Operation or function in process at the time.

CURSOR CONTROL Knob (40)

The CURSOR CONTROL knob moves the cursor to select fields, screens, and settings from the lists of choices; and to select or change numeric field values. Turning the knob clockwise moves the cursor to the right and down; turning it counterclockwise moves the cursor to the left and up. Pressing the knob once activates (selects) the function or terminates a data entry.

VOLUME Control Knob (41)

The volume control adjusts the speaker output sound level for monitoring the selected input of the AF Analyzer.

SQUELCH Control Knob (42)

The squelch control ordinarily adjusts the squelch level in demodulating AM, FM, or SSB signals. However, during execution of the Test Software in cellular telephone testing, the squelch function is set to a fixed level. Thus, the squelch control is not effective during cellular telephone testing.

Parallel Port Connector (On Rear Panel) (43)

The parallel port connector is used as an interface to printers that require a parallel port for printing screen images or test results.

AC/DC Switch (On Rear Panel) (44)

The ac/dc switch is used to select the Test Set’s power source type. The source type must be selected with the Test Set’s power turned off.

Chassis Ground Connector (On Rear Panel) (45)

The chassis ground connector is used for a safety ground connection when dc power is supplied to the Test Set. This connector can be used as a general chassis ground point.

Tests Subsystem

The Tests Subsystem consists of a group of associated Test Set displays that are used to create, edit, and run automated test procedures.

NOTE: A test procedure consists of groups of Operations (for instance: Page, or TX RF Power Output Test) that are performed on groups of channels (for instance: 355, 790, and 991) using specific parameters (for instance: SAT tone = 5970, or SID = 19) and specific pass/fail limits specifications (for instance: TX power at level 2). The Operations in a procedure perform specific setup, control, or test actions.

The Operations described in this user's guide are supplied on the Test Software OTP card. These Operations are run on an HP 8920B, Option 800, RF Communications Test Set.

The Tests Subsystem thus forms an easy-to-use test environment that can be used to automate a group of Operations, with easy set up and customization of the Operation sequence. The subsystem features are as follows:

- Test suites.
- Easy addition of Operations to a suite.
- Easy deletion of Operations from a suite.
- Easy customization of parameter values for each Operation in a suite.
- Easy customization of global pass/fail limits specification values.
- Large number of parameters and specifications available in the library.
- Easy grouping of parameters and pass/fail limits according to the Operation.
- Easy access to relevant parameters and specifications for an Operation from the setup screen.
- Easy customization of global parameters.

NOTE: In the left-hand column in the fields sections of the screen descriptions, the following conditions apply:

- The first term (one word or more) shown (such as “Cnfg” in the item “Cnfg [External Devices] Field” is classed as the field title. It is always displayed and is highlighted when the field is selected. (See the third item below for exceptions.)
- Items shown in brackets (such as “[External Devices]” in the “Cnfg [External Devices] Field”) are classed as explanatory words. These words are shown with the field name on the display, but are not highlighted when the field is selected.
- Items shown in braces (such as in “{List Number}” in the “{List Number} Field”) are classed as undisplayed field titles. These titles are not shown on the display. However, the field is highlighted when selected.

Default TESTS (Main Menu) Screen

Before loading a procedure from the Test Software OTP card, the TESTS (Main Menu) screen will be as shown in **figure 10**. For detailed information on the fields of this screen, refer to the *HP 8920B RF Communications Test Set User's Guide*.

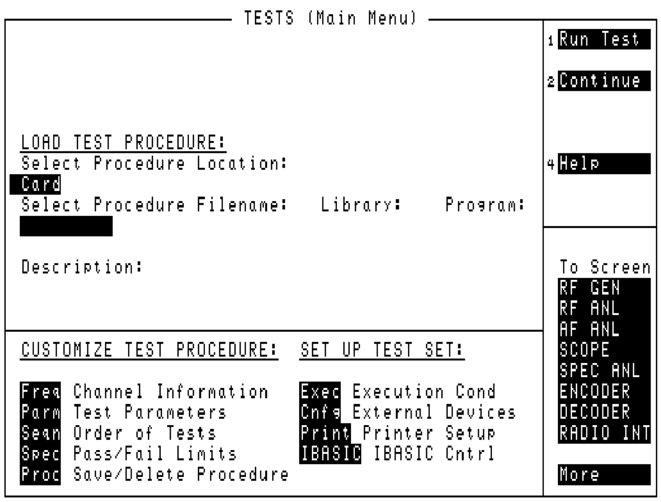

Figure 10 **Default TESTS (Main Menu) Screen**

Most of the fields in the HP 11807E Test Software TESTS (Main Menu) screen described in the following sections are the same as those found in the Default TESTS (Main Menu) screen shown above (and used with other software). The differences occur in the lower left-hand section of the screen. Four fields that access other screens (Freq Channel Information; Parm Test Parameters; Seqn Order of Tests; and Spec Pass/Fail Limits) are replaced by three different fields (Setup Chan, Seq, Parm, Spec; Parms Default Parameters; and Specs Pass/Fail Limits). In addition, the screen accessed by the Setup Chan, Seq, Parm, Spec, in turn, accesses another screen. Thus, the four screens accessed from the default TESTS (Main Menu) screen are replaced by four other screens that are accessed essentially from the HP 11807E Test Software TESTS (Main Menu) screen and perform somewhat similar functions.

The screens that are used with software other than the HP 11807E, Option 024 Test Software are described in the *HP 8920B RF Communications Test Set User's Guide*.

HP 11807E TESTS (Main Menu) Screen

When you access the Tests Subsystem by pressing the TESTS key, inserting the HP 11807E Test Software OTP card, and selecting a procedure from the **`Choices:`** field, the Tests Subsystem displays this TESTS (Main Menu) screen for the HP 11807E, Option 024 Test Software (see **figure 11 on page 51**). This screen then becomes the active default screen as long as a procedure filename is selected. If a procedure filename is not selected, the original system default TESTS (Main Menu) screen remains the default (see **figure 10 on page 48**).

The following paragraphs describe the various fields of this screen.

`Cnfg [External Devices]` Field

Selecting this field displays the TESTS (External Devices) screen.

`Continue` Field

Selecting this field or pressing k2 restarts a paused test.

`Description:` Field

Selecting this field displays a description of the file selected in the **`Select Procedure Filename:`** field. The description is updated as a result of updating the **`Select Procedure Filename:`** field.

`Exec [Execution Cond]` Field

Selecting this field displays the TESTS (Execution Conditions) screen.

`Help` Field

Selecting this field (or pressing k4) displays the help screen that contains assistance information in the TESTS (Set Up) screen.

`IBASIC [IBASIC Cntrl]` Field

Selecting this field displays the TESTS (IBASIC Controller) screen.

`Library:` Field

Selecting this field displays the library information of the file chosen in the **`Select Procedure Filename:`** field.

`Parms [Default Parameters]` Field

Selecting this field displays the TESTS (Default Parameters) screen, which displays all of the parameters available in the parameters library.

`Print [Printer Setup]` Field

Selecting this field displays the TESTS (Printer Setup) screen.

`Proc [Save/Delete Procedure]` Field

Selecting this field displays the TESTS (Save/Delete Procedure) screen.

`Program:` Field

Selecting this field displays program information for the file chosen in the **`Select Procedure Filename:`** field. The program information is updated automatically.

`Run Test` Field

Selecting this field or pressing k1 loads and runs the procedure chosen in the **`Select Procedure Filename:`** field.

`Select Procedure Filename:` Field

Selecting this field allows you to specify the procedure that you wish to load from or save to the location chosen in the **`Select Procedure Location:`** field. Selecting this field displays the **`Choices:`** field in the lower right-hand corner of the display. The choices displayed are the procedures already available in the selected location. If you are saving a new procedure, you may enter the new name from the list of characters available.

`Select Procedure Location:` Field

Selecting this field allows you to select the location from which you wish to load a procedure, or the location to which you wish to save a procedure. Selecting this field displays the **`Choices:`** field in the lower right-hand corner of the display. The choices available are: **`Card`**, **`ROM`**, **`RAM`**, and **`Disk`**.

`Setup [Chan, Seq, Parm, Spec]` Field

Selecting this field displays the TESTS (Set Up) screen, which functions as the operational control for the Test Software.

`Specs [Pass/Fail Limits]` Field

Selecting this field displays the TESTS (Pass/Fail Limits) screen, which displays all of the pass/fail limits specifications in the library.

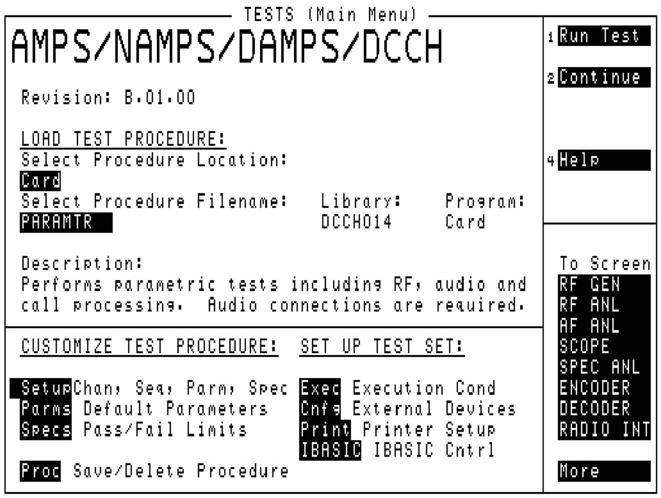

Figure 11 **Test Software TESTS (Main Menu) Screen**

TESTS (Set Up) Screen

Access this screen by selecting the **`Setup Chan, Seq, Parm, Spec`** field of the TESTS (Main Menu) screen.

This screen functions as the control facility for the Test Software. (Basically, this screen combines the Order of Tests and Channel Information screens from the test environment of earlier software, and adds the capability to loop on a group of tests, or Operations, plus some extra usability features.)

NOTE: This screen introduces the new term “test suite,” sometimes “suite”, to the test environment. A test suite is a set of Operations performed over a range or list of channels. (Note that horizontal dashed lines separate test suites in the display.)

The following paragraphs describe the various fields of this screen. Two versions of the screen are shown in **figure 12 on page 55** and **figure 13 on page 56**.

`Help` Field

Selecting this field (or pressing k4) displays the help screen that contains assistance information in the TESTS (Set Up) screen.

`Insert` and `Delete` Fields

Selecting the **`Insert`** field (or pressing k1) performs an insert function when the cursor is located in the operations field, in the channel field (in lists), or in any of the number fields. For instance, if you wish to set up a new test suite, moving the cursor to the **`Suite Number`** field and performing an insert function adds a test suite. The suite added is a duplicate of the one currently in the **`Suite Number`** field. If the cursor is located in the **`List Number`** field, performing an insert function adds a duplicate channel in the list. If the cursor is located in the **`Operation Number`** field, performing an insert function adds a duplicate of the Operation currently in the active field.

Selecting the **`Delete`** field (or pressing k2) performs the opposite action to that of the Insert key.

{List Number} Field

This is the small field to the left of the first list number in the **`Range/List:`** field *(*see **figure 13 on page 56***)*. It represents the Operation list number.

Selecting this field and turning the CURSOR CONTROL knob scrolls through the CHANNELS in the list field. This allows for adding or deleting channels anywhere in the list.

`Main Menu` Field

Selecting this field (or pressing k5) switches the display to the TESTS (Main Menu) screen.

`Operations` Field

Selecting this field displays a menu that contains all of the Operations in the library. Once you have located the desired Operation, selecting that field will insert that Operation into the test suite.

{Operation Number} Field

This is the small field to the left of the description of the first Operation in the **`Range/List:`** field when **`List`** is selected *(see* **figure 13 on page 56***)*. It displays the Operation number in the suite.

Selecting this field and turning the CURSOR CONTROL knob scrolls through the Operations in the test suite. This allows for adding or deleting Operations, or changing to different Operations, anywhere in the suite.

`Print All` Field

Selecting this field (or pressing k3) prints all of the information in the TESTS (Set Up) screen, including any data scrolled off the screen.

`Range/List:` Field

This is a toggle field that allows you to select either a range or a list of channels.

Selecting **`Range`** displays the start, stop, and **`Step`** fields (see **figure 12 on page 55**).

Selecting **`List`** displays a scroll box and a list field (see **figure 13 on page 56**).

`Set Parameters` Field

Selecting this field switches the display to the TESTS (Set Parameters) screen. In this screen, you may select from Operations in the suite only, and you may set parameters so that those parameters are uniquely defined for the Operation in that suite. If you wish to use default parameters, pressing k1 switches the display to the TESTS (Default Parameters) screen.

`Set Pass/Fail Limits` Field

Selecting this field switches to the TESTS (Pass/Fail Limits) screen. This screen displays the specification limits associated with the Operation indicated in the TESTS (Set Up) screen. These limits are considered to be defaults.

{Start} Field

This is a five-digit field located to the left of **`To`** when **`Range`** is selected in the **`Range/List:`** toggle field *(*see **figure 12 on page 55***)*. It represents the start channel for a range. (Five digits allow for a four-digit channel number and an optional letter U,M,L, for NAMPS or H for PCS.)

Selecting this field allows you to enter the start channel number.

`Step` Field

This is a four-digit field located below the start and stop fields when **`Range`** is selected in the **`Range/List:`** toggle field. It represents the increment or step in the range. This is an integer entry field.

Selecting this field allows you to enter the step value.

{Stop} Field

This is a five-digit field located to the right of **`To`** when **`Range`** is selected in the **`Range/List:`** toggle field *(*see **figure 12 on page 55***)*. It represents the stop channel for a range. (Five digits allow for a four-digit channel number and an optional letter U,M,L, for NAMPS or H for PCS.)

Selecting this field allows you to enter the stop channel number.

{Suite Number} Field

This is the small field to the left of the **`Range/List:`** toggle field *(*see **figure 12 on page 55** and **figure 13 on page 56***)*. It displays the number of the test suite.

Selecting this field and turning the CURSOR CONTROL knob scrolls the test suite information up or down in the display.

The default TESTS (Set Up) screen is shown in **figure 12 on page 55**.

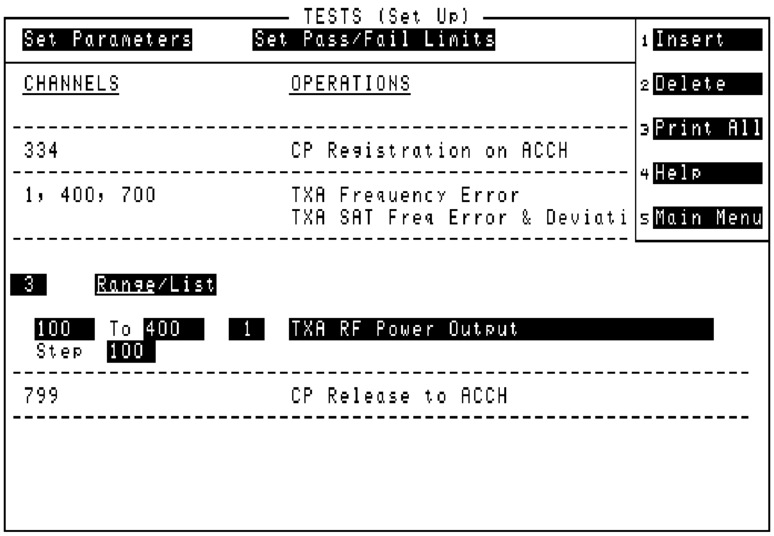

Figure 12 **TESTS (Set Up) Screen Showing Range of Channels.**

The example shown in the default TESTS (Set Up) screen above illustrates a typical IS-136 TDMA test scenario. Selecting **`Main Menu`** from this screen, then selecting **`Run Test`** in that menu would perform the scenario as follows:

334	CP Registration on ACCH
001	TXA Frequency Error
	TXA SAT Freq Error & Deviation
400	TXA Frequency Error
	TXA SAT Freq Error & Deviation
	...
	...
700	TXA Freq Error
	TXA SAT Freq Error & Deviation
100	TXA RF Power Output
200	TXA RF Power Output
300	TXA RF Power Output
400	TXA RF Power Output

The test suite shown in figure 12 shows a range of channels highlighted. If a list of channels is included in a selected suite, the active fields change to accommodate this fact. The screen shown in figure 13 on page 56 illustrates a suite that shows a list of channels highlighted.

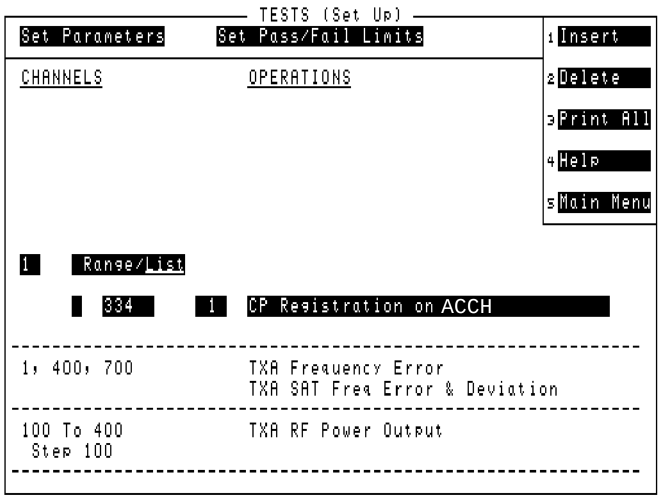

Figure 13 **TESTS (Set Up) Screen Showing List of Channels**

TESTS (Specific Parameters) Screen

Access this screen by selecting the **`Set Parameters`** field in the TESTS (Set Up) menu. It is not accessible by any other means.

This screen allows you to define specific parameter settings for the Operations in a test suite. These new parameter settings then become the defaults for that test suite. If you do not wish to customize the parameter values for an Operation in a test suite, you may use the **`Def Parms`** field to set the parameters globally for all Operations in the suite. The screen also serves to provide default settings for specific parameters.

If, after you have completed changes to a test suite, you wish to change the parameters in another suite, you must return to the TESTS (Set Up) menu to select that suite, then return to this menu.

The following paragraphs describe the various fields of this screen (see **figure 14 on page 59**, **figure 15 on page 59**, **figure 16 on page 60**, **figure 17 on page 60**, and **figure 18 on page 61**).

`Apply Def` Field

Selecting this field (or pressing k2) resets the parameter settings for the selected Operation to the default settings specified in the defaults menu.

`Def Parms` Field

Selecting this field (or pressing k1) switches the display to the TESTS (Default Parameters) screen. This allows you to edit the default parameters.

`Help` Field

Selecting this field (or pressing k4) displays the help screen that contains assistance information in the TESTS (Specific Parameters) screen.

{Operation List} Field

This is the field at the top left of the display (see **figure 14 on page 59**). It identifies the Operation for which the parameter value can be set. The Operation indicated in this field is associated with the test suite identified in the TESTS (Set Up) screen.

Selecting this field displays a menu that contains all of the Operations in the suite. This allows you to create your own set of parameter values for any Operation in the suite. Changing an Operation in this field updates the screen to display the relevant parameters for the selected Operation.

{Parameter Number} Field

This is the field at the middle left of the display (see **figure 14 on page 59**). It identifies the parameter number.

Selecting this field and turning the CURSOR CONTROL knob scrolls through the parameters for the Operation.

`Print All` Field

Selecting this field (or pressing k3) prints the suite number and the Operation, with its associated parameters and values. (The Operation numbers for a suite must be identified to distinguish between parameter values in suites that use an Operation multiple times.)

`Setup` Field

Selecting this field (or pressing k5) switches the display to the TESTS (Set Up) screen.

{Value} Field

This is the field at the middle left of the display, just to the right of and slightly below the Parameter Number field *(*see **figure 14 on page 59**, **figure 15 on page 59**, **figure 16 on page 60**, **figure 17 on page 60**, and **figure 18 on page 61***)*. This field is a variable type, and changes according to the kind of value. For instance, if the value is a toggle, the field is represented as a toggle; if the value is a numeric quantity, it is represented as such. It can be any of the four following types, dependent upon the specific parameter: Choices (see **figure 15 on page 59**), Toggle (see **figure 16 on page 60**), Numerical Entry (Float) (see **figure 17 on page 60**), or Integer (see **figure 18 on page 61**). The definitions are self-explanatory.

Selecting the available field allows you to set the appropriate value.

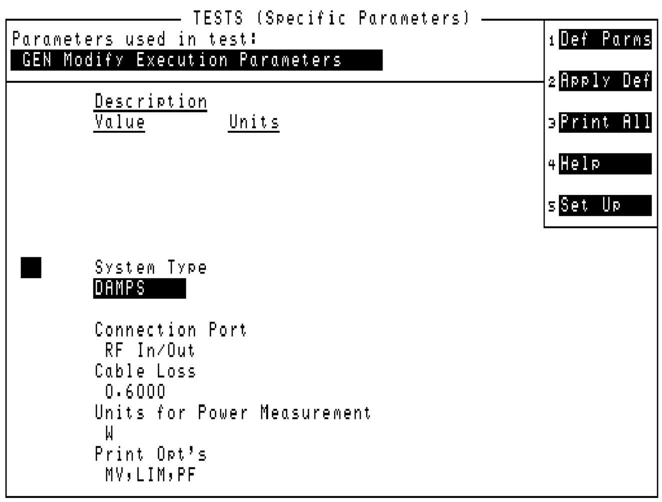

Figure 14 TESTS (Specific Parameters) Screen

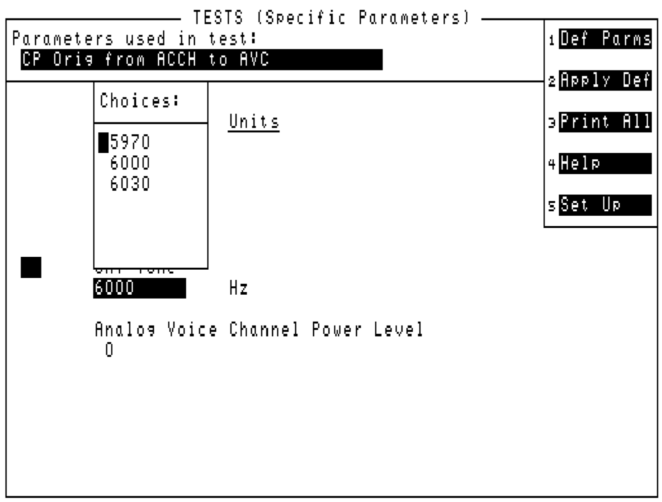

Figure 15 TESTS (Specific Parameters) Screen Showing Choices

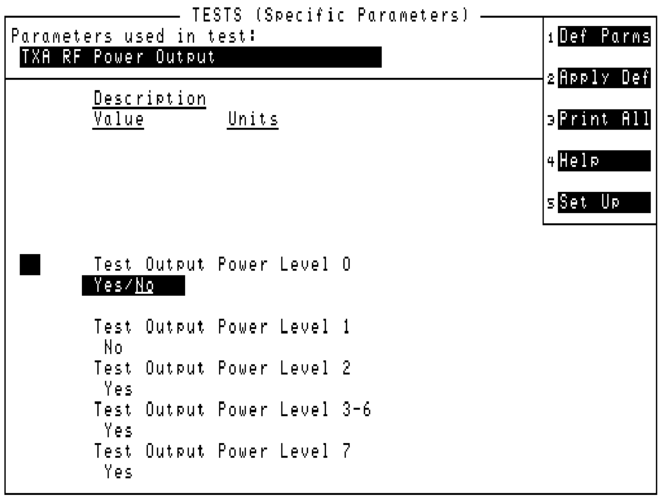

Figure 16 **TESTS (Specific Parameters) Screen Showing Toggle**

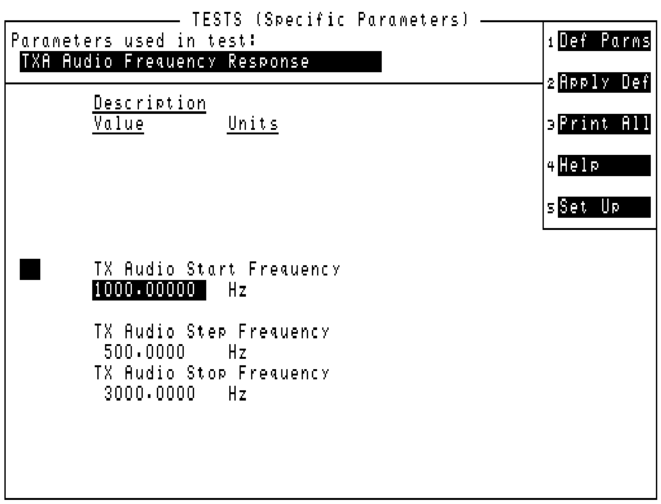

Figure 17 **TESTS (Specific Parameters) Screen Showing Numerical Entry**

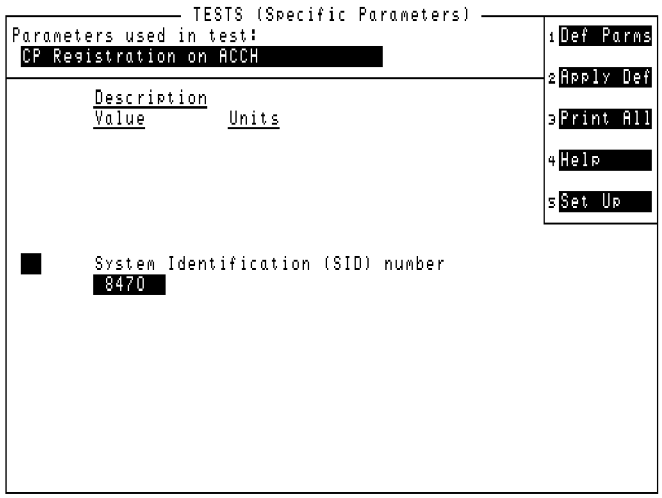

Figure 18 **TESTS (Specific Parameters) Screen Showing Integer**

TESTS (Default Parameters) Screen

Access this screen by selecting the **`Parms Default Parameters`** field in the TESTS (Main Menu) screen.

This screen displays all of the parameters available in the library, grouped by Operation. Selecting the Operation from the menu updates the screen to display all of the relevant parameters for that Operation. Any of the Operations in the library may be selected.

Defaults may be changed to create a tailored set of defaults that apply to all of the parameters specific to an Operation. Defaults are used as initial settings for all Operations. If a parameter in an Operation is changed using the TESTS (Specific Parameters) screen, that parameter value is used as the default when the Operation is used in a test suite.

The following paragraphs describe the various fields of this screen (see **figure 19 on page 64**, **figure 20 on page 64**, **figure 21 on page 65**, **figure 22 on page 65**, and **figure 23 on page 66**).

`Help` Field

Selecting this field (or pressing k4) displays the help screen that contains assistance information in the TESTS (Default Parameters) screen.

{Operation} Field

This is the field near the top of the display (see **figure 19 on page 64**). It identifies the Operation for which the parameter values can be set.

Selecting this field and turning the CURSOR CONTROL knob scrolls through a menu that contains all of the Operations in the library. Selecting an Operation in the menu updates the screen to display the relevant parameters for that Operation.

{Parameter Number} Field

This is the small field at the left side near the middle of the display (see **figure 19 on page 64**). It identifies the parameter number.

Selecting this field and turning the CURSOR CONTROL knob scrolls through the parameters for the Operation.

`Print Tst` Field

Selecting this field (or pressing k3) prints all of the default parameters for the selected Operation.

`Reset All` Field

Selecting this field (or pressing k2) applies the parameter value in the currently selected Operation to *all occurrences of the parameter in any Operation* in the TESTS (Set Up) screen. For instance, if Page is selected and parameter three is changed from Yes to No, and parameter three is used in several Operations, then parameter three will be changed to No in each of those Operations. This change can be verified by switching to the TESTS (Specific Parameters) screen for any suite that uses a Page Operation and verifying that the value has been updated. Selecting this field also results in a user prompt to verify that the change is desired.

NOTE: The differences between the Reset All and Reset One functions are somewhat subtle. Read these two descriptions very carefully, especially the underlined words.

`Reset One` Field

Selecting this field (or pressing k1) applies the parameter value in the currently selected Operation to *each occurrence of the parameter in each occurrence of the selected Operation* in the TESTS (Set Up) screen. For instance, if Page is selected and parameter three is changed from Yes to No, then parameter three will be changed to No for every Page Operation in the TESTS (Set Up) menu. This change can be verified by switching to the TESTS (Specific Parameters) screen for any suite that uses a Page Operation and verifying that the value has been updated. Selecting this field also results in a user prompt to verify that the change is desired.

`Setup` Field

Selecting this field (or pressing k5) switches the display to the TESTS (Set Up) screen.

{Value} Field

This is the field at the middle left of the display, just to the right of and slightly below the Parameter Number field *(*see **figure 19 on page 64**, **figure 20 on page 64**, **figure 21 on page 65**, **figure 22 on page 65**, and **figure 23 on page 66***)*. This field is a variable type, and changes according to the kind of value. For instance, if the value is a toggle, the field is represented as a toggle; if the value is a numeric quantity, it is represented as such. It can be any of the four following types, dependent upon the specific parameter: Choices (see **figure 20 on page 64**), Toggle (see **figure 21 on page 65**), Numerical Entry (Float) (see **figure 22 on page 65**), or Integer (see **figure 23 on page 66**). The definitions are self-explanatory.

Selecting the available field allows you to set the appropriate value.

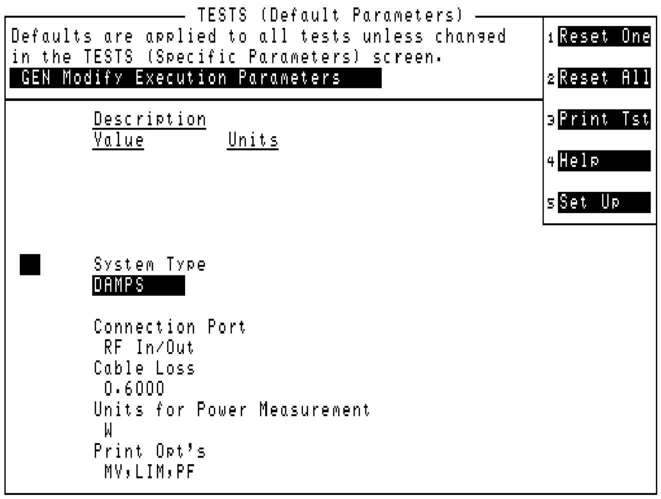

Figure 19 **TESTS (Default Parameters) Screen**

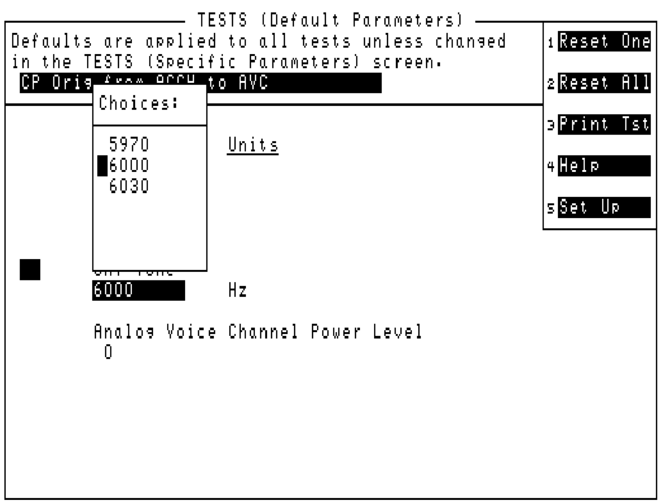

Figure 20 **TESTS (Default Parameters) Screen Showing Choices**

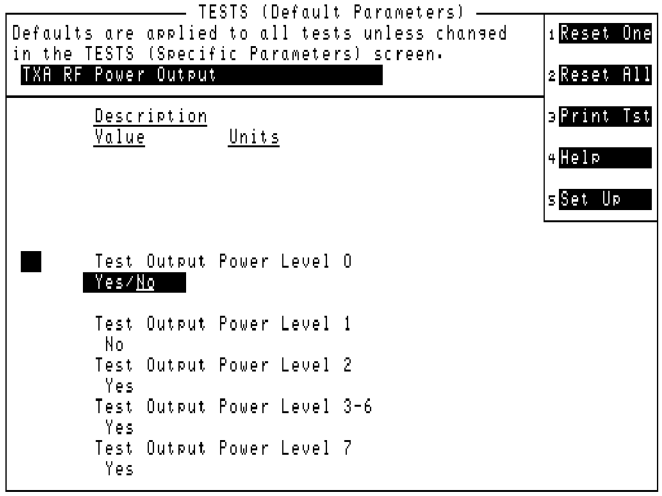

Figure 21 **TESTS (Default Parameters) Screen Showing Toggle**

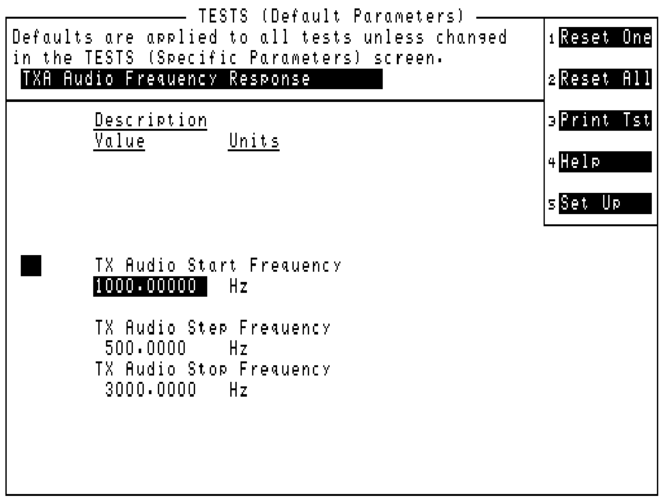

Figure 22 **TESTS (Default Parameters) Screen Showing Numerical Entry**

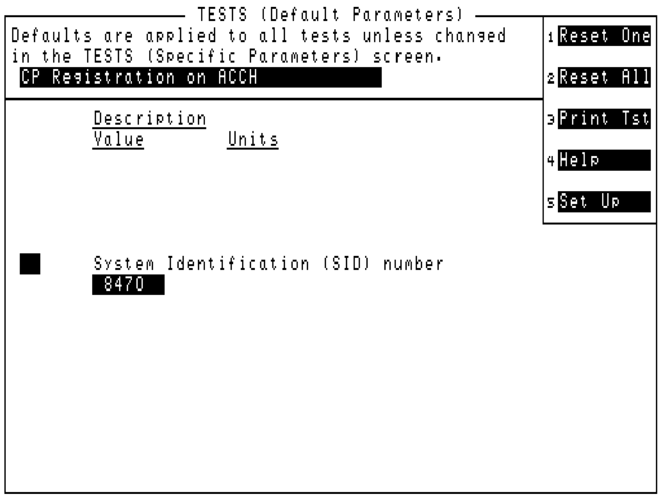

Figure 23 **TESTS (Default Parameters) Screen Showing Integer**

TESTS (Set Up Pass/Fail Limits) Screen

Access this screen by selecting the **`Specs Pass/Fail Limits`** field in the TESTS (Main Menu) screen.

This screen displays all of the Operation pass/fail limits specifications available in the library, grouped by Operation. Selecting the Operation from the menu updates the screen to display all of the relevant pass/fail limits specifications for the Operation. Any of the Operations in the library may be selected.

Defaults may be changed to create a tailored set of pass/fail limits specifications that apply to all of the Operations.

The following paragraphs describe the various fields of this screen (see **figure 24 on page 68**).

`Check` Field

Selecting this field allows you to select whether the Operation will verify only the upper, only the lower, both, or none of the specified limits. Selecting both upper and lower limits increases test time, but might be required for some Operations.

`Help` Field

Selecting this field (or pressing k4) displays the help screen that contains assistance information in the TESTS (Set Up Pass/Fail Limits) screen.

`Lower Limit` Field

Selecting this field allows you to set the lower limit to be compared with the measured result. If the measured result is below this limit, the test fails.

{Operation} Field

This is the field near the top of the display *(*see **figure 24 on page 68***)*. It identifies the Operation for which the parameter values can be set.

Selecting this field and turning the CURSOR CONTROL knob scrolls through a menu that contains all of the Operations in the library. Selecting an Operation in the menu updates the screen to display the relevant pass/fail limits specifications for that Operation.

`Print All` Field

Selecting this field (or pressing k3) prints all of the pass/fail limits specifications for all of the Operations identified in the TESTS (Set Up) screen. The printout will indicate the Operation name and its associated pass/fail limits.

`Print Tst` Field

Selecting this field prints the pass/fail limits specifications for the current Operation only. The printout is similar to the display.

`Setup` Field

Selecting this field (or pressing k5) switches the display to the TESTS (Set Up) screen.

{Specification Number} Field

This is the small field at the left side near the middle of the display *(*see **figure 24 on page 68***)*. It represents the pass/fail limits specification number.

Selecting this field and turning the CURSOR CONTROL knob scrolls through the pass/fail limits specifications for the Operation.

`Upper Limit` Field

Selecting this field allows you to set the upper limit to be compared with the measured result. If the measured result is above this limit, the test fails.

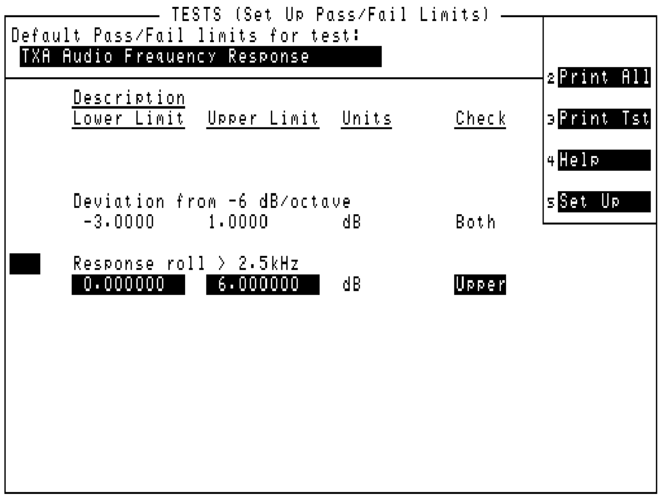

Figure 24 **TESTS (Set Up Pass/Fail Limits) Screen**

3

Using the Software

Introduction

This chapter provides detailed information on loading, running, and customizing test procedures.

The HP 11807E, Option 024, AMPS/NAMPS/DAMPS/DCCH/PCS Mobile Test Software operates under control of various test suites, Operations, parameters, and pass/fail limits specifications. These are defined in two ways. In the first, the Test Software includes factory default settings that you may use without change. In the second, you may customize the settings to your specific requirements.

The Test Set includes also two methods for accessing on-line help. In the first, in each of the screens in the test environment, pressing the k4 (**Help**) key accesses specific information about procedures to set up and use the current screen. In the second, pressing the SHIFT key, then the TX key accesses the master help file, which includes an alphabetical listing of help topics about the Test Set.

NOTE: Special presentations of text in this manual are as shown in **"Conventions" on page 4**.

Connecting Equipment

Various cables and adaptors are required to connect the Test Set to the cellular telephone and to other equipment. Interconnections are shown in **figure 25 on page 72**. Cable descriptions and part numbers are listed in **table 2 on page 73** and **table 3 on page 74**.

CAUTION: The Test Set can be damaged by transient RF power, excessive continuous RF power, high voltage, and electrostatic discharge from cables and other sources.

Observe proper grounding techniques and exercise care in connecting and applying power to the Test Set and ancillary equipment.

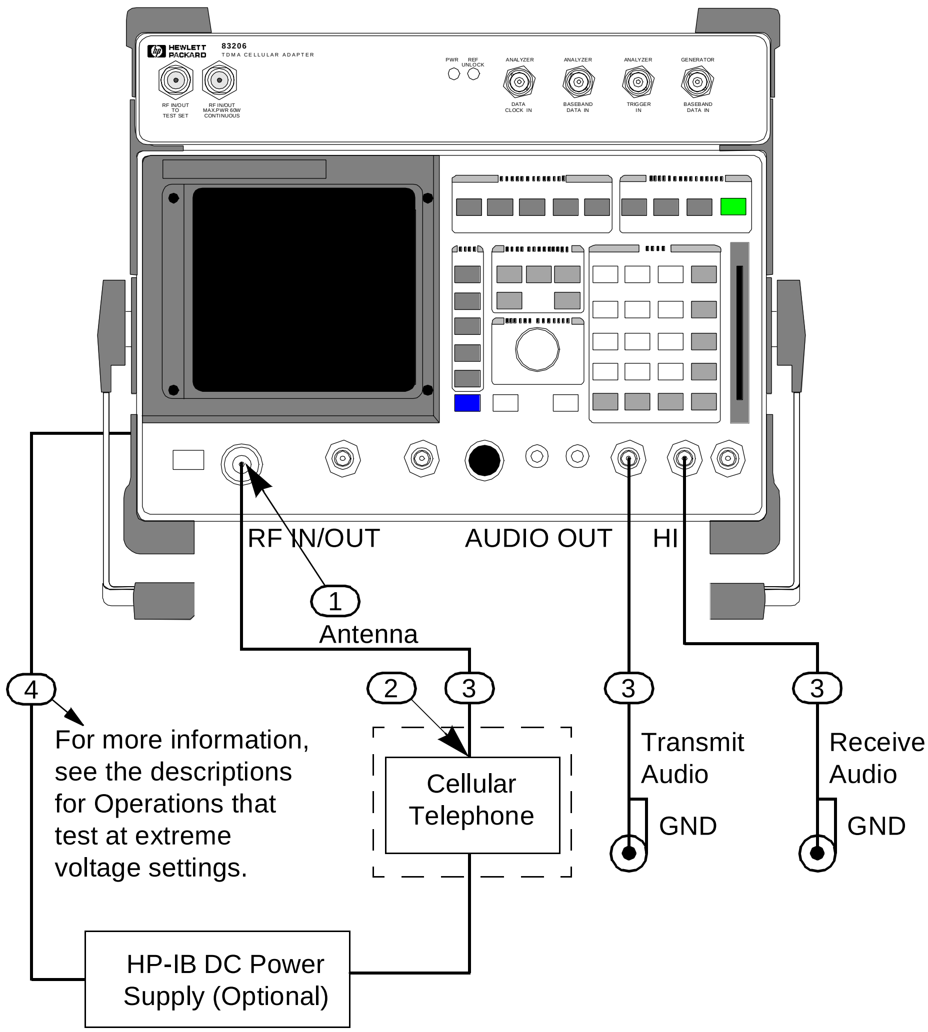

Figure 25 **Equipment Connections**

Cellular Telephone to Test System Connections

Table 2 lists the equipment required for connecting the cellular telephone to the Test System.

Table 2 Cables and Connectors

Refer-ence #	Description	Purpose	Quantity Needed	Part Number
1	BNC(f) to Type N(m) adapter	Adapt BNC cable to RF IN/OUT	1	HP 1250-0780
2	BNC(f) to TNC(m) adapter or BNC(f) to mini-UHF(m) adapter, depending on cellular telephone	Adapt BNC cable to antenna out	1	HP 1250-2441 for TNC only or Tessco part #74720
3	BNC(m) to BNC(m) cable, 1.2 meters (4 feet)	Antenna and audio	3	HP 10503A
4	HP-IB Interface cable, 1 meter (3.3 feet)	Test system HP-IB to power supply HP-IB	1	HP 10833A

Test System to Printer Connections

Table 3 lists cables available from Hewlett-Packard for connection to Hewlett-Packard printers.

Table 3 Hewlett-Packard Printer Cables

Description	Purpose	Quantity	HP Model Number or Part Number
HP-IB (IEEE 488) Cable, 1 meter (3.3 feet)	Test Set to HP-IB Printer	1	10833A
HP-IB (IEEE 488) Cable, 2 meters (6.6 feet)	Test Set to HP-IB Printer	1	10833B
Parallel (IEEE 1284) Printer Cable, 2 meters (6.6 feet)	Test Set to Parallel (Centronics) Printer	1	C2950A
Parallel (IEEE 1284) Printer Cable, 3 meters (9.9 feet)	Test Set to Parallel (Centronics) Printer	1	C2951A
Serial Printer Cable, 4-pin RJ-11 (male) to 9-pin DB-9 (female), 2 meters (6.6 feet)	Test Set to Serial Printer (with 9-pin connector)	1	08921-61038
Serial Printer Cable, 4-pin RJ-11 (male) to 25-pin DB-25 (male), 3 meters (9.9 feet)	Test Set to Serial Printer (with 25-pin connector)	1	08921-61039

Audio Connections

Audio connections are used for only the following Operations:

TXA Audio Distortion

TXA Audio Frequency Response

TXA Hum and Noise

TXA Modulation Deviation Limiting on Analog Voice Channel

TXA Modulation Deviation Limiting on Narrow Analog Voice Channel

RXA Audio Distortion

RXA Audio Frequency Response

RXA Expandor

RXA Hum and Noise

RXA Sensitivity (SINAD)

RXA Sensitivity (SINAD), Narrow Analog Voice Channel

RXA Sensitivity versus Channel (Plotted)

The method of the audio connections is dependent on the cellular telephone being tested. Consult the telephone manufacturer’s documentation for the correct method. Some manufacturers provide a method for audio signal breakout; others require that the audio lines to the cellular telephone be tapped or an acoustic coupler be used on the handset.

Calibrating Cable Loss

Inaccuracies can occur in your RF measurements because of cable losses and impedance mismatches. Thus, the following two steps are required for accurate testing.

1. Measure or calculate losses to arrive at a calibration factor for RF cables, connectors, and adapters using standard techniques and methods.
2. Include this calibration factor in the Cable Loss parameter in the GEN Modify Execution Parameters Operation (see **"GEN Modify Execution Parameters" on page 114**).

NOTE: The Test Software includes a default calibration factor. If you do not provide specific information, the tests will be run using the default factor.

Testing Overview

The overall testing process is shown in **figure 26 on page 79** and described in the following paragraphs.

NOTE: Before beginning testing, you must have loaded the Test Software, as described in **chapter 1, "Getting Started," on page 19**, and completed the equipment connections *(see* **"Connecting Equipment" on page 71***)*.

Pressing the TESTS key displays the TESTS (Main Menu) screen. From the TESTS (Main Menu) screen, you must select a procedure from the **`Choices:`** field (to access the TESTS Subsystem), and then you may select one of the following three options:

Begin testing:

- If the factory default settings are acceptable for your application, you may simply start testing using those defaults.
- If the Test Software has already been customized and saved to an SRAM card, you may start testing using the custom procedures.

Customize the Test Software:

In the **CUSTOMIZE TEST PROCEDURE:** list, select the TESTS Subsystem processes by which you wish to change the procedure. For detailed information on the TESTS Subsystem, see chapter 2, "Product Description".

- If you wish to specify a new list of Operations, or change the current list of Operations, or change the sequence of the Operations, select the **Setup Chan, Seq, Parm, Spec** field to display the TESTS (Set Up) screen.
- If you wish to change specific parameters, select the **Setup Chan, Seq, Parm, Spec** field, then select the **Set Parameters** field in the TESTS (Set Up) screen to display the TESTS (Specific Parameters) screen.
- If you wish to specify a new range or list of channels to test, or change the current list, select the **Setup Chan, Seq, Parm, Spec** field to display the TESTS (Set Up) screen, then the **Range** or **List** field in that screen.
- If you wish to change the test environment and conditions, select the **Parms Default Parameters** field to display the TESTS (Default Parameters) screen.
- If you wish to change the pass/fail limits specifications for specific measurements, select the **Specs Pass/Fail Limits** field to display the TESTS (Pass/Fail Limits) screen.
- If you wish to save any or all of the above customized changes to an SRAM card, or delete any from the card, select the **Proc Save/Delete Procedure** field to display the TESTS (Save/Delete Procedure) screen.

Set up the Test Set for printing results:

- If you wish to print test results or certain screens, select the **Print Printer Setup** field in the TESTS (Main Menu) screen.
- If you wish to select when and where test results are to be displayed, select the **Exec Execution Cond** and **Print Printer Setup** fields, as appropriate, in the TESTS (Main Menu) screen.

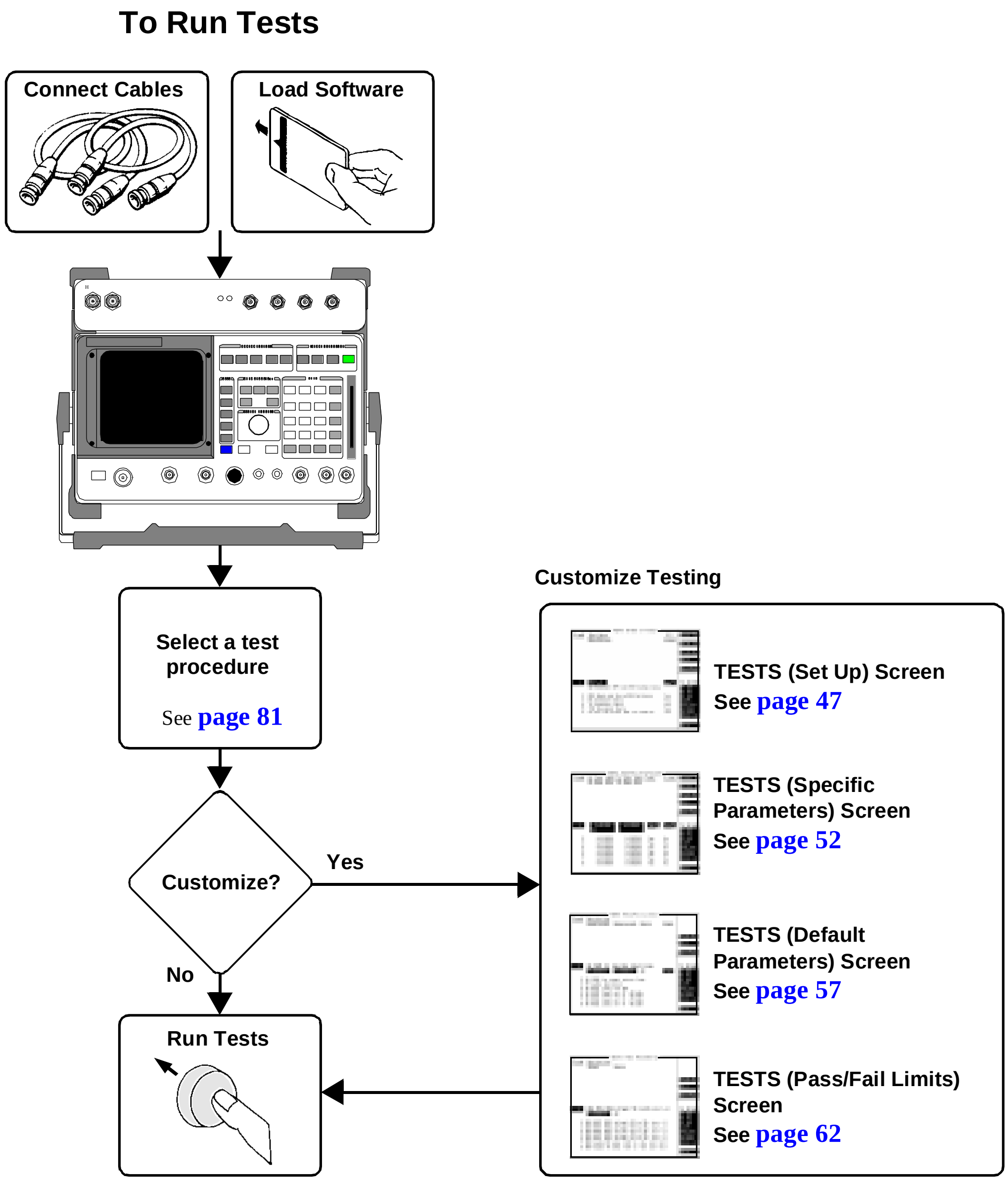

Figure 26 Testing Overview

Using the Software

Before Running Tests

Select a procedure from the HP 11807E, Option 024,Test Software OTP card. The Test Software is shipped with the following preprogrammed procedures:

`CP_ACCH` -- Contains call processing tests using an analog control channel.

`CP_DCCH` -- Contains call processing tests using a digital control channel.

`CP_NAMP` -- Contains call processing tests using Narrow Analog Voice Channels and Wide Analog Voice Channels.

`CP_PCS` -- Contains call processing tests using digital traffic channels at PCS and cellular frequencies.

`FUNCTNL` -- Contains RF and parametric tests. No audio functions are required.

`PARAMTR` -- Contains parametric tests including RF, audio, and call processing. Audio connections are required.

`STARTED` -- Contains five tests used in **chapter 1, "Getting Started"**.

Before you begin testing, you should have made the appropriate hardware connections. See **"Connecting Equipment" on page 71**.

Selecting a Test Procedure

To load the test procedure *(*see **figure 27 on page 82***)*, you must first select the location from which to load (ordinarily, it will be **`Card`**). Then, you must select a procedure filename. The OTP card that contains your Test Software also contains several pre-programmed procedures. Finally, you must start the procedure.

NOTE: The Test Software code is not loaded into the Test Set's memory until you press the k1 (**`Run Test`**) key. It will then take approximately 15 seconds to load the code.

You may remove the Test Software OTP card after the software code is loaded into the Test Set's memory. The procedure and code will remain in memory after a power-down/power-up cycle unless it is manually deleted or a new procedure is loaded.

When the procedure begins to run, the Operations are executed in the order of entry into the procedure.

You may press the CANCEL key at any time to pause the current procedure, then press the k2 (**`Continue`**) key to resume it.

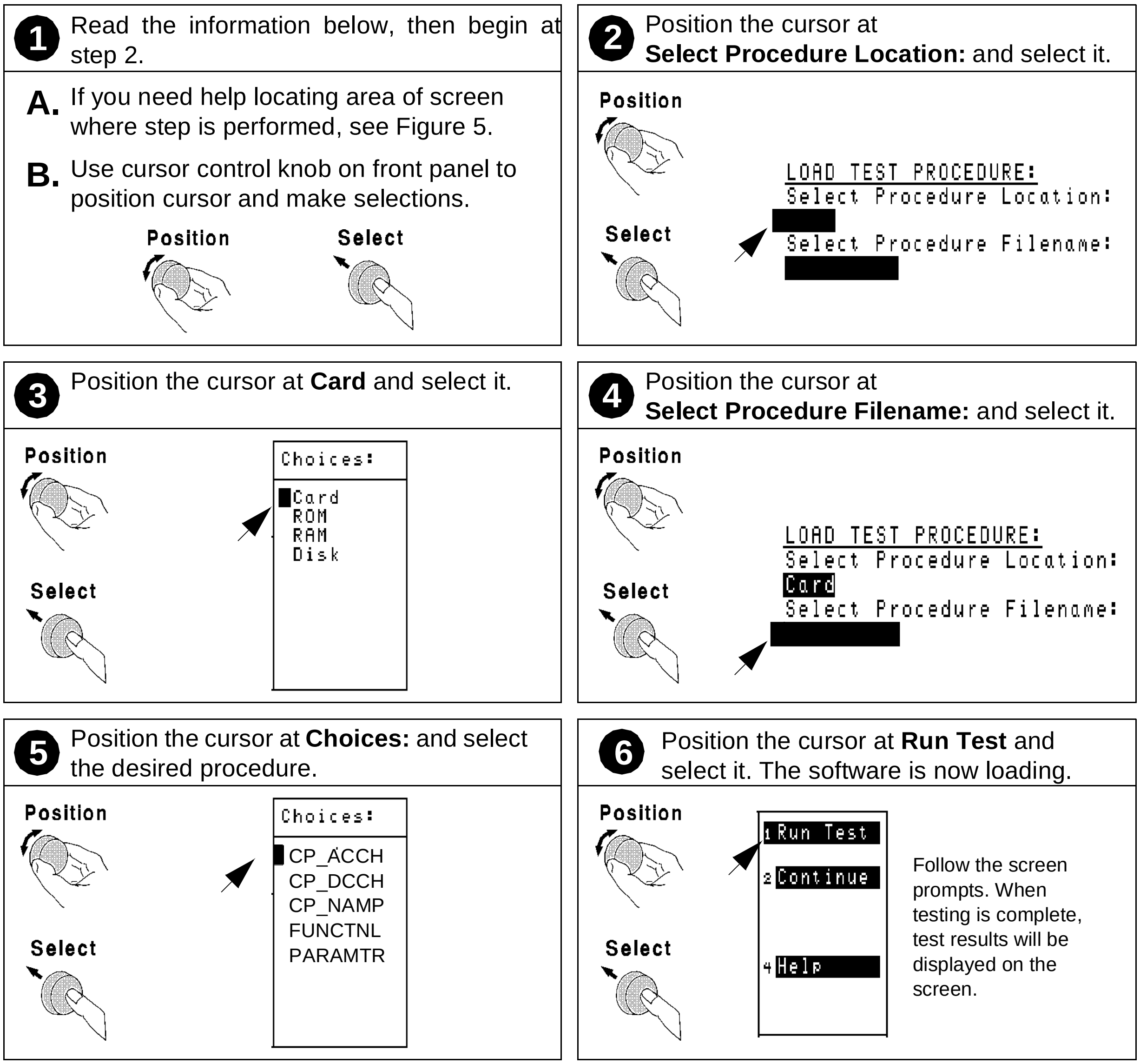

Figure 27 **Selecting a Test Procedure**

Using Common Processes

This section includes descriptions of the more commonly useful processes available for using the Test Software. These descriptions are selected for inclusion here because you will probably use most in your everyday applications. Other processes that are not used very often are described in **chapter 6, "Reference" on page 309.**. The descriptions are presented in alphabetical order as follows:

- Exiting a Procedure
- Pausing, Stopping, or Continuing a Procedure
- Printing
- Setting Test Execution Conditions
- Using Procedures
- Verifying and Editing Parameters
- Verifying and Editing Pass/Fail Limits Specifications

Exiting a Procedure

To exit a procedure, either:

Press the CANCEL key to pause the procedure.

NOTE: At this point, the procedure is stopped. You may elect to restart the procedure (**see "Pausing, Stopping, or Continuing a Procedure" on page 85**), but be aware that subsequent testing might be unpredictable.

or,

Press the SHIFT key, then the CANCEL key, to stop the procedure. This performs an IBASIC RESET function.

Pausing, Stopping, or Continuing a Procedure

To pause a procedure:

Press the CANCEL key or

Press the k2 (**`Stop Test`**) key.

NOTE: At this point, the procedure is stopped. You may elect to restart the procedure, but be aware that subsequent testing might be unpredictable.

To stop a procedure:

Press the SHIFT key, then the CANCEL key. (This performs an IBASIC RESET function.) or

Press the k1 (**`Stop Test`**) key twice.

NOTE: If you make changes to instrument settings while the procedure is paused, subsequent testing might be unpredictable. Error messages might be displayed. **See "Exiting a Procedure" on page 84**.

To continue a paused procedure:

1. Press the TESTS key (if the TESTS (Main Menu) screen is not being displayed).
2. Press the k2 (**`Continue`**) key.

The test time is displayed when the procedure is completed. This time includes the period during which the procedure is paused and the period during which it is waiting for connection and inputs to be completed. If a procedure is run through midnight, the test time will not display properly.

Printing

You may print any of the following:

- Test results
- TESTS screens
  - TESTS (Set Up)
  - TESTS (Specific Parameters)
  - TESTS (Default Parameters)
  - TESTS (Pass/Fail Limits)

There are six basic steps to the printing process. For more detailed information on each of these steps, **see "Printing," in chapter 6, on page 333**.

To print test results or screens:

1. Verify that your printer is supported by the Test Set (**see "Supported Printers," in chapter 6, on page 333**).
2. Determine if your printer requires serial, parallel, or HP-IB connection (see the printer documentation).
3. Connect the printer to the appropriate port on the Test Set (**see "Printing," in chapter 6, on page 333**).
4. Configure the Test Set for your printer and its interface (**see "Configuring the Test Set for Printing," in chapter 6, on page 336**).
5. Direct the Test Set as to what to print (**see "Printing," in chapter 6, on page 333**.
6. Select the desired value in the Print Opt's parameter for controlling printing (**see "GEN Modify Execution Parameters," in chapter 4, on page 114**.)

Setting Test Execution Conditions

Test execution conditions define where and when test results output occurs. In some situations, you may wish to change the way the Test Software operates when a test result is obtained. Test execution conditions allow you to do this and are accessed from the TESTS (Main Menu) screen. Test execution conditions are not retained after a power-down and power-up cycle.

1. Press the TESTS key. The TESTS (Main Menu) will appear.
2. Move the cursor to the **`Exec Execution Cond`** field in the **`SET UP TEST SET:`** list and select it to switch to the TESTS (Execution Conditions) screen.
3. Change the settings in the screen as required.

The fields in the TESTS (Execution Conditions) screen in which you may change conditions are described in the following paragraphs:

`Output Results To:` Field

You may select either **`Crt`** or **`Printer.`** The default is **`Crt.`**

You may specify where test results are to be placed. If you select **`Crt`**, results will be displayed on the Test Set's screen. If you select **`Printer`**, test results will be sent to the display and to a printer. You must connect and configure a printer if you select **`Printer`**. **See "Printing" on page 86** and **see "Printing," in chapter 6, on page 333**.

`Output Results For:` Field

You may select either **`All`** or **`Failures`**. The default is **`All.`**

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

`Output Heading:` Field

You may use this field to enter a heading to be printed or displayed.

Select the field, then use the CURSOR CONTROL knob to select from the list of characters in the **`Choices:`** field and enter the characters that you wish to appear in the heading.

Select **`Done`** when you have finished.

`If Unit-Under-Test Fails:` Field

You may select either **`Continue`** or **`Stop`**. The default is **`Continue.`**

If you select **`Stop`**, and a pass/fail result is **`F`**, the program will stop.

`Test Procedure Run Mode:` Field

You may select either **`Continuous`** or **`Single Step`**. The default is **`Continuous.`**

You may command testing to pause at certain times. If you set this mode to **`Single Step`**, the procedure will pause after a comparison is made between a test determination and the expected result. For example, Operations will pause after the procedure compares the results to a specification. You may continue the Operation from the paused state by pressing the k2 (**`Continue`**) key.

`Autostart Test Procedure on Power-Up:` Field

You may select either **`On`** or **`Off.`** The default is **`Off.`**

You may set up the Test Set so that, if the procedure was previously loaded, the procedure will be immediately executed when the Test Set is powered on.

Using Procedures

A procedure is a collection of Operations and an order of Operations, all contained in a file that customizes the Test Software to a specific application. You may save the file on an SRAM card or an external disk drive.

When you save a procedure, it includes a list of Operations (each of which includes channel and other communications information, parameters, and pass/fail limits specifications), an order of Operations, plus a library that contains the names of all Operations, parameters, and pass/fail limits specifications that are resident in the Test Software. The library file is part of the Test Software and cannot be modified. The library file is saved automatically on the card or disk that is being used to store the new procedure.

The procedures supplied with the Test Software are listed in the **`Choices:`** field when you select the **`Select Procedure Filename:`** field. Procedures are displayed only if the Test Software OTP card is inserted.

Saving a Procedure

After you have set up the Test Software, you may save the procedure to an SRAM card, external disk drive, or internal RAM.

The SRAM card, external disk drive, or RAM disk that you use must be initialized before its *first* use. **See "Initializing an SRAM Card," in chapter 6, on page 330**, or **see "Initializing a Disk," in chapter 6, on page 324** or **see "Initialize RAM disk Volume 0 as follows:," in chapter 6, on page 342**.

Using the Software

To save a procedure:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
   If you intend to select any item other than `Disk` in step 4, proceed to step 2 now.
   If you intend to select `Disk` in step 4, perform the following four sub-steps to enter the disk specification, then proceed to step 2.
   a. Move the cursor to the `Cnfg External Devices` field in the `CUSTOMIZE TEST PROCEDURE:` list and select it to switch to the TESTS (External Devices) screen.
   b. Move the cursor to the `External Disk Specification` field and select it.
   c. From the list of characters in the `Choices:` field, enter the disk specification. When the specification is complete, move the cursor to `Done` and select it.
   d. Press the k5 (`Main Menu`) key to return to the TESTS (Main Menu) screen.
2. Move the cursor to the `Proc Save/Delete Procedure` field in the `CUSTOMIZE TEST PROCEDURE:` list and select it to switch to the TESTS (Save/Delete Procedure) screen.
3. Move the cursor to the `Select Procedure Location:` field and select it.
4. From the `Choices:` field, select the desired location.
5. Move the cursor to the `Enter Procedure Filename:` field and select it.
6. From the list of characters in the `Choices:` field, enter a filename. When the filename is complete, move the cursor to `Done` and select it.

NOTE: A procedure file name must be nine characters or less. Procedure file names that already exist on the card will appear at the top of the list of characters.

7. If you selected `Card`, insert an initialized SRAM card into the card slot on the Test Set's front-panel.
8. Verify that the card or other medium is not write-protected. **See "Memory Cards," in chapter 6, on page 327**.
9. Move the cursor to the `Enter Description for New Procedure:` field and select it. From the list of characters in the `Choices:` field, enter comments. When the comments are complete, move the cursor to `Done` and select it.
10. Move the cursor to the `Procedure Library:` field and select `Current` (the default). The name of the Library is displayed in the TESTS (Main Menu) screen.
11. Move the cursor to the `Proc` field and select it.
12. Press the k1 (`Save Proc`) key. The procedure will be saved at the location that you selected.

Loading a Procedure

A procedure can be loaded from another storage medium into the Test Set's battery-backed-up memory.

To load a procedure:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select the desired location.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.
5. From the **`Choices:`** field, select the procedure that you wish to load.
6. Read the **`Description:`** field to ensure that the procedure that you have chosen is the one that you wish to load.

Deleting a Procedure

Procedures can be removed from an SRAM card, external disk drive, or RAM disk at any time.

To delete a procedure:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select the desired location.
4. Move the cursor to the **`Proc Save/Delete Procedure`** field in the **`CUSTOMIZE TEST PROCEDURE:`** list and select it to switch to the TESTS (Save/Delete Procedure) screen.
5. Move the cursor to the **`Enter Procedure Filename:`** field and select it.
6. From the **`Choices:`** field, select the name of the procedure that you wish to delete.
7. Press the k2 (**`Del Proc`**) key.
8. Press the Yes key.

Securing and Un-Securing a Procedure

After you have set up your Test Software with a test suite, channel information, parameters, and pass/fail limits specifications, you might wish to secure it. This will prevent viewing and changing those functions. You may select the items to secure or un-secure. The IBASIC ROM program to perform this function is included in the Test Set.

You may secure the procedures that are supplied with the Test Software. These are shipped un-secured.

To secure a procedure:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select **`ROM`**.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.
5. From the **`Choices:`** field, select **`IB_UTIL`**.
6. Press the k1 (**`Run Test`**) key.
7. Select the location of the procedure that you wish to secure by pressing the k1 key for SRAM card, or the k2 key for RAM.

NOTE: RAM refers to the RAM disk memory in the Test Set. Before selecting RAM for the first time, you must initialize the RAM as a disk. **See "Initialize RAM disk Volume 0 as follows:," in chapter 6, on page 342**

8. Proceed with the displayed instructions. If you wish to secure only one of the items, such as pass/fail limits specifications, this is permissible.
9. When you are prompted to enter the **`pass number`**, enter any sequence of numerals 0 through 9 using the DATA keypad. Enter 9 digits or less. Record this number for future use.

To un-secure a procedure:

NOTE: To un-secure a procedure, you must know the **`pass number`** of that procedure.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select **`ROM`**.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.
5. From the **`Choices:`** field, select **`IB_UTIL`**.
6. Press the k1 (**`Run Test`**) key.
7. Select the location of the procedure that you wish to un-secure by pressing the k1 key for SRAM card or the k2 key for RAM.
8. Enter the name of the procedure that you wish to un-secure.
9. If the procedure has any item secured, you will be prompted for the **`pass number`**.
10. Proceed with the displayed instructions. Select the items that you wish to un-secure.
11. When you are prompted, enter the **`pass number`** using the DATA keypad. Press the ENTER key when the entry is complete.

Verifying and Editing Parameters

Parameters are values that you enter to optimize your use of the Test Software. Many of the parameters are determined by examining your testing needs.

Default values are included in the Test Software. Some of these values have been derived from standard methods of measurement and some are derived from industry standard requirements. Each Operation includes applicable parameters. It is not necessarily required that you change these parameters when you select an Operation or change the Operations in your procedure. However, it might be desirable to change one or more to reflect the desired testing regimen. A list of the parameters used is included in each of the Operation descriptions in **chapter 4, "Operation Descriptions" on page 105.**.

NOTE: You must first select and load a Procedure to access the TESTS Subsystem. In the case of verifying and editing parameters, the procedure that you select contains the default parameters, grouped by Operation. You may then select the **`Parms Default Parameters`** field in the **`CUSTOMIZE TEST PROCEDURE:`** list to switch to the TESTS (Default Parameters) screen and edit the default values.

You should verify that parameters are set properly after you select the Operations to be placed in your procedure.

A lock is provided in the Test Software to prevent uncontrolled access to the parameters. **See "Securing and Un-Securing a Procedure" on page 91**.

Each parameter remains in battery-backed-up memory until you select a another procedure to run. If you wish to prevent its loss when you select a new procedure, you must save it in a procedure (**See "Saving a Procedure" on page 89**). If you wish to print the parameters list, **see "Printing" on page 86**.

To edit a parameter value:

NOTE: The appropriate procedure filename must be selected before editing a parameter value. If this has not been done already, perform the following steps:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select **`Card`** for the location at which the procedure is stored.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.

If the appropriate procedure filename is already selected, edit the value as follows:

1. Move the cursor to the **`Parms Default Parameters`** field in the **`CUSTOMIZE TEST PROCEDURE:`** list and select it to switch to the TESTS (Default Parameters) screen.
2. Move the cursor to the Operation field and select it.
3. Rotate the CURSOR CONTROL knob to the desired Operation and select it.
4. Move the cursor to the Parameter Number field and select it.
5. Move the cursor to the Value field of the parameter to be changed and select it.
6. Enter the desired value using the DATA keypad, then press the ENTER key.
    - Use the backspace key to correct entries.
    - Press the CANCEL key to cancel entries and retain the old value.
7. Press the k5 (**`Main Menu`**) key (or the TESTS key) to return to the TESTS (Main Menu) screen.

Verifying and Editing Pass/Fail Limits Specifications

Pass/fail limits are values that you enter to optimize your use of the Test Software. Many of the pass/fail limits specifications are determined by examining your testing needs.

Default values are available in the Test Software. Some of these values have been derived from standard methods of measurement and some are derived from industry standard requirements. Each Operation includes applicable pass/fail limits specifications. It is not necessarily required that you change these pass/fail limits specifications when you select an Operation or change the Operations in your procedure. However, it might be desirable to change one or more to reflect the desired testing regimen. A list of the pass/fail limits specifications used is included in each of the Operation descriptions in **chapter 4, "Operation Descriptions" on page 105.**

NOTE: You must first select and load a Procedure to access the TESTS Subsystem. You may then select the TESTS (Pass/Fail Limits) screen from the **`CUSTOMIZE TEST PROCEDURE:`** list to see and edit the default values.

You should verify that pass/fail limits specifications are set properly after you select the Operations to be placed in your procedure.

A lock is provided to prevent uncontrolled access to the pass/fail limits specifications. **See "Securing and Un-Securing a Procedure" on page 91**.

Each set of pass/fail limits specifications remains in battery-backed-up memory until you select a new procedure to run. If you wish to prevent its loss when you select a another procedure, you must save it in a procedure (**see "Saving a Procedure" on page 89**). If you wish to print the pass/fail limits specifications list, **see "Printing," in chapter 6, on page 333**.

To edit a pass/fail limits specifications value:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the **`Choices:`** field, select among **`Card`**, **`ROM`**, **`RAM`**, or **`Disk`** for the location at which the procedure is stored.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.
5. From the **`Choices:`** field, select a procedure that you wish to load.
6. Move the cursor to the **`Specs Pass/Fail Limits`** field in the **`CUSTOMIZE TEST PROCEDURE:`** list and select it to switch to the TEST (Pass/Fail Limits) screen.
7. Move the cursor to the Operation field and select it.
8. Rotate the CURSOR CONTROL knob to the desired Operation and select it.
9. Move the cursor to the Specification Number field and select it.
10. Move the cursor to the Value field of the pass/fail limits specification to be changed and select it.
11. Move the cursor to the **`Lower Limit`** or the **`Upper Limit`** field and select it.
12. Enter the desired value using the DATA keypad and press the ENTER key.
    - Use the left-arrow key to backspace.
    - Press the CANCEL key to cancel entries and retain the old value.
13. Move the cursor to the **`Check`** field and select it.
14. From the **`Choices:`** field, select the combination of upper and lower limits to be checked.
15. Press the k5 (**`Main Menu`**) key (or the TESTS key) to return to the TESTS (Main Menu) screen.

Customizing Testing

Because of the diversity of individual testing requirements, the Test Software has been designed so that changes may be made easily from the Test Set's front panel. You may store these changes on an SRAM card for later use. **See "Using Procedures" on page 89.**

Because your requirements might change, the Test Software allows changes to default settings whenever you wish. For example, you might decide to insert or delete Operations, then later, after running the Operations, you might decide to change the parameters or pass/fail limits specifications, or test different channels.

Most testing customization is accomplished through the customization screens. These screens are accessed from the main TESTS (Main Menu) screen as shown in **figure 28, "Customizing a Test Procedure," on page 99**.

The following sections describe the various overall processes used in customizing testing procedures for a particular application. These processes include:

- Specifying Channel Information
- Specifying the Order of Operations
- Specifying Parameters
- Specifying Pass/Fail Limits

NOTE: External devices, printer setup, and IBASIC will not be described in this section on customizing the Test Software.

- External devices and printer setup are used in setting up printers and external disk drives, and are described in **"Data Collection and Retrieval" in chapter 6, on page 313** and **"Printing" in chapter 6, on page 333**.
- IBASIC is used in writing your own programs and is not described in this manual. If you wish to write IBASIC programs, you will find the following manuals useful:
  - *HP Instrument Basic User's Handbook, Version 2.0,* HP part number E2083-90005.
  - *HP 8920B Programming Manual,* HP part number 08920-90222

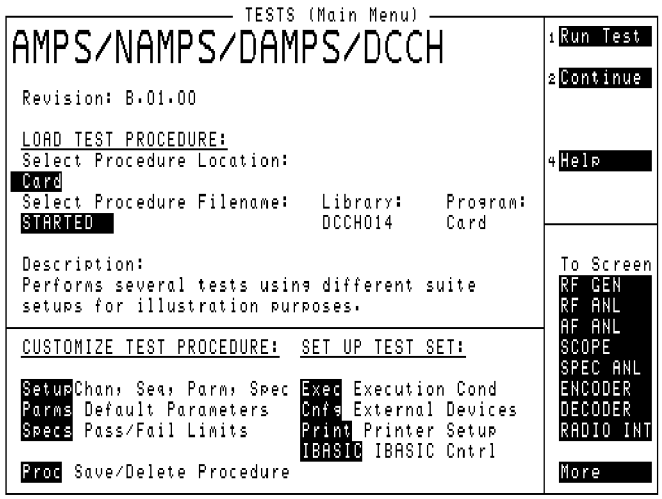

Figure 28 **Customizing a Test Procedure**

Specifying Channel Information

Specify each new channel in the **`Range/List`** field in the TESTS (Set Up) screen as follows:

- Enter the cellular channel number.
- For narrow analog voice channels (NAMPS only), specify lower, middle, or upper channel by appending an “L”, “M”, or “U” after the channel number. Example: For narrow lower analog voice channel 156 enter 156L in the channel information screen.
- For PCS frequency channels, specifying by appending an “H” after the channel number.

NOTE: Customized channel information may be saved only as parts of procedures.

For information on saving customized channel information, **see "Using Procedures" on page 89**.

Specifying the Order of Operations

You may define the order of Operations to include all, some, or just one of the Operations available. When the first Operation is finished, the next will run. The sequence will remain in the Test Set’s battery backed-up memory until another sequence is loaded or set up. For information on saving a customized Operation sequence, **see "Using Procedures" on page 89**.

Defining the order of Operations is accomplished by inserting or deleting items from the list of Operations that comes with the Test Software package. See **chapter 4, "Operation Descriptions," on page 105** for descriptions of the Operations included in the Test Software.

Specify the order by adding, deleting, and/or inserting operations in the TESTS (Set Up) screen.

Specifying Test Parameters

The Test Software uses parameters to optimize the test environment and conditions for an application. Typical requirements for each parameter are derived from applicable standards, and the Test Software includes appropriate default settings. However, some parameters will require modification after examination of specific test requirements. Review the defaults and change those only as necessary to accomplish your testing regimen.

For detailed information on the parameters in any specific Test Software Operation, see the “Parameters Used” section of the description of that Operation in **chapter 4, "Operation Descriptions" on page 105.**.

NOTE: Customized test parameters may be saved only as parts of procedures.

For information on saving customized test parameters, **see "Using Procedures" on page 89**.

To verify and edit parameters, **see "Verifying and Editing Parameters" on page 94**.

Specifying Pass/Fail Limits

Pass/fail limits specifications define the values with which a measurement result is compared to determine if the cellular telephone meets its specified standards. Typical specifications for each limit are derived from applicable standards, and the Test Software comes with appropriate default settings. However, some pass/fail limits specifications will require modification after examination of specific test requirements. Review the defaults and change those only as necessary to accomplish your testing regimen.

For detailed information on the pass/fail limits specifications in any specific Test Software Operation, see the “Pass/Fail Limits Used” section of the description of that Operation in **chapter 4, "Operation Descriptions" on page 105.**.

NOTE: Customized pass/fail limits specifications may be saved only as parts of procedures.

For information on saving customized pass/fail limits specifications, **see "Using Procedures" on page 89**.

To verify and edit pass/fail limits specifications, **see "Verifying and Editing Pass/Fail Limits Specifications" on page 96**.

4

Operation Descriptions

Introduction

This chapter presents a description of each Operation available in the Test Software. Some of these Operations accomplish preliminary or set-up processes that are necessary for testing; the others perform actual tests.

The first few capital letters in the title of each Operation indicate the class of the Operation. The classes are:

GEN = General

CP = Call Processing

TXA = Transmitter, Analog

RXA = Receiver, Analog

TXD = Transmitter, Digital

RXD = Receiver, Digital

MISC = Miscellaneous

Each Operation is described in relatively complete detail, and each includes any appropriate parameter descriptions and pass/fail limits specifications.

Parameters

Parameters are values that you enter to optimize the test environment or conditions for using the Test Software. Many of the parameters are determined by examining your test needs. Other parameters are determined by performing measurements to calibrate items in your system. Default values are set into the software. Some of these values are derived from standard methods of testing and some are derived from applicable cellular telephone test standards.

Parameters remain in battery-backed-up memory until overwritten when you select a different procedure to run. If you wish to prevent parameters from being lost when a new procedure is selected, you must save those parameters in a procedure. **See "Using Procedures," in chapter 3, on page 89**.

To print the parameters list, **see "Printing," in chapter 6, on page 333**.

Pass/Fail Limits Specifications

Pass/fail limits specifications are values that you enter to set the pass or fail limits for testing. Default values are available in the Test Software. Some of these values are derived from standard methods of measurement and some are derived from applicable cellular telephone test standards. However, your pass/fail limits specifications should be set according to the standards to which you wish to test your cellular telephone.

Pass/fail limits specifications remain in the Test System battery-backed-up memory until overwritten whey select a different procedure to run. If you wish to prevent the specifications from being lost when a new procedure is selected, you must save those in a procedure. **See "Using Procedures," in chapter 3, on page 89**.

To print the pass/fail limits specifications list, **see "Printing," in chapter 3, on page 86**, and in **chapter 6, "Reference," on page 309**.

Testing Strategy

Testing strategy consists of several components. These are described in the following paragraphs.

Explicit and Implicit Call Processing

In call processing Operations (such as handoffs, pages, and releases), a transfer-type function is included. This function is called a “handoff” and is a transfer from one channel to another. A handoff may be explicitly or implicitly specified in a test procedure. The difference between explicit and implicit call processing is explained using the following description of a handoff from an analog channel to a digital channel.

When there is a change from an analog to a digital channel, and the change is accomplished using a Handoff Operation, that Operation states the handoff explicitly and includes parameters that allow you to set the parameters that control the handoff (such as the time slot to be used on the digital traffic channel). For purposes of description, it is called an “explicit” handoff. It offers full control over the Operation parameters.

Example -- Assume that, for channel 100 in a test suite, the Operations are as follows:

TXA Modulation Deviation Limiting on Analog Voice Channel
CP Handoff Analog Voice Channel to Digital Traffic Channel
TXD RF Power Output

In these three Operations, the second Operation performs explicitly a handoff from the first (on an analog channel) to the third (on a digital channel). Because the Handoff Operation is used, the parameters contained in that Operation are adjustable and may be set to desired values.

However, when there is a change from one channel to another, and the change is accomplished automatically, with no Handoff Operation explicitly specified, a handoff nonetheless takes place. For purposes of description, this is called an “implicit” handoff. It offers less control because it uses default parameters.

Example -- Assume that, for channel 100 in a test suite, the Operations are as follows:

TXA Modulation Deviation Limiting on Analog Voice Channel
TXD RF Power Output

In these two Operations, the first (on an analog channel) is followed directly by the second (on a digital channel). Thus, a handoff from an analog voice channel to a digital traffic channel is required between these two Operations, and is performed automatically by the Test Software. It is called an implicit handoff, and is the equivalent of the CP Handoff Analog Voice Channel to Digital Traffic Channel Operation but, because it is not really stated, default values are used for the parameters in the Operation and are thus not adjustable.

Verifying Functionality

Running the Call Processing Operations first will verify the functionality of the cellular telephone. Then, running other Operations will find parametric problems such as distorted audio.

The following is a suggested testing strategy.

1. Make connections as described in **chapter 3, "Using the Software," on page 69**.
2. Insert the Test Software OTP card into the Test Set's front panel slot. See **chapter 1, "Getting Started," on page 19**; **chapter 2, "Product Description," on page 29**; and **chapter 3, "Using the Software," on page 69**.
3. Load the procedure that you wish to run from the OTP card.
4. Run the procedure. A Registration Operation or one of the Origination Operations should be the first Operation in your test procedure sequence because these Operations obtain the mobile identification number (MIN) of the cellular telephone.

NOTE: In step 4 above, if the cellular telephone number or the MIN is known, that information may be loaded in the Phone Number (0=Use # from Reg/Orig) parameter.

Cellular Telephone Number or Mobile Identification Number

The Test System requires a telephone number or a mobile identification number (MIN) to page the cellular telephone. Once a telephone number or MIN is obtained from the telephone, it is retained by the Test Set until a new telephone number or MIN is obtained. Therefore, the Registration or Origination Operation must be performed only once on each telephone. Subsequent test procedures need not start with a Registration or Origination Operation.

If the first Operation in a test procedure sequence is not a Registration or Origination type, and the MIN from the cellular telephone has not been previously obtained by the Test System, the Test System will prompt you for the cellular telephone number. The Test System will then create the MIN from the telephone number (see also the description for the Phone Number (0=Use # from Reg/Orig) parameter in the description of any of the Page Operations).

It is often advisable to run analog Call Processing Operations to verify that the cellular telephone is functional. Dependent upon the testing strategy, it might also be advisable to run digital Call Processing Operations. Do this as follows:

a. From the TESTS (Main Menu) screen, switch to the TESTS (Set Up) screen.

b. Edit the test sequence so as to include the Operations listed in **table 4 on page 112** in the order presented.

Table 4 **Operations in Sequence**

Operation Name	Purpose
CP Registration	To verify that the cellular telephone is functioning (only RF and dc power connections are required) and return the telephone number, serial number, and power class
CP Page	To simulate an analog call to the cellular telephone
CP Release	To release the cellular telephone
CP Origination	To simulate an analog call from the cellular telephone

c. Establish whether the cellular telephone uses A control channels (channels 313 to 333), B control channels (channels 334 to 354) or both A and B control channels.

d. Check and update the Analog Control Channel parameter that is required by the cellular telephone (see **"Verifying and Editing Parameters" on page 94** and **"Specifying Test Parameters" on page 102**).

e. Verify that the cellular telephone is connected.

f. Press the TESTS key to switch to the TESTS (Main Menu) screen and then press the k1 (`Run Test`) key. Tests run in the sequence entered earlier. As the results are reported on the Test Set's screen, you will be able to better isolate and determine the cause of any problems. To save this group of Call Processing Operations as a test procedure, **see "Saving a Procedure," in chapter 3, on page 89**. You might also wish to add the Digital Call Processing Operations to this procedure.

Miscellaneous Items

Add transmitter and receiver tests to your test procedure through the TESTS (Set Up) screen. You may save the test procedure, **see "Saving a Procedure," in chapter 3, on page 89**. Note that some of these tests require audio connections. In doing so, take care to make the appropriate audio connections specific to the requirements of your cellular telephone.

Also, you might wish to add the Operations listed in **table 5** to your test procedure.

Table 5 **Additional Operations**

Operation Name	Purpose
TXA RF Power Output	To verify analog transmitter operation
TXA Audio Distortion	To verify transmitter audio connection
RXA RF Sensitivity	To verify analog receiver and receiver audio connection

GEN Modify Execution Parameters

This Operation is used to modify a parameter that affects general functioning of a test procedure. It may be included in a test suite merely to set the parameter values that affect the manner in which the Test System operates when running the Test Software. It does not perform any tests, make any measurements, or compare any readings to limit specifications.

Parameters Used

The parameters used in the GEN Modify Execution Parameters Operation are:

Connection Port [RF In/Out, Dup/Ant]

Cable Loss [0-120] dB

Units for Power Measurement [W, dBW, or dBm]

Print Opt's [MV, P/F, MV & PF, MV & Limits & P/F, or Limits & P/F]

These parameters are described in the following paragraphs.

Connection Port [RF In/Out, Dup/Ant]

This parameter allows you to specify the Test System RF ports to be used for cellular telephone tests.

Two selections are provided in a one-of-many format: **`RF In/Out`**, and **`Dup/Ant`**. Selecting **`RF In/Out`** causes the RF IN/OUT port to be used for both forward and reverse channels. Selecting **`Dup/Ant`** causes the DUPLEX OUT port to be used for the forward channel and the ANT IN port to be used for the reverse channel.

Use of the DUPLEX OUT and ANT IN ports allows the RF link between the Test System and the cellular telephone to be established via antennas instead of coaxial cable. In either case, the Cable Loss parameter should be used to compensate for the path loss.

For typical bench testing, you will use the RF In/Out connector. For over-the-air testing, you might wish to use the DUPLEX OUT and ANT IN ports.

CAUTION: If the ANT IN connector is used, do not exceed the maximum input power of 200 milliwatts.

NOTE: If the RF link is accomplished via antennas, it should be done inside a shielded environment to avoid interference with local cellular telephone service.

Cable Loss [0-120] dB

This parameter allows you to specify the amount of loss for any external cables or pads (attenuators) connected to the Test System. It may be used also to compensate for path loss when the RF link between the cellular telephone and the Test System is accomplished via antennas. This compensation is provided in power measurements and in signal generator level settings in the Test System.

The value is entered as a real number, in dB, in the range 0 through 120.

Example -- If the cable loss between the cellular telephone antenna and the Test System RF IN/OUT is 4.0 dB, enter 4.0.

Units for Power Measurement [W, dBW, or dBm]

This parameter allows you to specify the measurement units to be used in cellular telephone transmitter testing. It affects the pass/fail limits specifications for Level 0 through Level 7 in the **"TXA RF Power Output" on page 205** and the **"TXA RF Power Output vs Channel (Plotted)" on page 209** and for Level 0 through Level 10 in the **"TXD RF Power Output" on page 264**, and the “**"TXD RF Power Output vs Channel (Plotted)" on page 269**.

Three selections are provided in a one-of-many format: **W**, **dBW**, and **dBm**. Selecting **W** causes the Test System to use the watt as the unit of measurement; selecting **dBW** causes the Test System to use decibels relative to 1 watt; and selecting **dBm** causes the Test System to use decibels relative to 1 milliwatt.

Example -- If you wish to use watts as the unit of measurement, select **W**.

Print Opt’s [MV, P/F, MV & PF, MV & Limits & P/F, or Limits & P/F]

This parameter controls the appearance of the printout if an external printer is being used.

Five selections are provided in a one-of-many format. These are:

MV (Measured Value) causes only the measured value of the selected test to be printed.

P/F (Pass/Fail) causes a pass or fail indication to be printed. This denotes only that the value is within the established limits (Pass) or is not (Fail). It does not print either the value or the limits.

MV & P/F (Measured Value and Pass/Fail) causes both the measured value and the pass/fail indication to be printed.

MV & Limits & P/F (Measured Value and Limits and Pass/Fail) causes the measured value, the pass/fail limits specifications, and the pass/fail indication to be printed.

Limits & P/F (Limits and Pass/Fail) causes the pass/fail limits specifications and the pass/fail indication to be printed.

Example -- If you wish to print out only the measured value, select **MV**.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the GEN Modify Execution Parameters Operation.

GEN Modify External Power Supply Parameters

This Operation sets system set-up type parameters that require the use of an external programmable power supply. These parameters affect tests that use supply voltages other than nominal.

Parameters Used

The parameters used in the GEN Modify External Power Supply Parameters Operation are:

Test at Extreme Supply Voltages [Yes, or No]

Low Supply Voltage [0-20]

Nominal Supply Voltage [0-20]

High Supply Voltage [0-20]

These parameters are described in the following paragraphs.

NOTE: The following described parameters are effective only if a programmable, external, HP-IB power supply is connected and configured to operate with the Test System.

Test at Extreme Supply Voltages [Yes, or No]

This parameter allows you to specify whether testing will be performed at extreme supply voltages for any test in which testing at those voltages is possible.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the measurements to be performed at high and low supply voltage settings in addition to measurements at the nominal supply voltage setting. Selecting **`No`** causes measurement at only the nominal supply voltage setting.

Low Supply Voltage [0-20]

This parameter allows you to specify the low voltage to be supplied by the programmable power supply and used in the test as the low extreme voltage.

The value is entered as a real number in the range 0 through 20.

Nominal Supply Voltage [0-20]

This parameter allows you to specify the nominal voltage to be supplied by the programmable power supply and used in the test as the nominal voltage.

The value is entered as a real number in the range 0 through 20.

High Supply Voltage [0-20]

This parameter allows you to specify the high voltage to be supplied by the programmable power supply and used in the test as the high extreme voltage.

The value is entered as a real number in the range 0 through 20.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the GEN Modify External Power Supply Parameters Operation.

GEN Modify Analog Control Channel Parameters

This Operation is used to modify the cellular telephone's System Identification (SID) number. It is recommended that you include this Operation at the beginning of a test suite to identify the SID and control channel number. The channel number associated with this test will be the control channel number. In the event that the first Operation is a Registration type, this Operation is not required because the Registration Operation will identify the control channel number. This Operation does not perform any tests, make any measurements, or compare any reading to limit specifications.

Parameters Used

One parameter is used in the GEN Modify Analog Control Channel Parameters Operation. It is:

System Identification Number [0-32767]

This parameter is described in the following paragraphs.

System Identification Number [0-32767]

This parameter allows you to specify the cellular telephone's System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone's permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

Example -- If your cellular telephone's SID number is 11111, enter 11111.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the GEN Modify Analog Control Channel Parameters Operation.

GEN Modify Digital Control Channel Parameters

This Operation is used to modify the cellular telephone's System Identification (SID) number and the digital control channel's (DCCH) digital verification color code (DVCC). It is recommended that you include this Operation at the beginning of a test suite to identify the SID, DCCH DVCC, and control channel for the cellular telephone. The channel number associated with this Operation will be control channel number. In the event that the first Operation is a Registration type, this Operation is not required because the Registration Operation will identify the control channel number. This Operation does not perform any tests, make any measurements, or compare any readings to limit specifications.

Parameters Used

The parameters used in the GEN Modify Digital Control Channel Parameters Operation are:

System Identification Number [0-32767]

DCCH DVCC [0-255]

These parameters are described in the following paragraphs.

System Identification Number [0-32767]

This parameter allows you to specify the cellular telephone's System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

Example -- If your cellular telephone's SID number is 11111, enter 11111.

DCCH DVCC [0-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital control channel.

The value is entered as an integer in the range 0 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the GEN Modify Digital Control Channel Parameters Operation.

CP Registration on Analog Control Channel

This Operation causes a cellular telephone to transmit registration data to the Test System. The Test System reads and decodes the cellular telephone's Reverse Control Channel (RECC) data and outputs the following registration information:

Cellular telephone number.

Serial number in both decimal and hexadecimal format.

Power class.

Transmission (continuous or discontinuous).

Bandwidth (20 MHz or 25 MHz).

The Operation functions as follows:

- The Test System transmits the Registration ID message repeatedly, with the value of the REGID field set alternately to 0 and 500. This induces the cellular telephone to register with the Test System.
- If an error occurs in this Operation, all testing is stopped.

A Registration on an analog channel, Registration on a digital channel, or Origination Operation must be run at least once before any Call Processing Operation may be run. If this is not done, you will be prompted to enter the cellular telephone number during testing. (Alternatively, you may enter the cellular telephone number in a parameter.) After the Registration or Origination Operation is run, it need not be run again for the Test System to perform other tests. The registration is remembered by the Test System unless it is erased by loading new test software, registering a different cellular telephone, or executing a **`SCRATCH C`** command in IBASIC.

In practical applications, there are three possibilities:

1. The test procedure performs a Registration or Origination Operation. This obtains the telephone number from the cellular telephone.
2. If you know the cellular telephone number, you enter it into the Phone Number (0=Use # from Reg/Orig) parameter.
3. If the cellular telephone number is not obtained through either of the above actions, the Test System will prompt the operator for it. The operator must then determine the number and supply it in response to the prompt.

Parameters Used

No parameters are used in the CP Registration on Analog Control Channel Operation.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Registration on Analog Control Channel Operation.

CP Registration on Digital Control Channel

This Operation causes a cellular telephone to transmit registration data to the Test System. The Test System reads and decodes the cellular telephone's Reverse Digital Control Channel (RDCCH) data while the telephone is camped on a digital control channel, and outputs the following registration information:

Cellular telephone number.

Serial number in both decimal and hexadecimal format.

Power class.

Transmission (continuous or discontinuous).

Bandwidth (20 MHz or 25 MHz).

The test works as follows:

- The Test System transmits the Registration ID message repeatedly, with the value of the REGID field set alternately to 0 and 500. This induces the cellular telephone to register with the Test System.
- If an error occurs in this Operation, all testing is stopped.

A Registration or Origination Operation must be run at least once before any Call Processing tests may be run. If not, you will be prompted to enter the cellular telephone number during testing. (Alternatively, you may enter the cellular telephone number in a parameter.) After the Registration or Origination Operation is run once, it need not be run again for the Test System to be able to perform other tests. The registration is remembered unless it is erased by loading new test software, registering a different cellular telephone, or executing a **`SCRATCH C`** command in IBASIC.

In practical applications, there are three possibilities:

1. The test procedure performs a Registration or Origination Operation. This obtains the telephone number from the cellular telephone.
2. If you know the cellular telephone number, you enter it into the Phone Number (0=Use # from Reg/Orig) parameter.
3. If the cellular telephone number is not obtained through either of the above actions, the Test System will prompt the operator for it. The operator must then determine the number and supply it in response to the prompt.

Parameters Used

No parameters are used in the CP Registration on Digital Control Channel Operation.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Registration on Digital Control Channel Operation.

CP Page from Analog Control Channel to Analog Voice Channel

This Operation simulates a call to the cellular telephone from the base station.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Specifically, in this Operation, the Test System does the following:

1. Performs a page to the cellular telephone
2. Performs 3 of 5 majority voting on the Reverse Control Message
3. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message
4. Sends an Initial Voice Channel Designation order to the cellular telephone, directing it to tune to the analog voice channel specified in the **`Channels`** field of the TESTS (Set Up) screen.
5. Sends an ALERT order to the cellular telephone by way of the forward voice channel (FVC)
6. Makes a supervisory audio tone (SAT) measurement on the initial voice channel to verify that the voice channel was obtained. The SAT measurement result is not displayed in this Operation.

Parameters Used

The parameters used in the CP Page from Analog Control Channel to Analog Voice Channel Operation are:

Source for Phone Number [Use Prev, Ph # Below, Prompt]

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

Source for Phone Number [Use Prev, Ph # Below, Prompt]

This parameter allows you to specify the location from which the Test System will obtain the cellular telephone number.

Three selections are provided in a one-of-many format: **`Use Prev`**, or **`Phone # Below`**, and **`Prompt`**. Selecting **`Use Prev`** causes the Test System to use the mobile identification number (MIN) obtained in a prior Registration or Origination Operation. If there was no prior Registration or Origination Operation, the Test System will prompt you to enter the telephone number. Selecting **`Phone # Below`** causes the Test System to use the Phone Number (0=Use # from Reg/Orig) parameter to obtain the cellular telephone number. Selecting **`Prompt`** causes the Test System to prompt you to enter the telephone number.

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

This parameter allows you to specify the telephone number of the cellular telephone being tested. It is ordinarily entered as a 10-digit real number in the range 0 through 9999999999, but it is sometimes advantageous to use a negative number.

Setting the phone number parameter to a negative number results in the Test System using a MIN consisting of all zeroes. An all-zeroes MIN is invalid according to Interim Standard 54. However, some cellular telephones have an all-zeroes MIN after manufacture or service. Thus, entering a negative number allows the Test System to page such cellular telephones.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Page from Analog Control Channel to Analog Voice Channel Operation.

CP Page from Analog Control Channel to Narrow Analog Voice Channel

This Operation simulates a call to the cellular telephone from the base station.

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Specifically, in this Operation, the Test System does the following:

1. Performs a page to the cellular telephone
2. Performs 3 of 5 majority voting on the Reverse Control Message
3. Tests each section of the page response, bit by bit
4. Sends an Initial Voice Channel Designation order to the cellular telephone, directing it to tune to the narrow analog voice channel specified in the **`Channels`** field of the TESTS (Set Up) screen.
5. Sends an ALERT order to the cellular telephone by way of the forward voice channel (FVC)
6. Checks the digital supervisory audio tone (DSAT) on the initial voice channel to verify that the voice channel was obtained. The DSAT measurement result is not displayed on this Operation.

Parameters Used

The parameters used in the CP Page from Analog Control Channel to Narrow Analog Voice Channel Operation are:

Source for Phone Number [[Use Prev, Ph # Below, Prompt]]

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

DSAT Vector [0-6]

Narrow Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

Source for Phone Number [Use Prev, Ph # Below, Prompt]

This parameter allows you to specify the location from which the Test System will obtain the cellular telephone number.

Three selections are provided in a one-of-many format: **`Use Prev`**, or **`Phone # Below`**, and **`Prompt`**. Selecting **`Use Prev`** causes the Test System to use the mobile identification number (MIN) obtained in a prior Registration or Origination Operation. If there was no prior Registration or Origination Operation, the Test System will prompt you to enter the telephone number. Selecting **`Phone # Below`** causes the Test System to use the Phone Number (0=Use # from Reg/Orig) parameter to obtain the cellular telephone number. Selecting **`Prompt`** causes the Test System to prompt you to enter the telephone number.

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

This parameter allows you to specify the telephone number of the cellular telephone being tested. It is ordinarily entered as a 10-digit real number in the range 0 through 9999999999, but it is sometimes advantageous to use a negative number.

Setting the phone number parameter to a negative number results in the Test System using a MIN consisting of all zeroes. An all-zeroes MIN is invalid according to Interim Standard 54. However, some cellular telephones have an all-zeroes MIN after manufacture or service. Thus, entering a negative number allows the Test System to page such cellular telephones.

DSAT Vector [0-6]

This parameter allows you to specify the Digital Supervisory Audio Tone (DSAT) sequence to be used whenever the cellular telephone is operating on a narrow voice channel.

The value is entered as an integer in the range 0 through 6.

The seven valid sequences are:

0 = 2556CB

1 = 255B2B

2 = 256A9B

3 = 25AD4D

4 = 26AB2B

5 = 26B2AD

6 = 2969AB

Example -- If you wish to use the first sequence shown above, enter 0.

Narrow Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a narrow analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Page from Analog Control Channel to Narrow Analog Voice Channel Operation.

CP Page from Analog Control Channel to Digital Traffic Channel

This Operation simulates a call to the cellular telephone from the base station.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Specifically, in this Operation, the Test System does the following:

1. Performs a page to the cellular telephone
2. Performs 3 of 5 majority voting on the Reverse Control Message
3. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message
4. Sends an Initial Traffic Channel Designation order to the cellular telephone, directing it to tune to the traffic channel specified in the **`Channels`** field of the TESTS (Set Up) screen
5. Sends a physical layer control FACCH message to the cellular telephone by the way of the forward digital traffic channel (FDTC)
6. Sends an ALERT order to the cellular telephone by way of the FDTC
7. Sends a Connect ACK message to the cellular telephone because the Test System is not able to respond quickly enough to an RDTC connect message (call answer) from the cellular telephone
8. Checks the digital verification color code (DVCC) on the initial traffic channel to verify that the traffic channel was obtained.

Parameters Used

The parameters used in the CP Page from Analog Control Channel to Digital Traffic Channel Operation are:

Source for Phone Number [Use Prev, Ph # Below, Prompt]

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Source for Phone Number [Use Prev, Ph # Below, Prompt]

This parameter allows you to specify the location from which the Test System will obtain the cellular telephone number.

Three selections are provided in a one-of-many format: **`Use Prev`**, or **`Phone # Below`**, and **`Prompt`**. Selecting **`Use Prev`** causes the Test System to use the mobile identification number (MIN) obtained in a prior Registration or Origination Operation. If there was no prior Registration or Origination Operation, the Test System will prompt you to enter the telephone number. Selecting **`Phone # Below`** causes the Test System to use the Phone Number (0=Use # from Reg/Orig) parameter to obtain the cellular telephone number. Selecting **`Prompt`** causes the Test System to prompt you to enter the telephone number.

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

This parameter allows you to specify the telephone number of the cellular telephone being tested. It is ordinarily entered as a 10-digit real number in the range 0 through 9999999999, but it is sometimes advantageous to use a negative number.

Setting the phone number parameter to a negative number results in the Test System using a MIN consisting of all zeroes. An all-zeroes MIN is invalid according to Interim Standard 54. However, some cellular telephones have an all-zeroes MIN after manufacture or service. Thus, entering a negative number allows the Test System to page such cellular telephones.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Page from Analog Control Channel to Digital Traffic Channel Operation.

CP Page from Digital Control Channel to Analog Voice Channel

This Operation simulates a call to the cellular telephone from the base station on the digital control channel specified by the Digital Control Channel Number parameter. It then issues an ALERT order to the telephone. You must press the cellular telephone's SEND key to respond. The test system then connects the cellular telephone on the analog voice channel specified in the **Channels** field of the TESTS (Set Up) screen.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

NOTE: If a PCS digital control channel is desired, the **Channels** field of the TESTS (Set Up) screen must include the H (hyper channel) indicator.

Parameters Used

The parameters used in the CP Page from Digital Control Channel to Analog Voice Channel Operation are:

Source for Phone Number [Use Prev, Ph # Below, Prompt]

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

Source for Phone Number [Use Prev, Ph # Below, Prompt]

This parameter allows you to specify the location from which the Test System will obtain the cellular telephone number.

Three selections are provided in a one-of-many format: **`Use Prev`**, or **`Phone # Below`**, and **`Prompt`**. Selecting **`Use Prev`** causes the Test System to use the mobile identification number (MIN) obtained in a prior Registration or Origination Operation. If there was no prior Registration or Origination Operation, the Test System will prompt you to enter the telephone number. Selecting **`Phone # Below`** causes the Test System to use the Phone Number (0=Use # from Reg/Orig) parameter to obtain the cellular telephone number. Selecting **`Prompt`** causes the Test System to prompt you to enter the telephone number.

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

This parameter allows you to specify the telephone number of the cellular telephone being tested. It is ordinarily entered as a 10-digit real number in the range 0 through 9999999999, but it is sometimes advantageous to use a negative number.

Setting the phone number parameter to a negative number results in the Test System using a MIN consisting of all zeroes. An all-zeroes MIN is invalid according to Interim Standard 54. However, some cellular telephones have an all-zeroes MIN after manufacture or service. Thus, entering a negative number allows the Test System to page such cellular telephones.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Page from Digital Control Channel to Analog Voice Channel Operation.

CP Page from Digital Control Channel to Digital Traffic Channel

This Operation simulates a call to the cellular telephone from the base station on the digital control channel specified by the Digital Control Channel Number parameter. It then issues an ALERT order to the telephone. You must press the cellular telephone's SEND key to respond. The test system then connects the cellular telephone on the digital traffic channel specified in the **`Channels`** field of the TESTS (Set Up) screen.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

NOTE: If a PCS digital control channel is desired, the **`Channels`** field of the TESTS (Set Up) screen must include the H (hyper channel) indicator.

Parameters Used

The parameters used in the CP Page from Digital Control Channel to Digital Traffic Channel Operation are:

Source for Phone Number [Use Prev, Ph # Below, Prompt]

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Source for Phone Number [Use Prev, Ph # Below, Prompt]

This parameter allows you to specify the location from which the Test System will obtain the cellular telephone number.

Three selections are provided in a one-of-many format: **`Use Prev`**, or **`Phone # Below`**, and **`Prompt`**. Selecting **`Use Prev`** causes the Test System to use the mobile identification number (MIN) obtained in a prior Registration or Origination Operation. If there was no prior Registration or Origination Operation, the Test System will prompt you to enter the telephone number. Selecting **`Phone # Below`** causes the Test System to use the Phone Number (0=Use # from Reg/Orig) parameter to obtain the cellular telephone number. Selecting **`Prompt`** causes the Test System to prompt you to enter the telephone number.

Phone Number (0=Use # from Reg/Orig) [–2 to 9999999999]

This parameter allows you to specify the telephone number of the cellular telephone being tested. It is ordinarily entered as a 10-digit real number in the range 0 through 9999999999, but it is sometimes advantageous to use a negative number.

Setting the phone number parameter to a negative number results in the Test System using a MIN consisting of all zeroes. An all-zeroes MIN is invalid according to Interim Standard 54. However, some cellular telephones have an all-zeroes MIN after manufacture or service. Thus, entering a negative number allows the Test System to page such cellular telephones.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Page from Digital Control Channel to Digital Traffic Channel Operation.

CP Origination from Analog Control Channel to Analog Voice Channel

This Operation simulates a call from the cellular telephone to the base station (cell site) by putting the cellular telephone in service and having the operator originate a call from the handset.

Specifically, in this Operation, the Test System does the following:

1. Simulates a control channel.
2. Prompts you to dial any telephone number (as many as 10 digits) after the cellular telephone has service. (Service is indicated by the cellular telephone NO SERVICE indicator extinguishing or the SERVICE indicator lighting.)
3. Performs 3 of 5 majority voting on the Reverse Control Message
4. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message, Wideband data
5. Sends an Initial Voice Channel Designation order to the cellular telephone directing it to tune to the voice channel specified in the **`Channels`** field of the TESTS (Set Up) screen.
6. Makes a supervisory audio tone (SAT) measurement on the initial voice channel to verify that the voice channel was obtained. The SAT measurement result is not displayed in this Operation.

It is not necessary to register the cellular telephone with the Test System by running a Registration Operation before running this Operation. This Operation will read the cellular telephone's Mobile Identification Number (MIN) and the Test System will retain it for use in performing other tests.

Parameters Used

The parameters used in the CP Origination from Analog Control Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **5970**, **6000**, and **6030** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **6000**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Origination from Analog Control Channel to Analog Voice Channel Operation.

CP Origination from Analog Control Channel to Narrow Analog Voice Channel

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

This Operation simulates a call from the cellular telephone to the base station (cell site) by putting the cellular telephone in service and having the operator originate a call from the handset.

Specifically, in this Operation, the Test System does the following:

1. Simulates a control channel.
2. Prompts you to dial any telephone number (as many as 10 digits) after the cellular telephone has service. (Service is indicated by the cellular telephone NO SERVICE indicator extinguishing or the SERVICE indicator lighting.)
3. Performs 3 of 5 majority voting on the Reverse Control Message.
4. Performs Bose-Chaudhuri-Hocqenghem (BCH) error detection and correction of the Reverse Control Message, Wideband data.
5. Sends an Initial Voice Channel Designation order to the cellular telephone directing it to tune to the voice channel specified in the **`Channels`** field of the TESTS (Set Up) screen.
6. Checks the digital supervisory audio tone (DSAT) on the initial voice channel to verify that the voice channel was obtained.

It is not necessary to register the cellular telephone with the Test System by running a Registration Operation before running this Operation. This Operation will read the cellular telephone's Mobile Identification Number (MIN) and the Test System will retain it for use in performing other tests.

Parameters Used

The parameters used in the CP Origination from Analog Control Channel to Narrow Analog Voice Channel Operation are:

DSAT Vector [0-6]

Narrow Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

DSAT Vector [0-6]

This parameter allows you to specify the Digital Supervisory Audio Tone (DSAT) sequence to be used whenever the cellular telephone is operating on a narrow voice channel.

The value is entered as an integer in the range 0 through 6.

The seven valid sequences are:

0 = 2556CB

1 = 255B2B

2 = 256A9B

3 = 25AD4D

4 = 26AB2B

5 = 26B2AD

6 = 2969AB

Example -- If you wish to use the first sequence shown above, enter 0.

Narrow Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a narrow analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Origination from Analog Control Channel to Narrow Analog Voice Channel Operation.

CP Origination from Analog Control Channel to Digital Traffic Channel

This Operation simulates a call from the cellular telephone to the base station by putting the cellular telephone in service and originating a call from the handset.

Specifically, in this Operation, the Test System does the following:

1. Simulates a control channel.
2. Prompts you to dial any telephone number (as many as 10 digits) after the cellular telephone has service. (Service is indicated by the cellular telephone NO SERVICE indicator extinguishing or the SERVICE indicator lighting.)
3. Performs 3 of 5 majority voting on the Reverse Control Message.
4. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message, Wideband data.
5. Sends an Initial Traffic Channel Designation order to the cellular telephone, directing it to tune to the traffic channel specified in the **`Channels`** field of the TESTS (Set Up) screen
6. Checks the digital verification color code (DVCC) on the initial traffic channel to verify that the traffic channel was obtained.

It is not necessary to register the cellular telephone with the Test System by running a Registration Operation before running this Operation. This Operation will read the cellular telephone's Mobile Identification Number (MIN) and the Test System will retain it for use in performing other tests.

Parameters Used

The parameters used in the CP Origination from Analog Control Channel to Digital Traffic Channel Operation are:

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Origination from Analog Control Channel to Digital Traffic Channel Operation.

CP Origination from Digital Control Channel to Analog Voice Channel

This Operation simulates a call from the cellular telephone to the base station by putting the cellular telephone in service and originating a call from the handset.

Specifically, in this Operation, the Test System does the following:

1. Simulates a control channel.
2. Prompts you to dial any telephone number (as many as 10 digits) after the cellular telephone has service. (Service is indicated by the cellular telephone NO SERVICE indicator extinguishing or the SERVICE indicator lighting.)
3. Performs 3 of 5 majority voting on the Reverse Control Message.
4. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message, Wideband data.
5. Sends an Initial Voice Channel Designation order to the cellular telephone, directing it to tune to the voice channel specified in the **Channels** field of the TESTS (Set Up) screen.
6. Makes a supervisory audio tone (SAT) measurement on the initial voice channel to verify that the voice channel was obtained. The SAT measurement result is not displayed in this Operation.

It is not necessary to register the cellular telephone with the Test System by running a Registration Operation before running this Operation. This Operation will read the cellular telephone's Mobile Identification Number (MIN) and the Test System will retain it for use in performing other tests.

Parameters Used

The parameters used in the CP Origination from Digital Control Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Origination from Digital Control Channel to Analog Voice Channel Operation.

CP Origination from Digital Control Channel to Digital Traffic Channel

This Operation simulates a call from the cellular telephone to the base station by putting the cellular telephone in service and originating a call from the handset.

Specifically, in this Operation, the Test System does the following:

1. Simulates a control channel.
2. Prompts you to dial any telephone number (as many as 10 digits) after the cellular telephone has service. (Service is indicated by the cellular telephone NO SERVICE indicator extinguishing or the SERVICE indicator lighting.)
3. Performs 3 of 5 majority voting on the Reverse Control Message.
4. Performs Bose-Chaudhuri-Hocquenghem (BCH) error detection and correction of the Reverse Control Message, Wideband data.
5. Sends an Initial Traffic Channel Designation order to the cellular telephone, directing it to tune to the traffic channel specified in the **`Channels`** field of the TESTS (Set Up) screen.
6. Checks the digital verification color code (DVCC) on the initial traffic channel to verify that the traffic channel was obtained.

It is not necessary to register the cellular telephone with the Test System by running a Registration Operation before running this Operation. This Operation will read the cellular telephone's Mobile Identification Number (MIN) and the Test System will retain it for use in performing other tests.

Parameters Used

The parameters used in the CP Origination from Digital Control Channel to Digital Traffic Channel Operation are:

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a traffic channel of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is paged to a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Origination from Digital Control Channel to Digital Traffic Channel Operation.

CP Handoff from Analog Voice Channel to Analog Voice Channel

This Operation performs an explicit handoff from one analog voice channel to another analog voice channel.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Analog Voice Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone (SAT) that will be used on analog voice channel. A SAT is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Analog Voice Channel to Analog Voice Channel Operation.

CP Handoff from Analog Voice Channel to Narrow Analog Voice Channel

This Operation performs an explicit handoff from an analog voice channel to a narrow analog voice channel.

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Analog Voice Channel to Narrow Analog Voice Channel Operation are:

DSAT Vector [0-6]

Narrow Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

DSAT Vector [0-6]

This parameter allows you to specify the Digital Supervisory Audio Tone (DSAT) sequence to be used whenever the cellular telephone is operating on a narrow voice channel.

The value is entered as an integer in the range 0 through 6.

The seven valid sequences are:

0 = 2556CB

1 = 255B2B

2 = 256A9B

3 = 25AD4D

4 = 26AB2B

5 = 26B2AD

6 = 2969AB

Example -- If you wish to use the first sequence shown above, enter 0.

Narrow Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on a narrow analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Analog Voice Channel to Narrow Analog Voice Channel Operation.

CP Handoff from Analog Voice Channel to Digital Traffic Channel

This Operation performs an explicit handoff from an analog voice channel Operation on a telephone channel to a digital traffic channel Operation on the same or another telephone channel.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Analog Voice Channel to Digital Traffic Channel Operation are:

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Analog Voice Channel to Digital Traffic Channel Operation.

CP Handoff from Narrow Analog Voice Channel to Analog Voice Channel

This Operation performs an explicit handoff from a narrow analog voice channel Operation on a telephone channel to an analog voice channel Operation on the same or another telephone channel.

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Narrow Analog Voice Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Narrow Analog Voice Channel to Analog Voice Channel Operation.

CP Handoff from Narrow Analog Voice Channel to Narrow Analog Voice Channel

This Operation performs an explicit handoff from a narrow analog voice channel Operation on a telephone channel to an narrow analog voice channel Operation on the same or another telephone channel.

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Narrow Analog Voice Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Narrow Analog Voice Channel to Analog Voice Channel Operation.

CP Handoff from Digital Traffic Channel to Digital Traffic Channel

This Operation performs an explicit handoff from one digital traffic channel Operation on a telephone channel to another digital traffic channel Operation on the same or another telephone channel.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Digital Traffic Channel to Digital Traffic Channel Operation are:

Digital Traffic Channel DVCC [1-255]

Digital Traffic Channel Slot [1-3]

Digital Traffic Channel Power Level [0-10]

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

These parameters are described in the following paragraphs.

Digital Traffic Channel DVCC [1-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital traffic channel.

The value is entered as an integer in the range 1 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Digital Traffic Channel Slot [1-3]

This parameter allows you to specify the timeslot assignment number to be transmitted to the cellular telephone.

The value is entered as an integer in the range 1 through 3.

Example -- If you wish the cellular telephone to be active on timeslots 2 and 4, enter 2.

Digital Traffic Channel Power Level [0-10]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on a digital traffic channel.

The value is entered as an integer in the range 0 through 10.

Example -- If you wish to use power level 10, enter 10.

Cellular Digital Traffic Channel Vocoder [VSELP/ACELP]

This parameter allows you to specify the type of speech decoding used during cellular digital traffic channel transmission. If the firmware revision in the HP 8920B is B.05.00 or later, this parameter is used when performing tests on IS-136 capable cellular telephones.

Example -- Two selections are provided in a one-of-many format: VSELP or ACELP. Selecting VSELP causes the Test System to use Vector-Sum Excited Linear Predictive coding (VSELP). Selecting ACELP causes the Test System to use Algebraic Code Excited Linear Predictive coding (ACELP).

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Digital Traffic Channel to Digital Traffic Channel Operation.

CP Handoff from Digital Traffic Channel to Analog Voice Channel

This Operation performs an explicit handoff from a digital traffic channel Operation on a telephone channel to an analog voice channel Operation on the same or another telephone channel.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Parameters Used

The parameters used in the CP Handoff from Digital Traffic Channel to Analog Voice Channel Operation are:

SAT Tone [5970, 6000, or 6030] Hz

Analog Voice Channel Power Level [0-7]

These parameters are described in the following paragraphs.

SAT Tone [5970, 6000, or 6030] Hz

This parameter allows you to specify the frequency of the supervisory audio tone that will be used on all analog voice channels. A supervisory audio tone (SAT) is an out-of-voice-band audio tone that is used for cell site identification.

Three selections are provided in a one-of-many format: **`5970`**, **`6000`**, and **`6030`** Hz.

One of the three tones is added to the voice transmission of all calls within an individual cell. The cellular telephone then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone that is filtered or regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT by a cellular telephone is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

Example -- If you wish to use 6000 Hz as the SAT, select **`6000`**.

Analog Voice Channel Power Level [0-7]

This parameter allows you to specify the power level at which the cellular telephone will transmit when it is operated on an analog voice channel.

The value is entered as an integer in the range 0 through 7.

Example -- If you wish to use power level 7, enter 7.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Handoff from Digital Traffic Channel to Analog Voice Channel Operation.

CP Release to Analog Control Channel

This Operation releases the cellular telephone from the current analog voice or digital traffic channel to the analog control channel specified by the Operation parameters.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Specifically, in this Operation, the Test System does the following:

1. Sets the cellular telephone to a voice channel (if it is not already on a voice channel).
2. Sends a release message to the cellular telephone.
3. Monitors the power continuously until the power drops below –25 dBW or until 6 seconds has passed, whichever occurs first.
4. Indicates that the test has failed if the 6-second limit is reached.

Parameters Used

The parameters used in the CP Release to Analog Control Channel Operation are:

Analog Control Channel Number [0-1023]

System Identification (SID) Number [0-32767]

These parameters are described in the following paragraphs.

Analog Control Channel Number [0-1023]

This parameter allows you to specify the control channel to be used by the cellular telephone.

The value is entered as an integer in the range 0 through 1023.

Control channels are numbered as follows:

Primary Control Channels, System A –– 1 through 133.

Primary Control Channels, System B — 334 though 366.

Secondary Control Channels, System A –– 667 through 716, and 991 through 1023.

Secondary Control Channels, System B — 717 through 799.

Some cellular telephones are designed to work only on System A or only on System B. For these cellular telephones, the control channel specified by this parameter must correspond to the correct system in order to allow the cellular telephone to obtain service.

Example -- If you wish to use control channel 333 to set up a call with the cellular telephone, verify that the control channel number corresponds to the correct system for your telephone, then enter 333.

System Identification (SID) Number [0-32767]

This parameter allows you to specify the cellular telephone's System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

NOTE: To perform testing in a non-roaming environment, this parameter must be equal to the cellular telephone home system ID. To perform testing in a roaming environment, this parameter must use an ID different from that of the cellular telephone.

Example -- If your cellular telephone's SID number is decimal 11111, enter 11111.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Release to Analog Control Channel Operation.

CP Release to Digital Control Channel

This Operation releases the cellular telephone from the current analog voice or digital traffic channel to the digital control channel specified by the Operation parameters.

NOTE: For information on explicit and implicit call processing, see **"Testing Strategy" on page 108**.

Specifically, in this Operation, the Test System does the following:

1. Sets the cellular telephone to a digital traffic channel (if it is not already on a digital traffic channel).
2. Sends a release message to the cellular telephone.
3. Waits for a release acknowledgment for the cellular telephone, or until 6 seconds has passed, whichever occurs first.
4. Indicates that the test has failed if the 6-second limit is reached.

Parameters Used

The parameters used in the CP Release to Digital Control Channel Operation are:

Digital Control Channel Number [0-1023]

System Identification (SID) Number [0-32767]

DCCH DVCC [0-255]

These parameters are described in the following paragraphs.

Digital Control Channel Number [0-1023]

This parameter allows you to specify the control channel to be used by the cellular telephone.

The value is entered as an integer in the range 0 through 1023.

The control channel number may be any valid cellular channel number from 1 through 799 and 990 through 1023.

NOTE: Some cellular telephones will operate only with a digital control channel in a particular range. In such instances, you must determine the telephone programming from the telephone documentation and select an appropriate control channel number.

Example -- If you wish to use control channel 333 to set up a call with the cellular telephone, enter 333.

System Identification (SID) Number [0-32767]

This parameter allows you to specify the cellular telephone’s System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

NOTE: To perform testing in a non-roaming environment, this parameter must be equal to the cellular telephone home system ID. To perform testing in a roaming environment, this parameter must use an ID different from that of the cellular telephone.

Example -- If your cellular telephone’s SID number is decimal 11111, enter 11111.

DCCH DVCC [0-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital control channel.

The value is entered as an integer in the range 0 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Release to Digital Control Channel Operation.

CP Hook Flash

This Operation verifies that the correct hook-flash number (3 digits) is correctly sent by the cellular telephone.

Specifically, in this Operation, the Test System does the following:

1. Establishes a voice channel (if it is not already on a voice channel).
2. Prompts you to dial a 3-digit number and press the cellular telephone's SEND key.
3. If the channel is a wide voice channel, the Test System detects the resulting signaling tone from the cellular telephone and sends a "send called address" order to the cellular telephone on the forward voice channel (FVC).

NOTE: Step 3 does not occur on narrow voice channels.

4. Receives the hook-flash number from the cellular telephone on the reverse voice channel (RVC) and displays it, but does not compare it to a specific value or number.

Parameters Used

No parameters are used in the CP Hook Flash Operation.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the CP Hook Flash Operation.

TXA Audio Distortion

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the level of the demodulated carrier audio distortion.

NOTE: The Test System does not include expandor circuitry. If your testing conditions require correction for this situation, you must change the limits in the TXA Audio Distortion pass/fail limits specifications as required.

Transmitter audio distortion is expressed as a percentage.

Also, this Operation uses the C-Message audio filter or the CCITT audio filter if it is installed in the Test Set.

Parameters Used

No parameters are used in the TXA Audio Distortion Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Audio Distortion Operation. It is:

Audio Distortion

This specification is described in the following paragraphs.

Audio Distortion

This specification sets the pass/fail limits used when measuring the audio distortion that is acceptable in the transmitter. Only the upper limit is used.

The value is entered as a decimal number, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Distortion and Noise

Example -- If you wish to use an upper limit of 5 percent, enter 5.

TXA Audio Frequency Response

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures how closely the frequency deviation of the transmitter follows a 6-dB/octave pre-emphasis slope over a specified frequency range. The test results indicate the flatness of the audio output as frequency is varied. Audio frequency response is expressed in dB error from the 6-dB/octave pre-emphasis slope.

This Operation is intended to be used between the audio response frequencies of 300 Hz and 3000 Hz only. However, the start frequency and stop frequency within that range are selectable through parameters, as is the step size to be used in the testing.

Background

Audio frequency response is measured at a 2.9-kHz peak deviation for wide voice channels and a 1.5-kHz peak deviation for narrow voice channels.

The frequency response measurement is made with the rms detector and is made with respect to a 1-kHz reference rate.

Parameters Used

The parameters used in the TXA Audio Frequency Response Operation are:

TX Audio Start Frequency [300-3000] Hz

TX Audio Step Frequency [0-2700] Hz

TX Audio Stop Frequency [300-3000] Hz

These parameters are described in the following paragraphs.

TX Audio Start Frequency [300-3000] Hz

This parameter allows you to specify the start frequency to be used in varying the input signal frequency in cellular telephone audio frequency response testing.

The value is entered as a real number, in Hz, in the range 300-3000.

Example -- If you wish to vary the modulation frequency, starting at a frequency of 1200 Hz, enter 1200.

TX Audio Step Frequency [0-2700] Hz

This parameter allows you to specify the step size used to vary the input signal frequency in cellular telephone audio frequency response testing.

The value is entered as a real number in the range 0-2700, in Hz.

Example -- If you wish to vary the modulation frequency from a start frequency to a stop frequency in 500-Hz steps, enter 500.

NOTE: If you specify a step frequency of 0, the Test System performs the Operation at the specified start frequency, then performs the Operation again, and again, indefinitely, until you stop it manually. This feature allows you to test the cellular telephone repetitively at a particular frequency.

TX Audio Stop Frequency [300-3000] Hz

This parameter allows you to specify the stop frequency to be used in varying the input signal frequency in cellular telephone audio frequency response testing.

The value is entered as a real number, in Hz, in the range 300-3000.

Example -- If you wish to vary the modulation frequency, stopping at a frequency of 2800 Hz, enter 2800.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Audio Frequency Response Operation are:

Deviation from 6 dB/octave

Response Roll >2.5 kHz

These specifications are described in the following paragraphs.

Deviation from 6 dB/octave

This specification sets the pass/fail limits used for the degree of closeness with which the frequency deviation of the transmitter follows the prescribed 6-dB/octave pre-emphasis characteristic curve.

The values are entered in decimal numbers, as upper and lower limits, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmit-Audio Response

Example -- If you wish to specify that, from 300 to 3000 Hz, the audio frequency response should not vary more than –1 dB and 3 dB from a true 6-dB/octave pre-emphasis curve, enter –1 as the lower limit and 3 as the upper limit

Response Roll >2.5 kHz

This specification sets the upper Pass/Fail Limit of the transmitter audio frequency response roll-off that is acceptable when the audio input is greater than 2.5 kHz.

The value is entered as a decimal number, in dB (dB/octave).

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmit-Audio Response

Example -- If an upper audio frequency roll-off of 6 dB/octave is permissible at audio input frequencies greater than 2.5 kHz, enter 6.

TXA Compressor Response

This Operation measures the compressor zero reference deviation and operating range. For every 2-dB change in input level, there should be a nominal output level change of 1 dB.

Specifically, in this Operation, the Test System sets the deviation to 2.9 kHz (1.5 kHz for narrow analog) and takes a reference with the rms detector. The voltage used to achieve a 2.9-kHz deviation is displayed as “TXA cmp volt for 2.9 kHz dev”. Compressor response is expressed in kHz for the zero reference deviation, and in dB of tracking error over the indicated operating range.

Also, this Operation uses the C-Message audio filter or the CCITT audio filter, if it is installed in the Test System.

Background

A compressor is used in the cellular telephone’s voice input circuitry to decrease the variability of the modulation because of volume changes from the speaker. In combination with an expandor in the cell site receiver, this provides improved signal-to-noise-ratio in the demodulated audio.

Parameters Used

The parameters used in the TXA Compressor Response Operation are:

Compressor Start Level [–30 to 25] dB

Compressor Step Level [0 to 55] dB

Compressor Stop Level [–30 to 25] dB

These parameters are described in the following paragraphs.

Compressor Start Level [–30-25] dB

This parameter allows you to specify the start level to be used in varying the input level to the expandor in cellular telephone compressor response testing.

The value is entered as a real number, in dB, in the range –30 to 25.

Example -- If you wish to start varying the relative input level at –5 dB, enter –5.

Compressor Step Level [0-55] dB

This parameter allows you to specify the step size to be used in varying the input level to the expandor in cellular telephone compressor response testing.

The value is entered as a real number, in dB, in the range 0 to 55.

Example -- If you wish to step the variance in the relative input level in 5-dB steps, enter 5.

Compressor Stop Level [–30-25] dB

This parameter allows you to specify the stop level to be used in varying the input level to the expandor in cellular telephone compressor response testing.

The value is entered as a real number, in dB, in the range –30 to 25.

Example -- If you wish to stop varying the relative input level at 20 dB, enter 20.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Compressor Response Operation are:

Compressor Tracking Error <0 dB

Compressor Tracking Error >0 dB

Compressor Minimum Output @>17.6 dB

These specifications are described in the following paragraphs.

Compressor Tracking Error <0 dB

This specification sets the pass/fail limits that are used when the compressor circuits are measured with the relative input levels below 0 dB. In this condition, the compressor relative output deviation tolerance should be within the limits that you set in this specification for the compressor track error.

The value is entered as a decimal number, as lower and upper limits, in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Compressor

Example -- If your standard sets the output voltage tolerance to ±1.0 dB from the compressor curve in **figure 29 on page 180**, enter –1.0 as the lower limit and 1.0 as the upper limit.

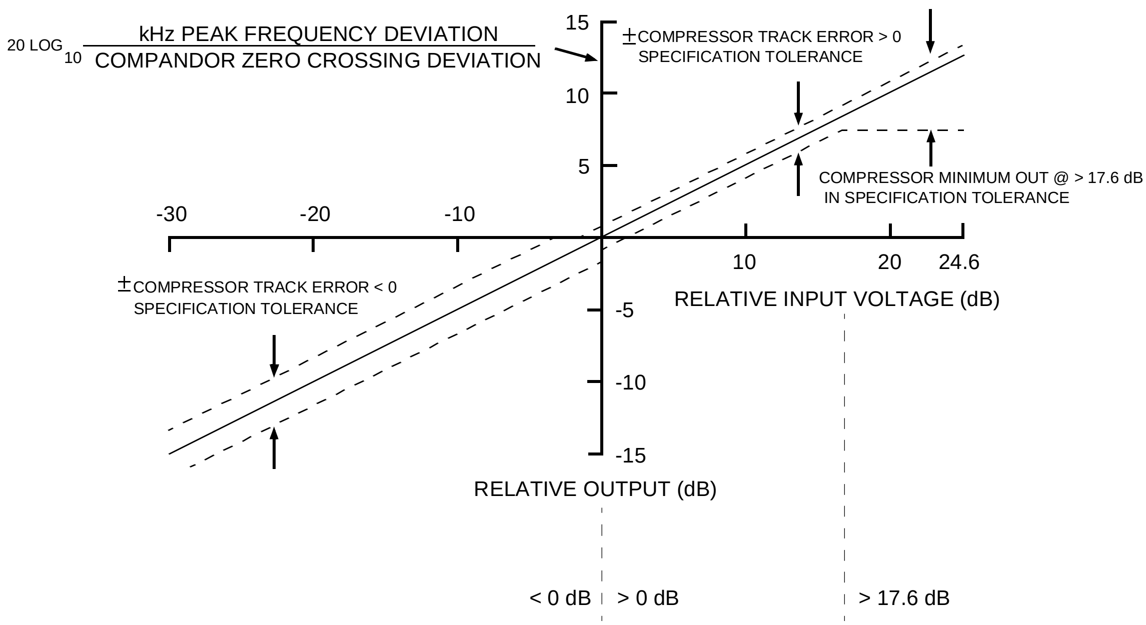

Figure 29 **Compressor Curve**

Compressor Tracking Error >0 dB

This specification sets the pass/fail limits that are used when the compressor circuits are measured with the relative input levels above 0 dB. In this condition, the compressor relative output deviation tolerance should be within the limits that you set in this specification for the compressor track error.

The value is entered as a decimal number, as upper and lower limits, in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Compressor

Example -- If your standard sets the output voltage tolerance to ±.5 dB from the compressor curve in **figure 29 on page 180**, enter –.5 as the lower limit and .5 as the upper limit.

NOTE: The lower limit (LL) used in the TXA Compressor Response Test when the relative input level is >17.6 dB is calculated using the following formula:

$$LL = -\left(\frac{RelativeInputVoltage}{2} - (8.8 - UpperLimitCompressorTrackingError > 0\text{ dB})\right)$$

Example for lower limit specification when the relative input level is 20 dB:

$$LowerLimit = -\left(\frac{20}{2} - 8.3\right) = 1.7$$

TXA Current Drain

This Operation measures the average power supply current drawn by the cellular telephone transmitter when it is keyed. The transmitter current drain is expressed in amperes. This Operation measures current drain using either of two methods, dependent upon whether an external HP-IB programmable power supply is available. The Test System determines this at the beginning of the Operation.

If an HP-IB power supply has been configured, the current drain is measured via the programmable power supply over the HP-IB (see **"Configuring the Rear-Panel DC-Current Measurement" on page 184**).

If an HP-IB power supply is not available, the Test System measures current drain through the rear-panel dc current measurement capability of the Test System (see **"Configuring the Rear-Panel DC-Current Measurement" on page 184**).

This Operation is not specified by EIA/TIA standards.

A Hewlett-Packard programmable dc power supply is required for this Operation if an HP-IB power supply is to be configured. A power supply with sufficient voltage and current capabilities from the following series must be used:

- HP 664xA
- HP 665xA
- HP 667xA
- HP 668xA

Configuring an HP-IB Power Supply

The following procedure describes configuring the power supply through the HP-IB on the Test System:

1. Connect the power supply's HP-IB interface to the Test System's HP-IB interface with an HP-IB cable of appropriate length.
2. Press the TESTS key. The TESTS (Main Menu) screen will appear.
3. From the **SET UP TEST SET:** list, select **Cnfg External Devices** to switch to the TESTS (External Devices) screen.
4. Move the cursor to the **Inst#** field and select it.
5. Rotate the CURSOR CONTROL knob until an empty **Calling Name** field appears, and select it.
6. Using the list of characters in the **Choices:** menu, enter the words "POWER SUPPLY" in the **Calling Name** field. Select **Done** when complete.
7. Move the cursor to the **Model** field and select it (optional).
8. Using the DATA keypad and list of characters in the **Choices:** menu, enter the Model # and press the ENTER key.
9. Move the cursor to the **Addr** (address) field and select it.
10. Using the DATA keypad, enter **7XX** (X = 1 through 30) for the HP-IB address and press the ENTER key.
11. From the **To Screen** menu, select **More**.
12. From the **Choices:** menu, select **IO CONFIG** to switch to the I/O CONFIGURE screen.
13. Move the cursor to the **Mode** field and select it.
14. From the **Choices:** menu, select **Control**.
15. Press the TESTS key to switch to the TESTS (Main Menu) screen. The power supply is ready to be controlled by the Test System when the current drain test is run.

Configuring the Rear-Panel DC-Current Measurement

NOTE: The dc current measurement function must be zeroed prior to the measurement.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`To Screen`** list, select **`AF ANL`** to switch to the AF ANALYZER screen.
3. Move the cursor to the **`DC Current`** field and select it (this should be done before any current is applied to the Test System's measurement terminals). This zeroes the dc current measurement function.
4. Use a power supply that provides the appropriate voltage and current for your cellular telephone.
5. Connect the positive lead of the power supply to the positive terminal (banana) of the dc current measurement connectors in the lower-left area of the Test Set's rear panel.
6. Connect the negative terminal (banana) of the dc current measurement connector to the positive terminal of the cellular telephone's power supply input.
7. Connect the negative terminal of the power supply directly to the negative terminal of the cellular telephone's power supply input.
8. The Test System automatically measures the current passing through the rear-panel connection. Make certain that there is no HP-IB power supply configured in the TESTS (External Devices) screen (see **"Configuring an HP-IB Power Supply" on page 183**).

Parameters Used

One parameter is used in the TXA Current Drain Operation. It is:

Power Lvl at which Current Drain Tested [0, 0-7, 2-7, 0 & 7, or 7]

This parameter is described in the following paragraphs.

Power Lvl at which Current Drain Tested [0, 0-7, 2-7, 0 & 7, or 7]

This parameter allows you to specify the power level at which current drain is tested.

Five selections are provided in a one-of-many format. These are:

`0` causes current to be measured at power level 0 only.

`0-7` causes current to be measured at power levels 0 through 7.

`2-7` causes current to be measured at power levels 2 through 7.

`0 & 7` causes current to be measured at power level 0 and 7.

`7` causes current to be measured at power level 7 only.

Example -- If you wish to measure the power drain at power levels 2, 3, 4, 5, 6, and 7, select **`2-7`**.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Current Drain Operation are:

Current Drain @ Levels 0-2

Current Drain @ Levels 3-7

These specifications are described in the following paragraphs.

Current Drain @ Levels 0-2

This specification sets the pass/fail limits for current consumption in transmitter tests at RF output power levels 0-2.

The values are entered as decimal numbers, as upper and lower limits, in amperes.

Pass/fail limits specifications are determined using any applicable standard, such as:

- Cellular Telephone Specification: Current Consumption, Transmit

Example -- If you determine that the transmitter current consumption specification should be 3.0 ±.5 amps for RF output power levels 0-2, enter 2.5 as the lower limit and 3.5 as the upper limit.

Current Drain @ Levels 3-7

This specification sets the pass/fail limits for current consumption in transmitter tests at RF output power levels 3-7.

The value is entered as a decimal number, as upper and lower limits, in amperes.

Pass/fail limits specifications are determined using any applicable standard, such as:

- Cellular Telephone Specification: Current Consumption, Transmit

Example -- If you determine that the transmitter current consumption specification should be 2.5 amps ±.5 amps for RF output power levels 3-7, enter 2.0 as the lower limit and 3.0 as the upper limit.

TXA Digital Signaling Tone Deviation and Code

NOTE: This is an NAMPS-only Operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

This Operation measures the deviation and code of the cellular telephone’s audio digital signaling tone (DST).

The peak deviation of the digital signaling tone (DST) is measured and the DST sequence is decoded and reported in hexadecimal.

Since this Operation is run in the “maintenance mode” where the Test System is waiting for an answer, you must press the cellular telephone’s SEND key to exit the Operation.

Background

The digital signaling tone (DST) is generated by the cellular telephone and is transmitted to the cell site for confirming orders (such as Alert, Audit, and Change Power.), and for signaling flash and release requests.

The DST is a 24-bit digital sequence that is transmitted continuously at 200 NRZ bits/second and that produces an average peak deviation of 700 Hz. Each DST sequence is the logical inverse of a corresponding digital supervisory audio tone (DSAT) sequence.

CAUTION: In narrow voice channels, an open microphone on your cellular telephone might affect the results of this Operation. If your cellular telephone has an open microphone, this Operation must be performed in a quiet environment.

Parameters Used

No parameters are used in the TXA Digital Signaling Tone Deviation and Code Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Digital Signaling Tone Deviation and Code Operation. It is:

DSAT Deviation

This specification is described in the following paragraphs.

DSAT Deviation

This specification sets the pass/fail limits that are used for peak frequency deviation measurements of the DSAT sequence transmitted by the cellular telephone on a narrow voice channel.

The values are entered as decimal numbers, as upper and lower limits.

Pass/fail limits specifications are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example -- If the standard states that the peak frequency deviation for the DSAT sequence must be ±700 Hz with a ±10-percent tolerance, enter 630 as the lower limit and 770 as the upper limit.

TXA Dual-Tone-Multiple-Frequency Key Pad and Dual-Tone-Multiple-Frequency Frequency Error

This Operation measures the cellular telephone transmitter's Dual-Tone-Multiple-Frequency (DTMF) frequency error for the cellular telephone's key pad. The low-tone (LT) and high-tone (HT) DTMF frequencies for each selected key are checked to make certain that the frequencies are within the DTMF frequency error limits for the nominal values.

The Test Software displays, on the Test Set's screen, a series of underscore marks, one for each DTMF telephone key. You may press the cellular telephone keys in any order, and, as you press the each key, the Test Software will display the number or symbol above the associated underscore, thus marking the keys that you have pressed.

DTMF frequency error is expressed as a percentage.

Background

There are two groups of sinusoidal high and low frequencies consisting of 1209, 1336, and 1477 Hz (high tones, or HT's) in one group, and 609, 770, and 941 Hz (low tones, or LT's) in the other group.

A DTMF signal is generated when a telephone handset key is pressed. Each dialing key makes use of one assigned frequency from each group. The DTMF signal is encoded and transmitted for control purposes when dialing an origination from the cellular telephone.

Parameters Used

No parameters are used in the TXA Dual-Tone-Multiple-Frequency Key Pad & Dual-Tone-Multiple-Frequency Frequency Error Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Dual-Tone Multiple-Frequency Key Pad & Dual-Tone Multiple-Frequency Error Operation. It is:

DTMF Frequency Error

This specification is described in the following paragraphs.

DTMF Frequency Error

This specification sets the pass/fail limits for the amount of frequency error allowed for the DTMF (Dual-Tone Multiple-Frequency) signals.

The values are entered as decimal numbers, as upper and lower limits, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Dual Tone Multiple-Frequency (DTMF) Signaling, Transmitted Pulse Characteristics

Example -- If you determine that the seven tone frequencies in the high and low group DTMF signals should be within ±1.5 percent of the nominal values, enter –1.5 as the lower limit and 1.5 as the upper limit.

TXA Digital Supervisory Audio Tone Deviation, Closure, and Phase Jitter

NOTE: This is a NAMPS-only operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

This Operation measures the deviation, closure, and phase jitter of the cellular telephone's digital supervisory audio tone (DSAT) response to the system prompt.

The Test System transmits DSAT sequence #3=25AD4D, which is a 24-bit digital sequence, continuously at 200 NRZ bits/second, in hexadecimal, to the cellular telephone. It produces an average peak deviation of 700 Hz. Seven different sequences are defined.

In this Operation, the cellular telephone detects the transmitted DSAT and responds. The Test System measures and reports the peak deviation of the DSAT returned by the telephone. The Test System then performs an eye-pattern test on the DSAT, and measures and reports the closure and phase jitter.

Parameters Used

One parameter is used in the TXA Digital Supervisory Audio Tone Deviation, Closure, and Phase Jitter Operation. It is:

DSAT Vector

This parameter is described in the following paragraphs.

DSAT Vector

This parameter allows you to specify the Digital Supervisory Audio Tone (DSAT) sequence to be used whenever the cellular telephone is operating on a narrow voice channel.

The value is entered as an integer in the range 0 through 6.

The seven valid sequences are:

0 = 2556CB

1 = 255B2B

2 = 256A9B

3 = 25AD4D

4 = 26AB2B

5 = 26B2AD

6 = 2969AB

Example -- If you wish to use the first sequence shown above, enter 0.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Digital Supervisory Audio Tone Deviation, Closure, and Phase Jitter Operation are:

DSAT Closure

DSAT Deviation

DSAT Phase Jitter

These specifications are described in the following paragraphs.

DSAT Closure

This specification sets the pass/fail limits that are used when closure of the eye pattern (see **figure 30**) is measured for the DSAT transmitted by the cellular telephone on a narrow voice channel.

The values are entered as decimal numbers, and as upper and lower limits.

Pass/fail limits specifications are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example -- If you determine that the eye pattern closure must be greater than .65, enter .65 as the lower limit and 1 as the upper limit.

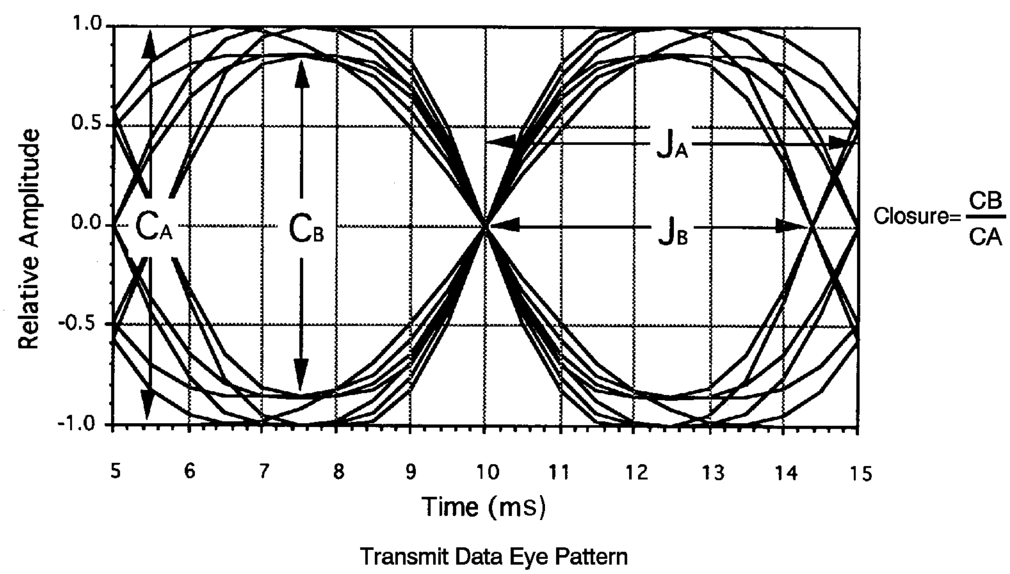

Figure 30 **Transmit Data Eye Pattern, DSAT Closure**

DSAT Deviation

This specification sets the pass/fail limits that are used for peak frequency deviation measurements of the DSAT sequence transmitted by the cellular telephone on a narrow voice channel.

The values are entered as decimal numbers, and as upper and lower limits.

Pass/fail limits specifications are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example -- If the standard states that the peak frequency deviation for the DSAT sequence must be ±700 Hz with a ±10-percent tolerance, enter 630 as the lower limit and 770 as the upper limit.

DSAT Phase Jitter

This specification sets the pass/fail limits that are used when phase jitter of the eye pattern (see **figure 31**) is measured for the DSAT transmitted by the cellular telephone on a narrow voice channel.

The values are entered as decimal numbers, and as upper and lower limits.

Pass/fail limits specifications are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example -- If the standard states that the phase jitter of the eye pattern must be less than .15, enter .15 as the upper limit and 0 as the lower limit.

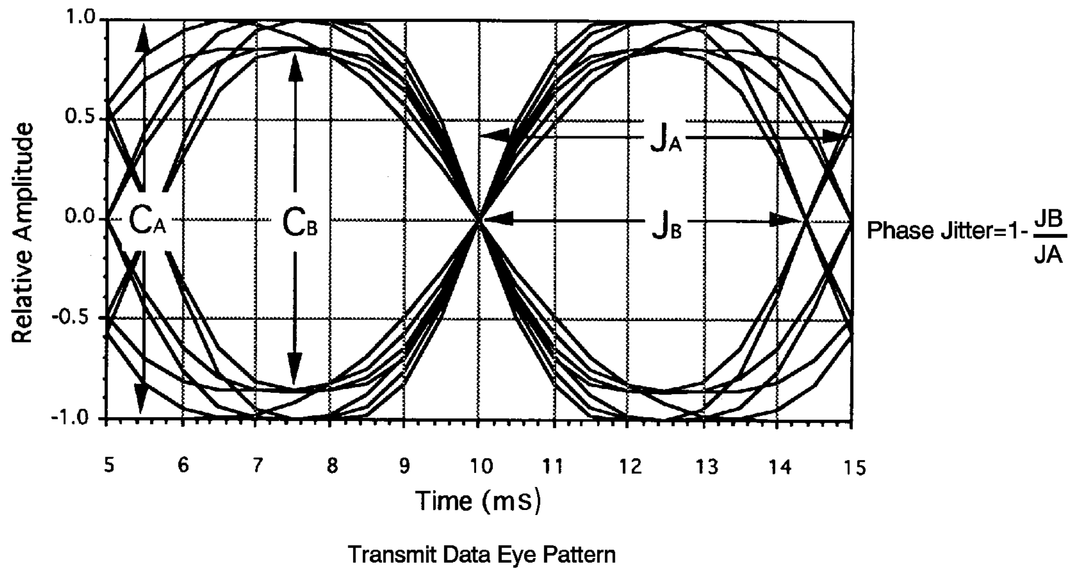

Figure 31 **Transmit Data Eye Pattern, DSAT Phase Jitter**

TXA FM Hum and Noise

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the cellular telephone transmitter's output for the ratio of residual frequency modulation to the standard test modulation.

NOTE: The Test System does not include expandor circuitry. If your testing conditions require correction for this situation, you must change the limits in the TXA FM Hum and Noise pass/fail limits specification as required.

FM hum and noise is expressed in dB, from the formula:

$-20 \times \text{Log}(\text{Reference Deviation} \div \text{Present Deviation})$

NOTE: An open microphone on your cellular telephone might affect the results of this Operation. If your cellular telephone has an open microphone, this Operation must be performed in a quiet environment.

Parameters Used

No parameters are used in the TXA FM Hum and Noise Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA FM Hum and Noise Operation. It is:

FM Hum and Noise

This specification is described in the following paragraphs.

FM Hum and Noise

This specification sets the pass/fail limits for the transmitter's residual FM hum and noise.

The value is entered as a decimal number, as the upper limit only, in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: FM Hum and Noise

Example -- If you determine that FM hum and noise should be at least 32 dB below the level of a 1-kHz tone at ±8 kHz deviation, enter –32.

TXA Frequency Error

This Operation measures the cellular telephone transmitter's output for the difference between the unmodulated carrier frequency and the assigned carrier frequency. TX frequency error is measured on a voice channel with voice modulation off, and SAT modulation on.

The frequency error is expressed in parts-per-million (ppm).

Parameters Used

No parameters are used in the TXA Frequency Error Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Frequency Error Operation. It is:

Frequency Error

This specification is described in the following paragraphs.

Frequency Error

This specification sets the pass/fail limits for the transmitter's carrier frequency error.

The values are entered as decimal numbers, as upper and lower limits, and in ppm (parts per million).

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Frequency Requirements, Frequency Stability

Example -- If you determine that the carrier frequency should be maintained within ±2.5 parts per million (ppm) of any assigned channel frequency, enter –2.5 as the lower limit and 2.5 as the upper limit.

TXA Modulation Deviation Limiting on Analog Voice Channel

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the capability of the transmitter's circuits to prevent the cellular telephone's transmitter from producing deviations in excess of the system specification when the telephone is operating on an analog voice channel. This Operation measures the Peak+ and the Peak– values of the instantaneous (INST) and steady state (SS) modulation and indicates whether the modulation is symmetrical. Symmetry is based upon the difference between positive and negative swings of the carrier at any level of modulation. Modulation limiting is expressed in kHz; modulation symmetry is expressed in a percent difference between positive and negative swings of the carrier.

Specifically, in this Operation, the Test System does the following:

1. Sets the audio generator's frequency to 1 kHz.
2. Sets the audio generator's level to produce an 8-kHz deviation by the cellular telephone.
3. Increases the audio generator's level by 20 dB.
4. Repeats Steps 2 and 3 three times, and holds and reports the maximum peak frequency deviation.
5. Steps the audio generator frequency from a start frequency to a stop frequency as specified in the Audio Start Frequency and Audio Stop Frequency parameters, in increments specified in the Audio Step Frequency parameter, while the audio generator level is maintained at the 20-dB overdrive. Peak frequency deviation is measured at each step.

Parameters Used

The parameters used in the TXA Modulation Limiting on Analog Voice Channel Operation are:

Audio Start Frequency [300-3000] Hz

Audio Step Frequency [0-2700] Hz

Audio Stop Frequency [300-3000] Hz

These parameters are described in the following paragraphs.

Audio Start Frequency [300-3000] Hz

This parameter allows you to specify the start frequency to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on an analog voice channel.

The value is entered as a real number, in Hz, and in the range 300 through 3000.

Example -- If you wish to start the measurement at 500 Hz, enter 500.

Audio Step Frequency [0-2700] Hz

This parameter allows you to specify the step size to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on an analog voice channel.

The value is entered as a real number, in Hz, and in the range 0 through 2700.

Example -- If you wish to step the measurement in 200-Hz steps, enter 200.

NOTE: If you specify a step frequency of 0, the Test System performs the Operation at the specified start frequency, then performs the Operation again, and again, indefinitely, until you stop it manually. This feature allows you to test the cellular telephone repetitively at a particular frequency.

Audio Stop Frequency [300-3000] Hz

This parameter allows you to specify the stop frequency to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on an analog voice channel.

The value is entered as a real number, in Hz, and in the range 300 through 3000.

Example -- If you wish to stop the measurement at 2500 Hz, enter 2500.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Modulation Limiting on Analog Voice Channel Operation. It is:

Modulation Deviation Limiting On AVC

This specification is described in the following paragraphs.

Modulation Deviation Limiting On AVC

This specification sets the pass/fail limits when the cellular telephone's transmitter circuits are tested for the capability to prevent the transmitter from producing peak deviation in excess of the system specification for analog voice channels.

The value is entered as a decimal number, as the upper limit only, and in kHz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Deviation Limiting

Example -- If you determine that the instantaneous peak and steady-state deviations of the transmitter should not exceed the rated system peak frequency deviation of ±12 kHz, enter 12 as the upper limit.

TXA Modulation Deviation Limiting on Narrow Analog Voice Channel

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

NOTE: This is an NAMPS-only Operation.

This Operation measures the capability of the transmitter circuits to prevent the cellular telephone transmitter from producing deviations in excess of the system specification when the telephone is operating on a narrow analog voice channel.

The Operation measures the Peak+ and the Peak– values of the instantaneous (INST) and steady state (SS) modulation and indicates whether the modulation is symmetrical. Symmetry is based upon the difference between positive and negative swings of the carrier at any level of modulation. Modulation limiting is expressed in kHz; modulation symmetry is expressed in a percent difference between positive and negative swings of the carrier.

Specifically, in this Operation, the Test System does the following:

1. Sets the audio generator’s frequency to 1 kHz.
2. Sets the audio generator’s level to produce an 8-kHz deviation by the cellular telephone.
3. Increases the audio generator’s level by 20 dB.
4. Repeats Steps 2 and 3 three times, and holds and reports the maximum peak frequency deviation.
5. Steps the audio generator’s frequency from a start frequency to a stop frequency as specified in the Audio Start Frequency and Audio Stop Frequency parameters, in increments specified in the Audio Step Frequency parameter, while the audio generator level is maintained at the 20-dB overdrive. Peak frequency deviation is measured at each step.

Parameters Used

The parameters used in the TXA Modulation Deviation Limiting on Narrow Analog Voice Channel Operation are:

Audio Start Frequency [300-3000] Hz

Audio Step Frequency [0-2700] Hz

Audio Stop Frequency [300-3000] Hz

These parameters are described in the following paragraphs.

Audio Start Frequency [300-3000] Hz

This parameter allows you to specify the start frequency to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on a narrow analog voice channel.

The value is entered as a real number, in Hz, and in the range 300 through 3000.

Example -- If you wish to start the measurement at 500 Hz, enter 500.

Audio Step Frequency [0-2700] Hz

This parameter allows you to specify the step size to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on a narrow analog voice channel.

The value is entered as a real number, in Hz, and in the range 0 through 2700.

Example -- If you wish to step the measurement in 200-Hz steps, enter 200.

NOTE: If you specify a step frequency of 0, the Test System performs the Operation at the specified start frequency, then performs the Operation again, and again, indefinitely, until you stop it manually. This feature allows you to test the cellular telephone repetitively at a particular frequency.

Audio Stop Frequency [300-3000] Hz

This parameter allows you to specify the stop frequency to be used in measuring the cellular telephone transmitter's output in modulation deviation testing on a narrow analog voice channel.

The value is entered as a real number, in Hz, and in the range 300 through 3000.

Example -- If you wish to stop the measurement at 2500 Hz, enter 2500.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXA Modulation Deviation Limiting on Narrow Analog Voice Channel Operation. It is:

Modulation Deviation Limiting On N-AVC

This specification is described in the following paragraphs.

Modulation Deviation Limiting On N-AVC

This specification sets the pass/fail limits when the cellular telephone's transmitter circuits are tested for the capability to prevent the transmitter from producing peak deviation in excess of the system specification for narrow analog voice channels.

The value is entered as a decimal number, as the upper limit only, and in kHz.

Pass/fail limits specifications are defined any applicable standard, such as:

- EIA Standard: Modulation Deviation Limiting

Example -- If you determine that the instantaneous peak and steady-state deviations of the transmitter should not exceed the rated system peak frequency deviation of ±12 kHz, enter 12 as the upper limit.

TXA RF Power Output

This Operation measures the power at the output terminals of the cellular telephone's transmitter when the output terminals are connected to a 50-ohm load. This Operation is ordinarily performed at the nominal supply voltage, but it may be performed with high and low supply voltages for extreme measurements.

High and low supply voltages are measured only if the Test at Extreme Supply Voltages parameter is set to test at extremes (see **"GEN Modify External Power Supply Parameters" on page 117**), and only if an external programmable power supply is available and has been configured to be used over HP-IB by the Test System. See **"TXA Current Drain" on page 182** for details on configuring an HP-IB power supply.

Ordinarily, all power levels are tested. However, this Operation allows you to select only the levels that you wish to test. Output power is expressed in watts or dBm by selection in the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Parameters Used

The parameters used in the TXA RF Power Output Operation are:

Test Output Power Level 0 [Yes, or No]

Test Output Power Level 1 [Yes, or No]

Test Output Power Level 2 [Yes, or No]

Test Output Power Level 3-6 [Yes, or No]

Test Output Power Level 7 [Yes, or No]

These parameters are described in the following paragraphs.

Test Output Power Level 0 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power level 0.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test at power level 0. Selecting **`No`** causes the Test System to skip the test at power level 0.

Test Output Power Level 1 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power level 1.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test at power level 1. Selecting **`No`** causes the Test System to skip the test at power level 1.

Test Output Power Level 2 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power level 2.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test at power level 2. Selecting **`No`** causes the Test System to skip the test at power level 2.

Test Output Power Level 3-6 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power levels 3 through 6.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test at power levels 3 through 6. Selecting **`No`** causes the Test System to skip the test at power levels 3 through 6.

Test Output Power Level 7 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power level 7.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test at power level 7. Selecting **`No`** causes the Test System to skip the test at power level 7.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA RF Power Output Operation are:

Output Power at Level 0

Output Power at Level 1

Output Power at Level 2

Output Power at Level 3

Output Power at Level 4

Output Power at Level 5

Output Power at Level 6

Output Power at Level 7

These specifications are described in the following paragraphs.

Output Power at Levels 0 through 7

These specifications set the pass/fail limits for output power levels 0 through 7, as measured in analog and/or digital tests at the transmitter's output terminal. Each power level limit is separate and may be set as required.

The values are entered as decimal numbers, in dBW.

NOTE: Units for power measurement are set by the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**). Units for pass/fail limits specifications are always dBW, regardless of the units for power measurement. If units for power measurement are other than dBW, the Test Software will convert the pass/fail limits specifications to the appropriate units automatically.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmitter Output Power

NOTE: Values for power levels in the standard are for effective radiated power (ERP) and not as measured directly from the cellular telephone. Power levels will be higher when measured directly from the cellular telephone.

Example -- If you determine that the output power levels should be maintained within the range of 2 dB and –4 dB of the nominal values over a specified temperature range, enter the values as shown in **table 6 on page 208** for the lower limit and the upper limit for power levels of 0 through 7.

Table 6 **Power Levels Example**

Power Level	Nominal Value (dBW)	Lower Limit (dBW)	Upper Limit (dBW)
Level 0	6	2	8
Level 1	2	–2	4
Level 2	–2	–6	0
Level 3	–6	–10	–4
Level 4	–10	–14	–8
Level 5	–14	–18	–12
Level 6	–18	–22	–16
Level 7	–22	–26	–20

TXA RF Power Output vs Channel (Plotted)

This Operation measures the power at the output terminals of the cellular telephone transmitter when the output terminals are connected to a 50-ohm load, then plots the output power in relation to channel number in the range of channels specified by the Operation parameters. At each channel measurement, a point is located in an X-Y plot, where the X axis represents increasing channel numbers, and the Y axis represents measured power, in watts or dBm. The measurement points are connected by a straight line to produce a plot of power versus channels.

NOTE: The number of the channel at which the Test System was working at the time that this Operation is encountered is irrelevant for the Operation. The Test System performs an implicit handoff to the channel specified as the start channel in the Operation and then performs the rest of the Operation. At the conclusion of the Operation, the Test Software hands the cellular telephone off to the channel specified for the next Operation.

This Operation is performed at the nominal supply voltage.

Ordinarily, all power levels are tested. However, this Operation allows you to select only the levels that you wish to test.

Output power is expressed in watts or dBm by selection in the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Parameters Used

The parameters used in the TXA RF Power Output vs Channel (Plotted) Operation are:

TXA Power Start Channel Number [1-799, 991-1023]

TXA Power Step Channel Number [1-1023]

TXA Power Stop Channel Number [1-799, 991-1023]

TXA Output Power Levels Tested [0, 0-7, 2-7, 0 & 7, or 7]

These parameters are described in the following paragraphs.

TXA Power Start Channel Number [1-799, 991-1023]

This parameter allows you to specify the start channel to be used in constructing a plot of the cellular telephone transmitter's output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on an analog channel.

The value is entered as an integer in the ranges 1 through 799 and 991 through 1023.

Example -- If you wish to start the plot at channel 55, enter 55.

TXA Power Step Channel Number [1-1023]

This parameter allows you to specify the step size to be used in constructing a plot of the cellular telephone transmitter's output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on an analog channel.

The value is entered as an integer in the range 0 through 1023.

Example -- If you wish to step the plot in 20-channel increments, enter 20.

TXA Power Stop Channel Number [1-799, 991-1023]

This parameter allows you to specify the stop channel to be used in constructing a plot of the cellular telephone transmitter's output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on an analog channel.

The value is entered as an integer in the ranges 1 through 799 and 991 through 1023.

Example -- If you wish to stop the plot at channel 799, enter 799.

TXA Output Power Levels Tested [0, 0-7, 2-7, 0 & 7, or 7]

This parameter allows you to specify the output power levels to be tested and plotted in relation to channel numbers.

Five selections are provided in a one-of-many format. These are:

`0` causes current to be measured and plotted at power level 0 only.

`0-7` causes current to be measured and plotted at power levels 0 through 7.

`2-7` causes current to be measured and plotted at power levels 2 through 7.

`0 & 7` causes current to be measured and plotted at power level 0 and 7.

`7` causes current to be measured and plotted at power level 7 only.

Example -- If you wish to plot the power output at power levels 2, 3, 4, 5, 6, and 7, select **`2-7`**.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA RF Power Output vs Channel (Plotted) Operation are:

Output Power at Level 0

Output Power at Level 1

Output Power at Level 2

Output Power at Level 3

Output Power at Level 4

Output Power at Level 5

Output Power at Level 6

Output Power at Level 7

These specifications are described in the following paragraphs.

Output Power at Levels 0 through 7

These specifications set the pass/fail limits for output power levels 0 through 7, as measured in analog and/or digital tests at the transmitter output terminal. Each power level limit is separate and may be set as required.

The values are entered as decimal numbers, in dBW.

NOTE: Units for power measurement are set by the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**). Units for pass/fail limits specifications are always dBW, regardless of the units for power measurement. If units for power measurement are other than dBW, the Test Software will convert the pass/fail limits specifications to the appropriate units automatically.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmitter Output Power

NOTE: Values for power levels in the standard are for effective radiated power (ERP) and not as measured directly from the cellular telephone. Power levels will be higher when measured directly from the cellular telephone.

Example -- If you determine that the output power levels should be maintained within the range of 2 dB and –4 dB of the nominal values over a specified temperature range, enter the values as shown in **table 7** for the lower limit and the upper limit for power levels of 0 through 7.

Table 7 Power Levels Example

Power Level	Nominal Value (dBW)	Lower Limit (dBW)	Upper Limit (dBW)
Level 0	6	2	8
Level 1	2	–2	4
Level 2	–2	–6	0
Level 3	–6	–10	–4
Level 4	–10	–14	–8
Level 5	–14	–18	–12
Level 6	–18	–22	–16
Level 7	–22	–26	–20

TXA Signaling Tone Frequency and Deviation

This Operation measures the frequency and deviation of the cellular telephone's signaling tone (ST).

The Operation measures the signaling tone's (ST) frequency and peak deviation. Since the SAT is always on in this Operation, deviation is measured with the rms detector, and both with ST on and with the ST off. The peak deviation of the ST is calculated from the two readings (ST on and ST off). Therefore, test results indicate peak deviation, not peak+ or peak–.

Since this Operation is run in the "maintenance mode", where the base station is waiting for an answer, you must press the cellular telephone's SEND key to exit the test.

Background

The ST is a 10-kHz tone generated by the cellular telephone on a wide voice channel. It is transmitted to the cell site for confirming orders (such as Alert, Audit, and Change Power) and for signaling flash and release requests.

Parameters Used

No parameters are used in the TXA Signaling Tone Frequency and Deviation Operation.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Signaling Tone Frequency and Deviation Operation are:

Signaling Tone Deviation

Signaling Tone Frequency

These specifications are described in the following paragraphs.

Signaling Tone Deviation

This specification sets the pass/fail limits for the signaling tone’s peak frequency deviation.

The values are entered as decimal numbers, as upper and lower limits, and in kHz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Signaling Tone (ST)

Example -- If you determine that the nominal peak frequency deviation of the carrier produced by the signaling tone should be ±8 kHz with a ±10% tolerance, enter 7.2 as the lower limit and 8.8 as the upper limit.

Signaling Tone Frequency

This specification sets the pass/fail limits for the signaling tone’s frequency accuracy.

The values are entered as decimal numbers, as upper and lower limits, and in Hz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Signaling Tone (ST)

Example -- If you determine that the Signaling Tone frequency should be 10 kHz ±1 Hz, enter 9999 as the lower limit and 10001 as the upper limit.

TXA Supervisory Audio Tone Frequency Error and Deviation

This Operation measures the frequency error and deviation of the cellular telephone's response to the three supervisory audio tones (SATs). The rms detector is used for measuring SAT deviation. The SAT deviation is then converted to a peak reading.

Background

Three frequencies (5970, 6000, and 6030 Hz) are used as supervisory audio tones (SAT) for signaling. One of the three tones is added to the wide channel voice transmission by a cell site. The cellular telephone then detects the tone and modulates the transmitted voice-channel carrier with a constant (relative) phase tone that is regenerated from the received tone to establish a closed loop between the cellular telephone and the cell site. Transmission of the SAT is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

NOTE: This Operation uses the 6 kHz Bandpass Filter (Test Set Option 014), if it is installed. If the filter is not included in the Test Set, and the cellular telephone has an open microphone, the readings might be affected by background noise. If your cellular telephone has an open microphone, this Operation must be performed in a quiet environment.

Parameters Used

The parameters used in the TXA Supervisory Audio Tone Frequency Error and Deviation Operation are:

Test SAT Tone 5970 [Yes, or No]

Test SAT Tone 6000 [Yes, or No]

Test SAT Tone 6030 [Yes, or No]

These parameters are described in the following paragraphs.

Test SAT Tone 5970 [Yes, or No]

This parameter allows you to specify whether the 5970-Hz tone will be tested during testing in the Supervisory Audio Tone Frequency Error and Deviation Operation.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test. Selecting **`No`** causes the Test System to ignore the test.

Test SAT Tone 6000 [Yes, or No]

This parameter allows you to specify whether the 6000-Hz tone will be tested during testing in the Supervisory Audio Tone Frequency Error and Deviation Operation.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test. Selecting **`No`** causes the Test System to ignore the test.

Test SAT Tone 6030 [Yes, or No]

This parameter allows you to specify whether the 6030-Hz tone will be tested during testing in the Supervisory Audio Tone Frequency Error and Deviation Operation.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test System to perform the test. Selecting **`No`** causes the Test System to ignore the test.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Supervisory Audio Tone Frequency Error and Deviation Operation are:

SAT Deviation

SAT Frequency Error

These specifications are described in the following paragraphs.

SAT Frequency Deviation

This specification sets the pass/fail limits for the SAT tone's peak frequency deviation.

The values are entered as decimal numbers, as upper and lower limits, and in kHz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Supervisory Audio Tone (SAT)

Example -- If you determine that the peak frequency deviation of each transponded SAT should be 2 kHz ±.2 kHz, enter 1.8 as the lower limit and 2.2 as the upper limit.

SAT Frequency Error

This specification sets the pass/fail limits for the SAT tone frequency accuracy.

The values are entered as decimal numbers, as upper and lower limits, and in Hz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Supervisory Audio Tone (SAT)

Example -- If you determine that any one of the three SAT tones should not vary in frequency more than ±1 Hz, enter –1 as the lower limit and 1 as the upper limit.

TXA Wideband Data Deviation

This Operation measures the Peak+ and Peak– frequency deviation of the cellular telephone’s output data burst.

The Operation provides three possible methods of testing. These are described in the following paragraphs.

In the first method, the Test System measures the Peak+ and Peak– frequency deviation of the data in the entire reverse voice channel (RVC) burst to ensure that it is within the specified limits. The Test System tests the entire burst by sending the FVC message 5 times while the Peak+ hold detector is on, and another 5 times while the Peak– hold detector is on.

This method is selected by setting the Data Portion Tested parameter to **`Trans`**.

In the second method, the Test System first performs the test on the steady state portion of the RVC data signal, then on the entire signal (as described in the first method).

The Test System performs the steady state portion of the test by measuring the RVC data signal between 20 milliseconds and 50 milliseconds following the beginning of the data burst. The Test System compares the Peak + and Peak – results with the values in the Steady State Deviation pass/fail limits specification. It then compares the results of the transient portion of the test with the values in the Transient Data Deviation pass/fail limits specification.

This method is selected by setting the Data Portion Tested parameter to **`Both`**.

In the third method, the Test System performs the test on only the steady state portion of the RVC data signal (as described in the second method).

This method is selected by setting the Data Portion Tested parameter to **`Steady`**.

Background

In all three methods, the cellular telephone should blank the supervisory audio tone (SAT) before sending the RVC message; therefore, SAT deviation should not be included in the deviation measurement. If the cellular telephone has an open microphone, the readings might be affected by background noise. In this case, mute the handset.

Using the first method, Hewlett-Packard Company has found that some cellular telephones fail this Operation because the telephones produce a carrier frequency transient at the beginning of wideband data transmission. This causes the peak frequency deviation to exceed the maximum specification of ±8 kHz ±10 percent (or a total of ±8.8 kHz) specified in the EIA/TIA IS-55 Standard. This transient typically occurs during the first 10 milliseconds of the wideband data transmission from the telephone. The Test System measures the FM peak deviation during the entire period while the telephone transmits its data and holds and displays only the highest positive and negative peaks detected. The Test Set has a fast peak detector that captures the peak deviation that occurs over the entire period, including the deviation that occurs in the first 10 milliseconds. The measurement method conforms to the EIA/TIA IS-55 Standard.

Applications:

RVC data are Manchester-encoded data that are used for cellular system signaling and control. Manchester encoding is accomplished by transforming each NRZ (non-return to zero) binary one to a zero-to-one transition and each NRZ binary zero to a one-to-zero transition. The data stream is then used to modulate the transmitter carrier using direct binary frequency-shift keying (FSK).

On the wide voice channels, the data rate is 10 kilobits/second and the nominal peak transmitted deviation is 8 kHz. All other modulation sources to the transmitter are inhibited when the data are transmitted (“blank and burst”).

On the narrow voice channels, the data rate is 100 bits/second and the nominal peak transmitter deviation is 700 Hz. The data words are inserted into the DSAT data stream. The transmitter is modulated simultaneously by voice audio and the data stream.

Parameters Used

One parameter is used in the TXA Wideband Data Deviation Operation. It is:

Data Portion Tested [Steady, Trans, or Both]

This parameter is described in the following paragraphs.

Data Portion Tested [Steady, Trans, or Both]

This parameter allows you to specify the mode for execution of the Operation.

Three selections are provided in a one-of-many format. These are:

`Steady` causes the Test System to perform the test on only the steady-state portion of the data burst from the cellular telephone.

`Trans` causes the Test System to perform the test on only the transient portion of the data burst from the cellular telephone.

`Both` causes the Test System to perform the test on both the steady-state and transient portions of the data burst from the cellular telephone.

Example -- If you wish to test only the transient portion of the data burst, select **`Transient`**.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXA Wideband Data Deviation Operation are:

Steady State Data Deviation

Transient Data Deviation

These specifications are described in the following paragraphs.

Steady State Data Deviation

This specification sets the pass/fail limits for the Steady State Data deviation.

The values are entered as decimal numbers, as upper and lower limits, and in kHz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: Wideband Data

Example -- If you determine that the frequency deviation should be ±8 kHz with a ±10-percent tolerance, enter 7.2 as the lower limit and 8.8 as the upper limit.

Transient Data Deviation

This specification sets the pass/fail limits for the transient portion of the TXA Wideband Data Deviation Operation.

The values are entered as decimal numbers, as upper and lower limits, and in kHz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: Wideband Data

Example -- If you determine that the frequency deviation should be ±8 kHz with a ±10-percent tolerance, enter 7.2 as the lower limit and 8.8 as the upper limit.

RXA Audio Distortion

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the distortion from the cellular telephone receiver when a standard test tone (a –50 dBm RF signal) is applied to the receiver antenna. The –50 dBm RF signal is modulated to deviate to 8 kHz at a 1-kHz rate with a 6000-Hz supervisory audio tone (SAT) present. Narrow analog operation uses 3 kHz deviation and DSAT.

NOTE: This Operation uses the C-Message audio filter or the CCITT audio filter if it is installed in the Test System.

Parameters Used

No parameters are used in the RXA Audio Distortion Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA Audio Distortion Operation. It is:

Audio Distortion

This specification is described in the following paragraphs.

Audio Distortion

This specification sets the pass/fail limits used when the receiver's audio distortion is measured while receiving the Standard RF Level.

The value is entered as a decimal number, as the upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Audio Harmonic Distortion

Example -- If you determine that the audio distortion should not exceed 5 percent at a normal audio output, enter 5 as the upper limit.

RXA Audio Frequency Response

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the capability of the cellular telephone receiver's audio output circuitry to follow a 6-dB/octave de-emphasis curve, as well as to follow an audio-bandpass response. The signal specified by the Analog Voice Channel Power Level parameter (see **"CP Page from Analog Control Channel to Analog Voice Channel" on page 126**) is applied with a constant deviation. The modulation rate is swept over the audio frequency-response range, from a specified start level, to a specified stop level, in specified increments.

Specifically, in this Operation, the Test System does the following:

1. Applies a –50 dBm RF signal to the cellular telephone receiver's antenna.
2. Modulates the –50 dBm RF signal to deviate to 2.9 kHz at a 1-kHz rate with a supervisory audio tone (SAT) present and makes a reference. (Narrow analog operation uses 1.5-kHz deviation and DSAT.)
3. Sweeps the frequency rate over the desired range and measures the response.
4. Applies a 2:1 correction to the measured results if the compandor is set to **`Always On`**.

Receiver audio frequency response is expressed in dB error from a 6-dB/octave curve.

Parameters Used

The parameters used in the RXA Audio Frequency Response Operation are:

RX Audio Start Frequency [300-3000] Hz

RX Audio Step Frequency [0-2700] Hz]

RX Audio Stop Frequency [300-3000] Hz

Compandor State [Always On, Controllable]

These parameters are described in the following paragraphs.

RX Audio Start Frequency [300-3000] Hz

This parameter allows you to specify the start frequency to be used in varying the input signal frequency in cellular telephone's audio frequency response testing.

The value is entered as a real number, in Hz, and in the range 300-3000.

Example -- If you wish to vary the modulation frequency, starting at a frequency of 1200 Hz, enter 1200.

RX Audio Step Frequency [0-2700] Hz

This parameter allows you to specify the step size used to vary the input signal frequency in cellular telephone's audio frequency response testing.

The value is entered as a real number, in Hz, and in the range 0-2700.

Example -- If you wish to vary the modulation frequency from a start frequency to a stop frequency in 500-Hz steps, enter 500.

NOTE: If you specify a step frequency of 0, the Test System performs the Operation at the specified start frequency, then performs the Operation again, and again, indefinitely, until you stop it manually. This feature allows you to test the cellular telephone repetitively at a particular frequency.

RX Audio Stop Frequency [300-3000] Hz

This parameter allows you to specify the stop frequency to be used in varying the input signal frequency in cellular telephone audio frequency response testing.

The value is entered as a real number, in Hz, and in the range 300-3000.

Example -- If you wish to vary the modulation frequency, stopping at a frequency of 2800 Hz, enter 2800.

Compandor State [Always On, Control]

This parameter allows you to specify the cellular telephone compandor's operating mode. The selections are **`Always On`**, and **`Controllable`**.

NOTE: If the compandor is selected to be enabled, the Test System assumes that the cellular telephone's compressor circuitry is located before the pre-emphasis circuitry in the transmitter, and after the de-emphasis circuitry in the receiver.

If **`Always On`** is selected, the effects of an "ideal expandor" are removed from the test results. Audio Frequency Response results are reduced by half. Also, the test operator is not prompted to turn the compandor "ON" and "OFF".

If **`Control`** is selected, you will be prompted to turn the cellular telephone's compandor on as appropriate during testing. Some manual control of the cellular telephone compandor state is required.

Pass/Fail Limits Used

The pass/fail limits specifications used in the RXA Audio Frequency Response Operation are:

Deviation from –6 dB/Oct 400 Hz-2400 Hz

Deviation from –6 dB/Oct <400 Hz & >2400 Hz

These specifications are described in the following paragraphs.

Deviation from –6 dB/Oct 400 Hz-2400 Hz

This specification sets the pass/fail limits used in testing the audio frequency response of the cellular telephone receiver's audio output circuitry, with the audio response tested against the standard 6-dB/octave de-emphasis curve. The audio response should not deviate beyond the specification limits over the frequency range of 400 to 2400 Hz.

The values are entered as decimal numbers, as upper and lower limits, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Voice Audio Frequency Response

Example -- If you determine that the audio response should not deviate more than 1 to –3 dB over the frequency range of 400 to 2400 Hz, enter –3 as the lower limit and 1 as the upper limit.

Deviation from –6 dB/Oct <400 Hz & >2400 Hz

This specification sets the pass/fail limits used in testing the audio frequency response for the cellular telephone receiver’s audio output circuitry, with the audio response tested against the standard 6-dB/octave de-emphasis curve. The audio response should not deviate beyond the pass/fail limits specifications in the regions of 300 to 400 Hz and 2400 to 3000 Hz.

The values are entered as decimal numbers, as upper and lower limits, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Voice Audio Frequency Response

Example -- If you determine that the audio response should not deviate more than 1 to –6 dB over the frequency range of 300 to 400 Hz and 2400 to 3000 Hz, enter –6 as the lower limit and 1 as the upper limit.

RXA Expandor

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the cellular telephone expandor's zero reference level and operating range. For every 1 dB change in input level, there should be a nominal output level change of 2 dB.

Expandor response is expressed in dBV for the zero reference level, and in dB for the tracking error over the indicated operating range.

Specifically, in this Operation, the Test System does the following:

1. Measures the expandor response at a 1-kHz rate and an RF input level of –50 dBm.
2. Applies a 2.9-kHz (1.5 kHz for narrow analog operation) deviation and measures the "zero crossing" of the receiver. This value is retained as the reference level.
3. The input is varied from the start level specified in the Expandor Start Level parameter to the stop level specified in the Expandor Stop Level parameter, in increments as specified in the Expandor Step Level parameter.
4. Deviation is varied over the range and the expandor response relative to the "zero crossing" point is calculated.

Background

An expandor is used to provide the complement of the compressor in the cell site transmitter. Together, the compressor and expandor provide improved signal-to-noise-ratio in the demodulated audio.

Parameters Used

The parameters used in the RXA Expandor Operation are:

Expandor Start Level [–21 to 12.3] dB

Expandor Step Level [0 to 33.3] dB

Expandor Stop Level [–21 to 12.3] dB

These parameters are described in the following paragraphs.

Expandor Start Level [–21 to 12.3] dB

This parameter allows you to specify the starting value to be used in varying the input level to the expandor in testing.

The value is entered as a real number, in dB, and in the range –21 through 12.3.

Example -- If you wish to start varying the input level to the expandor at –10 dB, enter 10.

Expandor Step Level [0 to 33.3] dB

This parameter allows you to specify the step size to be used in varying the input level to the expandor in testing.

The value is entered as a real number, in dB, and in the range 0 through 33.3.

Example -- If you wish to step the input level to the expandor in 2-dB increments, enter 2.

Expandor Stop Level [–21 to 12.3] dB

This parameter allows you to specify the ending value to be used in varying the input level to the expandor in testing.

The value is entered as a real number, in dB, and in the range –21 through 12.3.

Example -- If you wish to stop varying the input level to the expandor at 8 dB, enter 8.

Pass/Fail Limits Used

The pass/fail limits specifications used in the RXA Expandor Operation are:

Expandor Tracking Error <0 dB

Expandor Tracking Error >0 dB

Expandor Zero Reference Level

These specifications are described in the following paragraphs.

Expandor Tracking Error <0 dB

This specification sets the pass/fail limits used when the expandor's output level is measured at input levels below the 0 dB reference level (see **figure 32 on page 232**). The output voltage tolerance should be within the pass/fail limits specifications.

The values are entered as decimal numbers, as upper and lower limits, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Expandor

Example -- If you determine that the output voltage tolerance below the 0 dB reference level should be ±2 dB, enter –2 as the lower limit and 2 as the upper limit.

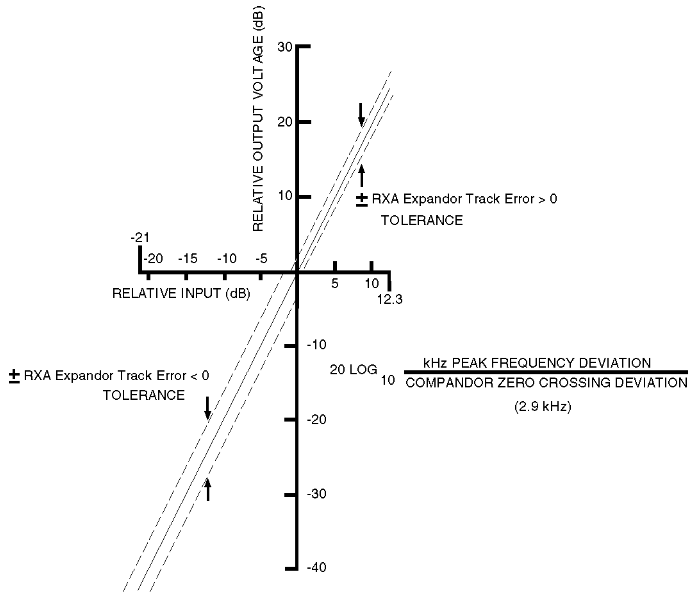

Figure 32 Expandor Tracking Error

Expandor Tracking Error >0 dB

This specification sets the pass/fail limits used when the expandor's output level is measured at input levels above the 0 dB reference level (see **figure 32**). The output voltage tolerance should be within the pass/fail limits specifications.

The values are entered as decimal numbers, as upper and lower limits, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Expandor

Example -- If you determine that the output voltage tolerance above the 0 dB reference level should be ±1 dB, enter –1 as the lower limit and 1 as the upper limit.

Expandor Zero Reference Level

This specification sets the pass/fail limits used when the expandor’s output voltage is measured at the 0 dB reference level.

The values are entered as decimal numbers, as upper and lower limits, and in dBV rms.

Pass/fail limits specifications are determined using any applicable standard, such as:

- The applicable Cellular Telephone Specification

The Expandor Zero Reference Level is not specified in the EIA/TIA standard for NADC or NAMPS cellular telephones. The test is performed and pass/fail limits specifications are available so that you may measure the Expandor Zero Reference Level and compare the result to specifications that meet testing requirements.

If you do not wish to compare the measurement results to specifications, set the *Check* setting in the pass/fail limits specification for TXA Compressor Zero Reference Deviation to *None (see* **"Verifying and Editing Pass/Fail Limits Specifications" on page 96** and **see "Specifying Pass/Fail Limits," in chapter 3, on page 103**).

Example -- If you wish the output voltage from the receiver to be –20 dBV rms ±1 dB, enter – 21 as the lower limit and –19 as the upper limit.

RXA Forward Voice Channel Order Message Error Rate

This Operation simulates sending a forward voice channel (FVC) order message from the Test System to the cellular telephone and measures the Order Message Error Rate.

Specifically, in this Operation, the Test System does the following:

1. Sends a forward voice channel (FVC) audit message 100 times and counts the number of acknowledgments from the cellular telephone.
2. Sets the RF level as specified by the RF Level for Message Error Rate Test parameter.
3. Terminates the Operation if the cellular telephone misses 10 acknowledgments in a row.

The FVC order message error rate is expressed in percent.

Parameters Used

One parameter is used in the RXA Forward Voice Channel Order Message Error Rate Operation. It is:

RF Level for Message Error Rate Test [–30 to –120] dBm

This parameter is described in the following paragraphs.

RF Level for Message Error Rate Test [–30 to –120] dBm

This parameter allows you to specify the RF signal level to be used for testing the cellular telephone forward voice channel (FVC) message error rate. The standard level required for call processing tests is –100 dBm. The typical level is –50 dBm.

The value is entered as a real number, in dBm, and in the range –120 to –30.

Example -- If you wish to use an RF level of –50 dBm, enter –50.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA Forward Voice Channel Order Message Error Rate Operation. It is:

Order Message Error Rate (OMER)

This specification is described in the following paragraphs.

Order Message Error Rate (OMER)

This specification sets the pass/fail limits for testing the receiver as it processes the forward voice channel (FVC) order message.

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: FVC Order Message

Example -- If you determine that the order message error rate should not exceed 5 percent, enter 5 as the upper limit.

RXA Hum and Noise

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation measures the ratio, expressed in dB, of the cellular telephone's residual audio output in the absence of modulation, to the rated audio output.

Also, this Operation uses the C-Message audio filter or the CCITT audio filter, if it is installed in the Test System.

Specifically, in this Operation, the Test System does the following:

1. Applies a −50 dBm RF signal to the receiver antenna.

2. Modulates the −50 dBm RF signal to deviate to 8 kHz at a 1-kHz rate with a SAT present. (Narrow analog operation uses a 3-kHz deviation and DSAT.) The SAT is always on during this Operation.

Parameters Used

No parameters are used in the RXA Hum and Noise Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA Hum and Noise Operation. It is:

RXA Hum and Noise

This specification is described in the following paragraphs.

RXA Hum and Noise

This specification sets the pass/fail limits used in testing the hum and noise level of the cellular telephone receiver.

The value is entered as a decimal number, as the upper limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Hum and Noise

Example -- If you determine that the hum and noise level of the receiver should be at least 32 dB below the audio output for a 1-kHz modulated RF carrier at –50 dBm having a ±8-kHz peak frequency deviation, enter –32 as the upper limit.

RXA Mobile Reported Interference

NOTE: This is an NAMPS-only Operation.The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

This Operation sweeps the level of the RF carrier generated by the Test System on a forward voice channel and sent to the cellular telephone, and displays the telephone mobile reported interference (MRI) response.

In this Operation, the signal that is sent to the cellular telephone is varied from the start level specified in the RF Start Level parameter to the stop level specified in the RF Stop Level parameter, in increments as specified in the RF Step Level parameter.

At each level step, the Test System sends the MRI Parameter Message to the cellular telephone with the RSSI and BER threshold fields set to zero. This induces the cellular telephone to report the current status of its received signal strength indicator (RSSI) and bit error rate (BER) measurements via the reverse voice channel (RVC). These RSSI and BER values are then displayed.

Background

NAMPS cellular telephones are capable of reporting RSSI and BER values to the base station on command. The BER pertains to the signaling used on narrow voice channels. This Operation may be run on only a narrow voice channel or a NAMPS cellular telephone.

Parameters Used

The parameters used in the RXA Mobile Reported Interference Operation are:

RF Start Level [–30 to –120] dBm

RF Step Level [0 to 90] dBm

RF Stop Level [–30 to –120] dBm

These parameters are described in the following paragraphs.

RF Start Level [–30 to –120] dBm

This parameter allows you to specify the level of the RF carrier that is output by the Test System at the beginning of the Operation. The level will be decremented during the test, so the start level is the highest one used.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to start varying the output RF level at –75 dBm, enter –75.

RF Step Level [0 to 90] dBm

This parameter allows you to specify the step size used in varying the RF carrier that is output by the Test System during the Operation. The level is decremented by the specified amount at each step during the test.

The value is entered as a real number, in dBm, and in the range 0 through 90.

Example -- If you wish to decrement the output RF level in 5 dB steps, enter 5.

RF Stop Level [–30 to –120] dBm

This parameter allows you to specify the level of the RF carrier that is output by the Test System at the end of the Operation. The level is decremented during the test, so the stop level is the lowest one used.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to stop varying the output RF level at –25 dBm, enter –25.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the RXA Mobile Reported Interference Operation.

RXA RF Sensitivity

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation sets and measures the cellular telephone receiver’s RF sensitivity, or SINAD, when the telephone is operating on an analog voice channel (AVC).

SINAD is the ratio, expressed in dB, of Signal + Noise + Distortion, to Noise + Distortion.

The receiver’s SINAD is measured at the receiver’s audio output, at the RF level specified by the RF Level for SINAD Test parameter. This measurement differs from a distortion measurement in that it is conducted at low RF input levels where the noise contribution is significant. Receivers are typically required to provide at least 12 dB SINAD (less than 25 percent noise and distortion) for RF input levels below 1 microvolt.

In this Operation, the Test System modulates the RF signal to deviate to 8 kHz at a 1-kHz rate with a supervisory audio tone (SAT) present. (Narrow analog operation uses a 3-kHz deviation and DSAT.)

NOTE: This Operation is ordinarily performed at the nominal supply voltage, but it may be performed with high and low supply voltages for extreme measurements. In such case, the measurement is repeated at high and low supply voltages if the Test at Extreme Supply Voltages parameter is set to `Yes.`

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If the Test at Extreme Supply Voltages parameter is set to `Yes` (see “**"GEN Modify External Power Supply Parameters" on page 117**), so that output power measurements are made at high supply voltage and low supply voltage, this Operation requires a properly configured programmable power supply (see **"TXA Current Drain" on page 182**).

Parameters Used

The parameters used in the RXA RF Sensitivity Operation are:

RF Level for SINAD Test [–30 to –120] dBm

RF Lvl for SINAD at Extreme Supply Volt [–30 to –120] dBm

These parameters are described in the following paragraphs.

RF Level for SINAD Test [–30 to –120] dBm

This parameter allows you to specify the receiver input RF signal level for measuring SINAD on wide voice channels at the nominal power supply voltage.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to set the receiver input RF signal level to –116 dBm, enter –116.

RF Lvl for SINAD at Extreme Supply Volt [–30 to –120] dBm

This parameter allows you to specify the RF signal level for measuring SINAD on wide voice channels at extreme supply voltage conditions.

The value is entered as a real number, in dBm, and in the range –30 through –120.

NOTE: The Test at Extreme Supply Voltages parameter must be set to **`Yes`** for this parameter to be active (see **"GEN Modify External Power Supply Parameters" on page 117**).

Example -- If you wish to use an RF signal level of –90 dBm, enter –90.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA RF Sensitivity Operation. It is:

SINAD for AVC

This specification is described in the following paragraphs.

SINAD for AVC

This specification sets the pass/fail limits to be used when SINAD is measured at the audio output of the cellular telephone receiver when the telephone is operating on an analog voice channel.

The value is entered as a decimal number, as the lower limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: RF Sensitivity

Example -- If you determine that the usable sensitivity measurement results in 12 dB SINAD at the audio output of the receiver, enter 12 as the lower limit.

RXA RF Sensitivity, Narrow Analog Voice Channel

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

NOTE: This is an NAMPS-only Operation. The channels must indicate the offset desired, U (Upper), M (Middle), or L (Lower).

This Operation sets and measures the cellular telephone receiver's RF sensitivity, or SINAD, when the telephone is operating on a narrow analog voice channel (N-AVC).

SINAD is the ratio, expressed in dB, of Signal + Noise + Distortion, to Noise + Distortion.

The receiver's SINAD is measured at the receiver audio output, at the RF level specified by the RF Level for SINAD Test on N-AVC parameter. This measurement differs from a distortion measurement in that it is conducted at low RF input levels where the noise contribution is significant. Receivers are typically required to provide at least 12 dB SINAD (less than 25 percent noise and distortion) for RF input levels below 1 microvolt.

In this Operation, the Test System modulates the RF signal to deviate to 3 kHz at a 1-kHz rate with a digital supervisory audio tone (DSAT) present.

NOTE: This Operation is ordinarily performed at the nominal supply voltage, but it may be performed with high and low supply voltages for extreme measurements. In such case, the measurement is repeated at high and low supply voltages if the Test at Extreme Supply Voltages parameter is set to `Yes`.

If the Test at Extreme Supply Voltages parameter is set to `Yes` (see **"GEN Modify External Power Supply Parameters" on page 117**), so that output power measurements are made at high supply voltage and low supply voltage, this Operation requires a properly configured programmable power supply (see **"TXA Current Drain" on page 182**).

Parameters Used

The parameters used in the RXA RF Sensitivity, Narrow Analog Voice Channel Operation are:

RF Level for SINAD Test on N-AVC [–30 to –120] dBm

RF Lvl for SINAD Test on N-AVC at Extreme V [–30 to –120] dBm

These parameters are described in the following paragraphs.

RF Level for SINAD Test on N-AVC [–30 to –120] dBm

This parameter sets the RF signal level for measuring SINAD on narrow analog voice channels at the nominal power supply voltage.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to set the RF signal level to –90 dBm, enter –90.

RF Lvl for SINAD Test on N-AVC at Extreme V [–30 to –120] dBm

This parameter allows you to specify the RF signal level for measuring SINAD on narrow voice channels at extreme power supply voltages.

The value is entered as a real number, in dBm, and in the range –30 through –120.

NOTE: The Test at Extreme Supply Voltages parameter must be set to `Yes` for this parameter to be active (see **"GEN Modify External Power Supply Parameters" on page 117**).

Example -- If you wish to set the RF signal level to –90 dBm, enter –90.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA RF Sensitivity, Narrow Analog Voice Channel Operation. It is:

SINAD for N-AVC

This specification is described in the following paragraphs.

SINAD for N-AVC

This specification sets the pass/fail limits to be used when SINAD is measured at the audio output of the cellular telephone's receiver when the telephone is operating on a narrow analog voice channel.

The value is entered as a decimal number, as the lower limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: RF Sensitivity

Example -- If you determine that the usable sensitivity measurement results in 12 dB SINAD at the audio output of the receiver, enter 12 as the lower limit.

RXA RF Sensitivity vs Channel (Plotted)

NOTE: Audio connections from the cellular telephone to the Test System are required for this Operation.

This Operation sets and measures the cellular telephone receiver's RF sensitivity, or SINAD, then plots the sensitivity in relation to channel number in the range of channels specified by the Operation's parameters. At each channel measurement, a point is located in an X-Y plot, where the X axis represents increasing channel numbers, and the Y axis represents sensitivity, in dB. The data points are then connected to create a plot.

NOTE: The number of the channel at which the Test System was working at the time that this Operation is encountered is irrelevant for the Operation. The Test System performs an implicit handoff to the channel specified as the start channel in the Operation and then performs the rest of the Operation. At the end of the Operation, the Test System performs another handoff (either explicit or implicit) to whatever channel is next.

SINAD is the ratio, expressed in dB, of:

- Signal + Noise + Distortion,
- to Noise + Distortion.

The receiver's SINAD is measured at the receiver's audio output and at the RF level specified by the RF Level for SINAD Test parameter. This measurement differs from a distortion measurement in that it is conducted at low RF input levels at which the noise contribution is significant. Receivers are typically required to provide at least 12 dB SINAD (less than 25 percent noise and distortion) for RF input levels below 1 microvolt.

In performing the Operation, the Test System modulates the RF signal to deviate to 8 kHz at a 1-kHz rate with a SAT tone present.

NOTE: This Operation is ordinarily performed at the nominal supply voltage, but it may be performed with high and low supply voltages for extreme measurements. In such case, the measurement is repeated at high and low supply voltages if the Test at Extreme Supply Voltages parameter is set to **`Yes`**.

If the Test at Extreme Supply Voltages parameter is set to **Yes** (see **"GEN Modify External Power Supply Parameters" on page 117**), so that output power measurements are made at high supply voltage and low supply voltage, this Operation requires a properly configured programmable power supply (see **"TXA Current Drain" on page 182**).

Parameters Used

The parameters used in the RXA RF Sensitivity vs Channel (Plotted) Operation are:

Start Channel Number [1-799, 991-1023]

Step Channel Number [1-1023]

Stop Channel Number [1-799, 991-1023]

RF Level for SINAD Test [–30 to –120] dBm

RF Lvl for SINAD at Extreme Supply Volt [–30 to –120] dBm

These parameters are described in the following paragraphs.

Start Channel Number [1-799, 991-1023]

This parameter allows you to specify the start channel to be used in constructing a plot of the cellular telephone receiver sensitivity in relation to channel numbers in RF sensitivity testing.

The value is entered as an integer in the ranges 1 through 799 and 991 through 1023.

Example -- If you wish to start the plot at channel 100, enter 100.

Step Channel Number [1-1023]

This parameter allows you to specify the step size to be used in constructing a plot of the cellular telephone receiver sensitivity in relation to channel numbers in RF sensitivity testing.

The value is entered as an integer in the range 1 through 1023.

Example -- If you wish to step the plot in 100-channel steps, enter 100.

Stop Channel Number [1-799, 991-1023]

This parameter allows you to specify the stop channel to be used in constructing a plot of the cellular telephone receiver sensitivity in relation to channel numbers in RF sensitivity testing.

The value is entered as an integer in the ranges 1 through 799 and 991 through 1023.

Example -- If you wish to stop the plot at channel 500, enter 500.

RF Level for SINAD Test [–30 to –120] dBm

This parameter allows you to specify the receiver input's RF signal level for measuring SINAD on wide voice channels at the nominal power supply voltage.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to set the receiver input RF signal level to –116 dBm, enter –116.

RF Lvl for SINAD at Extreme Supply Volt [–30 to –120] dBm

This parameter allows you to specify the RF signal level for measuring SINAD on wide voice channels at extreme supply voltage conditions.

The value is entered as a real number, in dBm, and in the range –30 through –120.

NOTE: The Test at Extreme Supply Voltages parameter must be set to `Yes` for this parameter to be active (see **"GEN Modify External Power Supply Parameters" on page 117**).

Example -- If you wish to use an RF signal level of –90 dBm, enter –90.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXA RF Sensitivity vs Channel (Plotted) Operation. It is:

SINAD for AVC

This specification is described in the following paragraphs.

SINAD for AVC

This specification sets the pass/fail limits to be used when SINAD is measured at the audio output of the cellular telephone's receiver when the telephone is operating on an analog voice channel.

The value is entered as a decimal number, as the lower limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA Standard: RF Sensitivity

Example -- If you determine that the usable sensitivity measurement results in 12 dB SINAD at the audio output of the receiver, enter 12 as the lower limit.

TXD Adjacent Channel Power

This Operation measures the relative adjacent, first alternate, and second alternate channel power at the output terminals of the cellular telephone's transmitter. Only the relative (not the absolute) measurement is displayed.

Parameters Used

No parameters are used in the TXD Adjacent Channel Power Operation.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXD Adjacent Channel Power Operation are:

Relative Adjacent Channel Power

Relative Alternate Channel Power

These specifications are described in the following paragraphs.

Relative Adjacent Channel Power

This specification sets the pass/fail limits for the upper and lower adjacent channel power, as measured at frequency offsets of ±30 kHz relative to the mean, in-channel output power of the transmitter.

The value is entered as a decimal number, as the upper limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Adjacent and Alternate Channel Power due to Modulation

Example -- If you determine that the average power in either the upper or lower adjacent channel should be 26 dB below the mean, in-channel power of the transmitter, enter –26.

Relative Alternate Channel Power

This specification sets the pass/fail limits for the first and second alternate channel power, as measured at frequency offsets of ±60 kHz (first alternate) and ±90 kHz (second alternate) relative to the mean in-channel output power of the transmitter.

The value is entered as a decimal number, as an upper limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Adjacent and Alternate Channel Power due to Modulation

Example -- If you determine that the average power in either the first or second alternate channel should be 45 dB below the mean, in-channel power of the transmitter, enter –45.

TXD Modulation Accuracy

This Operation measures the quality of the π/4 DQPSK modulation of the cellular telephone transmitter across one transmitted burst. Measurements that can be made with this Operation are: error vector magnitude (EVM), phase error, magnitude error, burst amplitude droop, I/Q origin offset, and carrier frequency error.

Each measurement is separate and may be selected and performed individually or included as part of a combination of measurements.

Background

The Test System captures one transmitted burst of 162 symbols. It then predicts an ideal I/Q trajectory of the burst. The phase and magnitude of the I/Q vector and its error are calculated at each detection decision point and the rms error vector magnitude is calculated.

Parameters Used

The parameters used in the TXD Modulation Accuracy Operation are:

Test Error Vector Magnitude [Yes, or No]

Test Phase Error [Yes, or No]

Test Magnitude Error [Yes, or No]

Test Burst Amplitude Droop [Yes, or No]

Test I/Q Origin Offset [Yes, or No]

Test Carrier Frequency Error [Yes, or No]

These parameters are described in the following paragraphs.

Test Error Vector Magnitude [Yes, or No]

This parameter allows you to specify whether error vector magnitude will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the error vector magnitude. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Phase Error [Yes, or No]

This parameter allows you to specify whether phase error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the phase error. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Magnitude Error [Yes, or No]

This parameter allows you to specify whether magnitude error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the magnitude error. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Burst Amplitude Droop [Yes, or No]

This parameter allows you to specify whether burst amplitude droop will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the burst amplitude droop. Selecting **`No`** causes the Test Software to ignore the measurement.

Test I/Q Origin Offset [Yes, or No]

This parameter allows you to specify whether I/Q origin offset will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the I/Q origin offset. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Carrier Frequency Error [Yes, or No]

This parameter allows you to specify whether carrier frequency error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the carrier frequency error. Selecting **`No`** causes the Test Software to ignore the measurement.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXD Modulation Accuracy Operation are:

Error Vector Magnitude (EVM)

Phase Error

Magnitude Error

Burst Amplitude Droop

I/Q Origin Offset

Carrier Frequency Error

These specifications are described in the following paragraphs.

Error Vector Magnitude (EVM)

This specification sets the pass/fail limits for the error vector magnitude (EVM).

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the error vector magnitude should be ≤12.5 percent, enter 12.5.

Phase Error

This specification sets the pass/fail limits for the rms value of the phase error components of the error vectors measured over one burst.

The phase error component is the difference in phase, at the detection decision points, between the measured signal (after root Nyquist filtering, I/Q origin offset removal, burst amplitude droop removal, and carrier frequency error removal) and the ideal signal generated from the same data pattern. The rms value is obtained by taking the square root of the sum of the squares of the individual values at each detection decision point over the measured burst. Phase error is an indicator of the quality of the phase component of the $\pi/4$ DQPSK signal and is one of the components that contribute to the error vector magnitude.

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the rms phase error should be ≤10 percent, enter 10.

Magnitude Error

This specification sets the pass/fail limits for the rms value of the magnitude error components of the error vectors measured over one burst.

The magnitude error component is the difference in amplitude, at the detection decision points, between the measured signal (after root Nyquist filtering, I/Q origin offset removal, burst amplitude droop removal, and carrier frequency error removal) and the ideal signal generated from the same data pattern. The rms value is obtained by taking the square root of the sum of the squares of the individual values at each detection decision point over the measured burst. Magnitude error is an indicator of the quality of the amplitude component of the π/4 DQPSK signal and is one of the components that contribute to the error vector magnitude.

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the rms magnitude error should be ≤10 percent, enter 10.

Burst Amplitude Droop

This specification sets the pass/fail limits for the burst amplitude droop rate.

Burst amplitude droop rate is the average rate of decay of the magnitude of the signal at the detection decision points across the measured burst. Burst amplitude droop rate is expressed in dB/symbol.

The value is entered as a decimal number, as an upper limit only, and in dB/symbol.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the average rate of decay in the magnitude of the measured signal should be ≤1 dB/symbol, enter 1.

I/Q Origin Offset

This specification sets the pass/fail limits for the I/Q origin offset.

The value is entered as a decimal number, as an upper limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the I/Q origin offset should be –20 dB, enter –20.

Carrier Frequency Error

This specification sets the pass/fail limits for the cellular telephone's carrier frequency stability. Frequency error is measured over one burst.

The values are entered in decimal numbers, as upper and lower limits, and in Hz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Frequency Tolerance For Digital Mode Operation

Example -- If you determine that the carrier frequency should be maintained within ±200 Hz of any assigned channel frequency, enter –200 as the lower limit and 200 as the upper limit.

TXD Modulation Accuracy (10 Burst)

This Operation measures the quality of the π/4 DQPSK modulation of the cellular telephone transmitter across the first 10 symbols of 10 transmitted bursts. Measurements that result from this Operation are: error vector magnitude (EVM), phase error, magnitude error, burst amplitude droop, I/Q origin offset, and carrier frequency error.

Each measurement is separate and may be selected and performed individually or included as part of a combination of measurements.

Parameters Used

The parameters used in the TXD Modulation Accuracy (10 Burst) Operation are:

Test Error Vector Magnitude [Yes, or No]

Test Phase Error [Yes, or No]

Test Magnitude Error [Yes, or No]

Test Burst Amplitude Droop [Yes, or No]

Test I/Q Origin Offset [Yes, or No]

Test Carrier Frequency Error [Yes, or No]

These parameters are described in the following paragraphs.

Test Error Vector Magnitude [Yes, or No]

This parameter allows you to specify whether error vector magnitude will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the error vector magnitude. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Phase Error [Yes, or No]

This parameter allows you to specify whether phase error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to measure the phase error. Selecting **`No`** causes the Test Software to ignore the measurement.

Test Magnitude Error [Yes, or No]

This parameter allows you to specify whether magnitude error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **Yes**, and **No**. Selecting **Yes** causes the Test Software to measure the magnitude error. Selecting **No** causes the Test Software to ignore the measurement.

Test Burst Amplitude Droop [Yes, or No]

This parameter allows you to specify whether burst amplitude droop will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **Yes**, and **No**. Selecting **Yes** causes the Test Software to measure the burst amplitude droop. Selecting **No** causes the Test Software to ignore the measurement.

Test I/Q Origin Offset [Yes, or No]

This parameter allows you to specify whether I/Q origin offset will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **Yes**, and **No**. Selecting **Yes** causes the Test Software to measure the I/Q origin offset. Selecting **No** causes the Test Software to ignore the measurement.

Test Carrier Frequency Error [Yes, or No]

This parameter allows you to specify whether carrier frequency error will be measured during transmitter testing when the cellular telephone is on a digital traffic channel.

Two selections are provided in a toggle format: **Yes**, and **No**. Selecting **Yes** causes the Test Software to measure the carrier frequency error. Selecting **No** causes the Test Software to ignore the measurement.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXD Modulation Accuracy (10 Burst) Operation are:

Error Vector Magnitude (EVM)

Phase Error

Magnitude Error

Burst Amplitude Droop

I/Q Origin Offset

Carrier Frequency Error

These specifications are described in the following paragraphs.

Error Vector Magnitude (EVM)

This specification sets the pass/fail limits for the error vector magnitude (EVM).

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the error vector magnitude should be ≤12.5 percent, enter 12.5.

Phase Error

This specification sets the pass/fail limits for the rms value of the phase error components of the error vectors measured over one burst.

The phase error component is the difference in phase, at the detection decision points, between the measured signal (after root Nyquist filtering, I/Q origin offset removal, burst amplitude droop removal, and carrier frequency error removal) and the ideal signal generated from the same data pattern. The rms value is obtained by taking the square root of the sum of the squares of the individual values at each detection decision point over the measured burst. Phase error is an indicator of the quality of the phase component of the $\pi/4$ DQPSK signal and is one of the components that contribute to the error vector magnitude.

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the rms phase error should be ≤10 percent, enter 10.

Magnitude Error

This specification sets the pass/fail limits for the rms value of the magnitude error components of the error vectors measured over one burst.

The magnitude error component is the difference in amplitude, at the detection decision points, between the measured signal (after root Nyquist filtering, I/Q origin offset removal, burst amplitude droop removal, and carrier frequency error removal) and the ideal signal generated from the same data pattern. The rms value is obtained by taking the square root of the sum of the squares of the individual values at each detection decision point over the measured burst. Magnitude error is an indicator of the quality of the amplitude component of the π/4 DQPSK signal and is one of the components that contribute to the error vector magnitude.

The value is entered as a decimal number, as an upper limit only, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the rms magnitude error should be ≤10 percent, enter 10.

Burst Amplitude Droop

This specification sets the pass/fail limits for the burst amplitude droop rate.

Burst amplitude droop rate is the average rate of decay of the magnitude of the signal at the detection decision points across the measured burst. Burst amplitude droop rate is expressed in dB/symbol.

The value is entered as a decimal number, as an upper limit only, and in dB/symbol.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Modulation Accuracy

Example -- If you determine that the average rate of decay in the magnitude of the measured signal should be ≤1 dB/symbol, enter 1.

I/Q Origin Offset

This specification sets the pass/fail limits for the I/Q origin offset.

The value is entered as a decimal number, as an upper limit only, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the I/Q origin offset should be –20 dB, enter –20.

Carrier Frequency Error

This specification sets the pass/fail limits for the cellular telephone's carrier frequency stability. Frequency error is measured over one burst.

The values are entered in decimal numbers, as upper and lower limits, and in Hz.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Frequency Tolerance For Digital Mode Operation

Example -- If you determine that the carrier frequency should be maintained within ±200 Hz of any assigned channel frequency, enter –200 as the lower limit and 200 as the upper limit.

TXD RF Power Output

This Operation measures the cellular telephone transmitter's output power when the telephone is on a digital traffic channel.

NOTE: If this Operation is performed using a Test Set without Option 006 (10 W to 50 µW power measurement range), the Test Software will perform a calibration for making digital power measurements. The calibration routine momentarily places the cellular telephone on an analog voice channel to provide an arbitrary constant (not pulsed) signal to the Test Set. The Test Software makes an average power measurement and a relative digital DSP measurement, and calculates a calibration factor between the measurements. This calibration factor is then used by the Test Software when making digital power measurements.

If the Test at Extreme Supply Voltages parameter is set to **Yes** (see **"GEN Modify External Power Supply Parameters" on page 117**), so that output power measurements are made at high supply voltage and low supply voltage, this Operation requires a properly configured programmable power supply (see **"TXA Current Drain" on page 182**).

Output power is expressed in watts, dB relative to 1 watt, or dB relative to 1 milliwatt, according to the setting of the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Parameters Used

The parameters used in the TXD RF Power Output Operation are:

Test Power Level 0 [Yes, or No]

Test Power Level 1 [Yes, or No]

Test Power Level 2 [Yes, or No]

Test Power Level 7 [Yes, or No]

Test Power Level 10 [Yes, or No]

Test Power Levels [3-6, 8-9, or 3-6 & 8-9]

These parameters are described in the following paragraphs.

Test Power Level 0 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter's output power testing will be performed at power level 0.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to perform the test. Selecting **`No`** causes the Test Software to ignore the test.

Test Power Level 1 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter's output power testing will be performed at power level 1.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to perform the test. Selecting **`No`** causes the Test Software to ignore the test.

Test Power Level 2 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter's output power testing will be performed at power level 2.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to perform the test. Selecting **`No`** causes the Test Software to ignore the test.

Test Power Level 7 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter output power testing will be performed at power level 7.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to perform the test. Selecting **`No`** causes the Test Software to ignore the test.

Test Power Level 10 [Yes, or No]

This parameter allows you to specify whether cellular telephone transmitter's output power testing will be performed at power level 10.

Two selections are provided in a toggle format: **`Yes`**, and **`No`**. Selecting **`Yes`** causes the Test Software to perform the test. Selecting **`No`** causes the Test Software to ignore the test.

Test Power Levels [3-6, 8-9, or 3-6 & 8-9]

This parameter allows you to specify groups of power levels at which the cellular telephone transmitter's output power will be tested.

Three selections are provided in a one-of-many format. These are:

`3-6` causes transmitter output power to be tested at power levels 3, 4, 5, and 6.

`8-9` causes transmitter output power to be tested at power levels 8 and 9.

`3-6 and 8-9` causes transmitter output power to be tested at power levels 3, 4, 5, 6, 8, and 9.

Example -- If you wish to plot the transmitter output power at power levels 3, 4, 5, and 6, select **`3-6`**.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXD RF Power Output Operation are:

Output Power at Level 0

Output Power at Level 1

Output Power at Level 2

Output Power at Level 3

Output Power at Level 4

Output Power at Level 5

Output Power at Level 6

Output Power at Level 7

Output Power at Level 8

Output Power at Level 9

Output Power at Level 10

These specifications are described in the following paragraphs.

Output Power at Levels 0 through 10

These specifications set the pass/fail limits for output power levels 0 through 10, as measured in digital tests at the transmitter's output terminal. Each power level limit is separate and may be set as required.

The values are entered as decimal numbers, and in watts or dBm. Measurement units for the specification are set by the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmitter Output Power

NOTE: Values for power levels in the standard are for effective radiated power (ERP) and not as measured directly from the cellular telephone. Power levels will be higher when measured directly from the cellular telephone.

Example -- If you determine that the output power levels should be maintained within the range of 2 dB and –4 dB of the nominal values over a specified temperature range, enter the values as shown in **table 8** for the lower limit and the upper limit for power levels of 0 through 10.

Table 8 **Power Levels Example**

Power Level	Nominal Value (dBW)	Lower Limit (dBW)	Upper Limit (dBW)
Level 0	6	2	8
Level 1	2	–2	4
Level 2	–2	–6	0
Level 3	–6	–10	–4
Level 4	–10	–14	–8
Level 5	–14	–18	–12
Level 6	–18	–22	–16
Level 7	–22	–26	–20
Level 8	–26	–30	–24
Level 9	–30	–34	–28
Level 10	–34	–38	–32

TXD RF Power Output vs Channel (Plotted)

This Operation measures the cellular telephone transmitter's output power when the telephone is on a digital traffic channel, then plots the output power in relation to channel number in the range of channels specified by the Operation's parameters. At each channel measurement, a point is located in an X-Y plot, where the X axis represents increasing channel numbers, and the Y axis represents measured power, in watts or dBm. At the end of the point location process, the Test System connects the points to produce and display a true plot.

NOTE: The number of the channel at which the Test System was working at the time that this Operation is encountered is irrelevant for the Operation. The Test System performs an implicit handoff to the channel specified as the start channel in the Operation and then performs the rest of the Operation. At the end of the Operation, the Test System performs another handoff (either explicit or implicit) to whatever channel is next.

NOTE: If this Operation is performed using a Test Set without Option 006 (10 W to 50 µW power measurement range), the Test Software will perform a calibration for making digital power measurements. The calibration routine momentarily places the cellular telephone on an analog voice channel to provide an arbitrary constant (not pulsed) signal to the Test Set. The Test Software makes an average power measurement and a relative digital DSP measurement, and calculates a calibration factor between the measurements. This calibration factor is then used by the Test Software when making digital power measurements.

NOTE: This Operation is ordinarily performed at the nominal supply voltage, but it may be performed with high and low supply voltages for extreme measurements.

If the Test at Extreme Supply Voltages parameter is set to `Yes` (see **"GEN Modify External Power Supply Parameters" on page 117**), so that output power measurements are made at high supply voltage and low supply voltage, this Operation requires a properly configured programmable power supply (see **"TXA Current Drain" on page 182**).

Ordinarily, all power levels are tested. However, this Operation allows you to select only the levels that you wish to test.

Output power is expressed in watts, dB relative to 1 watt, or dB relative to 1 milliwatt, according to the setting of the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Parameters Used

The parameters used in the TXD RF Power Output vs Channel (Plotted) Operation are:

TXD Power Start Channel Number [1-799, 991-1023]

TXD Power Step Channel Number [1-1023]

TXD Power Stop Channel Number [1-799, 991-1023]

TXD Output Power Levels Tested [0, 0-10, 2-10, 0 & 10, or 10]

These parameters are described in the following paragraphs.

TXD Power Start Channel Number [1-799, 991-1023]

This parameter allows you to specify the start channel to be used in constructing a plot of the cellular telephone transmitter output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on a digital channel.

The value is entered as an integer in the range 1 through 799, and 991 through 1023.

Example -- If you wish to start the plot at channel 100, enter 100.

TXD Power Step Channel Number [1-1023]

This parameter allows you to specify the step size to be used in constructing a plot of the cellular telephone transmitter output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on a digital channel.

The value is entered as an integer in the range 1 through 1023.

Example -- If you wish to step the plot in 100-channel increments, enter 100.

TXD Power TXD Power Stop Channel Number [1-799, 991-1023]

This parameter allows you to specify the stop channel to be used in constructing a plot of the cellular telephone transmitter output power in relation to channel numbers in RF power output testing when the cellular telephone is operating on a digital channel.

The value is entered as an integer in the range 1 through 799, and 991 through 1023.

Example -- If you wish to stop the plot at channel 500, enter 500.

TXD Output Power Levels Tested [0, 0-10, 2-10, 0 & 10, or 10]

This parameter allows you to specify the output power levels to be tested and plotted in relation to channel numbers.

Five selections are provided in a one-of-many format. These are:

`0` causes current to be measured and plotted at power level 0 only.

`0-10` causes current to be measured and plotted at power levels 0 through 10.

`2-10` causes current to be measured and plotted at power levels 2 through 10.

`0 & 10` causes current to be measured and plotted at power level 0 and 10.

`10` causes current to be measured and plotted at power level 10 only.

Example -- If you wish to plot the power output at power levels 0 and 10, select **`0 & 10`**.

Pass/Fail Limits Used

The pass/fail limits specifications used in the TXD RF Power Output vs Channel (Plotted) Operation are:

Output Power at Level 0

Output Power at Level 1

Output Power at Level 2

Output Power at Level 3

Output Power at Level 4

Output Power at Level 5

Output Power at Level 6

Output Power at Level 7

Output Power at Level 8

Output Power at Level 9

Output Power at Level 10

These specifications are described in the following paragraphs.

Output Power at Levels 0 through 10

These specifications set the pass/fail limits for output power levels 0 through 10, as measured in digital tests at the transmitter output terminal. Each power level limit is separate and may be set as required.

The values are entered as decimal numbers, and in watts or dBm. Measurement units for the specification are set by the Units for Power Measurement parameter (see **"GEN Modify Execution Parameters" on page 114**).

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: Transmitter Output Power

NOTE: Values for power levels in the standard are for effective radiated power (ERP) and not as measured directly from the cellular telephone. Power levels will be higher when measured directly from the cellular telephone.

Example -- If you determine that the output power levels should be maintained within the range of 2 dB and –4 dB of the nominal values over a specified temperature range, enter the values as shown in **table 9** for the lower limit and the upper limit for power levels of 0 through 10.

Table 9 **Power Levels Example**

Power Level	Nominal Value (dBW)	Lower Limit (dBW)	Upper Limit (dBW)
Level 0	6	2	8
Level 1	2	–2	4
Level 2	–2	–6	0
Level 3	–6	––10	–4
Level 4	–10	–14	–8
Level 5	–14	–18	–12
Level 6	–18	–22	–16
Level 7	–22	–26	–20
Level 8	–26	–30	–24
Level 9	–30	–34	–28
Level 10	–34	–38	–32

TXD Time Alignment

This Operation measures the capability of the cellular telephone to respond correctly to time alignment commands from the base station.

In this Operation, the cellular telephone is commanded to change to various time alignments by being issued physical layer FACCH messages from the Test System. The first data bit in the reverse traffic channel is located and referenced to the start of the corresponding forward channel data sent by the Test System. From this information, the transmit offset (end of the reverse channel slot to the beginning of the corresponding forward channel slot) is calculated and the absolute time offset is displayed as the result. The cellular telephone is commanded to change to time alignments of 5, 9, 16, 19, 24, 30, 25, 18, 11, 4 and 0. The measured time offset for each of these is displayed. The measurement is made at power level 0 only.

Parameters Used

No parameters are used in the TXD Time Alignment Operation.

Pass/Fail Limits Used

One pass/fail limits specification is used in the TXD Time Alignment Operation. It is:

Time Alignment Error

This specification is described in the following paragraphs.

Time Alignment Error

This specification sets the pass/fail limits for the cellular telephone transmitter's digital time alignment error. The software measures the actual transmit offset at time alignments of 5, 9, 16, 19, 24, 30, 25, 18, 11, 4, and 0, and uses these pass/fail limits specifications to set the upper and lower error tolerance.

The values are entered as decimal numbers, as a positive value for the upper limit and a negative value for the lower limit, and in bits (or half symbols).

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- While measuring the cellular telephone at each time alignment (TA), if you determine that an acceptable transmit offset range for your cellular telephone is 45 +.5(TA) ± .25 symbols, enter –.25 (symbol) for the lower limit and .25 (symbol) for the upper limit.

RXD Receiver Sensitivity

This Operation measures the receiver's sensitivity by performing a channel quality measurement (Ch Qual) on the current forward traffic channel at an RF signal set by the RF Level for Sensitivity Test parameter. The cellular telephone reports the bit error rate (BER) to the Test System. The received signal strength indicator (RSSI) is also reported and checked for accuracy.

Background

Digital RF sensitivity is a measure of the ability of a cellular telephone's receiver to receive and process digital data at a BER of 3 percent or less under static and faded conditions. This Operation measures only the static condition.

Parameters Used

One parameter is used in the RXD Receiver Sensitivity Operation. It is:

RF Level for Sensitivity Test [–30 to –120] dBm

This parameter is described in the following paragraphs.

RF Level for Sensitivity Test [–30 to –120] dBm

This parameter sets the RF signal level that is used in the digital sensitivity tests.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to apply a –110-dBm signal, enter –110.

Pass/Fail Limits Used

The pass/fail limits specifications used in the RXD Receiver Sensitivity Operation are:

BER

RSSI Error

These specifications are described in the following paragraphs.

BER

This specification sets the pass/fail limits for the bit error rate (BER) for a cellular telephone operating on a digital channel and being tested for receiver sensitivity in a mobile assisted hand-off mode.

The value is entered as a decimal number, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the BER Pass/Fail Limit should be ≤3 percent, enter 3.

RSSI Error

This specification sets the pass/fail limits for the error in the received signal strength indication (RSSI) reported by a cellular telephone operating on a digital channel and being tested for receiver sensitivity.

The value is entered as a decimal number, and in dB.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the error in the RSSI should be ≤5 dB, enter 5.

RXD Receiver Sensitivity (Loopback)

This Operation tests the cellular telephone's receiver sensitivity by setting the telephone to loopback mode and measuring the telephone's capability to receive a base station signal at low RF levels, as set by the RF Level for Sensitivity Test parameter. The Operation tests for bit error rate (BER).

NOTE: In this Operation, you must set the cellular telephone manually to loopback mode through the handset. The process for manually setting loopback mode is dependent upon the telephone and must be obtained from the telephone's documentation.

Background

RXD receiver sensitivity is a measure of the ability of a cellular telephone to process and receive digital data at a BER of 3 percent or less under static and faded conditions. This Operation measures only the static condition.

Parameters Used

The parameters used in the RXD Receiver Sensitivity (Loopback) Operation are:

Test BER [Yes, or No]

RF Power Level for BER Measurement [–30 to –120] dBm

These parameters are described in the following paragraphs.

RF Power Level for BER Measurement [–30 to –120] dBm

This parameter allows you to specify the cellular telephone's receiver input RF power level for Bit Error Rate measurement during receiver sensitivity testing when the cellular telephone is operating on a digital channel.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Pass/Fail Limits Used

One pass/fail limits specification is used in the RXD Receiver Sensitivity (Loopback) Operation. It is:

BER

This specifications is described in the following paragraphs.

BER

This specification sets the pass/fail limits for the bit error rate (BER) for a cellular telephone operating on a digital channel and being tested for receiver sensitivity in loopback mode.

The value is entered as a decimal number, and as a percentage.

Pass/fail limits specifications are determined using any applicable standard, such as:

- EIA/TIA Standard: IS-137

Example -- If you determine that the BER Pass/Fail Limit should be ≤3 percent, enter 3.

MISC Battery Life on Analog Voice Channel, Transmit

This Operation measures the continuous time that the cellular telephone can be turned on and transmitting at the specified power level before the telephone battery charge is depleted.

In this Operation, the Test System monitors the status of the analog voice channel every 5 seconds. As long as the cellular telephone remains on the analog voice channel, the Test System concludes that the battery is still functional.

If the channel is dropped by the cellular telephone, the Test System concludes that the battery charge is depleted and records and displays the time between the start of the Operation and the time at which the battery was determined to be depleted of charge.

Parameters Used

One parameter is used in the MISC Battery Life on Analog Voice Channel, Transmit Operation. It is:

AVC Transmit Power Level [0-10]

This parameter is described in the following paragraphs.

AVC Transmit Power Level [0-10]

This parameter allows you to specify the cellular telephone transmitter output power during a battery life test.

The value is entered as an integer in the range 0 through 10.

Pass/Fail Limits Used

One pass/fail limits specification is used in the MISC Battery Life on Analog Voice Channel, Transmit Operation. It is:

Transmit Time

This specification is described in the following paragraphs.

Transmit Time

This specification sets the pass/fail limits for the time that the cellular telephone transmitter will transmit before the battery charge is depleted.

The value is entered as a decimal number, and in minutes.

Example -- If you determine that the transmit time should be 80 minutes, enter 80.

MISC Battery Life on Digital Traffic Channel, Transmit

This Operation measures the continuous time that the cellular telephone can be turned on and transmitting at the specified power level before the telephone's battery charge is depleted.

In this Operation, the Test System monitors the status of the digital traffic channel every 5 seconds. As long as the cellular telephone remains on the digital traffic channel, the Test System concludes that the battery is still functional.

If the channel is dropped by the cellular telephone, the Test System concludes that the battery charge is depleted and records and displays the time between the start of the Operation and the time at which the battery was determined to be depleted of charge.

Parameters Used

One parameter is used in the MISC Battery Life on Digital Traffic Channel, Transmit Operation. It is:

DTC Transmit Power Level [0-10]

This parameter is described in the following paragraphs.

DTC Transmit Power Level [0-10]

This parameter allows you to specify the cellular telephone's transmitter output power during a battery life test.

The value is entered as an integer in the range 0 through 10.

Pass/Fail Limits Used

One pass/fail limits specification is used in the MISC Battery Life on Digital Traffic Channel, Transmit Operation. It is:

Transmit Time

This specification is described in the following paragraphs.

Transmit Time

This specification sets the pass/fail limits for the time that the cellular telephone transmitter will transmit before the battery charge is depleted.

The value is entered as a decimal number, and in minutes.

Example -- If you determine that the transmit time should be 80 minutes, enter 80.

MISC Battery Life on Analog Control Channel, Standby

This Operation measures the continuous time that the cellular telephone can be turned on and operated in standby mode, ready to receive calls, before the telephone battery charge is depleted.

In this Operation, the Test System performs a registration Operation every 10 minutes. As long as the cellular telephone can successfully register with the Test System, the Test System concludes that the battery is still functional.

After the first failure to register, the Test System attempts one more registration Operation. If the cellular telephone fails again, the Test System concludes that the battery charge is depleted and records and displays the time between the start of the Operation and the time at which the battery was determined to be depleted of charge.

Parameters Used

One parameter is used in the MISC Battery Life on Analog Control Channel, Standby Operation. It is:

System Identification Number [0-32767]

This parameter is described in the following paragraphs.

System Identification Number [0-32767]

This parameter allows you to specify the cellular telephone's System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

Example -- If your cellular telephone's SID number is 11111, enter 11111.

Pass/Fail Limits Used

One pass/fail limits specification is used in the MISC Battery Life on Analog Control Channel, Standby Operation. It is:

Standby Time

This specification is described in the following paragraphs.

Standby Time

This specification sets the pass/fail limits for the time that the cellular telephone will remain on in standby mode, ready to receive calls, before the battery charge is depleted.

The value is entered as a decimal number, and in minutes.

Example -- If you determine that the standby time should be 240 minutes, enter 240.

MISC Battery Life on Digital Control Channel, Standby

This Operation measures the continuous time that the cellular telephone can be turned on and operated in standby mode, ready to receive calls, before the telephone battery charge is depleted.

In this Operation, the Test System performs a registration Operation every 10 minutes. As long as the cellular telephone can successfully register with the Test System, the Test System concludes that the battery is still functional.

After the first failure to register, the Test System attempts one more registration Operation. If the cellular telephone fails again, the Test System concludes that the battery charge is depleted and records and displays the time between the start of the Operation and the time at which the battery was determined to be depleted of charge.

Parameters Used

The parameters used in the MISC Battery Life on Digital Control Channel, Standby Operation are:

System Identification Number [0-32767]

DCCH DVCC [0-255]

These parameters are described in the following paragraphs.

System Identification Number [0-32767]

This parameter allows you to specify the cellular telephone's System Identification (SID) number to be used in testing. The SID is stored as a 15-bit binary number in the telephone permanent security and identification memory.

The value is entered as an integer in the range 0 through 32767.

Example -- If your cellular telephone's SID number is 11111, enter 11111.

DCCH DVCC [0-255]

This parameter allows you to specify the Digital Verification Color Code (DVCC) number to be transmitted to the cellular telephone on the digital control channel.

The value is entered as an integer in the range 0 through 255.

Example -- If you wish to use a DVCC of 101 during testing, enter 101.

Pass/Fail Limits Used

One pass/fail limits specification is used in the MISC Battery Life on Digital Control Channel, Standby Operation. It is:

Standby Time

This specification is described in the following paragraphs.

Standby Time

This specification sets the pass/fail limits for the time that the cellular telephone will remain on in standby mode, ready to receive calls, before the battery charge is depleted.

The value is entered as a decimal number, and in minutes.

Example -- If you determine that the standby time should be 240 minutes, enter 240.

MISC Digital Talk Back

This Operation verifies proper function of the cellular telephones digital transmit and receive channel. It provides a qualitative evaluation of the digital audio function of the cellular telephone.

In running this Operation, you will be prompted to speak into the cellular telephone's microphone.

NOTE: The message spoken into the microphone must include words that will allow you to evaluate the quality of the received message on a mobile telephone. It might be necessary to remove the handset from the cradle while speaking.

Test cables connected to the cellular telephone must not mute the microphone or disconnect the received audio from the ear piece.

As you listen to the looped back message, you will be prompted to press the k1 key for pass and the k2 key for fail.

Parameters Used

No parameters are used in the MISC Digital Talk Back Operation.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the MISC Digital Talk Back Operation.

MISC TX Qualitative Audio

This Operation provides a quick qualitative evaluation of the cellular telephone's transmitter audio function.

In this Operation, you will be prompted to whistle into the transmitter, to observe the deviation on the Test System, and then decide whether the test passed or failed. The pass/fail decision is qualitative, and is usually based on whether the change in deviation corresponds with the amplitude of the whistle into the transmitter.

Parameters

No parameters are used in the MISC TX Qualitative Audio Operation.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the MISC TX Qualitative Audio Operation.

MISC RX Qualitative Audio

This Operation provides a quick qualitative evaluation of the cellular telephone's receiver audio function.

In this test, you will be prompted to listen for tones from the receiver and then decide whether the test passed or failed. The pass/fail decision is qualitative, and is usually based on whether the tones are heard clearly.

No responses from you are required. Once the parameters and pass/fail limits specifications for the Operation are set and the procedure saved during the test procedure preparation, this Operation occurs automatically. (For detailed information on SINAD testing and preparation for such testing, see **"RXA RF Sensitivity" on page 240**).

Parameters Used

One parameter is used in the MISC RX Qualitative Audio Operation. It is:

RF Level for SINAD Test [–30 to –120] dBm

This parameter is described in the following paragraphs.

RF Level for SINAD Test [–30 to –120] dBm

This parameter allows you to specify the receiver input RF signal level for measuring SINAD on wide voice channels at the nominal power supply voltage.

The value is entered as a real number, in dBm, and in the range –30 through –120.

Example -- If you wish to set the receiver input RF signal level to –116 dBm for SINAD measurements, enter –116.

Pass/Fail Limits Used

No pass/fail limits specifications are used in the MISC RX Qualitative Audio Operation.

5

Problem Solving

Introduction

This chapter contains problem modules and error messages. Problem modules alphabetically list the location of the problem with a brief symptom (for example, Test Set Doesn't Power Up).

Each problem module describes possible causes and corrections. The error messages section is located at the end of the chapter and provides a brief description of the message as well as possible corrective actions.

If a problem persists, call the HP Factory Hotline from anywhere in the USA (1-800-922-8920, 8:30 am - 5:00 pm Pacific time; in the USA and Canada only).

NOTE: If the Test Set displays an error that states "One or more self-tests failed", this indicates a hardware problem. In this case, refer to the Test Set's *Assembly Level Repair* manual.

The following subjects are covered in this chapter:

Data Collection Function Does Not Work

❒ Verify that you have entered **DATA C** in the TESTS (External Devices) screen.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **Cnfg External Devices** to switch to the TESTS (External Devices) screen.
3. Move the cursor to the **Calling Name** field, select it, and enter:

   DATA C.

❒ Check the **Model** field, which should be empty because it is not used.

❒ Check the **Addr** (address) field to make certain that the correct address is entered for the data storage location.

1. If data are to be stored on an SRAM card, enter **1** into the **Addr** field.
2. If data are to be stored on an external computer through the Test Set RS-232 serial port (if available), enter 9 into the **Addr** field.
3. If data are to be stored on an external disk drive over the HP-IB, enter an address of 700 or greater into the **Addr** field.

❒ Check the **Options** field to make certain that it is correctly set up:

1. **For an external disk drive (LIF format) or an SRAM card:**
   a. Enter **ASCII** for saving data as an ASCII file.
   b. Enter **BDAT** for saving data as a Binary-Data file.
   c. As an option, you may enter **REC=xxx**, where "**xxx**" is the number of records for each file. (*The software defaults to 80 records. However, if too small a record size is used, an* "**End of file error**" *will display when the test is run.*)

2. **For a DOS disk drive, you may keep the Options field empty, or you may enter any of the following key words:**

   a. Enter **ASCII** for saving data as an ASCII file.
   b. Enter **BDAT** for saving data as a Binary-Data file.
   c. Enter **REC=xxx** for the file record size, where "**xxx**" is the number of records for each file. (*The software defaults to 80 records. However, DOS systems automatically change record size if it is too small.*)
   d. Enter a **(dot extension)** of 3 characters or less for the file name. For example, all model ABCD cellular telephones tested may be organized to have an ".ABC" file extension.

❒ Check the Test Set to make certain that it is set to the controller mode *if you are using an external disk drive*.

1. Access the I/O CONFIGURE screen from the **`More`** field in the **`To Screen`** menu.
2. Move the cursor to the **`Mode`** field and select **`Control`**.

NOTE:

When you are prompted to enter a file name in which data are to be stored, the protocol for the mass-storage device being used must be followed.

Hierarchical directory paths are not allowed, and all files are created with **`FORMAT ON`**.

Also, when initializing a disk, use the following format ("**`7xx`**" is the disk address, "**`y`**" is the device selector):

DOS disk: `INITIALIZE "DOS:CS80,7xx,y"`
LIF disk: `INITIALIZE ":,7xx,y"`

Memory Space Problems

The program uses a substantial amount of the Test Set's RAM space. If a message displays that indicates a memory problem, check the memory space that has been used.

To determine the memory space used:

1. Load the program, if it is not already loaded, by pressing the k1 (**`Run Test`**) key and waiting for the program display to appear.
2. Press the SHIFT key, then the CANCEL key to stop the program.
3. Press the DUPLEX key to exit the TESTS (Main Menu) screen.
4. Press the SHIFT key, then the SAVE key.
5. Read the number to the left of **`free memory`**.

If this number is a few percent or less, the Test System might display an error message after saving additional set-ups to SAVE registers.

If there is not sufficient memory space available, you might be required to delete unnecessary save registers.

To delete save registers:

1. Press the DUPLEX key.
2. Press the RECALL key.
3. Press the ON/OFF to clear the register.
4. Press the ON/OFF again to answer **YES**.

Printing Problems

- ❒ Verify that the printer is turned on.
- ❒ Verify that the HP-IB, parallel, or serial cable from the Test Set to the printer is connected.

Then, perform the following:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Print Printer Setup`** to switch to the TESTS (Printer Setup) screen.
3. Verify that **`Printer`** was selected in the **`Output Results To:`** field.
4. Verify that the Test Set is correctly configured for HP-IB or serial printing:
   a. Select **`Model`**, then select the most compatible printer model from the **`Choices:`** menu.
   b. Select **`Printer Port`** and then select the printer port.
   c. If the HP-IB port was selected, verify that the correct printer address was entered in the **`Printer Adrs`** field.
   d. If the Serial port was selected, verify that the I/O CONFIGURE screen has been set up correctly for the printer baud rate, parity, and so forth.

Refer to the Test Set *User’s Guide* for details about configuring the printer.

Test Results Are Unexpected

If one or more tests fail unexpectedly, or you believe that there is a problem with the way tests are running, check the settings that are used for the tests.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **Exec Execution Cond** to switch to the TESTS (Execution Conditions) screen.
3. Move the cursor to the **Test Procedure Run Mode:** field and select **Single Step**.
   a. Press the k1 (**Run Test**) key.
   b. When the message **Press continue when ready** is displayed in the top line of the TESTS (IBASIC Controller) screen, press the CANCEL key to pause the IBASIC program.
4. From the **To Screen** menu, move the cursor to the desired instrument screen and select it.
5. After viewing the instrument settings, press the PREV key to return to the TESTS (Main Menu) screen.

NOTE: Do not alter the instrument settings. The IBASIC program will not re-configure the settings when continue is executed. You may alter settings to experiment with the measurement, but all must be returned to the initial settings before leaving the instrument screen.

6. Press the k2 (**Continue**) key to return to the TESTS (IBASIC Controller) screen.
7. Press the k2 (**Continue**) key to continue the program.

Test Set Doesn’t Power Up

Check the AC or DC power connection and the setting of the AC/DC switch on the rear panel. See the Test Set’s *User’s Guide*.

Error Messages

Many error messages are coded into the Test Sets firmware and Test Software. If the problem is related to Test Set operation, access the MESSAGE screen to see any messages that have occurred since the instrument was turned on. To do this, press the SHIFT key, then the RX key.

The following pages list alphabetically many of the error messages and include descriptions of the problems and possible corrections. If the Test System displays a message that is not described here, press the CANCEL key, and then the MSSG key. The Test System might display other related error messages.

For a listing of additional error messages, see the Test Set's *User's Guide* and the *Programmer's Guide*.

If The Test System displays an error message that contains a program line number, and it is not listed in this section, write down the message with the line number and call the factory at 1-800-922-8920 (in the USA and Canada only).

Error Message Reference

The following error messages are possible:

ADC overdriven. Absolute value of the peak sample is at the ADC full scale.

The analog-to-digital converter in the HP 83206A TDMA Cellular Adapter must not be overdriven. This message might be displayed if the transmitter is not being set to the correct power levels.

- Check the level of the RF signal being applied to the Test Set.

1. Press the DUPLEX key.
2. Read the value on the power meter.
3. Compare this value with the power setting of the cellular telephone.

The test will continue with this error present and the results will be displayed. However, performance might be degraded.

ADC underdriven. Absolute value of the peak sample is less than 30 dB below FS of the ADC.

The analog-to-digital converter in the HP 83206A TDMA Cellular Adapter must have sufficient level applied.

❒ Check the level of the RF signal being applied to the Test Set.

   1. Press the DUPLEX key.
   2. Read the value on the power meter.
   3. Compare this value with the output power setting of the cellular telephone.

The test will continue with this error present and the results will be displayed. However, performance might be degraded.

An error free sync word was not found. The SyncLoc result is not valid.

The Test Set was unable to use the synchronization word sent.

- The digital mode of the cellular telephone might not be functioning properly.

1. Run the test on another cellular telephone to determine if this message occurs again.
2. If the message does not occur, it is likely that the cellular telephone is not functioning properly.
3. If the message does occur again, check with the factory for a solution. Call the factory at 1-800-922-8920 (in the USA and Canada only).

- The level of the signal applied to the Test Set might be too low.

1. Press the DUPLEX key.
2. Read the value on the power meter.
3. Compare this value with the power setting of the cellular telephone.

Channel error. Range is 1 to 799 and 991 to 1023. Change channel number in the TESTS (Set Up) screen.

Channel entries must be in this specified range.

- Enter channel numbers into the **`Range/List`** field.

Data collection address cannot be set to 10. Program stopped.

The second serial port in the Test Set has an address of 10, and is used for mobile control. The Serial port, with an address of 9, can be used for data collection. If you are collecting data to an HP-IB device, you must enter all three digits of the address. For additional information, **see "Data Collection and Retrieval," in chapter 6, on page 313**.

Duplicate file. Over-write old file?

The entered file name has the same name as one that is already stored on the storage medium. (You may use a file name once only.) If you answer **`Yes`** to **`Over-write old file?`**, the old file will be over-written. Once a file is over-written, it is unretrievable. There is no backup.

Error 80 during Procedure catalog. Catalog aborted.

The Test System displays this message when it is unable to load a procedure from a PC card.

- Verify that the card is properly inserted and has procedures saved on it.

ERROR 80 in (line number). Medium changed or not in drive. Re-try?

The Test System displays this message when it is unable to access valid files from a PC card.

- Verify that the card is properly inserted and has procedures saved on it.

Error in channel. Re-enter in Range/List field

The channels that are tested must be entered into the **`Range/List`** field in the TESTS (Set Up) screen. The entry ranges are 1 through 799 and 991 through 1023.

Error in data collection information on cnfg screen.

The Test System displays this message if the file type or record number is not properly entered into the TESTS (External Devices) screen.

To access the TESTS (External Devices) screen:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Cnfg External Devices`** to switch to the TESTS (External Devices) screen.
3. Verify that the entries are correct.

HP-IB Command not accepted. Option not installed.

This message might be displayed when the software tries to control a non-existent Test Set option.

To verify the options installed in the Test Set:

CAUTION: Loading this program into the Test Set's memory will erase any other programs and Procedures that you have loaded. If you have not already done so, save your setups to a Procedure on an SRAM card before loading the "LIST_OPTS" program. **See "Using Procedures," in chapter 3, on page 89**.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **`Select Procedure Location:`** field and select it.
3. From the list in the **`Choices:`** menu, select **`ROM`**.
4. Move the cursor to the **`Select Procedure Filename:`** field and select it.
5. From the **`Choices:`** menu, select **`LIST_OPTS`**.
6. Press the k1 (**`Run Test`**) key to display the installed options.

No trigger or clock is present.

The Test Set was unable to find the data clock and use it in subsequent data recovery. The digital mode of the cellular telephone might not be functioning properly. The level into the Test Set might be too low, or no trigger was received by the digital analyzer from the **`Trig Type`** field in the TDMA screen (should be 2X Frame for NADC).

Parameter estimator did not converge.

The Test Set was unable to demodulate the signal captured by the digital analyzer. Test results are not displayed.

- The digital mode of the cellular telephone might not be working properly.
- The level of the signal applied to the Test Set might be too low.
- The frequency or other characteristic of the digital mode signal might be out of specification.

Printer address cannot be set to 10.

The second Test Set serial port, Serial B, has an address of 10. The serial port, having an address of 9, can be used for printing. If you are using an HP-IB printer, you must enter all three digits of the printer address. **See "Printing," in chapter 6, on page 333**.

Sync word began on the 2nd bit of the symbol.

The synchronization word in the captured signal was not properly timed when it was transmitted by the cellular telephone.

- Verify that the cellular telephone is functioning properly.

The test will continue with this error present and results will be displayed. However, the performance might be degraded.

Sync word contained errors or was not found.

The synchronization word in the transmitted signal did not have the correct bits in it when it was measured by the Test Set.

- The level of the signal applied to the Test Set might be too low.
- Verify that the cellular telephone is functioning properly.

The test will continue with this error present and results will be displayed. However, performance might be degraded.

Sync word was too soon in the burst.

There was not enough data ahead of the synchronization word in the captured time record to reconstruct an entire TDMA timeslot.

Test results are not displayed.

Sync word was too late in the burst.

There was not enough data after the synchronization word in the captured time record to reconstruct an entire TDMA timeslot.

Test results are not displayed.

Synchronization to received data did not occur.

The Test Set was unable to use the synchronization word to recover the data sent.

- The level of the signal applied to the Test Set might be too low.

The Test Set must be configured in Control Mode. No other controllers may be on the HP-IB bus. Do you want to put the Test Set in Control Mode? Select desired softkey.

The Test Set can be set to operate in the HP-IB **`Control`** mode or can be set to operate in the **`Talk&Lstn`** mode. This selection is made in the Test Set I/O CONFIGURE screen. If the TESTS (External Devices) screen has entries that require the Test Set to operate as a controller, the Test Software will verify that the Test Set is configured properly. Answer the question **`Yes`** if you wish to change the entry in the I/O CONFIGURE screen.

The memory of the RX DSP board was exceeded.

The Test Set was unable to terminate the entry of a signal into the digital analyzer. Test results are not displayed.

- The level of the signal applied to the Test Set might be too low.

This software will not run with firmware revision (FW rev. #) **presently installed in the Test Set. Consult software users manual for correct firmware revision.**

The Test Set must have a firmware revision **`B.04.01`** or higher. To determine the revision of the firmware:

- Press the CANCEL key, or press the SHIFT key, then the CANCEL key to pause the program.
- Press the SHIFT key, then the CONFIG key to switch to the CONFIGURE screen.
- View the revision number of the firmware in the upper right corner of the display.

Contact the factory (1-800-922-8920; in the USA and Canada only) if you do not have the necessary revision. Firmware is installed in the Test Set by running a program installed on a PCMCIA card.

Timeout error from an external instrument.

The Test System displays this message if it attempts to control a device on the HP-IB bus and is unable to do so for 5 seconds.

- Check cables.
- Verify that the HP-IB address and other setup conditions of your device are set properly.
- Verify entries made to the TESTS (External Devices) screen.

Timeout from printer at address (printer address). Retry?

- Check the cable and the connections.

Weak clock. Difficult to find data clock phase.

The Test Set was unable to recover the data clock and use it in subsequent data recovery.

- The level of the signal applied to the Test Set might be too low.

  The test will continue with this error present and the results will be displayed. However, the performance might be degraded.

6

Reference

This chapter provides detailed descriptions of the more sophisticated features and functions of the HP 11807E, Option 024, AMPS/NAMPS/DCCH/PCS Mobile Test Software. Topics are arranged alphabetically for quick, easy reference.

Introduction

This chapter includes the following sections:

Reference

Copying Files

You may copy files from one mass-storage device to another using IBASIC COPY commands. For example, to copy a file from an inserted PC card to the left drive of an external dual-disk drive with HP-IB address 700, proceed as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`IBASIC IBASIC Cntrl`** to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command line (the large field in the upper part of the screen) and select it.
4. From the list of characters in the **`Choices`**: menu, select and enter the following command:

   `COPY “MY_TEST:INTERNAL” TO “MYFILE:,700,0”`

You may copy a file from one type of PC card to another by loading the file from the first card into the Test Set, inserting a second (initialized) card, and then using the IBASIC SAVE command. To copy a file, select and enter the following characters:

`SAVE “MY_TEST:INTERNAL”`

You may list the names of the files stored in a PC card or disk catalog by using the IBASIC CAT command. To display a list of file names on a PC card, select and enter the following characters:

`CAT “:INTERNAL”` or **`CAT`**

Upon power-on, the default mass storage device is the PC card. If you did not change this setting, then **`”:INTERNAL”`** is optional. If you are entering many characters into the IBASIC command line, you might wish to connect a terminal to the Test Set (see "Serial Connection" on page 334). You might also wish to use a terminal if you have many files to list because file names displayed with the **`CAT`** IBASIC command scroll only from the top of the Test Set screen, not from the bottom.

You must use IBASIC when writing your own programs. However, IBASIC is not explained in this manual. If you wish to write your own IBASIC programs, the following manuals are advised:

- *HP Instrument Basic User's Handbook Version 2.0* HP part number E2083-90005.
- *HP 8920B Programming Manual* HP part number 08920-90222.

See "Data Collection and Retrieval" on page 313, and **"Initializing a Disk" on page 324**.

Reference

Data Collection and Retrieval

You may collect (save) and retrieve test results data. You may elect to save test results to a PC card, to a disk drive, or to a PC. The following paragraphs describe procedures for collecting and retrieving data and for various ancillary functions.

Collection to a PC Card or Disk

You must make entries into the TESTS (External Devices) screen to describe the type of data collection that you are using.

Configure external device entries as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Cnfg External Devices`** to switch to the TESTS (External Devices) screen.
3. Move the cursor to the **`Calling Name`** field and select it.
4. From the list of characters in the **`Choices:`** field, enter the following next to the **`Inst# 1`** field:

   `DATA C`

   The entry will be similar to:

   `1   DATA C`
5. Move the cursor to the **`Addr`** field and select it.
6. Using the DATA keypad, enter a number into the **`Addr`** field, depending on the type of storage medium that you will be using. Press the ENTER key when finished.

   If you are using a PC card, enter 1 into the **`Addr`** field. The display will be similar to:

   `1   DATA C                    1`

   If you are using a disk drive, enter the HP-IB disk address. For example, if the drive you are using is set to 700, the display will be similar to:

   `1   DATA C                    700`

Calling names may be entered in any order.

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

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

Specify the file type with your entry into the **`Options`** field immediately below **`DATA C`**. If you do not enter a file type, and the disk format is LIF, the Test Software will select an HP-UX file type. If you do not enter a file type, and the disk format is DOS, the Test Software will select a DOS file type. For example, if you are using a DOS file with no extension on the file name, the display will be similar to:

```
1  DATA C                    700
```

If you are using an ASCII, BDAT, or HP-UX file, you may specify the number of records allocated to the file. The DOS file is automatically updated as data are stored, so record allocation is not required.

If you are using HP-UX files, you must enter REC= to establish a usable number of records. REC=20480 sets the size to be the same as the default number of 256 byte records used for ASCII files (80×256). You may enter the REC= after the file type. For example, to use an ASCII file with 200 records of 256 bytes each, enter ASCII REC=200 into the **`Options`** field.

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

The display will be similar to:

```
1  DATA C                     700
    ASCII REC=200
```

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

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

If using a new disk, see **"Initializing a Disk" on page 324**. If using a new SRAM card, see **"Initializing an SRAM Card" on page 330**. The file types under LIF can be used by the Test Set's IBASIC controller and some HP workstations. The DOS format is required if you wish to use the disk with a PC.

See **table 10** for a summary of the various configurations.

Table 10 Data Collection Configuration Summary

Inst#	Calling Name Options	Model	Addr	Description
1	DATA Collection	don't care	7xx[1]	To HP-IB disk drive
1	DATA Collection	don't care	1	To PC card
Options[2]	File types of ASCII, or BDAT, or (EXT),[3] or blank,[4] REC=xxxxx, (number of records)	don't care	7xx[1]	LIF format LIF format DOS file type[4] DOS or HP-UX file type Number of records
1	DATA Collection	don't care	9	Serial to external computer (laptop)

1. xx = Last two digits of HP-IB address.
2. These options apply to disk drive and PC card data collection, not when collecting data with **`Addr`**=9.
3. A DOS file name extension. For example, the file name may be CELL1.EXT.
4. DOS is used if the disk format is DOS. HP-UX is used if the disk format is LIF

Retrieval from a PC Card

To retrieve the test results after those results have been saved on a PC card, you must run an IBASIC program. The following is a program to transfer data from a PC card to a terminal emulator. You may type the program lines into the IBASIC command line from a terminal emulator (see **"Configuration for Terminal or PC Operation" on page 321***)*.

Enter the data retrieval program as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **IBASIC IBASIC Cntrl** from the field to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command field (the large field in the upper part of the screen) and select it.

NOTE: In the following step, make certain that the any IBASIC program that you had been running is saved on disk or a PC card before deleting it from the Test Set's memory.

4. From the list of characters in the **Choices:** field, select and enter the following to delete the previous IBASIC program:

   SCRATCH

5. From the list of characters in the **Choices:** field, select and enter the following program:

```
10 DIM A$[120]
```

Sets the string length to 120.

```
20 ASSIGN @File TO "RES:INTERNAL";FORMAT ON
```

Opens a path to the PC card file called "RES" (for results).

```
30 ON ERROR GOTO 80
```

Exits at end of file if an error is encountered.

```
40 LOOP
```

Extracts file contents.

```
50 ENTER @File;A$
```

Transfers part of the file to the string.

```
60 OUTPUT 9;A$
```

The string is output at the Serial port.

```
70 END LOOP
```

Goes back to get more of the file.

```
80 END
```

End of the program.

6. Press the k1 (**Run)** key to run the entered IBASIC program.

NOTE: The **`Run`** field and the **`Run Test`** field do not perform the same function. The **`Run`** field, assigned as a default in the TESTS (IBASIC Controller) screen, will start an IBASIC program that is resident in the Test Set memory. The **`Run Test`** field, assigned as a default in the other TESTS screens, will load and run the program that is called from the **`Select Procedure Filename:`** and **`Select Procedure Location:`** entries in the TESTS (Main Menu) screen.

Collection to a PC

You may output test results through the serial port. A variety of devices can receive the data; such as an HP Palmtop computer, a PC, a notebook computer, or a terminal. A terminal emulator can log the test results to a file. Examples of terminal emulator programs are HP AdvanceLink and ProComm, which is a product of DataStorm Technologies, Inc.

Configure an IBM-Compatible PC with HP AdvanceLink for DOS as follows:

1. Load and run HP AdvanceLink on your PC.
2. Use the information in **table 11**, **table 12**, and **table 13** to set the global, terminal, and remote configuration settings, respectively.

Table 11 Global Configuration Settings

FIELD	SETTING	FIELD	SETTING
Keyboard	USASCII	Memory Size	32K
Personality	HP	Plotter I/F	None
Language	English	HP Mode	Yes
Terminal Mode	Alphanumeric	Video Type	*Select your display type*
Remote to	*enter PC serial port #*	Forms Path	*Enter path if used*
Printer I/F	None	Screen Size	*Enter the size*

Table 12 Terminal Configuration Settings

FIELD	SETTING	FIELD	SETTING
Terminal ID	2392A	Esc Xfer(N)	YES
Local Echo	OFF	ASCII 8 Bits	YES
CapsLock	OFF	FldSeparator	US
Start Col	01	BlkTerminator	RS
Bell	ON	ReturnDef	CR
XmitFnctn(A)	NO	Copy	Fields
SPOW(B)	NO	Type Ahead	NO
InhEolWrp(C)	NO	ROW Size	80
Line/Page(D)	LINE	Host Prmpt Char	D1
InhHndShk(G)	NO	Horiz. Scroll. Incr.	08
Inh DC2(H)	NO	Large [+] Key	+

Table 13 Remote Configuration Settings

FIELD	SETTING
Baud Rate	4800
Parity/Data Bits	None/8
Eng Ack	No
Asterisk	OFF
Chk Parity	NO
SR(CH)	LO
Recv Pace	None
Xmit Pace	None
CS(CB)Xmit	NO

Set up the Test System for data collection to a PC as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Cnfg External Devices`** to switch to the TESTS (External Devices) screen.
3. Move the cursor to the **`Calling Name`** field and select it.
4. From the list of characters in the **`Choices:`** menu, enter the following next to the **`Inst#`** **`1`** field:

   `DATA C`

   The entry will be similar to:

   `1  DATA C`
5. Move the cursor to the **`Addr`** field and select it.
6. Using the DATA keypad, enter 9 and press the ENTER key. The display will be similar to:

   `1  DATA C                    9`

Calling names may be entered in any order.

Reference

Configuration for Terminal or PC Operation

It is preferable to enter long strings of characters into fields using a terminal. Determine the characteristics of the serial port, when it is used for instrument control from a terminal or terminal emulator, by settings in the Test Set's I/O CONFIGURE screen.

Set the following:

- **`Serial In`** to **`Inst`**
- **`IBASIC Echo`** to **`On`**.
- **`Inst Echo`** to **`On`**.

Set the remaining configuration entries to match the settings of your terminal or PC program. **Table 14 on page 322** lists the terminal/computer keystrokes that equate to front-panel controls.

NOTE: Each equivalent character must be preceded by pressing the Escape key. For example, to remotely access the CONFIGURE screen, press the Esc key, then the C key on your terminal/computer. (Make certain to use upper-case C for this example.)

Alternate sequences for five commonly used functions also are available. Press and hold down the Ctrl (control) key and press the corresponding key for the desired function. (Example: Ctrl/H moves the cursor to the left one space.) These functions are:

NOTE: The carrot (^) represents the control key.

ENTER -^J or ^M	KNOB_TURN_CW - ^R
CANCEL - ^C	KNOB_TURN_CCW - ^L
BACKSPACE - ^H	

Table 14 Equivalent Front-Panel Control Characters

Function	Equiv. ESC Char.	Function	Equiv. ESC Char.
CANCEL	!	k5	5
PERCENT MHZ_V	(	K1_PRIME	6
S_KHZ_MV	)	K2_PRIME	7
BACKSPACE	-	K3_PRIME	8
ENTER	.	ASSIGN	9
RELEASE	0	KNOB_TURN_CCW	<
K1	1	KNOB_TURN_CW	>
K2	2	MSSG	A
K3	3	HELP	B
K4	4	CONFIG	C
HOLD	D	RX	a
PRINT	E	TX	b
ADRS	F	DUPLEX	c
SAVE	G	PREV	d
REF_SET	J	TESTS_MAIN	e
METER	K	LOCAL	f
AVG	L	RECALL	g
LO_LIMIT	M	MEAS_RESET	h
HI_LIMIT	N	PRESET	i
E	R	INCR_DIV_10	j
F	S	INCR_SET	k
B	U	INCR_TIMES_10	l
C	V	DOWN	m
D	W	UP	n

Table 14 Equivalent Front-Panel Control Characters

Function	Equiv. ESC Char.	Function	Equiv. ESC Char.
A	X	SEVEN	o
EEX	Z	EIGHT	p
YES_ON_OFF	[	NINE	q
NO_PPM_W	]	FOUR	r
RX	a	FIVE	s
SIX	t	POINT	y
ONE	u	PLUS_MINUS	z
TWO	v	OHM_PCT_DEL_DBUV	{
THREE	w	DB_GHZ_DBM	|
ZERO	x	MS_HZ_UV	}

Initializing a Disk

If you are starting with a blank disk, you must initialize it to the format that you have chosen. Disk drives require specific commands to perform initialization. You should verify that the drive that you are using can be controlled by the Test Set and that you are initializing a disk using a drive or PC that has a compatible format. Two procedures that use the Test Set's IBASIC commands to initialize some disks follow:

Initialize a disk to LIF in an HP-IB disk drive as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **IBASIC IBASIC Cntrl** to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command field (the large field in the upper part of the screen) and select it.
4. From the list of characters in the **Choices:** menu, select and enter the following:

INITIALIZE ":,7xx,y"
where:
xx = the HP-IB address of the disk drive, and
y = the unit number of the drive.

Initialize a disk to DOS in an HP-IB disk drive as follows:

Follow the procedure for the LIF format, replacing the INITIALIZE statement with **INITIALIZE "DOS:,7xx,y"**.

Retrieving Data from a Disk

One way to retrieve the test results from a disk is to run an IBASIC program. A program to transfer data from a disk to a terminal emulator is given below. You may type it into the IBASIC command line from the terminal emulator.

Make certain that your program is saved, because it will be deleted from programmable memory. The file name for this example is “RES”. The disk address is 700, and the drive number is 0. The entire file name is **`RES:,700,0`**.

Enter the data retrieval program as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`IBASIC IBASIC Cntrl`** from the field to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command field (the large field in the upper part of the display) and select it.

NOTE: In the following step, make certain that the any IBASIC program that you had been running is saved on disk or a PC card before deleting it from the Test Set’s memory.

4. From the list of characters in the **`Choices:`** field, enter the following to delete the previous IBASIC program.

   `SCRATCH`

5. From the list of characters in the **Choices:** field, enter the following program:

```
10 DIM A$[120]
```

Sets the string length to 120.

```
20 ASSIGN @File TO ″RES:,700,0″
```

Opens a path to the file called "RES" (for results).

```
30 ON ERROR GOTO 80
```

Exits at end of file if an error is encountered.

```
40 LOOP
```

Extracts file contents.

```
50 ENTER @File;A$
```

Transfers part of the file to the string.

```
60 OUTPUT 9;A$
```

The string is output at the serial port.

```
70 END LOOP
```

Goes back to get more of the file.

```
80 END
```

End of the program.

6. Press the k1 (**Run)** key to run the entered IBASIC program.

NOTE: The **Run** field and the **Run Test** field do not perform the same function. The **Run** field, assigned as a default in the TESTS (IBASIC Controller) screen, will start an IBASIC program that is resident in the Test Set memory. The **Run Test** field, assigned as a default in the other TESTS screens, will load and run the program that is called from the **Select Procedure Filename:** and **Select Procedure Location:** entries in the TESTS (Main Menu) screen.

Memory Cards

Insert a memory (PC) card into the card slot on the Test Set's front panel. The Test Set powers the PC card while the card is inserted. Arrows printed on the PC card and the Test Set's front panel indicate the direction and orientation of card insertion.

Use PC cards to store or retrieve the following:

- Software code
- An HP-supplied Procedure that contains:
    - A default TEST sequence
    - Default parameter values
    - Default pass/fail limit specification values
- A Library file
- Procedures that you construct and that are optimized for your application
- Data collection files
- Channel information
- User-defined keys

Three types of PC cards are available:

- Static Random Access Memory (SRAM)
    - SRAM cards have read and write capability. You may program and read SRAM cards using the Test Set.
- One-Time Programmable (OTP)
    - Once programmed with a suitable card programmer, OTP cards have read-only capability. You may read OTP cards using the Test Set, but you cannot program cards using the Test Set.
- Flash Memory
    - Flash memory cards have read and write capability. You may read flash memory cards using the Test Set. However, these cards can be written to or programmed using only a suitable card reader/programmer. Flash memory cards cannot be written to or programmed with a Test Set.

NOTE: Hewlett-Packard software code and procedure and library files are typically supplied on either OTP cards or flash cards. Flash cards may be distinguished from OTP cards by a small write protect (WP) switch in the end of the flash cards. SRAM cards also have a write protect or safe switch in the end of the card, and also use a battery. Software and procedure/library files stored on a flash card cannot be overwritten by a Test Set regardless of the position of the write protect (WP) switch.

The memory card may be removed after the program is loaded into the Test Set's memory. The program will remain in memory after a power-down/power-up cycle, and until a new program is loaded. Loading a new program will replace the existing program.

SRAM Cards

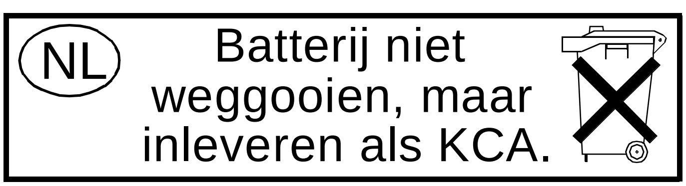
Use a static random-access memory (SRAM) card to store test results and procedures that you construct. Use the parts listed in **table 15**.

Table 15 SRAM Card Products

Memory	Product
64 kilobytes	HP 83230A
256 kilobytes	HP 83233A
1 megabyte	HP 83231A

SRAM cards use a lithium battery (HP part number CR 2025 or HP part number 1420-0509). Programs and data will be retained for over one year if the card is stored at 25° C. The Test Set powers the card while it is inserted. Replace the battery while the card is inserted into a powered-up Test Set. To retain data and programs, the battery should be replaced annually. See the *HP 8920B User's Guide*.

NOTE: The write-protect switch on an SRAM card will write protect the card when it is set toward the outside of the card.



Memory Card Storage Space

Regarding storage space on memory (PC) cards, the following characteristics apply:

- A record is 256 bytes.
- Procedures use 12 to 16 records each.
- A library uses 20 to 35 records.
- Only one library is permitted on a card.
- Overhead of approximately 11 kilobytes is required on each card.

Use the following formula to estimate the storage space required for an application:

Storage Space(in kilobytes) = (Number of Procedures × 4.1) + 20

For example, saving ten different procedures will require 61 kilobytes of memory. The 64 kilobyte or 128 kilobyte card is sufficient.

The storage space that you require for data collection depends on the number of test results to be saved. You will require approximately 4 kilobytes per page of test results that you save. A page of test results is approximately 57 lines of display or printer output.

The storage space of smaller SRAM cards can be filled quickly. If you are collecting large quantities of data, data collection using a PC or printer may be preferable.

Initializing an SRAM Card

NOTE: Initializing SRAM cards using the TESTS (Save/Delete Procedure) screen automatically defaults to DOS format.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **CUSTOMIZE TEST PROCEDURE:** list, select **Proc Save/Delete Procedure** to switch to the TESTS (Save/Delete Procedure) screen.

NOTE: Make certain that the switch on the card is not in the write-protect position.

3. Insert the SRAM card into the slot on the Test Set's front panel.
4. Press the k3 **(Init Card**.) key.
5. Press the Yes key if you wish to continue.

There are two ways to initialize an SRAM card to select the format. If you have a terminal emulator attached to the Test Set, enter a command into the IBASIC command line. A second way to initialize a card is to run the ROM program RAM_MNG.

Initialize an SRAM card using IBASIC as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **IBASIC IBASIC Cntrl** to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command line and select it.
4. Perform one of the following two steps, as appropriate:
   - LIF format:

   From the list of characters in the **Choices:** menu, select and enter the following IBASIC command:

   INITIALIZE “:INTERNAL”

   - DOS format:

   From the list of characters in the **Choices:** menu, select and enter the following IBASIC command:

   INITIALIZE “DOS:INTERNAL”

Initialize an SRAM card using RAM_MNG as follows:

NOTE: Loading RAM_MNG will delete any procedure or program in memory.

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **Select Procedure Location:** field and select it.
3. From the **Choices:** field, select **ROM**.
4. Move the cursor to the **Select Procedure Filename:** field and select it.
5. From the **Choices:** menu, select **RAM_MNG**.
6. Press the k1 (**Run Test**) key.
7. Follow the displayed instructions.

Retrieving Data from an SRAM Card

To retrieve the test results after the results have been saved on an SRAM card, you must run an IBASIC program. The following program transfers data from an SRAM card to a terminal emulator. You may type the program lines into the IBASIC command line from a terminal emulator (see **"Configuration for Terminal or PC Operation" on page 321**.

Enter the data retrieval program as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **IBASIC IBASIC Cntrl** to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the IBASIC command field (the large field in the upper part of the display) and select it.
4. From the list of characters in the **Choices:** field, select and enter the following IBASIC program statements and commands.

NOTE: In the next step, make certain that any IBASIC program that you had been running is saved on disk or an SRAM card before deleting it from the Test Set memory.

5. From the list of characters in the **Choices:** field, enter the following to delete the previous IBASIC program:

   SCRATCH

6. From the list of characters in the **`Choices:`** field, enter the following program:

```
10 DIM A$[120]
```

Sets the string length to 120.

```
20 ASSIGN @File TO ”RES:INTERNAL”;FORMAT ON
```

Opens a path to the SRAM card file called “RES” (for results).

```
30 ON ERROR GOTO 80
```

Exits at end of file if an error is encountered.

```
40 LOOP
```

Extracts file contents.

```
50 ENTER @File;A$
```

Transfers part of the file to the string.

```
60 OUTPUT 9;A$
```

The string is output at the serial port.

```
70 END LOOP
```

Goes back to get more of the file.

```
80 END
```

End of the program.

7. Press the k1 (**`Run)`** key to run the entered IBASIC program.

NOTE: The **`Run`** field and the **`Run Test`** field do not perform the same function. The **`Run`** field, assigned as a default on the TESTS (IBASIC Controller) screen, will start an IBASIC program that is resident in the Test Set memory. The **`Run Test`** field, assigned as a default in the other TESTS screens, will load and run the program that is called from the **`Select Procedure Filename:`** and **`Select Procedure Location:`** entries in the TESTS (Main Menu) screen.

Printing

You may print the following:

- Test results
- TESTS screens

The six basic steps to the printing process are:

1. Verify that your printer is supported by the Test Set (see **"Supported Printers" on page 333**).
2. Determine if your printer requires serial, parallel, or HP-IB connection (see the printer documentation).
3. Connect the printer to the appropriate port on the Test Set (see **"Printer Connection" on page 334**).
4. Configure the Test Set for your printer and its interface (see **"Configuring the Test Set for Printing" on page 336**).
5. Direct the Test Set as to what to print (see **"Printing Test Results" on page 337**).
6. Select the desired parameter value for controlling printing.

Supported Printers

The Test System supports the following Printers:

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

If you do not have one of these printers, consult your printer manual for the correct printer settings to emulate one of the supported printers.

Printer Connection

Printer connections are of two types: HP-IB, and serial. These are described in the following paragraphs.

HP-IB Connection

Connect an HP-IB printer to the Test Set's rear-panel HP-IB connector using an HP-IB cable.

Serial Connection

Connect a serial printer to the serial port as shown in **figure 33**. Use the following RJ-11 pins for this connection.

- RJ-11 Pin 2 - Test Set Receive Data
- RJ-11 Pin 4 - Ground
- RJ-11 Pin 5 - Test Set Transmit Data

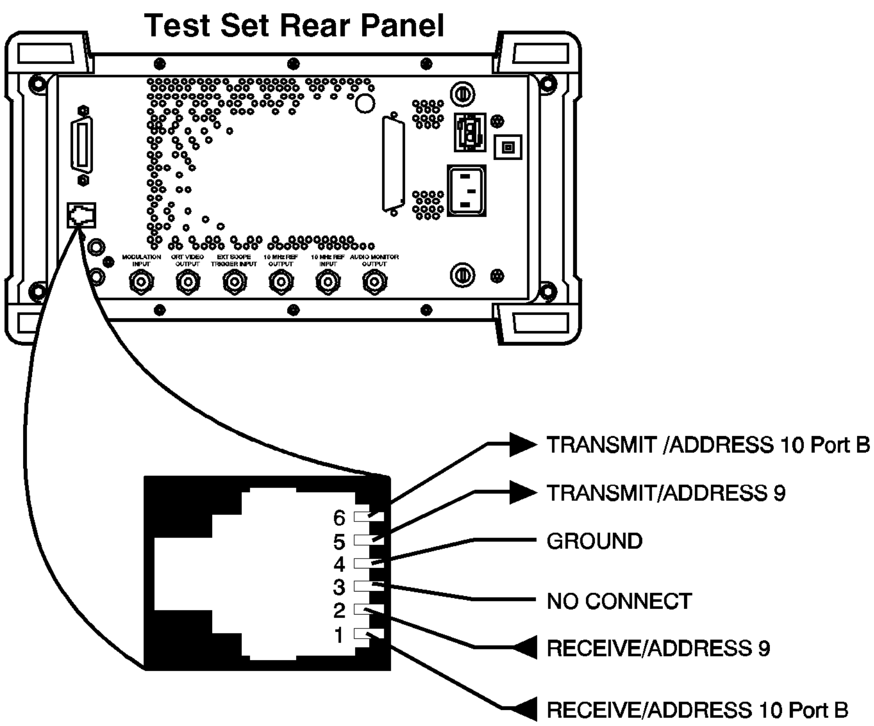


Figure 33 **Serial Port Configuration**

Parallel Connection

Connect a parallel printer the parallel port as shown in figure 34.

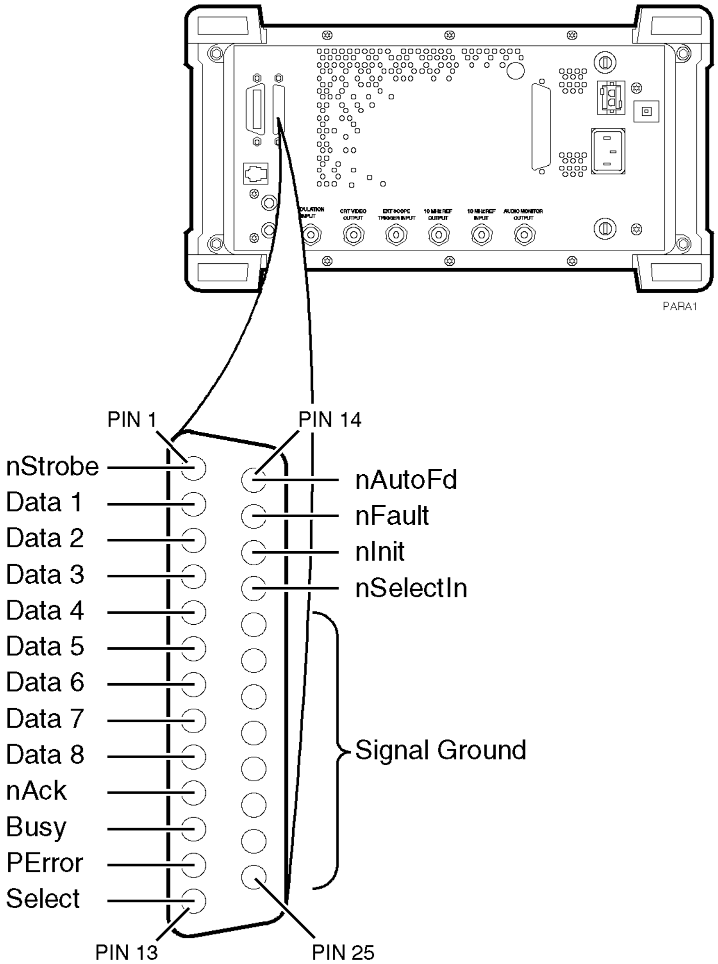


Figure 34 **Parallel Printer Connections**

Configuring the Test Set for Printing

NOTE: If you use a serial printer, you may not use the serial port for other connections (such as data collection for saving test results) at the same time (see **"Serial Port" on page 345**).

Set up the printer as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Print Printer Setup`** to switch to the TESTS (Printer Setup) screen.
3. Move the cursor to **`Model:`** and select the desired printer.
4. Move the cursor to **`Printer Port:`** and select the desired port.
5. If you are using the HP-IB, move the cursor to **`Printer Adrs:`** and enter the HP-IB address for your printer (0-30).
6. Set the following options as appropriate:
   - Lines/Page (controls the number of lines, from 20 to 120, printed on a page before a form feed is sent to the printer)
   - FF at Start (to cause a form feed at the start of a test sequence)
   - FF at End (to cause a form feed at the end of a test sequence)
7. From the **`To Screen`** menu, select **`More`**.
8. From the **`Choices:`** menu, select **`IO CONFIG`** to switch to the I/O CONFIGURE screen.
   - For Serial Printing, set the **`Serial Baud`** field and other serial communications fields listed under it to correspond to your printer configuration.
   - For HP-IB Printing, set the **`Mode`** field to **`Control`**.
9. Press the TESTS key to return to the TESTS (Main Menu) screen.

Printing Test Results

Print test results as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **Print Printer Setup** to switch to the TESTS (Printer Setup) screen.
3. Move the cursor to **Output Results To:** and select **Printer**.
4. Move the cursor to **Output Results For:** and select **All** if you wish to have all results printed, or **Failures** if you wish to have only failures printed.
5. If you wish to use a title for the printed results, move the cursor to **Output Heading:** and enter the words that you wish to use as the heading.

Sending Escape Sequences to the Printer

You may use the Test Set to send escape sequences to control printer options such as pitch, margins, paper size, and so forth. The Test Software includes some predefined escape sequences compatible with HP printers (listed in **table 16 on page 339**), or you may enter others that are compatible with your printer (refer to your printer's user's manual for the available print features and corresponding escape sequences).

NOTE: The Test Software includes an implied escape character for the first sequence. Thus, you need enter only the escape sequence following the escape character. However, if you are linking two or more sequences together, you must use the **~** to indicate the escape character between each two sequences. If the sequence exceeds the space allotted in the options field, you may continue with additional escape sequences in the next available **`Options`** field. You must however, still enter Escape Seq in the **`Calling Name`** field and the appropriate address in the **`Addr`** field for all subsequent entries.

To send an escape sequence to a printer:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **`SET UP TEST SET:`** list, select **`Cnfg External Devices`** to switch to the TESTS (External Devices) screen.
3. Move the cursor to the **`Inst#`** field and select it.
4. Rotate the CURSOR CONTROL knob until an empty **`Calling Name`** field appears, and select it.
5. Move the cursor to the **`Calling Name`** field and select it.
6. From the **`Choices:`** field, select **`Escape Seq`**.
7. Move the cursor to the **`Addr`** (address) field and select it.
8. Using the DATA keypad, enter 9 for serial printers, 15 for parallel printers, or 7XX for HP-IB printers, then press the ENTER key.
9. Move the cursor to the **`Options`** field (directly under **`Calling Name`**) and select it.
10. Select the desired escape sequence from the **`Choices:`** field if applicable, or enter an appropriate sequence using the list of characters below the choices.

Table 16 Escape Sequence Definitions for HP Printers

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

Printing TESTS Screens

TESTS screens include the following:

- TESTS (Set Up) (k3 **`(Print All)`**)
- TESTS (Specific Parameters) (k3 **`(Print All)`**)
- TESTS (Default Parameters) (k3 **`(Print Tst)`**)
- TESTS (Pass/Fail Limits) (k2 **`(Print All`** and k3 **`(Print Tst)`**)
- TESTS (External Devices) (k3 **`(Print All)`**)

Use the same general process to print the information for all of the above TESTS screens.

Print tests screens as follows:

1. Make certain that your printer is properly connected and configured (see **"Printing" on page 333**).
2. Press the TESTS key. The TESTS (Main Menu) screen will appear.
3. From the **`CUSTOMIZE TEST PROCEDURE:`** list or the **`SET UP TEST SET:`** list, select the screen of your choice.
4. Press the appropriate USER key.
5. Press the TESTS key to return to the TESTS (Main Menu) screen.

Reference

RAM Disk

RAM disk is a section of internal random-access memory that acts much like a flexible (floppy) or rigid (hard) disk. Programs can be stored, re-stored, erased, and retrieved.

Four partitions divide the RAM disk into four separate volumes: 0 through 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** through **MEMORY,0,3**. For example, to catalogue the contents of RAM disk Volume 0 from the TESTS (IBASIC Controller) screen, select and enter:

CAT ":MEMORY,0,0"

The contents of Volume 0 can be viewed.

NOTE: Any existing programs or formatting on RAM are erased if you use the RAM_MNG or COPY_PL ROM programs, or the SERVICE screen's RAM Initialize function. Therefore, you should use RAM disks for only short-term storage of files.

Each RAM disk volume must be initialized before it can be used.

NOTE: If you are using a RAM disk to store a test procedure, you must initialize the RAM disk Volume 0. When the Test Software saves a procedure to the Test Set's RAM, it automatically stores the procedure into the memory location Volume 0. This is not changeable.

Volume 0 can be initialized using the **RAM_MNG** procedure stored on the internal ROM's **IB_UTIL** menu.

Initialize RAM disk Volume 0 as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. Move the cursor to the **Select Procedure Location:** field and select it.
3. From the list in the **Choices:** field, select **ROM**.
4. Move the cursor to the **Select Procedure Filename:** field and select it.
5. From the list in the **Choices:** field, select **RAM_MNG,** which is the RAM manager program.
6. Press the k1 (**Run Test**) key to begin program execution.
7. Read the precautions in the Test Set screen and then press the k1 (**Yes**) key to continue.
8. Press the k3 (**Int RAM**) key to select the Test Set's internal RAM as the location to be initialized.

NOTE: In the following step, 50 records should be sufficient for saving a procedure.

9. Using the DATA keypad, enter the number of records that you wish to initialize, then press the ENTER key.
10. Press the k1 (**Yes**) key to verify that the number of records was entered correctly.

    The internal RAM :MEMORY,0,0 will be initialized.

Volumes 1, 2, and 3 must be initialized from the TESTS (IBASIC Controller) screen.

Initialize RAM disk Volumes 1, 2, and 3 as follows:

1. Press the TESTS key. The TESTS (Main Menu) screen will appear.
2. From the **SET UP TEST SET:** list, select **IBASIC IBASIC Cntrl** to switch to the TESTS (IBASIC Controller) screen.
3. Move the cursor to the data entry field and select it.
4. Using the list of characters in the **Choices:** menu, select and enter the following command:

   INITIALIZE “:MEMORY,0,<volume number 1-3>”,<volume size>

   or

   INITIALIZE “:MEMORY,0,1”,50

   The optional ‘volume size’ in the command lets you specify the memory area set aside for each disk in 256-byte blocks.

Saving Tests Results

See **"Data Collection and Retrieval" on page 313**.

Serial Port

Use the 6-pin, RJ-11 serial port to input and output serial data. Use serial data for entering programs, printing, and for sending test results to a connected controller, disk drive, or terminal.

Use the TESTS (External Devices) screen to define serial communications settings. Use ground with IBASIC and all other serial connections. Use Transmit B and Receive B exclusively with IBASIC programs. Use Transmit and Receive with all other serial connections (see **figure 35**).

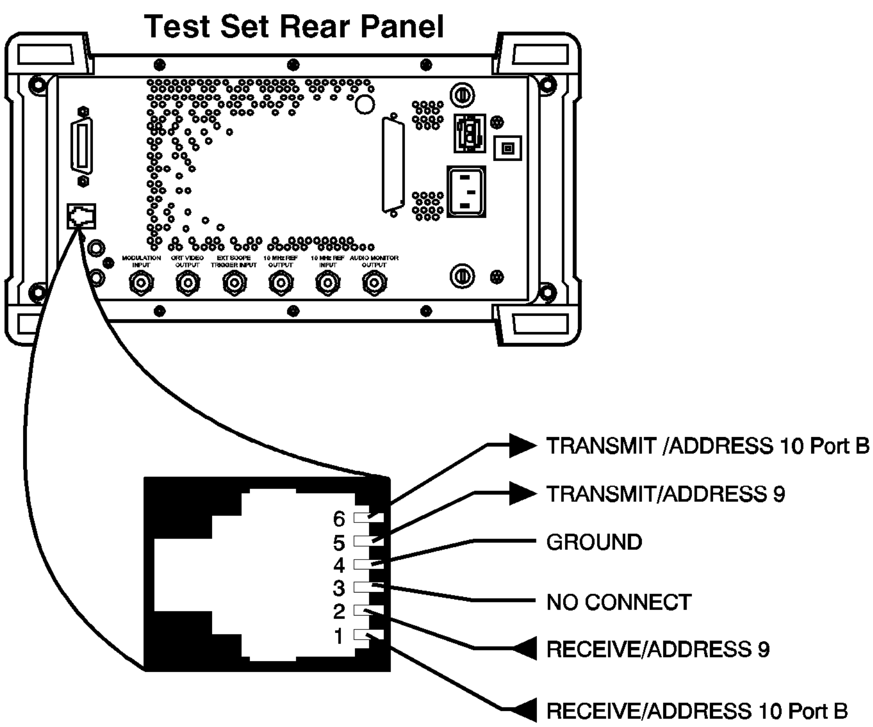


Figure 35 **Serial Port Configuration**

The IBASIC Controller sends data to and receives data from the serial ports using address **9** for the primary port, and address **10** for Port B.

NOTE: Use an RJ-11/25-pin RS-232 adapter (HP P/N 98642-66508) and RJ-11 cable (HP P/N 98642-66505) to connect the Test Set to a serial printer or terminal/computer.

NOTE: RJ-11 cables and adapters can be wired several ways. If you buy a cable or adapter other than the HP parts listed, verify the connections for the pins before connecting cables to the instruments.

Table 17 lists connections for transmit, receive, and ground pins (address 9).

Table 17 Transmit, Receive, and Ground Connections

HP 8920B RJ-11 Serial Port		Terminal/PC 25-Pin RS-232		Terminal/PC 9-Pin RS-232
Pin 2 (RX)	to	pin 2 (TX)	or	pin 3 (TX)
Pin 5 (TX)	to	pin 3 (RX)	or	pin 2 (RX)
Pin 4 (GND)	to	pin 7 (GND)	or	pin 5 (GND)

Understanding HP-IB Control Annunciators

The words, letters, and symbols at the top right corner of the Test Set display indicate the following conditions:

- **R** indicates remote operation from an external controller or IBASIC program in the Test Set. This letter will be displayed while the Test Software is running.
- **L** indicates that the Test Set is monitoring, and is ready to receive a manual or remote command.
- **T** indicates that the Test Set is communicating with another HP-IB device.
- **S** indicates that a service request has been generated.
- **C** indicates that the Test Set is currently an active controller. Control mode is set in the TESTS (External Devices) screen. The Test Set must be a controller if HP-IB peripherals are to be controlled.
- ***** indicates that an IBASIC program is running, or that the IBASIC controller is executing a command.
- **?** indicates that an IBASIC program is waiting for a user response.
- **-** indicates that the IBASIC program is paused.
- **SHIFT** indicates that the SHIFT key was pressed, and that the next key entry will be shifted. (Press the SHIFT key again to clear).

USER Keys

When you are using the Test Set, you will see the following USER assigned keys appear at times in the top right-hand corner of the display. (These keys are assigned to the hard keys k1 through k5.) In many cases, you may use these keys as “shortcuts” instead of positioning the cursor and selecting. USER keys are sometimes referred to as softkeys.

`Clr Scr` allows you to clear the Test Set’s display.

`Continue` allows you to continue the program after it has been paused.

`Delet Stp` allows you to edit items in a test sequence. When you press this key, the test in the displayed sequence with the **`Step #`** highlighted (inverse video) will be deleted. The tests that follow in the sequence will be scrolled up by one step.

`Del Proc` allows you to delete the selected procedure. When you press this key, you will be prompted to verify the command by pressing Yes.

`Done` allows you to exit a test or signal that a task is complete. The program will continue if there is a next test in the sequence or if there are additional program steps in the test being run.

`Help` allows you to secure information on how to use the current TEST screen.

`Init Card` allows you to initialize an SRAM card. Before you press this key, verify that the card is inserted correctly, that it is not write-protected, and that there are not programs stored on the card that you wish to save.

`Insrt Stp` allows you to enter items into a test sequence. When you press this key, the test in the displayed sequence with the **`Step #`** highlighted (inverse video) will be copied into a new sequence location, immediately after the highlighted one. The tests that follow in the sequence will be scrolled down by one step. This key does nothing if there are no items in the sequence. Select a test before using this key to insert another.

`Main Menu` allows you to return to the main TESTS screen. The same result is achieved by pressing the TESTS key.

`Page Up`/**`Page Down`** allows you to display items quickly in the list when some of the items will not fit on the screen.

`Run` allows you to start an IBASIC program that has been loaded into the Test Set’s memory.

Reference

Run Test allows you to load and run the program that has been entered into the TESTS screen's **Select Procedure Filename:** field. If the program is already loaded into the Test Set's memory, it will be started.

Save Proc allows you to save the specified procedure.

Sngl Step allows you to step the IBASIC program one line at a time. This is different from **Continuous/Single Step** run mode.

Stop Test allows you to pause the Test Software.

Take It allows you to direct the program to accept the setting of an adjustment, and to proceed with the program. The test, determining if the adjustment is within limits, is ceased.

Yes/**No** allow you to answer questions displayed on the Test Set's display.

Glossary

ACC See analog control channel.

Access The Test Set state in which it is communicating with the mobile station under test.

ACCH See analog control channel.

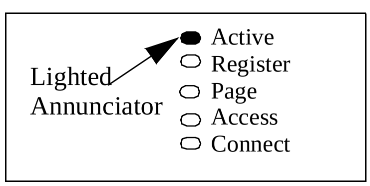
Active A Test Set state in which it is emulating a base station. In the Active state, the Test Set is ready to communicate with the mobile station.

Advanced Mobile Phone System (AMPS) The analog cellular telephone system in use on the North American continent and other places.

AMPS See Advanced Mobile Phone System.

analog control channel (ACC or ACCH) A channel used for transmission of digital control information from a base station to a mobile station or from a mobile station to a base station.

annunciator A screen graphic that identifies the call processing state of the Test Set. A lighted annunciator indicates the Test Set state. An example is shown in the following diagram.



band-pass filter (BPF) A filter that increasingly rejects frequency components of signals as those components diverge above and below certain cutoff frequencies. In the Test Set, audio band-pass filters are used to reduce the level of out-of-band signals during certain measurements.

base station (BS) Multiple definitions:

1. A fixed-site station in the Domestic Public Cellular Radio Telecommunications Service. It is used for communicating with mobile stations.

2. A fixed-location transceiver in a communications network.

3. The land station, in a cellular or PCS network, that carries on a radio communication with mobile units.

Dependent upon context, the term base station might also refer to a cell, a sector within a cell, a Mobile Telephone Switching Office (MTSO), or some other part of a cellular system.

BCH code See Bose-Chaudhuri-Hocquenghem code.

BER See bit error rate.

bit error rate (BER) The ratio of the number of erroneous bits received to the total number of bits received during the observation period, and expressed as a percentage, a fraction, or a ratio.

Bose-Chaudhuri-Hocquenghem code (BCH code) A large class of error-correcting cyclic codes. For any positive integers (m, $m \geq 3$, and $t < 2^m - 1$), there is a binary BCH code with a block length n equal to $2^m - 1$ and $n - k \leq mt$ parity check bits, where k is the number of information bits. The BCH code has a minimum distance of at least $2t + 1$.

BPF See band-pass filter.

call processing A system function that controls cellular call origination, paging, and messaging.

CANCEL key A push-button on the Test Set's front panel that is used to pause (stop) the IBASIC program running in the Test Set.

card (Familiar use) See PCMCIA card.

Cellular Adapter A self-contained module that attaches to the Test Set. It typically tests a specific system or provides a special function to the Test Set. The HP 83201, 83203, 83204, 83205, and 83206 Cellular Adapter are examples.

channel A transmission path between two points. Ordinarily, the smallest subdivision of a particular transmission system by means of which a single type of communication service is provided.

`Choices` A field in the lower right of the Test Set's screen that offers several possible functions for selection.

Connect The Test Set state in which it has established a communications link (for example, a call) to the mobile station under test.

`Continue` A Test Set function (pressing the Continue key) that causes the IBASIC program to restart if it has been paused (stopped).

control channel A pair of channels, forward and reverse, used for the transmission of digital control information. It is used typically for call setup and system administration.

cursor The brightened region of the Test Set's screen that indicates the field/function currently being accessed.

CURSOR CONTROL knob The large dial in the center of the Test Set's front panel that is rotated to position the cursor on the screen and then pressed to select the particular field or function. (Sometimes referred to as "knob".)

DAMPS See Digital Advanced Mobile Phone System.

DATA keys A group of push-buttons on the Test Set's front panel that are used for entering and changing data and controlling the various aspects of using data for measurements.

DATA FUNCTIONS keys A group of push-buttons on the Test Set's front panel that are used for changing field values and controlling the various aspects of making measurements.

DCCH See digital control channel.

`Del Step` A Test Software function that deletes a step in a procedure.

device under test (DUT) The device that is being tested, usually a mobile or base station. Sometimes referred to as the UUT (unit under test) or MSUT (mobile station-under test).

Digital Advanced Mobile Phone System (DAMPS) A revision to the advanced mobile phone system (AMPS) that increases channel capability through digital multiplexing, using time division multiple access (TDMA), and that meets the requirements of Specification IS-54.

digital control channel (DCCH) In TDMA cellular telephone systems that meet the requirements of Interim Standard 136, a channel used to transmit control information between the base station and mobile stations.

digital signaling tone (DST) A sub-audible FM data signal that is transmitted by a mobile station to a base station when certain signaling operations must occur.

digital supervisory audio tone (DSAT) A sub-audible FM data signal that is transmitted on a voice channel by a base station transmitter, transponded by a mobile station, and used in determining RF path integrity.

digital traffic channel (DTC) In TDMA cellular telephone systems that meet the requirements of Interim Standards 54B and 136, a channel used to transmit primary, secondary, and signaling traffic between the base station and mobile stations.

digital verification color code An eight-bit signal sent by the base station to the mobile station. It is used to generate the coded digital verification color code (CDVCC), which indicates that the correct data are being decoded.

`Disp Loc` (Displayed Location) A Test Software menu function that is used to display an assembly diagram that shows the location of the adjustable component.

downband In TDMA systems, a special set of frequencies below the normal cellular band.

DSAT See digital supervisory audio tone.

DST See digital signaling tone.

DTC See digital traffic channel.

DTMF See dual-tone multi-frequency.

dual-tone multi-frequency (DTMF) A scheme for signal multiplexing that uses simultaneous transmission of two tones, one from a group of low frequencies and another from a group of high frequencies. Each group, in turn, consists of four frequencies. Each key of the numeric keypad on a cellular phone is identified by two of these signals, which are transmitted when the key is pressed.

DVCC See digital verification color code.

electro-static discharge (ESD) A transfer of static electricity from one point to another. Electronic devices can be damaged by the energy transferred during the discharge.

Epson card A type of PC card that meets the requirements of the Epson standard. Such cards are used for static random-access memory (SRAM), or for one-time programmable memory.

ESD See electro-static discharge.

explicit handoff A type of handoff in which a Handoff Operation is included in the process so as to allow for customized parameters and pass/fail limits specifications.

FACCH See fast associated control channel.

fast associated control channel A logical control channel that is associated with a TCH or SDCCH and that is used to perform handovers and call establishment or termination of a TCH or SDCCH.

field An area on the Test Set screen in which entries may be made. It is identified with an inverse video display.

A selectable location on the Test Set screen.

function A particular field, feature, or operation of the Test Set.

GEN (General) An abbreviation that appears in some titles in the Test Software and indicates that the item relates to the general system, as opposed to a transmitter (TX) or receiver (RX).

hand-held cellular telephone A portable cellular phone that may be used anywhere cellular telephone service is available, although it is somewhat limited in range because of its lower power output. It is a self-contained unit that includes a handset, transceiver, antenna, power supply, and battery. See also *mobile cellular telephone* and *transportable cellular telephone*.

handoff A transfer from one channel to another. A handoff may be explicit or implicit. See also *implicit handoff* and *explicit handoff*.

`Help` A Test Software feature that provides specific information about using the current screen in the TESTS environment. This feature is accessed by pressing k4 (**`Help`**) from any TEST screen. See also *HELP*.

HELP A Test Software feature that provides additional Test Set information. This feature is accessed by pressing SHIFT, then TX (HELP) keys. Help topics are listed in alphabetical order. See also *Help*.

highlight A brightened region (cursor) of the Test Set screen that indicates the field or function currently being accessed.

high-pass filter (HPF) A filter that increasingly rejects signal frequency components that decrease toward, and then pass, a certain cutoff frequency; at which point, lower frequencies are effectively blocked. In the Test Set, audio high-pass filters are used to reduce the level of low-frequency signals during certain measurements.

HPF See high-pass filter.

IBASIC See instrument BASIC.

IBASIC controller The controller built into the Test Set to run the IBASIC programs that perform automated tests of cellular communications equipment.

implicit handoff A type of handoff in which a Handoff Operation is not included. In such case, the handoff is implied and performed automatically by the Test Software. Thus, it does not allow for customized parameters and pass/fail limits specifications, but uses default values instead.

initialize To set a card or disk to a formatted, ready-to-use condition. This is done by either 1) selecting `InitCard` in the TESTS (Save/Delete Procedure) screen, or 2) pressing USER key k3. The default for PC cards is DOS format.

Interim Standard 136 (IS-136) An EIA/TIA Interim Standard that defines a TDMA cellular telephone system with a digital control channel, a digital voice channel, and a digital traffic channel.

Instrument BASIC (IBASIC) A computer language (code or software) used by the built-in Test Set controller. The IBASIC software is downloaded from the OTP Card into the Test Set's RAM. This software is then used to control the Test Set during cellular telephone testing.

INSTRUMENT STATE keys A group of push-buttons on the Test Set's front panel that are used to control various hardware functions.

IS-136 See Interim Standard 136.

key Any of the various push-buttons located on the Test Set's front panel.

keypad A group of push-buttons on a cellular telephone that are used for dialing numbers and programming the telephone.

keys See DATA keys, DATA FUNCTIONS keys, INSTRUMENT STATE keys, SCREEN CONTROL keys, USER keys, SHIFT key, and CANCEL key.

knob See CURSOR CONTROL knob.

library A collection of the names of all of the operations, parameters, pass/fail limits, and tests in the Test Software. A library is stored as a file on a memory card or other mass storage device with its associated procedure files. The Test Software uses the library, program code file, and a procedure to run an application program.

location A device from which to retrieve or to which to save (store) a particular testing procedure (for instance: a disk, a card, RAM, or a PC).

low-pass filter (LPF) A filter that increasingly rejects signal frequency components that increase toward and then pass a certain cutoff frequency; at which point, higher frequencies are effectively blocked. In the Test Set, audio low-pass filters are used to reduce the level of high-frequency signals during certain measurements.

LPF See low-pass filter.

Main Menu The Test Set (Main Menu) screen that is used to customize and execute (run) automated testing procedures. It is accessed by: 1) pressing the TESTS key, or 2) pressing the k5 (Main Menu) key.

measurement A series of calculations performed by the Test Set on data supplied from a cellular telephone under test. These calculations provide a value to be compared with pass/fail limit values to verify the performance of the cellular telephone.

memory card A PCMCIA or Epson card used for data storage.

menu A part of the Test Set screen that displays a group of tasks from which to select using the CURSOR CONTROL knob or the USER keys.

message A block of text displayed on the Test Set screen that contains information of interest to the user, such as control, signaling, or application information. A message consists of a length field (MSG_LENGTH), a message body (the part conveying the information), and a CRC.

In the HP 11807E Test Software, the upper portion of the Test Set screen is reserved for messages and prompts.

MIN See mobile identification number.

mobile cellular telephone A cellular telephone that is installed in a vehicle and may be used anywhere cellular telephone service is available. It consists of a power supply, handset, transceiver, and antenna. It operates on dc power from the vehicle electrical system. See also *hand-held cellular telephone* and *transportable cellular telephone*.

mobile identification number (MIN) A 34-bit number that is a digital representation of the 10-digit directory telephone number assigned to a mobile station.

mobile station A telephone designed to operate in a cellular network, be installed in a vehicle or carried by a person, and be operated at unspecified locations or while in motion.

Mobile stations include hand-held personal units, transportable units, and units installed in vehicles. See also *hand-held cellular telephone*, *transportable cellular telephone*, and *mobile cellular telephone*.

mobile station under test (MSUT) The cellular device that is being tested. Sometimes referred to as the DUT (device under test) or UUT (unit under test).

MSUT See mobile station under test.

NAMPS See Narrow-band Advanced Mobile Phone System.

Narrow-band Advanced Mobile Phone System (NAMPS) A revision to the Advanced Mobile Phone System (AMPS) that increases channel capability through the use of narrower channels. Three NAMPS channels occupy the space of one AMPS channel.

no service indicator An indicator on the cellular phone that lights when there is no cellular service available in a given area.

one-of-many A type of display screen field that offers multiple selections. (Sometimes called one of M, or 1 of M.)

one-time programmable card (OTP card) A type of PC card that is capable of data storage, and into which data can be loaded one time only (similar to integrated-circuit ROM). The Test Software is shipped on an OTP card.

OTP card See one-time programmable card.

Page The Test Set state in which it is paging the mobile station under test in order to establish communication.

page The process of setting up and initiating a cellular phone call by the base station. (A call begun by a mobile station is called an origination.)

parameter A Test Software function that is user modifiable and that is used to specify certain values and control information to the Test Software. These include calibration data, cellular telephone characteristics, and test customization. Parameters provide flexibility in the use of the Test Software. Default values for all parameters are included in the Test Software.

pass/fail limit specifications A Test Software function that is user modifiable and that is used to specify the criteria for verifying the performance of the cellular telephone. Specifications can include high limits, low limits, and high/low limits. The associated measurement value must meet or fall within the pass/fail values to verify performance of the cellular telephone. Default values included in the Test Software have been derived from standard methods of measurement or from standard cellular telephone test requirements.

pause A Test Software function that momentarily stops the running of IBASIC software in the Test Set and allows access to the keyboard functions. It is activated by pressing the CANCEL key. Pressing the CONTINUE key allows the software to proceed. (Note that, in some instances, test results following a pause might be unreliable.)

PC card Any card of the two classes of cards that meet the requirements of the PCMCIA card standard or the Epson card standard.

PCMCIA See Personal Computer Memory Card International Association.

PCMCIA card Any of a class of cards that meet the requirements of the PCMCIA standard. Such cards are used for static random-access memory (SRAM), or read-only memory (ROM), or for one-time programmable memory.

peak+/- max A detector in the Test Set that measures and computes the maximum of the absolute value of the positive and negative excursions of the measurement. For example, when an FM waveform with +10-kHz and –9-kHz deviations is applied, 10 kHz will be displayed.

Personal Computer Memory Card International Association (PCMCIA) An international organization that devised a small-footprint, card-based computer interface, primarily for mobile computers.

port A place of access to a device where signals may be input, output, or measured. Also known as a connector or terminal.

PRESET function A Test Set function that sets the Test Set to its initial power-up state. It is activated by pressing the PRESET key.

procedure See test procedure.

prompt An on-screen message that requests an action by the user.

The upper portion of the Test Set (inverse video field) is reserved for prompts and messages.

RAM See random-access memory.

random-access memory (RAM) A type of integrated circuit that is capable of data storage, with the data read- or write-accessible on an address-selectable, or random-access, basis. RAM is used for the Test Set's memory that stores program code and data. The Test Set's RAM is battery-backed-up, retaining data and program code when the power is turned off.

read-only memory (ROM) A type of integrated circuit that is capable of data storage, into which data can be loaded one time only, with the data read-accessible on an address-selectable, or random-access, basis. ROM is used primarily for control applications in which data must be read multiple times.

Register The Test Set state in which registration occurs.

registration The process by which a mobile station identifies its location and parameters to a base station.

release The process of ending a call between a mobile station and a base station.

ROM See read-only memory.

`Run Test` A Test Software function that directs the Test Set to load the program from the current procedure and begin testing. (This process might require as long as two minutes).

SACCH See slow associated control channel.

SAT See supervisory audio tone.

save To place data into a memory device such as a memory card, a disk, or RAM. Save and store are used synonymously.

screen The Test Set's display.

SCREEN CONTROL keys A group of push-buttons on the Test Set's front panel that control various display functions.

select To choose a particular field or function. To: 1) rotate the CURSOR CONTROL knob and move the highlighted cursor to the desired field or function, then, 2) press the knob. Alternate method: To press the USER key that has the same number as displayed next to the desired function.

sequence The method used in the Test Set to run one or more tests in a desired order. A sequence is entered using the TESTS (Set Up) screen.

SHIFT key A push-button on the Test Set's front panel that is used to select the blue-labeled functions shown above some keys on the panel. Pressing the SHIFT key and pressing a second key activates the second (blue-labeled) function.

SID See system identification.

signaling tone (ST) A 10-kHz tone transmitted by a mobile station to confirm orders, signal flash requests, and signal release requests. This signal can vary in duration.

signal plus noise and distortion A representation of signal plus noise and distortion divided by noise and distortion. A measurement result that determines the quality of an audio tone in the presence of noise and distortion. A 12-dB SINAD value is often used when measuring receiver sensitivity.

SINAD See signal plus noise and distortion.

slow associated control channel (SACCH) A logical control channel that is associated with a physical channel and used to maintain proper timing and power between transmitter-receiver pairs communicating on that channel.

softkey (Familiar use.) One of the set of keys next to the Test Set screen (the USER keys) that can be assigned in the software to certain special actions or fields. The keys are associated with the five inverse video fields in the upper right-hand portion of the screen. The function associated with the softkey is activated by: 1) pressing the corresponding USER key or, 2) turning the CURSOR CONTROL knob to move the cursor to the field and then pressing the knob. See also *USER keys*.

specifications Representations of the criteria that the Test Software uses for verifying the performance of the cellular telephone. The specifications values may be changed by using the TESTS (Default Parameters) screen. The associated measurement value must meet or fall within the limits of specifications values to verify the performance. Default values in the Test Software have been derived from standard methods of measurements.See also *pass/fail limits*.

SRAM See static random-access memory.

SRAM card See static random-access memory card.

ST See signaling tone.

static random-access memory (SRAM) A sub-type of RAM integrated circuit that is optimized for relatively high-speed general memory applications. Memory cards that use SRAM technology can be used with the Test Set to save programs and test results.

static random-access memory card (SRAM card) A type of PC card that contains SRAM circuits and a back-up battery, and that is used with the Test Set to store programs, procedures, and test results.

Step# (Step Number) A Test Software function that orders the sequence of tests. (For instance, Step #1 might be a transmitter frequency error test and Step #2 might be a transmitter RF power test.)

store To place data into a memory device such as a memory card, a disk, or RAM. Store and save are used synonymously.

subsystem A section of firmware grouped together for a specific task.

suite See test suite.

supervisory audio tone (SAT) A tone (6000, 5970, or 6030 Hertz) that is transmitted by a base station on the forward analog voice channel and transponded by a mobile station on the reverse analog voice channel. It is used to confirm that the mobile station has connected to the desired base station on the voice channel.

system identification (SID) A digital code that identifies the home system of the mobile station. The code is transmitted to the mobile station by the base station in the System Parameter Overhead Message.

An identification associated with a cellular system.

System identification of the service area.

TDMA See time division multiple access.

test A collection of measurements (or a series of other tests) that verify a particular specification value or operation of the cellular telephone. A sequence of tests is contained in a test procedure.

test procedure A group of operations (for instance: Page, TX RF Power Output Test, and so forth) that are performed on groups of channels (for instance: 355, 790, 991) using specific parameters (for instance: SAT tone = 5970, SID = 19) and pass/fail limits specifications (for instance: TX power @ level 0.3 to 0.7 W), saved in a file. A procedure customizes the Test Software to a specific application. Procedures are constructed by editing existing channels, parameters, pass/fail limits, and testing order, and saving the resulting files to a memory card, disk, or internal Test Set's RAM.

test suite A group of operations (or tests) that is performed over a range or list of channels.

TESTS screens The Test Set screens that are used to customize and execute (run) all automated testing procedures. These screens are accessed by pressing the TESTS key and making various selections.

time division multiple access (TDMA) A technique for increasing cellular telephone channel capacity by allowing as many as six telephone calls to time-share a channel.

A type of frequency division in which one frequency is shared sequentially by multiple activities. In cellular phone technology, a TDMA system is defined by both a frequency and a time slot.

toggle A type of display screen field that switches between two functions upon selection. One function is always displayed. Selecting that function switches to the second function. The selected function is underlined.

transportable cellular telephone A portable cellular phone that may be used anywhere cellular telephone service is available. It consists of a handset, transceiver, antenna, power supply, and battery; all of which is installed in a carrying case. See also *hand-held cellular telephone* and *mobile cellular telephone*.

unit under test (UUT) The device that is being tested, usually a mobile or base station. Sometimes referred to as the DUT (device under test) or MSUT (mobile station under test).

UUT See unit under test.

USER keys A group of user programmable keys, located immediately to the right of the Test Set screen, that allow more rapid selection of certain functions without rotating and pressing the CURSOR CONTROL knob. These key assignments are displayed in the upper right portion of the Test Set screen. The number to the left of each displayed function name corresponds to the number on one of the keys, k1 through k5.

values The scalar quantities or numbers inserted in the inverse video fields of the parameters and pass/fail limits specifications. The units of measure contained in the values for parameters and pass/fail limits specifications are: dB, inches, volts, watts, and so forth.

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