will'tek

Willtek 4300

Mobile Service Tester

user's guide

Test configuration software version 1.3
CDMA system software versions 5.1, 5.2
TDMA system software version 7.5

Notice

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Ordering information

This guide is issued as part of the **4300 Series Mobile Service Tester**. The ordering number for a published guide is M 290 043.

The ordering number for the product depends on the exact model:

Table 1 4300 Series Mobile Service Tester models

Ordering number	Model	Supported formats
M 104 301	4301	AMPS
M 104 302	4302	AMPS, CDMA (cellular)
M 104 303	4303	AMPS, CDMA (cellular, PCS)
M 104 304	4304	AMPS, TDMA (cellular)
M 104 305	4305	AMPS, TDMA (cellular, PCS)

Federal Communications Commission (FCC) Notice

This product was tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

The authority to operate this product is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by Willtek.

Industry Canada Requirements

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Table of Contents

About This Guide

Purpose and scope

The purpose of this guide is to help you successfully use the 4300 Series Mobile Service Tester features and capabilities. This guide includes task-based instructions that describe how to install, configure, use, and troubleshoot the 4300 Series Mobile Service Tester. Additionally, this guide provides a description of Willtek's warranty and repair information.

Assumptions

This guide is intended for intermediate and experienced users who want to use the 4300 Series Mobile Service Tester effectively and efficiently. We are assuming that you have basic computer experience and are familiar with basic telecommunication concepts and terminology.

Related information

Use this guide in conjunction with the following information:

Table 1 Related manuals

Ordering number	Document name
M 295 043	4300 Series Mobile Service Tester: Getting Started Manual
M 293 043	4300 Series Mobile Service Tester: SCPI Reference Manual

Technical assistance

If you need assistance or have questions related to the use of this product, call or e-mail one of Willtek's technical assistance centers.

Table 2 Technical assistance centers

Region	Phone number	Fax number, email address
UK	+44 (0)20 8408 5720	+44 (0) 20 8397 6286 support.uk@willtek.com
Europe, Middle East, Asia, Africa	+49 (0)89 99641 386 +49 (0)89 99641 227	+49 (0)89 99641 440 support.eu@willtek.com
Americas	+1 317 595 2021 +1 866 WILLTEK	+1 317 595 2023 support.us@willtek.com

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 3 Typographical conventions

Description	Example
User interface actions appear in this **typeface**.	On the Status bar, click **Start**.
Buttons or switches that you press on a unit appear in this TYPEFACE.	Press the ON switch.
Code and output messages appear in this `typeface`.	`All results okay`
Text you must type exactly as shown appears in this **`typeface`**.	Type: **`a:\set.exe`** in the dialog box.
Variables appear in this **<typeface>**.	Type the new **<hostname>**.
Book references appear in this **typeface**.	Refer to **Newton's Telecom Dictionary**
A vertical bar | means "or": only one option can appear in a single command.	`platform [a|b|e]`
Square brackets [ ] indicate an optional argument.	`login [platform name]`
Slanted brackets < > group required arguments.	`<password>`

Table 4 Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive key strokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Table 5 Symbol conventions

	**This symbol represents a general hazard.**
	**This symbol represents a risk of electrical shock.**
	NOTE This symbol represents a Note indicating related information or tip.

Table 6 Safety definitions

	**WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	**CAUTION** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Safety Notes

This chapter provides the safety notes for the 4300 Series Mobile Service Tester. Topics discussed in this chapter include the following:

Safety notes

Danger of overheating

Insufficient air flow around the unit could cause overheating of the power supply and possible damage to the unit. Keep ventilation slits clear!

Danger of electrical shock

To prevent electrical shock, do not remove covers. No user serviceable parts inside. Refer servicing to qualified personnel.

4300 Series Mobile Service Tester Overview

1

This chapter provides a general description of the 4300 Series Mobile Service Tester. Topics discussed in this chapter include the following:

About the 4300 Series Mobile Service Tester

The 4300 Series Mobile Service Tester is intuitive and user-friendly to operate. The 4300 offers single-button automated tests. This allows unskilled personnel to run a complete Go/No Go test of a mobile phone.

Whichever mode of operation you use, your test will be displayed on an easy to read LCD display with soft key menu-driven screens providing a complete summary analysis of analog or digital performance to improve repair and testing times. The display screen has selectable inverse video capability. The 4300 provides a wide range of testing variations, allowing for reprogramming channel parameters, base and mobile transmit power levels. All of these test features can be programmed from your personal computer, put on a floppy disk, and directly loaded into the 4300 via its PC-compatible disk drive; this allows for uploading, downloading, and distribution of programs and test data using standard PC software.

The 4300 provides increased flexibility with a cross point switch that controls the input and output of internal generators and filter combinations. Engineers can configure the bandpass filters required to accurately measure signal distortion and technicians can implement non-standard modulation tests using the two internal 10 Hz to 100 kHz generators that are programmable in 1 Hz steps.

What's new in this version

This manual refers to the following software configuration of the 4300:

Table 1 Software versions

4300 Series model	Version number
4301	1.3
4302, 4303 (CDMA)	5.2
4304, 4305 (TDMA)	7.5

In version 5.2, TDSO (service option 32) has been added to the CDMA functionality.

Options

The models of the 4300 series are listed in section "Ordering information" on page i. The following options and accessories are recommended for use with the 4300 Series Mobile Service Tester:

ACELP vocoder software (TDMA only)

IS-136 custom software

Physical description

Elements such as the screen, keys, and connectors are described in detail in the following sections: "Using the front panel" on page 10, "Connecting test leads" on page 16.

Specifications

For detailed specifications, please refer to the 4300 Series data sheets.

Installation

2

This chapter describes how to install the 4300 Series Mobile Service Tester. The topics discussed in this chapter are as follows:

Unpacking and inspection

The instrument was inspected, and given final operational and quality control tests prior to being carefully packaged for shipment. The unit should operate in accordance with the specifications listed in this manual.

When unpacking the instrument, inspect the shipping container and instrument for shipping damage. If the container is damaged, phone Willtek immediately. Save the shipping carton and packing materials for possible future use.

When unpacking the instrument please verify that the following items are included with the 4300 Series Mobile Service Tester. If any items are missing, call Willtek Customer Service immediately. For contact addresses, please refer to "Technical assistance" on page xvi.

Item	Quantity	Description
1	1	4300 Series Mobile Service Tester
2	1	AC Power Cord
3	1	TNC-TNC RF Cable
4	1	Printer Cable
5	1	RS-232 Cable
6	1	CD containing: – user's guide – SCPI reference manual
7		this getting started manual
8	1	Mini UHF male to TNC female
9	1	UHF male to female
10	1	TNC-SMA Adapter

Environmental considerations

The 4300 is designed to operate between 10°C and 40°C, and should be used in an area where the air flow around the instrument is not restricted.

Danger of overheating

Insufficient air flow around the unit could cause overheating of the power supply and possible damage to the unit. Keep ventilation slits clear!

Setting up the unit

Once the unit is unpacked and the shipping inventory is complete, it's time to set up the unit for operation. The following is a step-by-step procedure on how to prepare the unit for operation including the hookup of a mobile to be tested.

Danger of electrical shock

To prevent electrical shock, do not remove covers. No user serviceable parts inside. Refer servicing to qualified personnel.

1. Attach the power cord to the rear of the unit, and plug it into a suitable power source.
2. If desired, attach mobile power source to the rear of the unit. Ensure to observe the labeled polarities when connecting the power source. Attach mobile power lines to front panel connectors. Mobile power source should be a 3-15 volt, 5 amp supply.
3. Using the RF cable provided, attach the mobile to be tested to the front-panel RF IN connector. It may be necessary to use the standard adapters supplied with the unit. Some phones require a manufacturer-specific test jig.
4. Apply power to the 4300 and the mobile under test.
5. Refer to the sections "Using the front panel" and "Connecting test leads" in order to familiarize yourself with the 4300.
6. Refer to section "Setting up the 4300" on page 18 to set up the 4300 for your individual requirements.
7. To run manual test, refer to "Setting up the 4300" on page 18.
8. To learn about the automated test features, refer to the sections "Performing a quick ID check", "Performing a Quick test", "Performing an Auto test", and "Performing a custom test" in Chapter 3.

Fire hazard

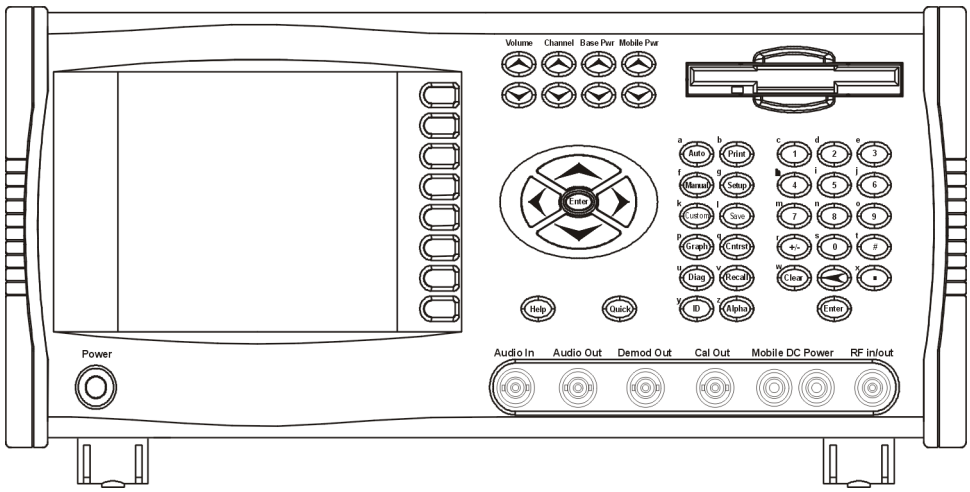
For continued protection against fire hazard, replace fuse only with same type and rating.

Operation

3

This chapter describes the functionality of the instrument. Topics discussed in this chapter are as follows:

Using the front panel

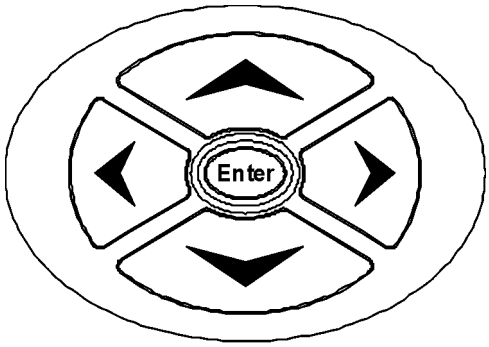


LCD Information is displayed on a 320 x 200 LCD with CCF backlight for good viewability.

AMPS Summary				Messages
Mobile Transmitter				Audio Setup
Power	6.2	dBW		
Freq Error	-0.02	kHz		RF Tests
SAT Deviation	1400	Hz		SAT
SAT Frequency	5970	Hz		
Audio Deviation	2650	Hz		ST
Mobile Receiver				Wide Band Deviation
Rx Sinad	20.0	dB		
DC Power	27.3W	12.6V	2.2A	Audio Deviation
Pwr Lever	5	Base Pwr	-75.0	
Channel	333			Release
System	A			

Keypad

Arrow keys



Left arrow

Function: Scroll left

Description: Selects the previous item (depending on the operating mode).

Up arrow

Function: Increment selected value

Description: Increments the value of the selected item (depending on the operating mode).

Down arrow

Function: Decrement selected value

Description: Decrements the value of the selected item (depending on the operating mode).

Right arrow

Function: Scroll right

Description: Selects the next item (depending on the operating mode).

Power key

ON/OFF

Function: Applies/Removes power to the 4300

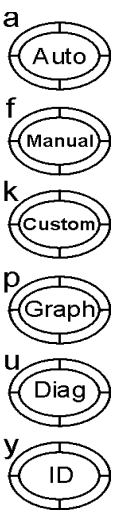
Description: Power is applied to the 4300 by pressing the **ON/OFF** key. The unit will display a start-up screen followed by automatically entering the manual mode.

Soft keys **S1 - S8**

Function: Selects display driven functions

Description: There are a total of eight vertically oriented soft keys, on the right side of the display. The function of each soft key changes depending on the operation being performed. The function is indicated on the display next to the associated soft key. Soft keys are not always active. When a soft key is inactive, its indicator is either dimmed (grayed) or does not appear at all.

Test mode keys:



Auto

Function: Performs automated test sequence

Description: Automatically performs a sequence of mobile tests. These tests are predefined and are loaded from the diskette that accompanied the unit.

Manual

Function: Allows manual performance of mobile tests

Description: You can manually select tests to be performed on the mobile.

Custom

Function: Custom tests

Description: Allows the user to custom program tests designed with specific parameters that can be saved for future reference.

Graph

Function: Provides graphical display of transmitter power

Description: The AutoGraph™ feature provides the user with a graphical display of the mobile's transmitted output power vs. voice channel at the eight power levels.

Diag

Function: Brings up the **Diagnostics – Self Test** screen.

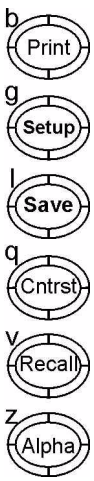
Description: The **Diagnostics – Self Test** screen permits the following: Run Self Test, View Test Results, View Software Revisions and Calibrate.

ID

Function: Perform a registration

Description: Extracts information from the mobile by performing a registration. The information is displayed following a successful registration.

Function mode keys



Print

Function: Print registration/test summary information

Description: You can print registration/test summary information by pressing the **PRINT** key. The print function is active whenever the information is being displayed or in the view mode for the selected file. A suitable printer must be connected to the parallel printer port. After pressing the **PRINT** key, a printer menu is displayed. The 4300 will prompt you of any printer error conditions that exist.

Setup

Function: Program operating parameters

Description: Selects the mode in which the following operating parameters of the 4300 can be selected and programmed by the user:

- System Setup
- Sequence Setup
- Cal Cable
- Preset
- Audio Filter
- Units Setup
- Upgrade Software
- Date/Time Setup
- Key Pad
- Print Setup
- Perf Spec Setup
- File Utilities
- TDMA/CDMA Setup
- Audio Setup
- Deviation Detector
- Stored Settings
- Self Test
- Remote Setup
- Contrast Setup

Save

Function: Provides access to disk drive

Description: Allows test results to be saved to disk. When the **Save** key is pressed, a menu is displayed with a variety of save options.

Cntrst

Function: Adjust display video contrast level

Description: Allows the operator to vary the contrast level of the display. Inverse video function is also available through this menu.

Recall

Function: Provides access to stored settings

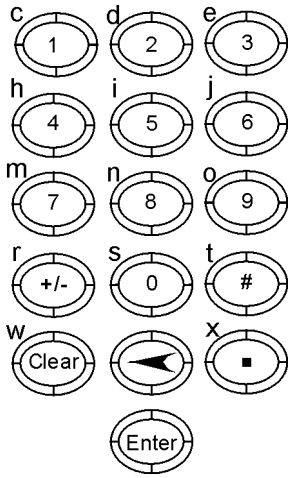
Description: Allows the operator to save instrument parameters in a stored setting memory location for later recall.

Alpha

Function: Places keypad in alphabet entry mode. Enters alpha values.

Description: Allows the alpha characters above Test, Function and Data entry keys to be entered. Pressing the **Enter** key will return the keypad to the primary key mode.

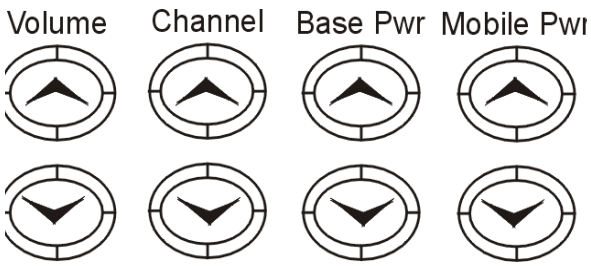
Data entry keys



The data entry keys are used to enter alphanumeric values in selected fields. The primary function of the key is to enter numeric values. The secondary function when used in conjunction with the test and function keys is to enter alpha values. The Backspace (arrow) key is used to delete a character in a specified field. The Clear key is used to delete all characters in a specified field. The Enter key is used to execute entered values or terminate the alpha entry mode.

To change the sign of a numerical value from positive to negative or vice versa, press the **+/–** key.

Base station adjustment keys



Volume

Function: Adjust 4300 audio output level

Description: The 4300 has an external speaker that audio signals can be directed to.

Channel

Function: Selects voice channel and performs hand off after a short delay

Description: The user can select the mobile/portable's voice channel. The desired channel can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

Base Pwr

Function: Selects base power level

Description: The user can select the 4300's output power level. The desired level can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

Mobile pwr

Function: Selects mobile power level

Description: The user can select the mobile/portable's transmit power level (0-7). The desired level can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

Miscellaneous function keys

Help

Function: Provides operational information to user

Description: The **Help** key provides operational information depending on the mode the unit is currently in. To receive Help information, simply press the **Help** key.

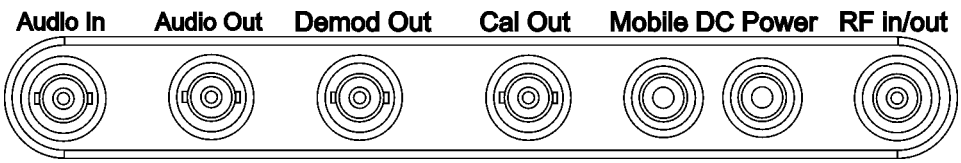
Quick

Function: Performs automated test sequence

Description: Automatically performs a sequence of mobile tests. These tests are predefined and are loaded from the diskette that accompanied the unit.

Connecting test leads

Front panel connections



RF in/out

Function: RF input connector

Description: Input connector to which the cellular phone or mobile phone is attached to. A TNC-TNC cable (provided with unit) is used to connect the cellular to the base station.

Mobile Pwr

Function: Provides power to cellular phone or mobile under test

Description: A mobile power input (rear-panel) is provided as a means of attaching a suitable power supply to the cellular under (15 VDC max) test. Once the power supply is attached to the rear, power is available at the front-panel Mobile DC power jacks current, voltage and power measurement can be made.

Cal out

Function: Cable loss measurements

Description: Provides a means of determining the amount of cable loss (in dB) associated with the specific RF cable being used. This value is used to automatically compensate for transmitted and received power measurements.

Demod out

Function: Demodulated output signal source

Description: Provides a demodulated signal output in the receive mode.

Audio out

Function: Audio synthesizer output or audio out

Description: Provides Audio output for further testing capabilities.

Audio in

Function: Provides SINAD testing capabilities or external modulation

Description: Audio can be directly supplied to unit for testing and analysis.

Rear panel connections

Parallel port

Function: Printer interface

Description: Connection port for printer operations. When a suitable printer is attached to the port, printing is available.

Serial port

Function: RS-232 interface

Description: Provides communication link between PC and 4300.

Mobile power **INPUT**

Function: Input connection for mobile power

Fire Hazard

For continued protection against fire hazard, replace fuse with same type and rating.

Description: Mobile power is made available to the front-panel though this input. The input is fuse protected at 5 Amps max. Max voltage 15 VDC.

GPIB interface **IEEE STD 488 PORT**

Function: Unit programming

Description: Allows for standard GPIB programming.

Setting up the 4300

Introduction

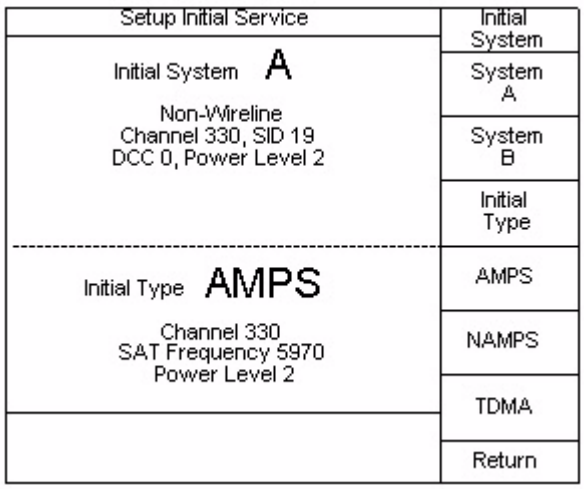
This mode allows you to program various operating parameters of the 4300. These parameters are stored in nonvolatile memory and are retained even while the unit is off.

To enter the setup mode, press the **SETUP** key. The following setup options are available in the setup mode:

- System Setup
- Sequence Setup
- Cal Cable
- Preset
- Audio Filter
- Units Setup
- Upgrade Software
- Date/Time Setup
- Key Pad
- Print Setup
- Perf Spec Setup
- File Utilities
- TDMA/CDMA Setup
- Audio Setup
- Deviation Detector
- Stored Settings
- Self Test
- Remote Setup
- Contrast Setup

System Setup

System setup is used to define initial service parameters of the mobile under test. The following screen is displayed when the **System Setup** soft key is pressed.



Initial System The 4300 is capable of simulating either a Non-Wireline (A) System or a Wireline (B) System. By pressing the **Initial System** soft key the system will toggle between A or B systems. The **up** and **down** arrow keys can also be used to toggle between settings.

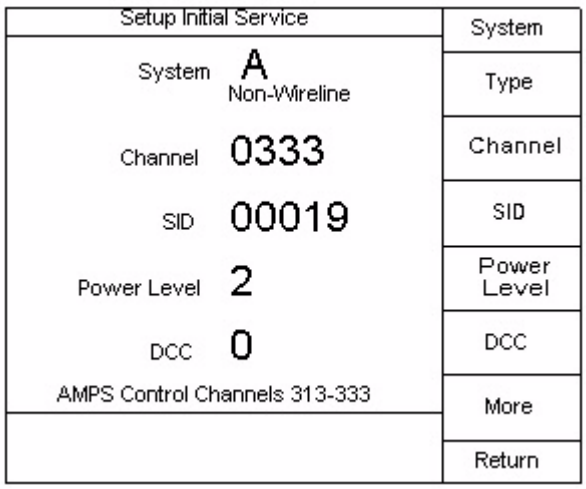
Initial Type The 4300 is capable of simulating several programming formats. These formats include; AMPS, NAMPS, TDMA (optional) and CDMA (optional). To select an Initial Type, press the **Initial Type** soft key until the desired type is displayed. The **up** and **down** arrow keys can also be used to toggle between settings. This will be the type of voice channel assigned on the initial voice channel assignment.

System A Pressing the **System A** soft key allows access to the system initial service parameters. From this screen the following parameters can be set:

- System
- Channel
- SID
- DCC
- Power Level

Most of the parameters of the local system can be verified with your local carrier contact.

Editing System Parameters



System

The System soft key can be used to toggle between System A or B. Separate setups are required for the A and B system.

Channel

The user can select the mobile/portable's voice channel. The arrow keys can be used to accomplish this function or the **Channel** keys. The desired channel can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

SID

The SID is a number which identifies the customer's Home system. To edit the SID, press the **SID** soft key which places the selection box around the current SID number. Enter the desired number using the 4300's numeric keypad, followed by the **Enter** key, or use the **up** and **down** arrow keys.

DCC

To edit the DCC (Digital Color Code), press the **DCC** soft key which places the selection box around the current DCC number. Enter the desired number using the 4300's numeric keypad, followed by the **Enter** key, or use the **up** and **down** arrow keys. DCC's are used to distinguish between cellsites with the same channel assignment within a cellular system.

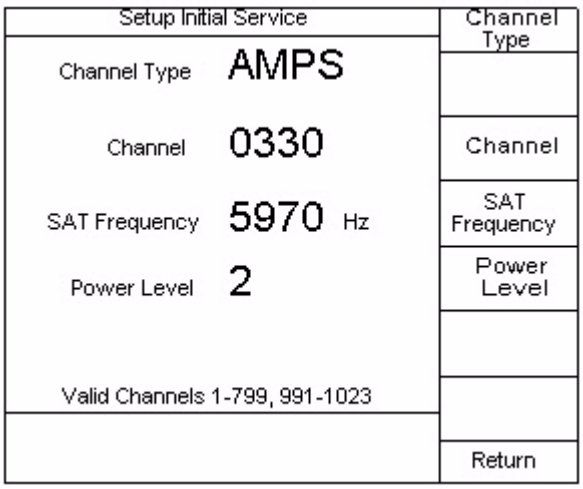
Valid DCC's are: 0-3

Power Level

The user can select the mobile/portable's power level. The arrow keys can be used to accomplish this function or the **Mobile Pwr** keys. The desired power level can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key. This is the initial Power Level that the phone will be commanded to.

System B Editing System B parameters is identical to System A in operation.

AMPS To edit parameters of an AMPS mobile under test, press the **AMPS** soft key. The following screen is displayed:



Channel Type

To select a Type, press the **Type** soft key until the desired type is displayed. The **up** and **down** arrow keys can also be used to toggle between settings.

Channel

The arrow keys can be used to accomplish this function or the **CHANNEL** keys. The desired channel can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key. We recommend setting the initial voice channel in the range 1-666. Some mobiles operate with only 20 MHz bandwidth and are thus not capable of operating on the additional channels 667-799 and 991-1023.

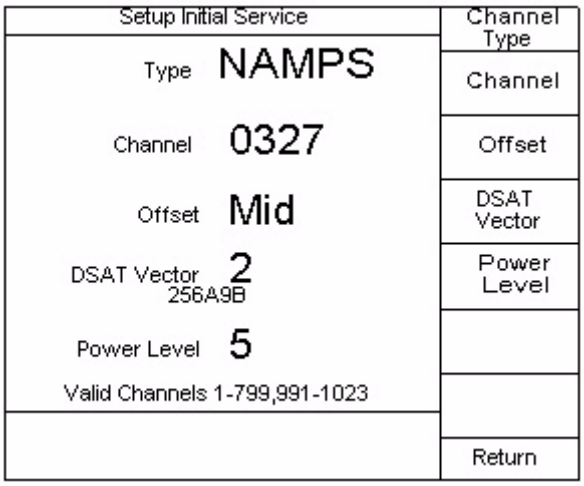
SAT Frequency

The up/down arrow keys or the **SAT Frequency** soft key can be used to accomplish this function.

Power Level

The user can select the mobile/portable's power level. The arrow keys can be used to accomplish this function or the **Mobile Pwr** keys. The desired power level can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

NAMPS To edit parameters of a NAMPS mobile under test, press the **NAMPS** soft key. The following screen is displayed.



Channel

The arrow keys can be used to accomplish this function or the **Channel** keys. The desired channel can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

Offset

The up/down arrow keys or the **Offset** soft key can be used to select the desired NAMPS channel offset.

DSAT Vector

To edit the DSAT Vector, press the **DSAT Vector** soft key which places the selection box around the current DSAT Vector selection. Enter the desired number using the 4300's numeric keypad, followed by the **Enter** key, or use the **up** and **down** arrow keys.

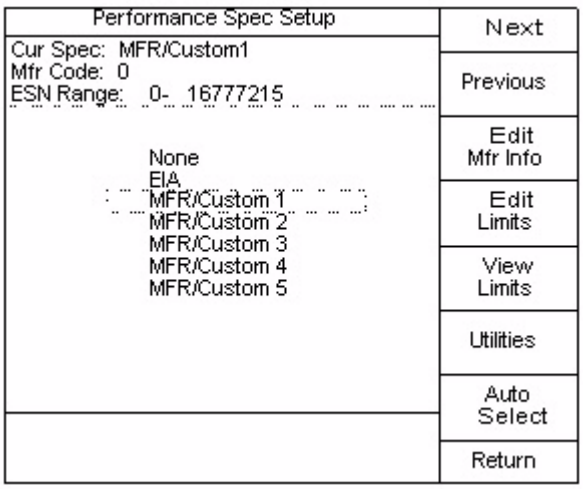
Power Level

The user can select the mobile/portable's power level. The arrow keys can be used to accomplish this function or the **Mobile Pwr** keys. The desired power level can also be selected by entering the desired value on the numeric keypad and pressing the **Enter** key.

Performance Specification Setup

The **Performance Specification Setup** soft key allows the user to select a mobile/portable performance specification table to be used by the 4300. For each test performed the 4300 will compare the mobile/portable's measured performance with the associated limits in the selected specification table. Based on this comparison the 4300 will decide if the mobile/portable has passed or failed.

When the **Perf Spec Setup** soft key is pressed the following screen is displayed:

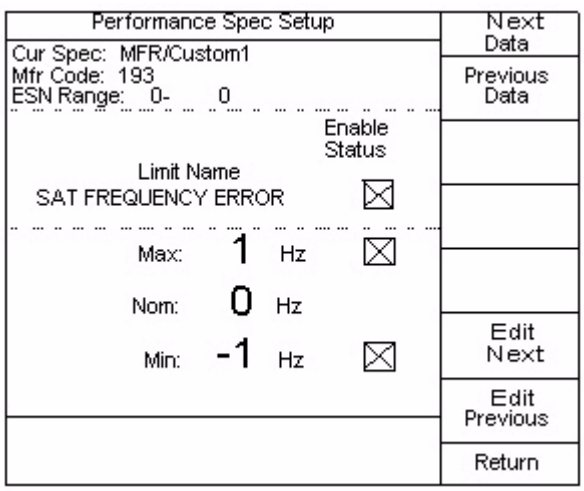


Next Moves the Specification Selection box to the next selection.

Previous Moves the Specification Selection box to the previous selection.

Edit Mfr Info The ability to edit Manufacturer Information is only available on Custom Specification tables. To edit Manufacturer Information, press the **Edit Mfr Info** soft key. Use the **Edit Next** and **Edit Previous** soft keys to select the field that you wish to edit. Use the **up** and **down** arrow keys or the numeric entry keypad to edit the selected field. The Current Specification label (Cur Spec) may be entered using the **ALPHA** key in conjunction with the **TEST**, **FCN**, and **DATA ENTRY** keys for alphanumeric entry. Refer to "Saving test results" on page 79 for details.

Edit Limits To edit Custom Performance Specification Limits, press the **Edit Limits** soft key. The following screen is displayed:



Next Data/Previous Data Use these soft keys to select the Limit to be edited. An "X" in the Enable Status box indicates that the limit is enabled. A blank indicates that the limit is disabled. Use the **up** and **down** arrow keys to make the selection.

Edit Next/Edit Previous Use these soft keys to select the parameter of the selected limit that is to be edited. The Max and Min portions of the limits can be enabled or disabled as desired. The numeric value of the limit can be changed using the **up** and **down** arrow keys or the numeric entry key pad.

View Limits Press the **View Limits** soft key to view all limits associated with a Specification Table. Editing of limits is not permitted in this mode.

Utilities The **Utilities** soft key allows the user to perform the following functions:

- Print - allows the user to print the selected performance specifications.
- Save To Disk - saves the selected performance specifications file to disk as a *.LIM file.
- Load From Disk - retrieves specification files from disk.

These features enable the user to save custom specification files for transfer to another unit, or to maintain a disk copy in the event that the file is lost.

Auto Select When the Auto Select feature is turned on, and a registration or origination is performed, the unit will search the Custom 1 through 5 specification parameters for a manufacturer code and ESN range that matches the mobile under test. This allows the user to define the Custom 1 through 5 performance specifications with specific manufacturer codes and ESN ranges. Press the **Auto Select** soft key to turn this feature on/off. If the mobile under test does not match a specific manufacturer code or ESN range it will automatically default to Custom 1.

Sequence Setup

Sequence Setup is used to set the parameters associated with running automatic, quick, or custom test sequences. The following items are programmed using the various Sequence Setup menus.

Load From Disk - Loads a test sequence that has been stored on a disk. The disk that accompanies the unit contains a sample quick, auto and custom test sequence. To load a test sequence, perform the following:

1. Insert disk into 4300.
2. Press the **SETUP** key.
3. Press the **Sequence Setup** soft key.
4. Press the soft key associated with the desired test sequence (automatic, quick, custom).

5 Press the **Load From Disk** soft key.

6 Use the **up** and **down** arrow keys to select the file to be uploaded.

7 Press the **Pick** soft key.

Log To Disk - Automatically logs test results to disk, the file will be created under the ESN of the mobile under test.

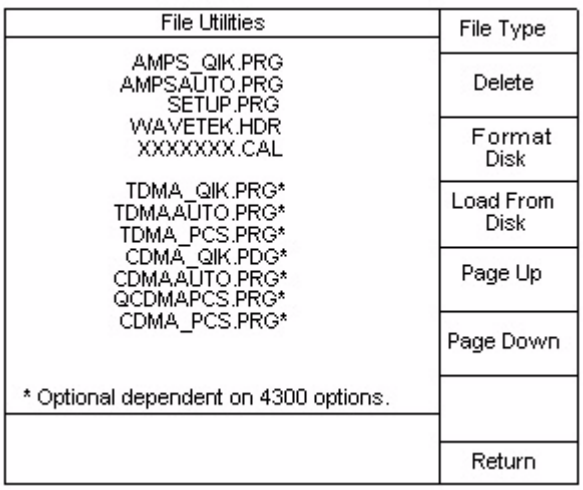
Log To Printer - Automatically sends test results to attached printer.

Pause Mode - Allows the automated test sequence to pause after each test, failed test, or on manual action only.

Sequence Number - Only available for custom tests, chooses 1 of 3 custom test sequences currently stored in memory.

File Utilities

When the **File Utilities** soft key is pressed, the 4300 will read the directory of the disk inserted into the disk drive. After the directory is read, the following screen is displayed:



File Type

Press the **File Type** soft key to list the various file types associated with the 4300. The following is a list of file types that the 4300 can process:

*.LOG - non-formatted test results output from test sequence

*.AGR - formatted test results output from Autograph

*.LIM - performance specification limits table

*.PRG - test sequence program

*.PAG - formatted test results output from test sequence

*.HDR - header information file

Other file types

There are two more file types recognized by the 4300 but not listed under the File Type menu. These are *.CAL and *.BIN. These files must be loaded using the Upgrade Software setup feature.

To only list files of a specific type, press the file type associated soft key.

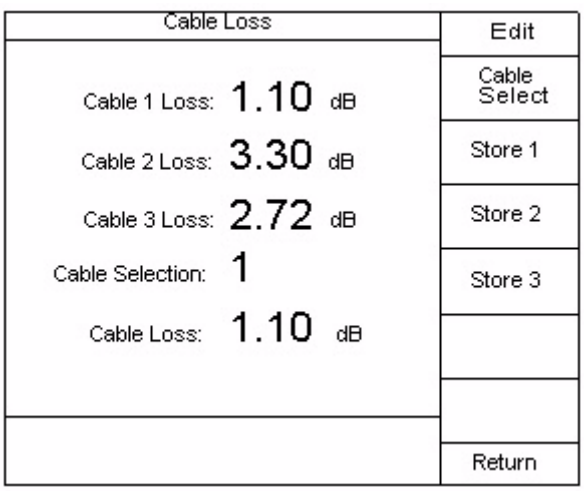
Delete Use the **Delete** soft key to delete unwanted files. Use the **up** and **down** arrow keys to scroll to the file to be deleted. When the file to be deleted is highlighted, press the **Delete** soft key. A confirmation screen will appear, press the **Yes** soft key to delete the file, or the **No** soft key to cancel the action.

Format Disk Press the **Format Disk** soft key to format disks. The screen will prompt you to insert the disk to be formatted. Insert the disk and press the **Format Disk** soft key.

Load From Disk Loads the selected file from the disk. Use the **up** and **down** arrow keys to select the file to be loaded. When the desired file is highlighted, press the **Load From Disk** soft key. If the selected file is *.PRG, then select the desired location (auto, quick, or custom 1-3) where the program sequence should be loaded. If the selected file is *.LIM, then select the desired location where the limits table should be loaded.

Cal Cable

The CAL Cable feature provides a means of determining the amount of cable loss (in dB) associated with the specific RF cable being used. This value is then added in all mobile/portable transmit and receive power measurements to compensate for the associated cable loss. More than one cable can be calibrated to trouble-shoot phones. The 4300 can store the results of up to three different cables. When the **CAL Cable** soft key is pressed, the following screen is displayed:



Comparing results

To compare results between two monitors, use the same setups and delete the cable calibration factor if one of the monitors is not capable of calibrating out cable loss.

Edit The **Edit** soft key is used to enter a known cable loss value for a specific cable being used. Press the **Edit** soft key until the desired cable is selected. Use the numeric entry keys or the arrow keys to enter a specific value.

Cable Select Use the **Cable Select** soft key to select the cable to be used in measurements. Press the **Cable Select** soft key until the desired cable is displayed. The Cable Loss compensation can also be turned off using the **Cable Select** soft key.

Store 1, 2, 3 To perform a Cable Loss measurement, attach the RF cable from the RF IN port to the CAL OUT port. The associated cable loss will be displayed. To store the cable loss, press one of the **Store** soft keys. The cable loss is then stored under that specific cable number.

Preset When the **Preset** soft key is pressed, the unit will automatically set the following parameters that are listed to their default values and reestablish the control channel. In addition to the following parameters, all parameters that are saved and recalled with Stored Settings (refer to "Stored Settings" on page 33) are also set to their default values.

from the Cable Loss screen (press **SETUP > Cal Cable**):

- • Cable Selection

from the Audio In Setup screen (press **SETUP > More > Audio Setup > Audio In Setup**):

- Type (with **Audio In Source** set to Mobile Rx Audio)

from the Units Setup screen (press **SETUP > More > Units Setup**):

- Tx Power
- Tx Frequency Error

from the ID/Registration Information screen (press **ID > Abort/Setup** > **Show Prev Data**):

- ESN Format

from the Page In Progress screen (from Manual Mode, press **Page Mobile > Abort/Setup**):

– MIN 1 and MIN 2

from the SSD Update Procedure screen (from AMPS Messages, press **SSD Update**):

– A-Key

from the Unique Challenge Procedure screen (from AMPS Messages, press **Unique Challenge**):

– SSDA

from the AutoGraph Mode screen (press **GRAPH**, **Setup**)

– Channel Type
– Channel Start
– Channel Stop
– Channel Step
– Power Levels (0-10)
– Log To Disk
– Log To Printer
– Pause On Failure

from the Key Pad Setup screen (press **SETUP**, **More**, **More**, **Key Pad**):

– Debounce
– Repeat Delay
– Repeat Rate

from the Calibrate Setup screen (press **SETUP**, **More**, **More**, **Self Test**, **Calibrate**):

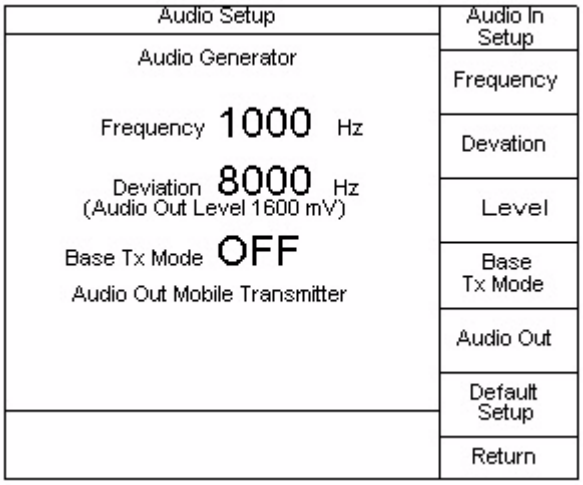
– Automatic Calibrate

In addition to the previous parameters, some parameters that may only be accessed through remote operation or through program sequence operation are set to their default values. These parameters affect the remote and program sequence's measurement units and the print buffer used by some program sequences.

Audio Setup

Audio Setup is used to set the Audio parameters of the 4300.

The following display shows the various Audio Setup options.



Audio Gen Setup

Audio Generator Setup is used to set up operating audio parameters for the 4300. The audio generator is an internal generator used for generating various signals in the test of cellular products. The following Audio Generator parameters can be varied from this menu:

Frequency

The frequency can be changed by entering the desired number using the 4300's numeric keypad, followed by the **ENTER** key, or use the **UP** and **DOWN** arrow keys.

Deviation

To edit deviation, press the **Deviation** soft key. The deviation can also be changed by entering the desired number using the 4300's numeric keypad, followed by the **ENTER** key, or use the **UP** and **DOWN** arrow keys.

Level

To edit level, press the **Level** soft key. The level can also be changed by entering the desired number using the 4300's numeric keypad, followed by the **ENTER** key, or use the **UP** and **DOWN** arrow keys.

Base Tx Mod

Use the **Base Tx Mod** soft key to turn the base modulation on or off.

Audio Out

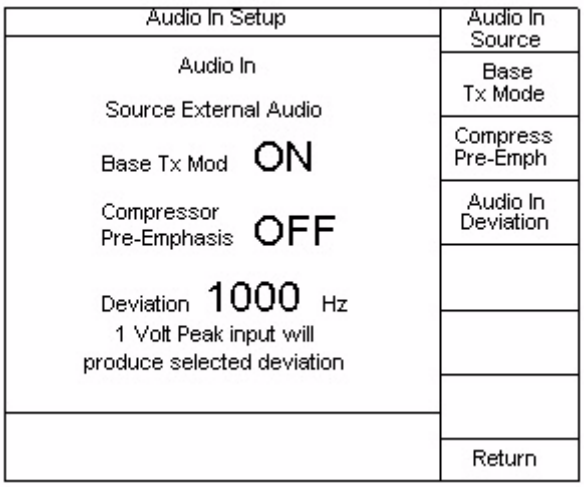
Use the **Audio Out** soft key to choose the audio out signal source. The source can originate from the audio generator or the mobile transmitter.

Default Setup

Automatically sets the audio parameters for typical cellular testing.

Audio In Setup

Audio In setup is used to define audio input source parameters for the 4300. The following screens are displayed when the **Audio In Setup** soft key is pressed. The difference between the two screens is dependent upon whether or not the Audio Source is External or Mobile Rx Audio. To select the Audio In source, press the **Audio In Source** soft key. The source will toggle when the soft key is pressed.



Base Tx Mod

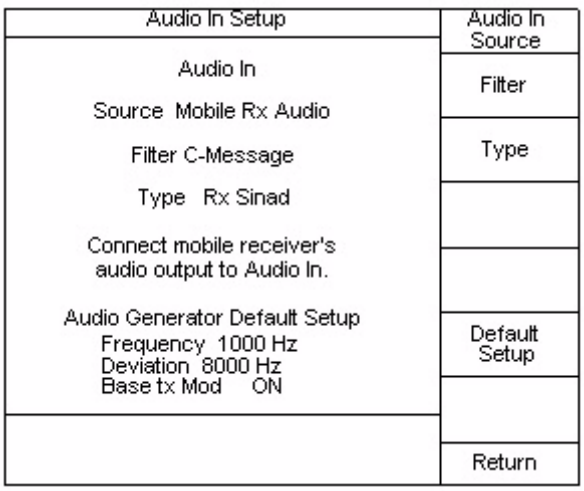
Use the **Base Tx Mod** soft key to turn the base modulation on or off.

Compressor Pre-Emphasis

Use the **Compressor Pre-Emphasis** soft key to turn Pre-Emphasis on or off.

Audio In Deviation

To edit Audio In Deviation, press the **Deviation** soft key. The deviation can be changed by entering the desired number using the 4300's numeric keypad, followed by the **Enter** key, or use the **up** and **down** arrow keys.



Filter

The Audio Input source provides a choice of two input filters. A telecommunications standard 1 kHz C-message filter or none is available. Use the up and down arrow keys to toggle between the two choices.

Type

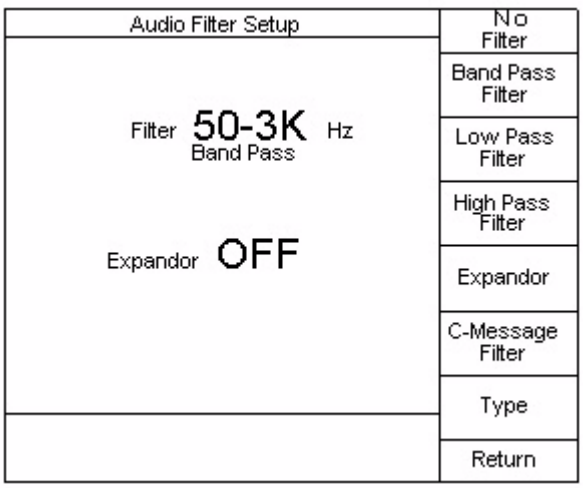
Type describes the audio measurement that is made on the Audio Input. The two measurements are:

- Rx Sinad
- Rx Distortion

Press the Type soft key to select the specific measurement to be made.

Audio Filter

The Audio Filter Setup menu allows the user to select the type and characteristics of the filter used during audio measurement tests. When the **Audio Filter** soft key is pressed, the following screen is displayed:



If no filter is desired, press the **No Filter** soft key.

Band Pass Filter

Use the **Band Pass Filter** soft key or the **up** and **down** arrow keys to select a Band Pass Filter. The following choices are available:

- 50-3K
- 50-15K
- 50-30K
- 300-3K
- 300-15K
- 300-30K

Low Pass Filter

Use the **Low Pass Filter** soft key or the **up** and **down** arrow keys to select a Low Pass Filter. The following choices are available:

- 3K
- 15K
- 30K

High Pass Filter Use the **High Pass Filter** soft key or the **up** and **down** arrow keys to select a High Pass Filter. The following choices are available:

- 50Hz
- 300Hz

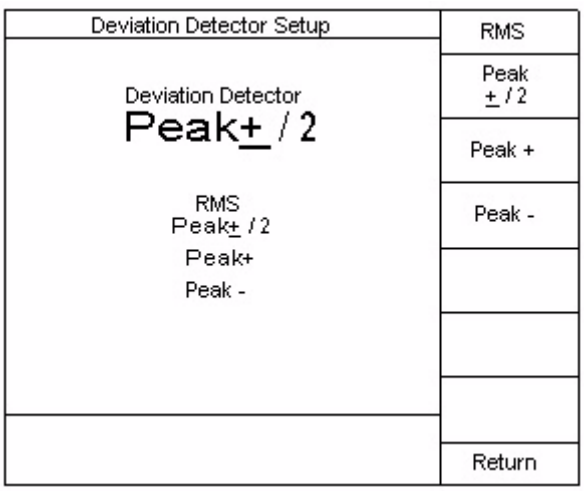
Expandor Audio signal Expandor capabilities are available on the 4300. Use the **Expandor** soft key to turn the Expandor function on or off.

C-Message Filter Use the **C-Message Filter** soft key to toggle the C-Message filter off or on. (Default is on)

Type Use the **Type** soft key to select Tx Sinad or Tx Distortion.

Deviation Detector

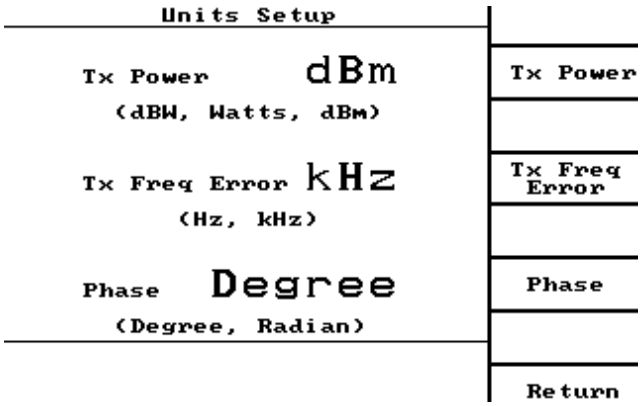
To select the form of the deviation measurements made, press the **Deviation Detector** soft key. When the **Deviation Detector** soft key is pressed, the following screen is displayed:



Press the soft key for the desired form.

Units Setup

To set the desired measuring units, press the **Units Setup** soft key. The following setup screen will be displayed. This screen selects the desired units displayed on the front panel screen during manual operation for Tx Power and Tx Frequency Error results.



Phase

The Phase selection appears in TDMA and CDMA only.

To set the desired Tx Power units, press the **Tx Power** soft key. Use the UP and DOWN arrow keys to select the desired units.

To set the desired Tx Freq Error units, press the **Tx Freq Error** soft key. Use the UP and DOWN arrow keys to select the desired units.

Units under remote control or in test sequences

This selection does not affect units for Tx Power and Tx Frequency results obtained through remote operation or within a test sequence. Refer to the remote and test sequence commands:

- MEASure:DEViation:FREQuency:UNITs
- MEASure:POWer:TRANsmitter:UNITs

for information on setting the units for remote and test sequence operation.

Stored Settings

The **Stored Settings** soft key provides access to the stored settings. The **Recall** key also accesses stored settings. The following instrument parameters may be saved in a stored setting memory location for later recall:

from the Manual Mode screen:

- RF Input
- Base Power
- Channel
- Mobile Power Level

- System
- Control Channel DCC
- Control Channel SID

from the Setup Initial Service screen

- Initial System
- Initial Type
- all initial System A parameters
- all initial System B parameters
- all initial AMPS parameters
- all initial NAMPS parameters
- all initial TDMA parameters

from the Performance Spec Setup screen

- Performance Specification table
- Auto Select from the Audio Setup screen
- Frequency
- Deviation
- Level
- Base Tx Mod
- Audio Out

from the Audio In Setup screen

- Audio In Source
- Base Tx Mod
- Compressor & Pre-Emphasis
- Deviation
- C-message Filter

from the Audio Filter Setup screen

- Filter
- Expandor

from the Deviation Detector Setup screen

- Deviation Detector

from the Alert With Info Message screen

- Optional Messages

from the Alert Signal Setup screen

- Pitch
- Cadence

from the Alert CNI Setup screen

- Party Number
- Number / Text
- Number Type
- Number Plan
- Presentation Indicator
- Screening Indicator

from the Flash With Info Message screen

- Optional Messages

from the Flash CNI Setup screen

- Calling Party
- Number / Text
- Number Type
- Number Plan
- Presentation Indicator
- Screening Indicator

from the Message Waiting Message screen

- Number Of Messages

from the Message Waiting Setup screen

- Number Of Messages

from the Flash Signal Setup screen

- Pitch
- Cadence
- from the SSD Update Procedure screen
- Automatic RANDSSD
- RANDSSD

from the Unique Challenge Procedure screen

- Automatic RANDU
- RANDU

from the Handoff screen

- Channel Type
- Channel
- Power Level
- SAT Frequency
- Offset, DSAT Vector
- Time Slot & Rate, DVCC, Time Alignment, Shortened Burst

from the Service Setup screen

- Channel Type
- Channel
- Power Level
- SAT Frequency (with Channel Type set to AMPS)
- Offset, DSAT Vector (with Channel Type set to NAMPS)
- Time Slot & Rate, DVCC, Time Alignment, Shortened Burst (with Channel Type set to TDMA)

The factory default settings may be recalled by highlighting the **Default Setting** selection and pressing the **Recall** soft key. Up to ten user-defined settings may be stored by pressing the **Save** soft key and later restored by pressing the **Recall** soft key.

Use the **Next** and **Previous** soft keys or the UP and DOWN arrow keys to select the desired setting. Then press the **Recall** soft key to recall that setting. Press the **Save** soft key to store the current set of instrument parameters in the selected stored setting memory location. Press the **Edit Label** soft key to enter a short description or label for the stored setting. Press the **Clear** soft key to remove previously stored settings from memory.

Upgrade Software

The following procedure is to be used when upgrading software:

1. In the Setup menu, press the **Upgrade Software** soft key.
2. Press the associated soft key for the software that is being upgraded.
3. Insert the new software disk and press **Continue**.

The SCP software upgrade process will take about 30 minutes, when completed, the unit will look as if it had just been turned on.

While the SCP software upgrade is in process, do not press any keys or cycle power unless instructed to do so.

The AMPS software upgrade process will take about 1 minute.

The CCM software upgrade process will take about 20 minutes.

The DCM software upgrade process will take about 7 minutes.

Self Test

The **Self Test** soft key provides access to a diagnostic test mode. These tests are further divided into individual tests on each of the 4300 modules. These tests are automated simply by pressing the **Run Self Test** soft key. The test results as well as the current software revisions can be accessed by pressing the appropriate soft key. The **Calibrate** soft key is used to enable the automatic calibrate function. This function routinely performs an internal calibration of the 4300. This feature can be disabled if desired. The **More** soft key provides access to a series of interactive diagnostic tests. These tests are intended for diagnostic and troubleshooting purposes.

Willtek does NOT recommend that the user make any adjustments/changes without direct contact with Willtek. Failure to follow these guidelines may result in rendering the unit inoperative.

If you suspect that the unit is malfunctioning in any way, contact a Willtek Technical Assistance Center (see "Technical assistance" on page xvi).

Self-Test Errors – SW/HW Mismatch

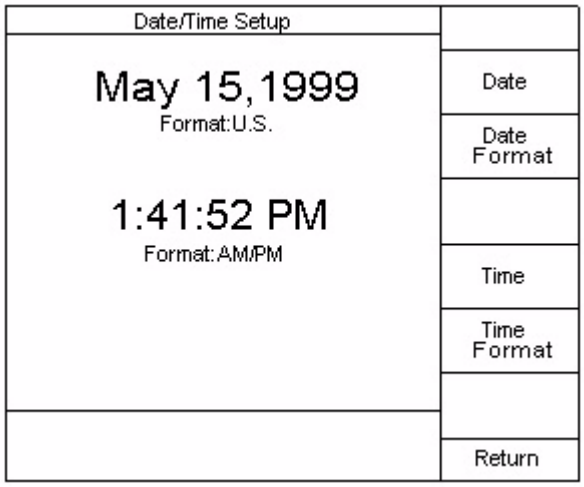
This error indicates that the SCP software that has been downloaded to the 4300 does not match the hardware that is installed. For instance, if the 4300 has the CCM board installed for the CDMA option and the SCP software was upgraded to TDMA, which requires the DCM board in place of the CCM, this error will be issued.

Also note that if any of the diagnostic self-tests fail on power up, the screen does not automatically advance to the Manual Mode screen. It will remain at the Diagnostics screen indicating the error(s) found, and will wait for the user to press the **Continue** soft key prior to exiting this screen.

When the user continues to the Manual or Service Mode screens, the status indicator on the lower right of the LCD will display "Run Self Test" to indicate there are diagnostic self-test errors, and that the user should run the diagnostic tests to determine what they are.

Date/Time Setup

To set the current Data and Time, press the **Date/Time Setup** soft key. The following setup screen will be displayed:

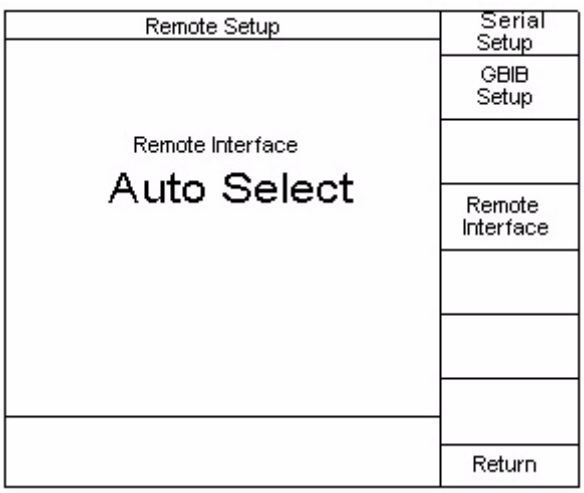


Date To set the desired date, press the **Date** soft key. Use the **LEFT** and **RIGHT** arrow keys to move the selection box to the value to be changed, then use the **up** and **down** arrow keys to edit the value. Use the **Date Format** soft key to toggle between U.S. and international (INTL) date format.

Time To set the desired time, press the **Time** soft key. Use the **LEFT** and **RIGHT** arrow keys to move the selection box to the value to be changed, then use the **up** and **down** arrow keys to edit the value. Use the **Time Format** soft key to toggle between AM/PM and 24 hr. time format.

Remote Setup

The Remote Setup menu allows the operator to set up the remote operating parameters associated with RS232 (serial port) or GPIB operations. When the **Remote Setup** soft key is pressed, the following screen is displayed:

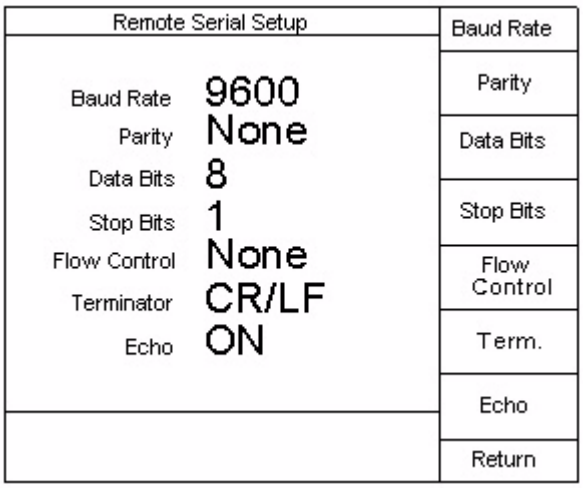


Remote Interface

The **Remote Interface** soft key allows the user to select the desired port for remote operations. Remote operations are accomplished through the RS232 (serial port) or the GPIB (IEEE STD 488 port). An Auto Select feature is available which automatically recognizes the port currently being accessed. In this mode, the first remote input (serial or GPIB) detected by the 4300 following this selection will be the port enabled, while the other port will be disabled. A new port selection will only be made if the selection is again changed, or following a power up of the 4300. Press the **Remote Interface** soft key until the desired selection is made.

Serial Setup

The **Serial Setup** soft key is used to set up the communications parameters between the 4300 and the controlling device.



Configure the following parameters to match those of the controlling terminal:

- Baud Rate
- Parity
- Data Bits
- Stop Bits
- Flow Control
- Term.
- Echo

The parameters can be changed by pressing the associated soft key repeatedly until the desired setting is displayed. The parameter changes take affect immediately. Exiting from this screen is not necessary. These parameters are saved when the 4300 is turned off, and will be restored to the previous values when power is restored.

Baud Rate

May be set to any of the following values: 19200, 9600, 4800, 2400, 1200, 300. The factory default value is 9600 baud.

Parity

Selections are NONE, ODD, EVEN, SPACE, and MARK. The appropriate parity bit is added to each character sent if NONE is not selected. The extra parity bit is required on each character received, as well. However, characters received with parity errors will still be accepted. The factory default value is NONE.

Data Bits

Selects the number of bits each character represents on input and output. This does not include the parity bit, if enabled, or the stop bits. The allowable values are 7 and 8, with factory default being 8.

Stop Bits

Selects the number of stop bits to append to each character. The allowable values are 1 and 2, with factory default being 1.

Flow Control

Is used to enable and disable the XON/XOFF software flow control. RTS/CTS hardware flow control is not supported. Flow control prevents the loss of data during communication by signaling to indicate when the instrument is ready to receive another character. When the 4300 is receiving data, an XOFF character (control-S or decimal 19) will be issued when there are only 100 characters available in the input buffer. The sender must be able to detect that an XOFF character has been sent and pause its transmission, prior to overflowing the receiver's input buffer. When at least 200 characters are again available in the input buffer, an XON character (control-Q or decimal 17) will be sent to tell the sender to continue transmission. Since the input buffer is 8192 characters in length, this is usually only necessary for commands that exceed this length. If XON/XOFF is disabled, another method of flow control is enabling echo, and verifying the characters received match those sent. The factory default value is NONE.

Terminator

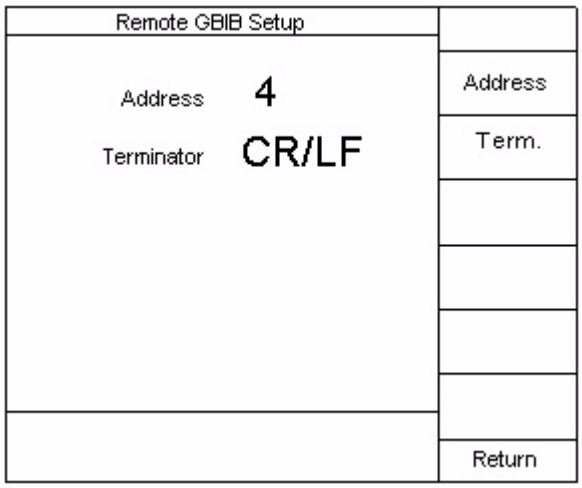
Is used to specify the output terminator character(s) to send at the end of each response. The input terminator definition is not modified by this parameter. Input is always terminated with either a carriage return (control-M or decimal 13) or a linefeed (control-J or decimal 10) character. The output terminator selections are CR (carriage return only), LF (linefeed only), or CR/LF (carriage return followed by a linefeed). The factory default value is CR/LF.

Echo

Is used to enable and disable echoing of the characters received by the 4300 back to the sender. When a terminator is received, the output terminator character selection is echoed, rather than the character received. If both a carriage return and a linefeed character are received, they are treated as a single terminator character. If the CR/LF output terminator is selected and a single linefeed character is received, both a carriage return and a linefeed will be output. This can be used for flow control on a character by character basis. This method is generally slower than XON/XOFF. The factory default value is ON.

GPIB Setup

The **Serial Setup** soft key is used to set up the communications parameters between the 4300 and the controlling device.



Configure the following parameters to match those of the controlling terminal:

- Address
- Term

Address

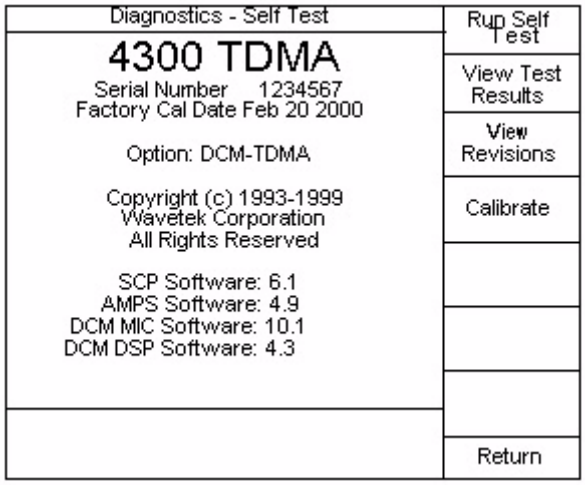
Selects the primary GPIB address, and has a valid range of 0 to 30. It may be changed by pressing the **Address** soft key followed by either the numeric entry or the **up** and **down** arrow keys. Secondary addressing is always disabled on power-up of the instrument and when programmed through the front panel. It can be enabled through the remote command **SYST:COMM:GPIB:ADDR**. The factory default address is 4.

Terminator

Is used to specify the output terminator character(s) to send at the end of each response. The input terminator definition is not modified by this parameter. Input is always terminated with either a carriage return (control-M or decimal 13) or a linefeed (control-J or decimal 10) character, or when an EOI (End or Identify) GPIB bus signal is received. The output terminator selections are CR (carriage return only), LF (linefeed only), or CR/LF (carriage return followed by a linefeed). An EOI is always issued on the last character sent. The factory default value is CR/LF.

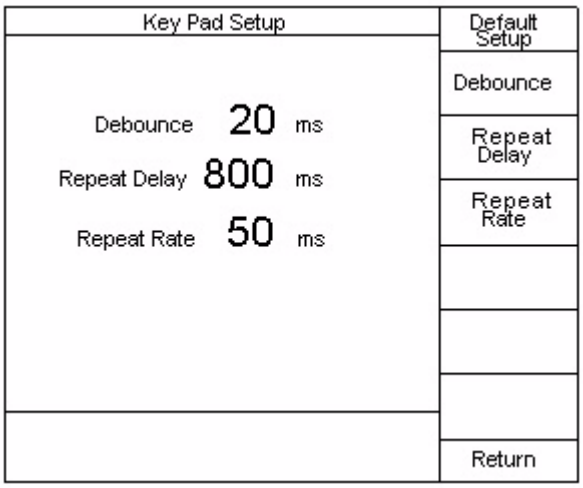
Instrument Information

Press the **DIAG** hard key to bring up an appropriate display similar the following display. The **Instrument Information** screen shows the unit mode number, protocol supported, serial number, last calibration date, installed options, and installed software versions.



Keypad Setup

To set the Keypad parameters, press the **Key Pad** soft key. The following setup screen will be displayed:

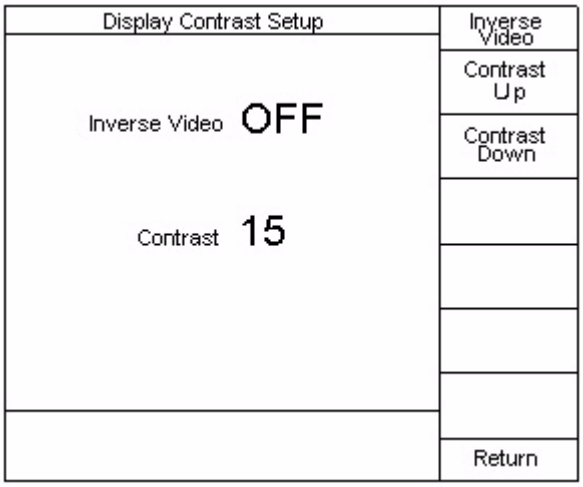


The **Default Setup** soft key can be used to assigned factory defaults values to Debounce, Repeat Delay, and Repeat Rate keypad parameters.

To edit the keypad parameters, press the corresponding parameter soft key. To enter a value, use the UP and DOWN arrow keys or the numeric entry keys.

Contrast Setup

Contrast Setup is used to adjust the viewing level of the LCD display. Pressing the **Contrast Setup** soft key will display the following screen



Inverse Video

Can be turned on or off by pressing the **Inverse Video** soft key.

Contrast

Contrast level of the LCD is adjusted using the **Contrast Up** or **Contrast Down** soft keys. The contrast can also be changed by entering the desired number using the 4300's numeric keypad, followed by the **Enter** key, or use the **up** and **down** arrow keys.

Print Setup

Print Setup is used to select the printer command language used by your printer.

The 4300 supports the following printer control languages:

EPSon: Epson compatible printers (typically dot-matrix printers)

PCL: Hewlett-Packard Printer Control Language level 3 or greater compatible printers (typically LaserJet or DeskJet printers).

Most dot-matrix printers may be placed into an Epson compatible mode. Most Laser-jet or Desk-jet printers may be placed into an HP PCL compatible mode. At the Print Setup screen, select the printer command language. To test the printer interface, press the **Print Test Page** soft key and select the following tests:

Print Line:	Prints one line of text (no form feed)
Print Page:	Prints 60 lines of 80 characters each in a diagonal test pattern, followed by a form feed
Print Font:	Prints several lines of text using all combinations of print styles used by the 4300 (no form feed)
Form Feed:	Issues a form feed to the printer

Reset: Issues a reset command to the printer

Screen Dump: Performs a graphical print of the screen as displayed.

Printer problem

If your printer does not respond properly, verify that the correct mode has been selected for both the 4300 and the printer. Many printers use either DIP switches or a setup menu to select between two or more different printer control languages. Make sure that either Epson or HP PCL mode is selected on your printer.

Character size and font

When PCL is selected, the 4300 will use the currently selected font. It assumes that this font will be a fixed-space font with a pitch of 10 cpi (characters per inch). For large text, a pitch of 5 cpi (or greater) will be chosen and for small text, a pitch of 16.66 cpi (or greater) will be chosen. If these pitch sizes are not available for the selected font, then you may wish to select a different font on your printer.

Manual mode

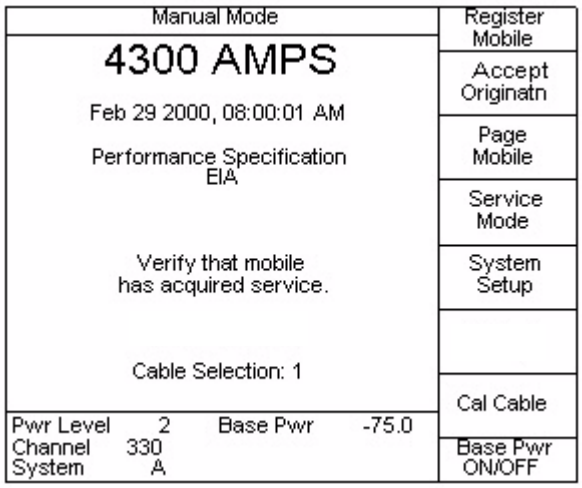
Introduction

The Manual test mode is entered by pressing the **MANUAL** key. The Manual mode is automatically entered when the unit is turned on.

Mobile connections

At this time if you have not already done so, connect the mobile to the 4300's RF input connector on the front panel. Ensure that power is provided to the mobile through the front-panel MBL Power jacks or from an independent source.

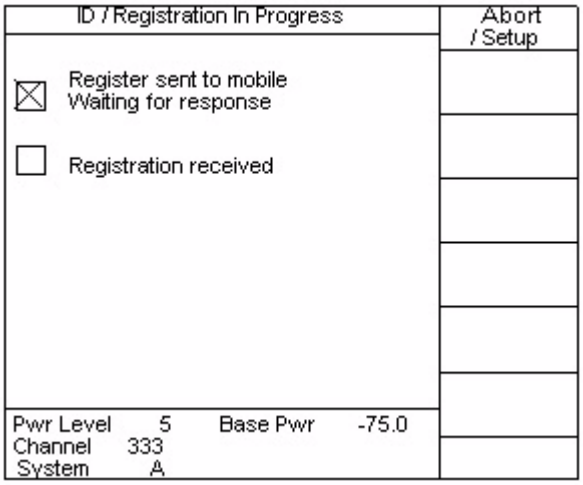
When the **MANUAL** key is pressed the following screen is displayed:



- A registration is performed to extract information from the mobile. Information obtained from the mobile includes:
- Manufacturer code
- Electronic Serial Number
- Mobile Identification Number
- Power class
- Transmission type
- Bandwidth
- Mobile type
- MPCI - Mobile station's capabilities

How to Perform a Mobile Registration

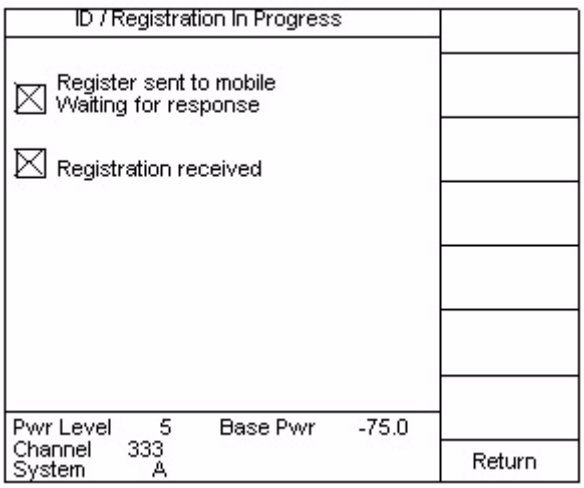
To start a registration, press the **Register Mobile** soft key. The **ID** key can also be used to perform a mobile registration. The following screen will be displayed when the registration has commenced:



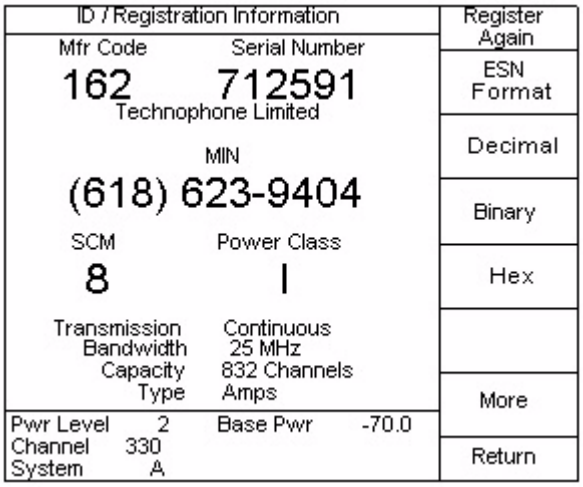
Note

If the mobile does not respond within a certain time out period, a time-out error message will be displayed. At that point the user can retry the registration attempt or return to the Manual Mode Base screen. The 4300 will also list possible things to check in the event of a registration time-out.

When the Registration is received the following screen is displayed:



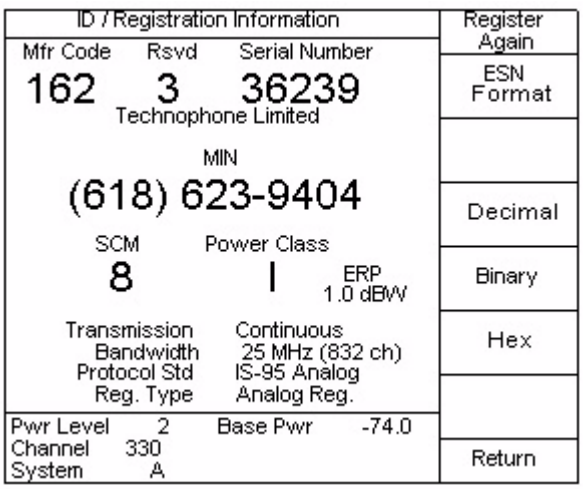
After the Registration is complete, the Registration information is displayed. The following screen is an example of a mobile registration display:



ESN Format The ESN can be displayed in two formats. To change formats, press the **ESN Format** soft key to toggle between the two formats. One format incorporates the Rsvd field information with the serial number of the mobile under test. The first format separates the Rsvd field information from the serial number and displays the information independently from the serial number. The following shows the different formats:

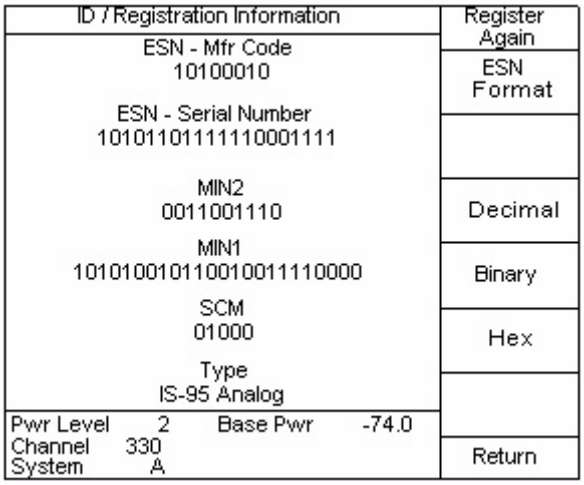
MFR Code	Reserved	Serial Number
10000010	000001	0000010011111111010
Decimal1:130	1	10234
Hex 1:82	1	27FA
Decimal 2:130		272378
Hex 2:82		427FA

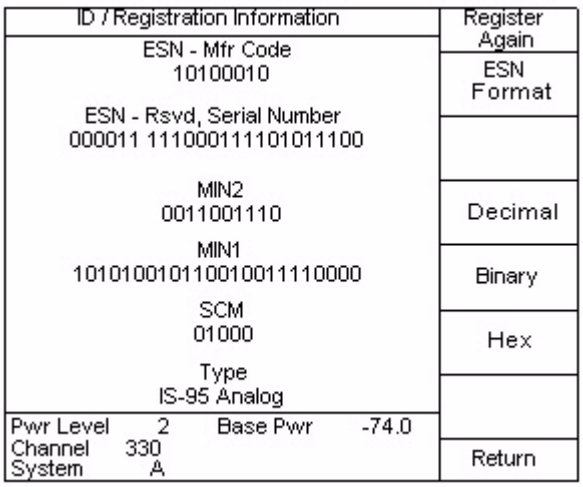
The following screen shows the Rsvd-Serial number in that format.



Display Format

To view Registration information in Decimal, Binary or Hexadecimal form, press either the **Decimal, Binary** or **Hex** soft key. The following two screens represent, in binary form, the ESN, and Rsvd-ESN registration information:



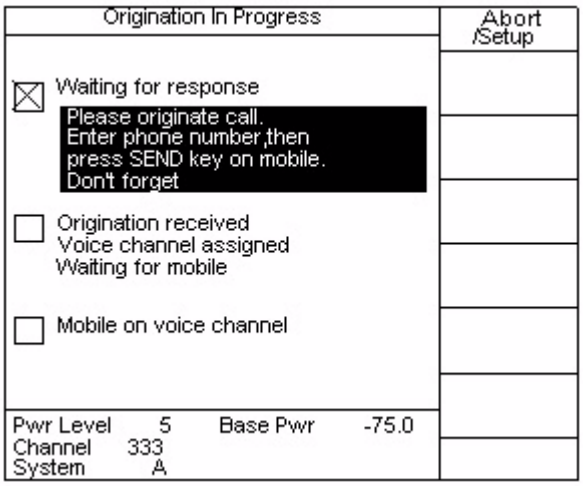


Printing the Registration Information

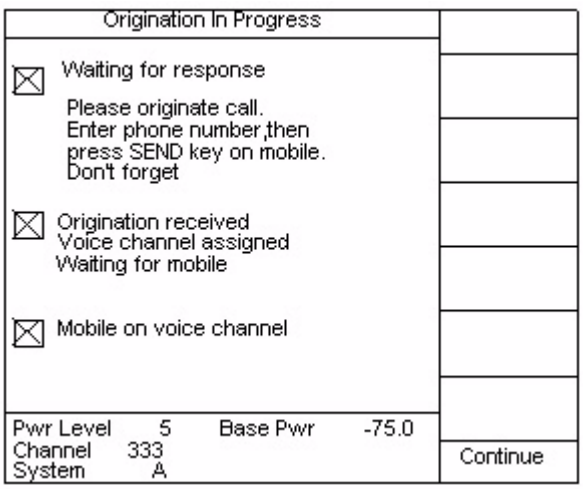
Pressing the **PRINT** key will access the printer menu. Press the **Screen Dump** soft key to give a hard copy printout of the mobile/portable registration information assuming that an appropriate printer is connected to the 4300.

A mobile origination simulates a mobile placing a call. An actual link is then set up between the mobile and the 4300. The mobile responds as though it was actually on-line with a cell site. If not in the Manual mode, press the **MANUAL** key. The **Accept Orignatn** soft key initiates the procedure to simulate a mobile origination.

How to perform a mobile origination



The user should dial a phone number on the mobile, then press the mobile's **SND** key. An acknowledgment that the Origination was received is displayed followed by the mobile coming up on the voice channel.



Pressing the **Abort** soft key will terminate the mobile origination, if desired.

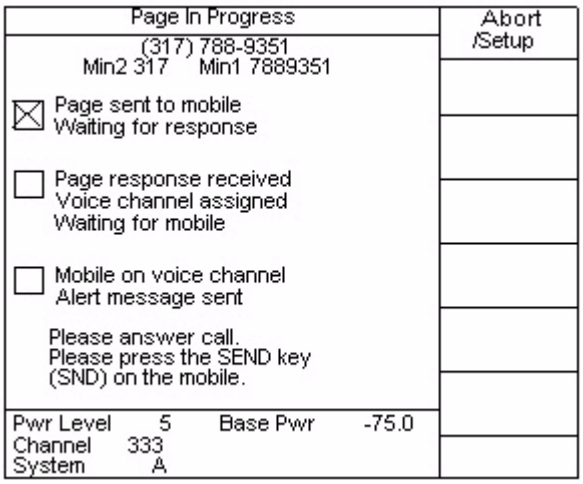
Another method of accessing the mobile is by performing a mobile page. A page consists of a message which is broadcast to the mobile unit which uniquely identifies a particular cellular telephone based on the information contained in the message. The mobile should acknowledge the message by entering a ringing state.

Note

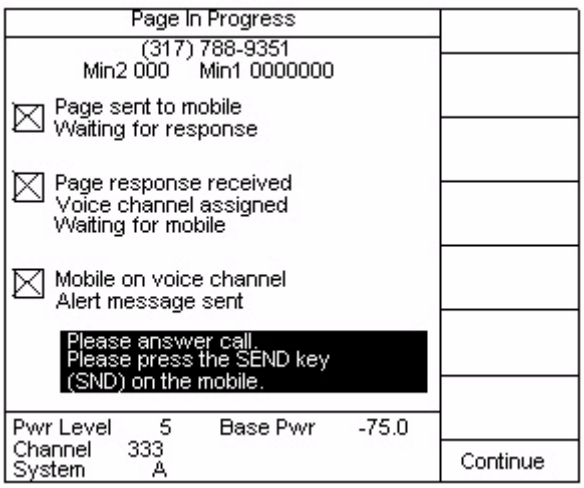
In order for the 4300 to identify the mobile under test, a registration or origination must be performed prior to performing the mobile page (this allows the 4300 to acquire the mobiles MIN - phone number).

How to perform a mobile page

Press the **Page Mobile** soft key to initiate the procedure to simulate a mobile page. After the **Page Mobile** soft key is pressed the following screen is displayed:



A voice channel is established and the following screen is displayed:



When the mobile rings, the user should answer the page by pressing the mobile's **SND** key.

Pressing the **Abort/Setup** soft key will terminate the mobile page request, if desired. Press the **Abort/Setup** soft key to access the setup menu. If you wish to page a number different from the last registered phone, use the **Enter MIN2** and **Enter MIN1** to enter the area code and phone number that you wish to page. Press the **Alert With Info** soft key if you wish to set up the caller ID, or distinctive ringing parameters. Refer to "Alert With Info" on page 56 for more information.

Service Mode

The **Service Mode** soft key allows the user to proceed with the Manual tests without gaining access to a voice channel through either a page or an origination. Service mode is typically used with the mobile placed in its self-diagnostic test mode in which the user manually commands the mobile to perform certain operations.

The 4300 is capable of reading registration information from a mobile telephone either through a cable connected directly to the mobile telephone or off the air using an antenna.

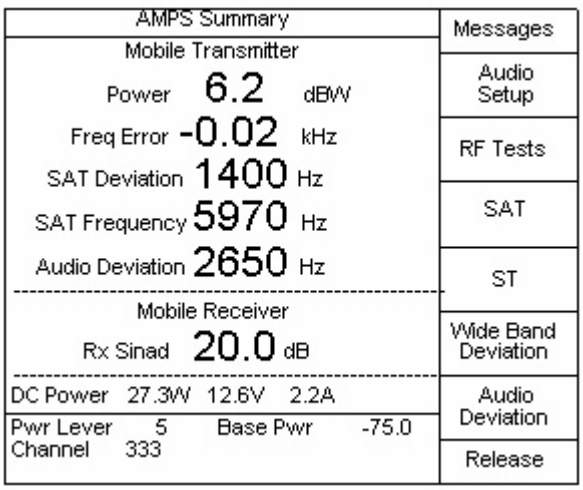
Cable or antenna

When using a cable, the 4300's RF Input should be set for DIRECT mode. When using an antenna, the RF Input should be set for OFF-AIR mode.

Note

The unit must be in direct connection to perform power measurement tests.

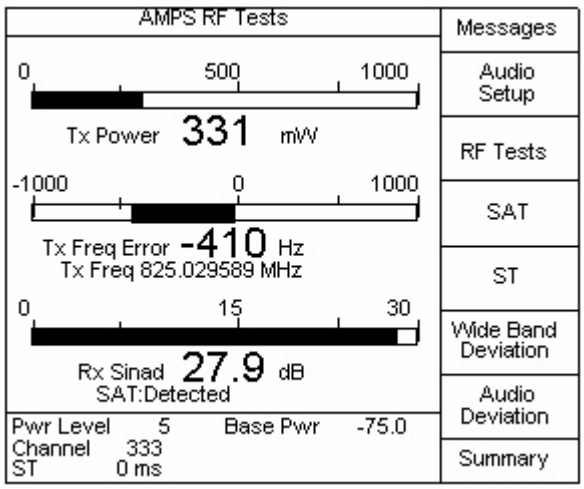
Viewing mobile information and test results



An ability of the Test Summary screen is to monitor the mobile's DC current draw. The instantaneous DC current draw, power and voltage is displayed. This feature is only available when the power for the mobile under test is routed through the Mobile Power connections on the rear-panel of the unit.

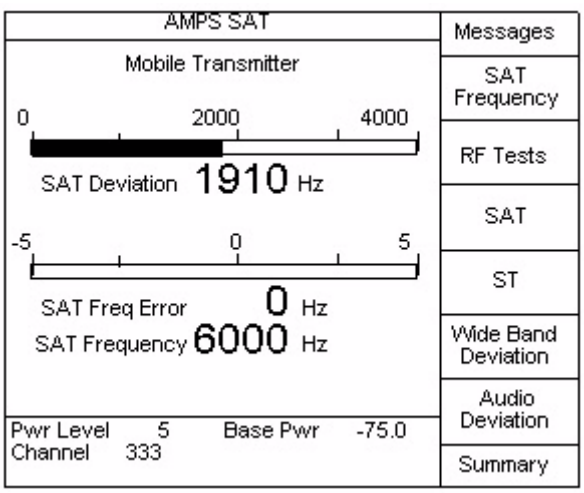
How to view various mobile tests

RF tests (AMPS/NAMPS only): The RF Tests are designed to verify and troubleshoot the RF performance and circuitry of a mobile. The RF Tests consist of both transmitter and receiver tests. Press the **RF Tests** soft key to access the various RF Tests. The light gray bar is the specification window and is controlled by the specification table selected.



The **Audio Setup** soft key is used to set the Audio parameters of the 4300. Refer to "Audio Setup" on page 28 for more information.

SAT The Supervisory Audio Tone (SAT) is one of three frequencies around 6 kHz used in AMPS signaling. The SAT Test is designed to verify and troubleshoot the base-band signaling performance and circuitry of a mobile. Pressing the **SAT** soft key will display the **SAT test** screen.

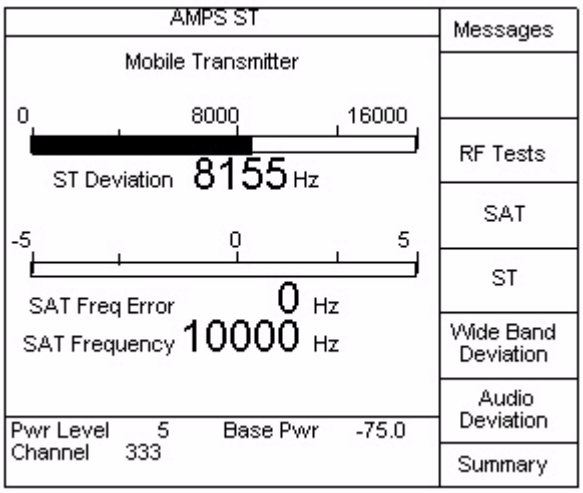


The upper meter shows the SAT Deviation in Hz with the numeric value directly below. A SAT deviation outside of the ±2 kHz (±0.2 kHz) range would indicate a problem.

The SAT Frequency Error is seen in the lower meter. The SAT Frequency Error and the actual SAT frequency are displayed numerically.

The **SAT Frequency** soft key can be used to set the SAT frequency.

ST The Signaling Tone (ST) is a 10 kHz tone used in AMPS for mobile ringing, call terminations, handoffs, and switch-hook operation. The ST Test is designed to verify and troubleshoot the baseband signaling performance and circuitry of a mobile. Pressing the **ST** soft key will display the **ST test** screen.

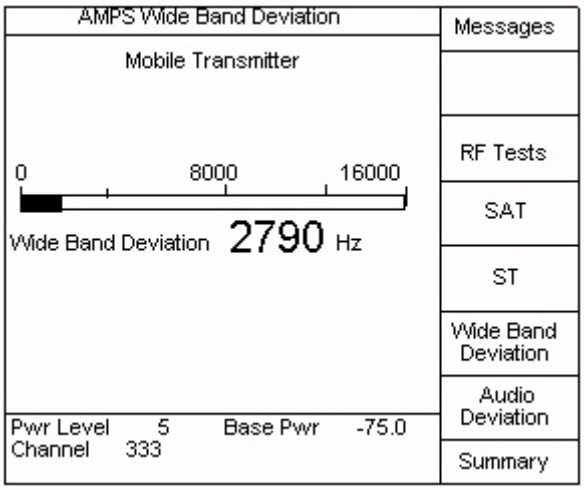


The upper meter shows the ST Deviation in Hz with the numeric value directly below. Typical ST Deviation is ±8 kHz (±0.8 kHz).

The ST Frequency Error is seen in the lower meter. The ST Frequency Error and the actual ST frequency are displayed numerically.

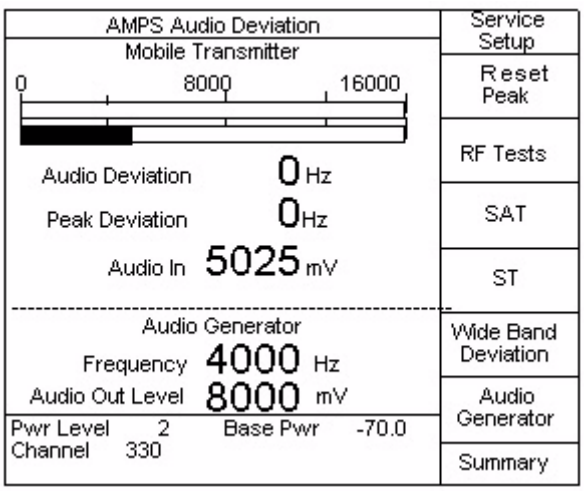
Wide Band Deviation (AMPS only):

Wide Band Deviation is an overall indicator of transmitter deviation. The Wide Band Deviation indicator is designed to verify and troubleshoot the baseband signaling performance and circuitry of a mobile. Pressing the **Wide Band Deviation** soft key will display the **Wide Band Deviation test** screen.



The meter shows the Wide Band Deviation with the numerical value in Hz below it.

Audio Deviation (AMPS only): The Audio Deviation indicator is designed to verify and troubleshoot the overall audio (includes microphone audio and DTMF) performance and circuitry of a mobile. Pressing the **Audio Deviation** soft key will display the **Audio Deviation test** screen.

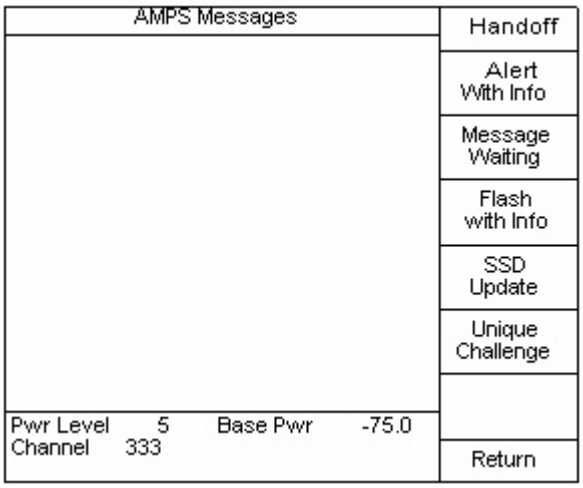


The meter shows the Audio Deviation (maximum ±12 kHz deviation) on top with the Peak Deviation on bottom with the numerical values in Hz below it. Speak into the mobile handset and observe the maximum deflection of the Audio Deviation graph. The **Reset Peak** soft key is used to reset the Peak Deviation graph.

The **Handoff** soft key allows the user to perform a handoff to test the mobile's performance on any of the allowable voice channels (Refer to "Handoff" on page 55.).

The **Summary** soft key is used to return to the **Test Summary** screen.

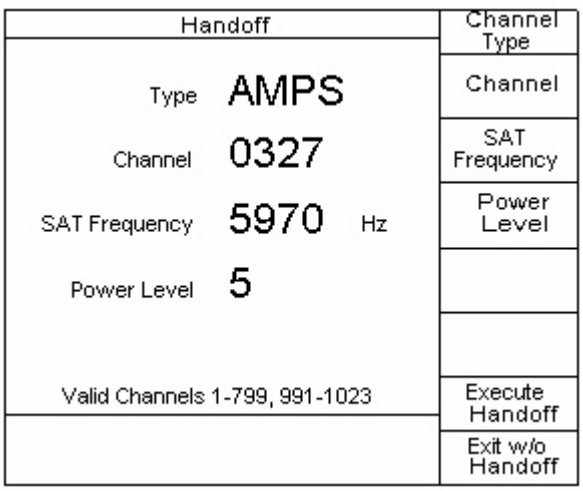
Messages (AMPS only)



One means of verifying operational performance of a mobile is to test the ability of the mobile to perform various call processing functions. The following call processing functions may be performed by selecting the appropriate soft key: **Handoff**, **Alert With Info**, **Message Waiting**, **Flash With Info**, **SSD Update**, and **Unique Challenge**.

The ability to perform a handoff allows the user to test the mobile's performance on any of the allowable voice channels. Pressing the **Return** soft key returns to the previous measurement screen.

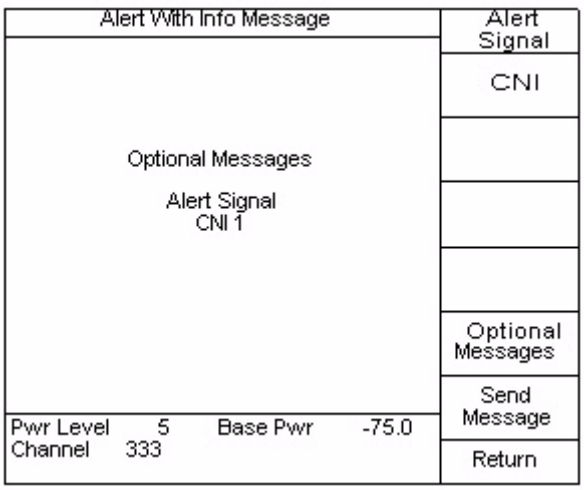
Handoff The **Handoff** soft key is available from the **Messages** screen. It allows the user to perform a handoff to test the mobile's performance on any of the allowable voice channels. The current voice channel is displayed in the information box at the bottom of the screen. When the **Handoff** soft key is pressed the **Handoff** screen is displayed.



If the mobile is capable of NAMPS operation, press the **Type** soft key to select AMPS or NAMPS voice channel. If the DCM option is installed and the mobile is capable of TDMA operation, press the **Type** soft key to select AMPS voice channel or TDMA traffic channel. If the CCM option is installed and the mobile is capable of CDMA, press the **Type** soft key to alert the AMPS voice channel or CDMA traffic channel. If the mobile is capable of AMPS only, then pressing the **Type** soft key will reset the parameters to the current channel conditions.

The desired channel and power level may be entered using the numeric keypad or the arrow keys. The remaining parameters will depend on the channel type selected. For AMPS voice channel, the desired **SAT Frequency** may be selected using the **SAT Frequency** soft key or the **up** and **down** arrow keys. For NAMPS voice channel, the desired **Offset** and **DSAT Vector** may be selected using these soft keys or the **up** and **down** arrow keys. For TDMA traffic channel, the desired **Time Slot & Rate**, **DVCC vector**, **Time Alignment**, and **Shortened Burst** may be selected using the **up** and **down** arrow keys or the numeric key pad. For the CDMA traffic channel, the desired frame offset traffic code and nominal power may be selected using the **up** and **down** arrow keys or the numeric key pad.

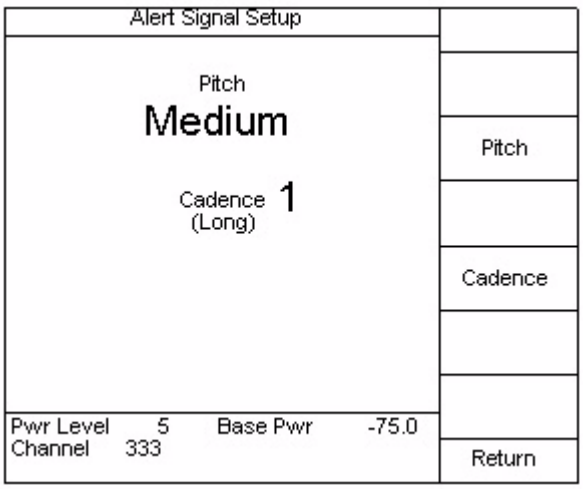
Alert With Info



When the **Send Message** soft key is pressed, the Alert With Info message is sent to the mobile phone. On an AMPS voice channel, this message may be sent with either of two optional parameters: Alert Signal and CNI 1. If the mobile is not a dual-mode phone or if no optional parameters are selected when the **Send Message** key is pressed, then the Alert message is sent instead of the Alert With Info message.

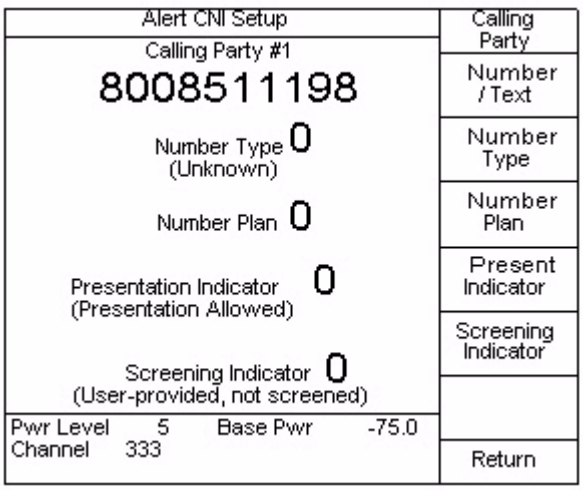
The Alert Signal tests the mobiles ability to provide distinctive ringing. Press the **Alert Signal** soft key to set up the desired distinctive ring. The CNI 1 tests the mobile's ability to display caller ID information. Press the **CNI** soft key to set up the caller ID information.

Alert Signal



The desired distinctive ring can be set by selecting the Pitch and Cadence. Pitch represents a distinction between tones. Cadence is the on/off pattern of the tones. The standard alert is medium pitch and a cadence of 1 (single long tone).

CNI



The calling number indicator, or caller ID, number may be set by selecting the parameters in this screen.

Number /Text

Pressing the **Number / Text** soft key allows the entry of the caller ID number and/or text. This may be up to 15 alphanumeric characters or numeric digits. Use the numeric keypad to enter numbers. Press the **Alpha** key followed by the key with the desired letter for alphabetical characters. Press the **Alpha** key followed by the **up** and **down** arrow keys to toggle between uppercase and lowercase characters. The **Alpha** key followed by the right arrow key enters a space. Any 7-bit ASCII

character may be selected by using the left/right and **up** and **down** arrow keys. Pressing **ENTER** terminates the entry and toggles between editing and entry mode.

Number Type

Pressing the **Number Type** soft key allows entry of the Type of Number as defined in ANSI T1.607. A description of the current type appears on the screen. This indicates the type of calling number.

Number Plan

Pressing the **Number Plan** soft key allows entry of the Numbering Plan Identification as defined in ANSI T1.607. A description of the current plan appears on the screen. This indicates the numbering plan used for the calling number.

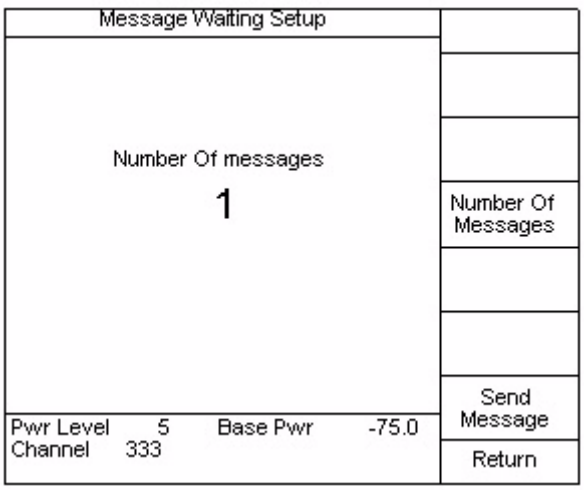
Present Indicator

Pressing the **Present Indicator** soft key allows entry of the Presentation Indicator as defined in ANSI T1.607. A description of the current selection appears on the screen. This indicates whether or not the calling number should be displayed.

Screening Indicator

Pressing the **Screening Indicator** soft key allows entry of the Screening Indicator as defined in ANSI T1.607. A description of the current selection appears on the screen. This indicates how the calling number was screened.

Message Waiting

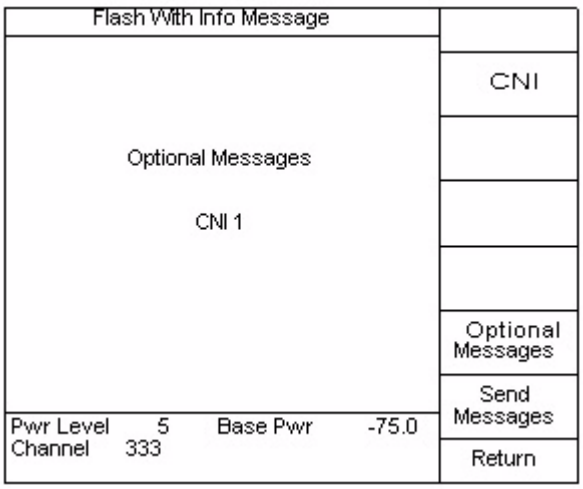


When the **Send Message** soft key is pressed, the Message Waiting message is sent to the mobile phone.

Number Of Messages The desired number of messages may be entered using the numeric keypad or the arrow keys. For a TDMA traffic channel, the maximum number of messages is 63. For an AMPS voice channel, the maximum number of messages is 31. If this

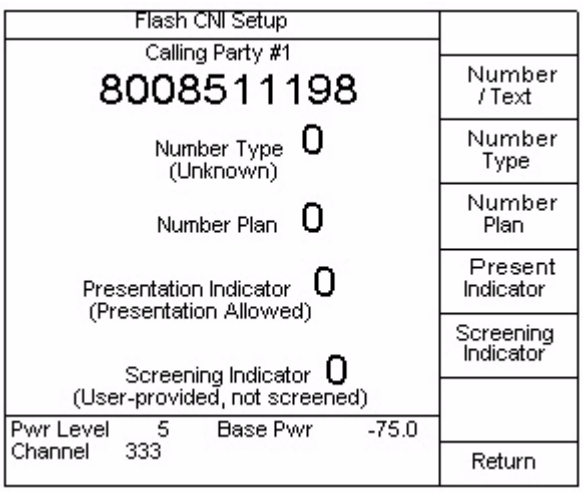
number is greater than 31 when the **Send Message** soft key is pressed while on an AMPS voice channel, then the 4300 sends that number minus 32 as the number of messages waiting.

Flash With Info



When the **Send Message** soft key is pressed, the Flash With Info message is sent to the mobile phone. On an AMPS voice channel, this message may be sent with the optional parameter of CNI 1. The CNI 1 tests the mobile's ability to display caller ID information. Press the **CNI** soft key to set up the caller ID information.

CNI



The calling number indicator, or caller ID, number may be set by selecting the parameters in this screen.

Number /Text

Pressing the **Number / Text** soft key allows the entry of the caller ID number and/or text. This may be up to 15 alphanumeric characters or numeric digits. Use the numeric keypad to enter numbers. Press the **Alpha** key followed by the key with the desired letter for alphabetical characters. Press the **Alpha** key followed by the **up** and **down** arrow keys to toggle between uppercase and lowercase characters. The **Alpha** key followed by the right arrow key enters a space. Any 7-bit ASCII character may be selected by using the left/right and **up** and **down** arrow keys. Pressing **Enter** terminates the entry and toggles between editing and entry mode.

Number Type

Pressing the **Number Type** soft key allows entry of the Type of Number as defined in ANSI T1.607. A description of the current type appears on the screen. This indicates the type of calling number.

Number Plan

Pressing the **Number Plan** soft key allows entry of the Numbering Plan Identification as defined in ANSI T1.607. A description of the current plan appears on the screen. This indicates the numbering plan used for the calling number.

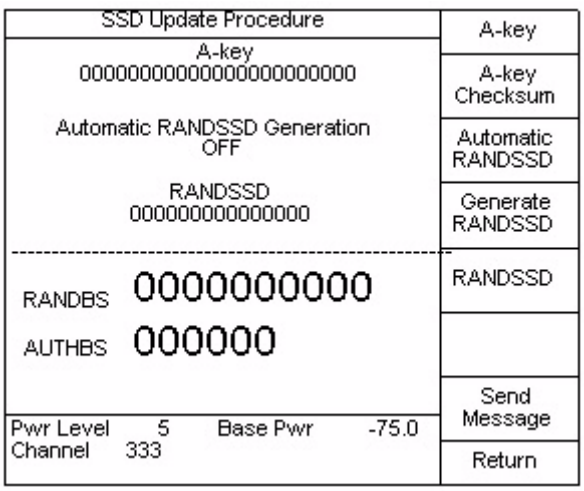
Present Indicator

Pressing the **Present Indicator** soft key allows entry of the Presentation Indicator as defined in ANSI T1.607. A description of the current selection appears on the screen. This indicates whether or not the calling number should be displayed.

Screening Indicator

Pressing the **Screening Indicator** soft key allows entry of the Screening Indicator as defined in ANSI T1.607. A description of the current selection appears on the screen. This indicates how the calling number was screened.

SSD Update



When the **Send Message** soft key is pressed, the SSD Update Procedure is initiated. This is the first step in testing the mobile's authentication capability.

The 4300 requires a valid A-key prior to successfully performing this procedure. The A-key must be entered by you and must match the A-key assigned to the mobile. If no A-key has been assigned to the mobile, then the default A-key value may be entered by entering 0 and then pressing the A-key Checksum soft key. If the phone's A-key is not known, then the authentication process may still be tested by performing the SSD Update Procedure and verifying that the procedure fails.

The SSD Update procedure consists of the following steps:

1 The A-Key is checked to verify that it is valid. If it is invalid, the procedure will stop and the **Invalid A-Key** message will be displayed.

2 The 4300 sends the SSD Update Order (including the RANDSSD value) to the mobile. The mobile should respond with the Base Station Challenge Order (including the RANDBS value). If the mobile fails to respond with this order, the procedure will stop and display **Base Station Challenge Order Not Received**.

3 The 4300 will calculate the AUTHBS value and send the Base Station Challenge Order Confirmation message to the mobile. The mobile should respond with the SSD Update Order Confirmation message (including a pass/fail status). If the mobile fails to respond with this message, the procedure will stop and display **SSD Update Order Confirmation Not Received**.

4 If the procedure completes, then the pass/fail status will be displayed. The RANDBS number sent by the mobile and the AUTHBS number calculated by the 4300 is also be displayed.

A-key

Pressing the **A-key** soft key allows entry of the 26-digit A-key. The first 20 digits represent the unique A-key as stored internal to the mobile and the last 6 digits represent the checksum value.

A-key Checksum

Pressing the **A-key Checksum** soft key allows the automatic calculation of the last 6 digits of the A-key.

Automatic RANDSSD

Pressing the **Automatic RANDSSD** soft key enables/disables the automatic generation of a new RANDSSD random number each time the SSD Update procedure is started.

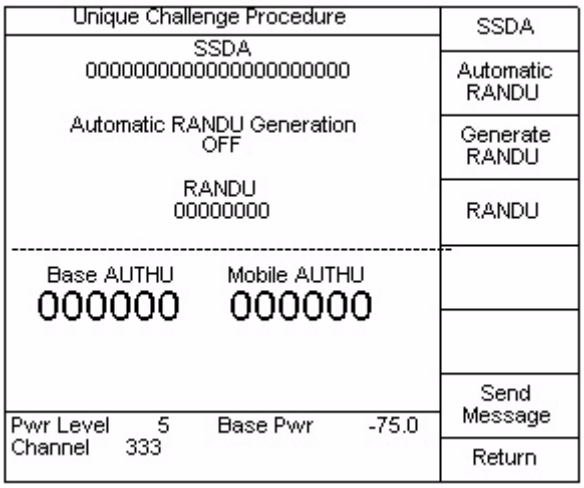
Generate RANDSSD

Pressing the **Generate RANDSSD** soft key causes the immediate generation of a new RANDSSD random number.

RANDSSD

Pressing the **RANDSSD** soft key allows entry of a RANDSSD value with the numeric keypad or arrow keys.

Unique Challenge



When the **Send Message** soft key is pressed, the Unique Challenge Procedure is initiated. This is the second step in testing the mobile's authentication capability.

The 4300 requires a valid SSDA value prior to successfully performing this procedure. Normally, the SSDA value is automatically generated as part of the SSD Update procedure (refer to "SSD Update Procedure screen" on page 134). Alternatively, the SSDA may be entered by pressing the **SSDA** soft key and using the numeric keypad or arrow keys. If the phone's SSDA value is not known, then the authentication process may still be tested by performing the Unique Challenge Procedure and verifying that the procedure fails.

The Unique Challenge procedure consists of the following steps:

1 The 4300 sends the Unique Challenge Order (including the RANDU value) to the mobile. The mobile should respond with the Unique Challenge Order Confirmation message (including its AUTHU value). If the mobile fails to respond with this message, the procedure will stop and display **Unique Challenge Order Confirmation Not Received**.

2 The 4300 compares the mobile's AUTHU value with the expected AUTHU value. If they match, then the authentication procedure passed. If they do not match, then the authentication failed. The pass/fail status will be displayed along with the expected Base AUTHU and the Mobile AUTHU sent by the mobile.

SSDA

Pressing the SSDA soft key allows entry of the 20-digit SSDA value. If the SSD Update Procedure passed successfully, then there is no need to enter the SSDA value.

Automatic RANDU

Pressing the Automatic RANDU soft key enables/disables the automatic generation of a new RANDU random number each time the Unique Challenge procedure is started.

Generate RANDU

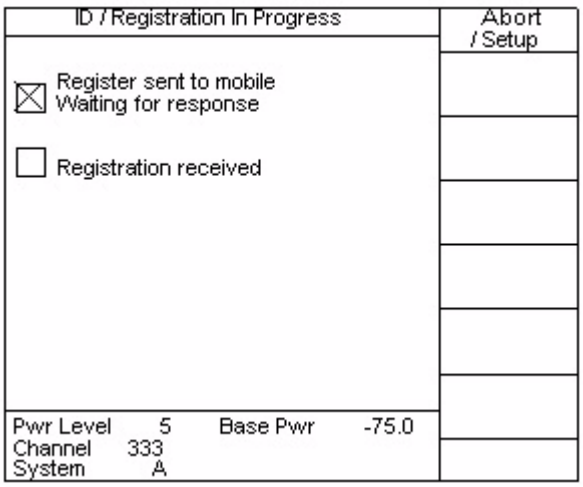
Pressing the Generate RANDU soft key causes the immediate generation of a new RANDU random number.

RANDU

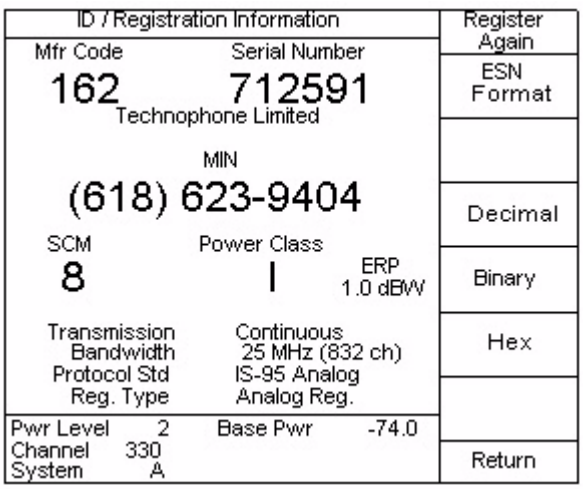
Pressing the RANDU soft key allows entry of a RANDU value with the numeric keypad or arrow keys.

Performing a quick ID check

Quick ID allows the user to quickly identify the system parameters of a mobile/portable. With the antenna port of the mobile/portable connected to the RF Input port of the 4300, turn the mobile/portable on and press the **ID** key. A message will be displayed on the screen indicating that registration of the mobile/portable is in progress. The registration can be stopped at any time by pressing the **Abort** soft key. The following display is shown when the **ID** key is pressed:

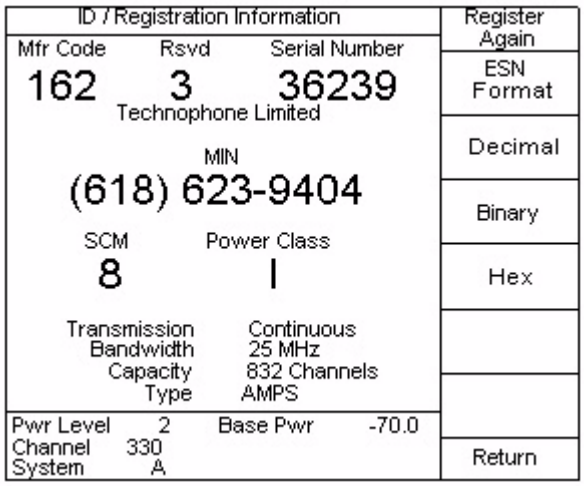


After the Registration is received and the Quick ID is complete, the screen will display the registration information obtained from the mobile/portable.



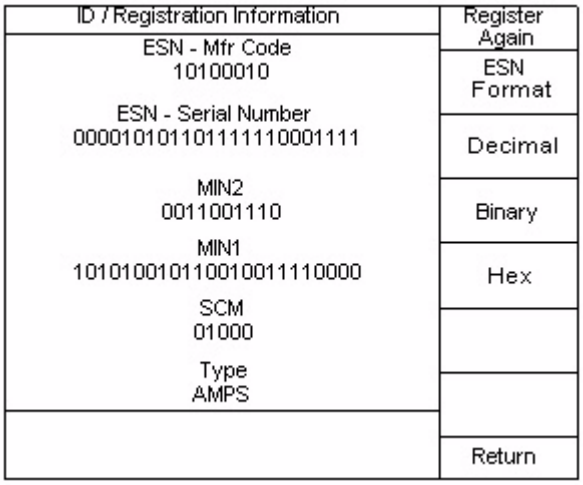
ESN Format: The ESN can be displayed in two formats. To change formats, press the **ESN Format** soft key to toggle between the two formats. One format incorporates the Rsvd field information with the serial number of the mobile under test. The second format separates the Rsvd field information from the serial number and displays the information independently from the serial number.

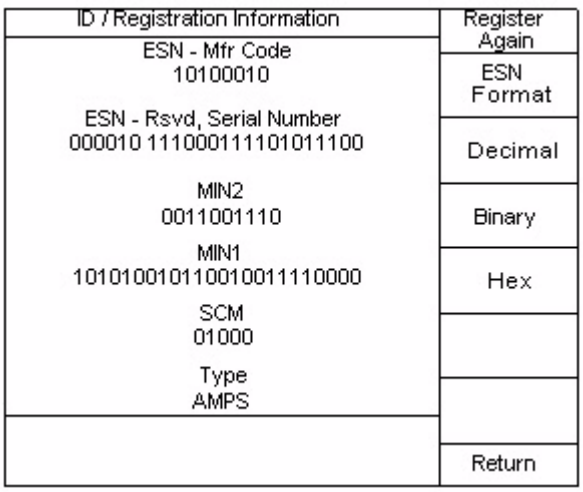
The following shows the different formats:



	MFR Code	Reserved	Serial Number
	10000010	000001	0000010011111111010
Decimal1:	130	1	10234
Hex 1:	82	1	27FA
Decimal 2:	130		272378
Hex 2:	82		427FA

Display format To view Registration information in Decimal, Binary or Hexadecimal form, press either the **Decimal, Binary** or **Hex** soft key. The following two screens represent, in binary form, the ESN, and Rsvd-ESN registration information:





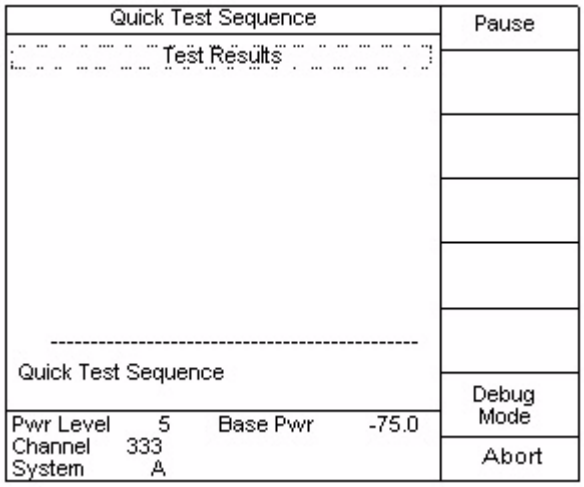
Printing the registration information

Pressing the **PRINT** key will access the printer menu. Press the **Screen Dump** soft key to give a hard copy printout of the mobile/portable registration information assuming that an appropriate printer is connected to the 4300.

Performing a Quick test

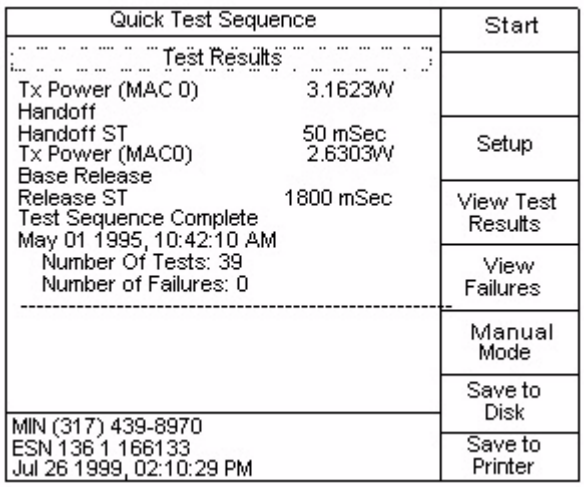
The **Quick** test is a series of automatic tests used to exercise basic call processing functions and measure key parameters of a mobile/portable. To enter the **Quick** mode, press the **Quick** key. If a Quick Test sequence has not been loaded into the unit, refer to "Sequence Setup" on page 24. The disk that accompanies the unit contains a Quick test sequence along with a header file. These files can be easily customized to your specific needs. Refer to "Reference Manual" for a listing of SCPI commands. The **Pause** soft key can be used at any time to pause the test in progress. The **Debug Mode** soft key can be used to display the command lines as they are being performed. The **Abort** soft key can be used to terminate the **QUICK**

test at any time. The **Start** soft key can be used to run the test sequence.The **Continue** soft key is used to resume the test in progress. The following screen is displayed when the **QUICK** key is pressed:



The screen will prompt the user to perform actions to the mobile/portable under test as needed. Once all the test are completed the Test Results menu will appear.

Upon completion of the Quick Test, the following screen is displayed:



Viewing, storing, and printing test results

While in the Test Results screen, the user has the option to view, store or print the Quick test results.

The **Setup** soft key can be used to access the test sequence setup menu (described earlier).

Pressing the **View Test Results** soft key will recall the test results to the screen for review. The user can scroll through the results by using the **up** and **down** arrow keys. Pressing the **View Failures** soft key will display all failed portions of the test.

The **Manual Mode** soft key can be used to access the Manual Mode for further mobile/portable testing.

Pressing the **Save To Disk** soft key will store the non-formatted test results to disk with a file name corresponding to the mobile/portable ESN.

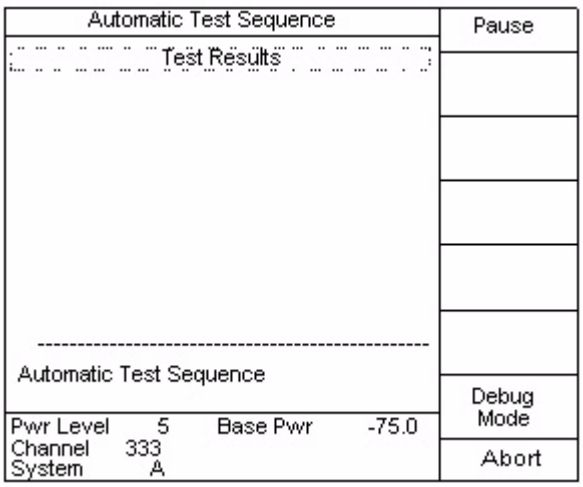
Pressing the **Save To Printer** soft key will print the non-formatted test results on the attached printer for hrd copy review.

The next page provides an example of a 4300 Quick Test Results printout when Log To Printer is enabled.

```
Your Company Name                  Phone: (555) 555-5555
Your Company Address               Fax:(555) 555-5551
Anywhere, IN 12345                 Tech-----------------------------

_____________________________________________________________________

Customer  _____________________________________Work
Address   _____________________________________Home
          _____________________________________Vehicle Type
          _____________________________________Antenna Type

_____________________________________________________________________

Quick Test Sequence
Mobile Origination AMPS Channel 330                              Passed
Digits Dialed     123
Mfr               Matsushita (Panasonic)
ESN               136 00428277
MIN               (317) 439-8970
SCM               8
Type              AMPS
Handoff           AMPS        Channel 100                        Passed
DTMF Digits       1234567890*#12345678990*#                      Passed
Mbl Hook Flash                                                   Passed
Hook Flash ST     406 mSec    Min: 360,      Max: 440 mSec       Passed
Peak Deviation    2775 Hz                    Max: 12000 Hz       Passed
ST Frequency      10000 Hz    Min: 9999,     Max: 10001 Hz       Passed
ST Deviation      7830 Hz     Min: 7200,     Max: 8800 Hz        Passed
SAT Deviation     1870 Hz     Min: 1800,     Max: 2200 Hz        Passed
SAT Frequency     5970 Hz     Min: 5969,     Max: 5971 Hz        Passed
Tx Freq Error     394 Hz      Min: -2060,    Max: 2060 Hz        Passed
Tx Power (MAC 0)  3.3884 W    Min: 1.1220,   Max:4.4668 W       Passed
Tx Power (MAC 1)  1.2589 W    Min: 0.447,    Max: 1.7783W        Passed
Tx Power (MAC 2)  0.4677 W    Min: 0.1778,   Max:0.7079 W        Passed
Tx Power (MAC 3)  0.1698 W    Min: 0.0708,   Max:0.2818 W        Passed
Tx Power (MAC 4)  0.0871 W    Min: 0.0282,   Max:0.1122 W        Passed
Tx Power (MAC 5)  0.0347 W    Min: 0.0112,   Max:0.0447 W        Passed
Tx Power (MAC 6)  0.0123 W    Min: 0.0045,   Max0.0178 W         Passed
Tx Power (MAC 7)  0.0048 W    Min: 0.0018,   Max0.0071 W         Passed
Rx Sensitivity    -116.0 dBm                                     Passed
Handoff           AMPS        Channel 100                        Passed
Handoff ST        49 mSec     Min:45         ,Max:55mSec         Passed
Tx Power (MAC 0)  3.3113 W    Min:1.1220,    Max:4.4668 W        Passed
Handoff           AMPS        Channel 350                        Passed
Handoff ST        49 mSec     Min:45,        Max:55mSec          Passed
Tx Power (MAC 0)  3.0200 W    Min:1.1220,    Max:4.4668 W        Passed
Base Release                                                     Passed
Release ST        1808 mSec   Min: 1620,     Max:1980 mSec       Passed
Test Sequence Complete
May 06 1999, 07:44:11 AM
Number of Tests: 38
Number of Failures: 0
```

Performing an Auto test

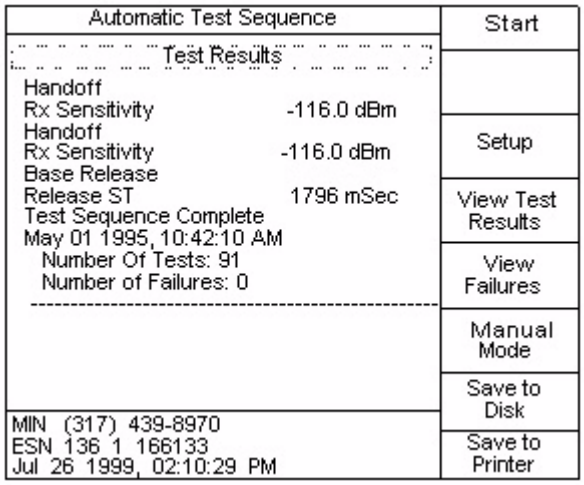
The Auto test is a series of automatic tests used to exercise call processing functions and measure key parameters of a mobile/portable. The Auto mode provides for more detailed testing than the **Quick** or **ID** function provide. If an Auto test sequence has not been loaded into the unit, refer to "Sequence Setup" on page 24. The disk that accompanies the unit contains an Auto test sequence along with a header file. These files can be easily customized to your specific needs. Refer to "Reference Manual" for a listing of SCPI commands. To enter the Auto mode, press the **AUTO** key. The **Start** soft key can be used to run the test sequence. The **Pause** soft key can be used at any time to pause the test in progress. The **Continue** soft key is used to resume the test in progress. The **Debug Mode** soft key can be used to display the command lines as they are being performed. The **Abort** soft key can be used to terminate the Auto test at any time. The following screen is displayed when the **AUTO** key is pressed:



The screen will prompt the user to perform actions to the mobile/portable under test as needed. Once all the test are completed the Test Results menu will appear.

Test results

Upon completion of the base release, the **Test Results** screen is displayed.



Viewing, storing, and printing test results

While in the **Test Results** screen, the user has the option to view, store or print the Auto test results.

The **Setup** soft key can be used to access the test sequence setup menu (described earlier).

Pressing the **View Test Results** soft key will recall the test results to the screen for review. The user can scroll through the results by using the **up** and **down** arrow keys. Pressing the **View Failures** soft key will display all failed portions of the test.

The **Manual Mode** soft key can be used to access the Manual Mode for further mobile/portable testing.

Pressing the **Save To Disk** soft key will store the non-formatted test results to disk with a file name corresponding to the mobile/portable ESN.

Pressing the **Save To Printer** soft key will print the non-formatted test results on the attached printer for hard copy review.

Pressing the **PRINT** key followed by the **Page Buffer** soft key, will print the page buffer which the test sequence used to create custom formatted test results.

The following is an example of a 4300 Automatic Test Results printout:

Willtek 4300

May 06, 1999 Auto Test Results

05-06-99 Mobile Specification Table: Custom 2

10:47:03

Your Company Name Phone: (555) 555-5555

Your Company Address Fax: (555) 555-5551

Anywhere, IN 12345 Tech

Customer _____ Work

Address _____ Home

_____ Antenna Type

Comment _____

Registration		**Tests**		**Pass/Fail**
ESN:	88 0688F5	HEX 2		
	136 00428277	DEC 2	Mobile Origination	Pass
MIN:	(317) 439-8970		Mobile Page	Pass
SCM: 008	DCC: 0	SID: 00019	DTMF: 1234567890*#	Pass

System: _____

ST Tests	Nominal		Actual	
Mobile Release	1800	mS	1803	Pass
Hook Flash	400	mS	405	Pass
Base Release	1800	mS	1806	Pass
ST Frequency	8000	Hz	10000	Pass
ST Deviation	8000	Hz	7865	Pass

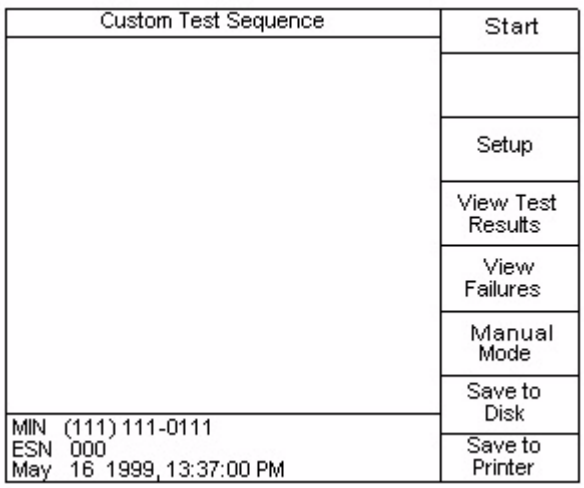
Handoff Tests			**Channels**			
	Nominal		100	350	650	
Power Level 0	2.8184	W	3.3113	3.3884	3.0200	Pass
Power Level 1	1.1220	W	1.2303	1.2303	1.1220	Pass
Power Level 2	446.7	mW	457.1	467.7	426.6	Pass
Power Level 3	177.8	mW	169.8	169.8	158.5	Pass
Power Level 4	70.8	mW	87.1	87.1	79.4	Pass
Power Level 5	28.2	mW	33.9	33.9	30.2	Pass
Power Level 6	11.2	mW	12.3	12.3	11.2	Pass
Power Level 7	4.5	mW	4.7	4.9	4.7	Pass
Tx Freq Error	0	Hz	489	498	504	Pass
Handoff ST	50	mS	49	49	49	Pass
SAT Frequency		Hz	5970	6000	6030	Pass
SAT Deviation	2000	Hz	1915	1885	1880	Pass
Rx Sensitivity	-116.0	dBm	Pass	Pass	Pass	Pass

Other Tests	Actual
Peak Audio Deviation	3370 Hz

Performing a custom test

The custom test is a series of automatic tests used to exercise call processing functions and measure key parameters of a mobile/portable. The Custom mode provides for more detailed testing than the Quick or ID function provide. The Custom test mode provides for more manufacturer specific testing than the Auto mode. If a Custom Test sequence has not been loaded into the unit, refer to "Sequence Setup" on page 24. The disk that accompanies the unit contains a Custom test sequence along with a header file. These files can be easily customized to your specific needs. Refer to "Reference Manual" for a listing of SCPI commands. To enter the Custom mode, press the **CUSTOM** key. To begin a Custom test press the **Start** soft key. The **Pause** soft key can be used at any time to pause the test in progress. The **Debug Mode** soft key can be used to single step through the test sequence, and display the command lines as they are being performed. The **Continue** soft key is used to resume the test in progress. The **Abort** soft key can be used to terminate the Custom test at any time.

Up to three custom test sequences can be stored for use. These tests are set up in the Sequence Setup menu in the Setup mode. The test sequences are loaded from disk and assigned the sequence number that is currently displayed. The following screen is displayed when the **CUSTOM** key is pressed:



The screen will prompt the user to perform actions to the mobile/portable under test as needed. Once all the test are completed the Test Results menu will appear.

Viewing, Storing, and Printing Test Results

While in the **Test Results** screen, the user has the option to view, store or print the Custom test results.

The **Setup** soft key can be used to access the test sequence setup menu (described earlier).

Pressing the **View Test Results** soft key will recall the test results to the screen for review. The user can scroll through the results by using the **up** and **down** arrow keys. Pressing the **View Failures** soft key will display all failed portions of the test.

The **Manual Mode** soft key can be used to access the Manual Mode for further mobile/portable testing.

Pressing the **Save To Disk** soft key will store the non-formatted test results to disk with a file name corresponding to the mobile/portable ESN.

Pressing the **Save To Printer** soft key will print the non-formatted test results on the attached printer for hard copy review.

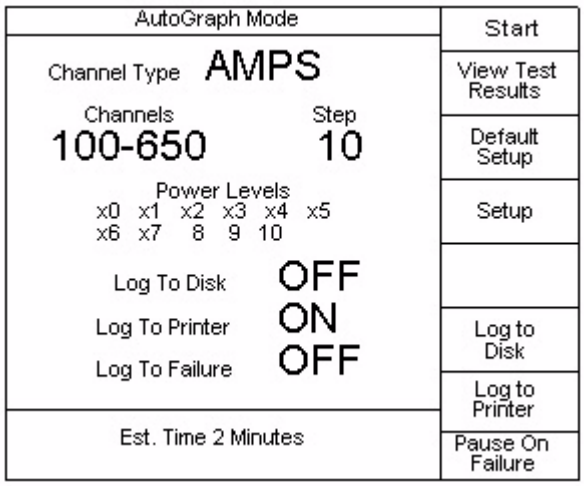
The following is an example of a 4300 Custom Test Results printout:

```
                                          Willtek 4300
May 06, 1999                              Quick Test Results
-------------------------------------------------------------------------
Your Company Name                         Phone: (555) 555-5555
Your Company Address                      Fax: (555) 555-5551
Anywhere, IN 12345                        Tech:

Customer_____________________________________Work
Address _____________________________________Home
        _____________________________________Vehicle Type
        _____________________________________Antenna Type
_________________________________________________________________________

        Mobile Identification Number
           (317) 439-8970

        Electronic Serial Number
           88          288F5       Hex Standard 2
           136         00428277    Decimal Standard 2

        Manufacturer
           Matsushita / Panasonic

        Type
           AMPS

        Station Class Mark
           008
           Power Class:I
           Transmission:  Continuous 25 MHz
           Operation:     832 Channels
```

AutoGraph™ mode

The AutoGraph™ feature provides the user with a graphical display of the mobile/portable's transmitted output power verses voice channel at any or all of the eight user selectable power levels.

The AutoGraph™ mode is entered by pressing the **GRAPH** key.



Start

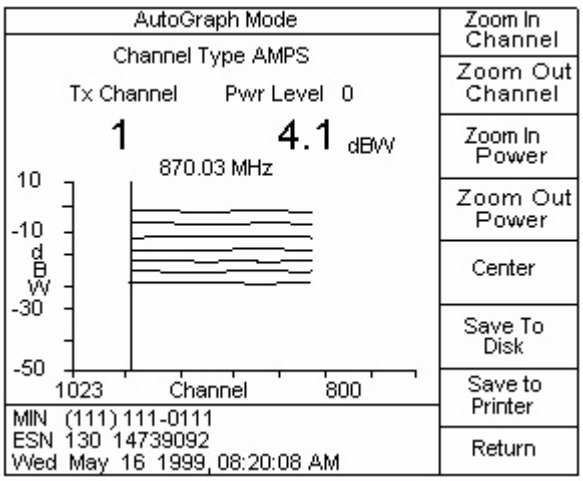
Initiates the AutoGraph™ sequence based on the setup parameters currently displayed. Once the **Start** soft key is pressed, the 4300 will display a mobile origination message, prompting the user to originate a call from the mobile/portable being tested.

The user should dial a phone number on the mobile/portable, then press the **SND** key. The AutoGraph™ test will begin when the origination is complete.

Pause and **Abort** soft keys are available to pause the test or to completely quit the test in progress.

Viewing test results

Press the **View Test Results** soft key to view the most recent AutoGraph™ test results. The following is an example of an AutoGraph™ test:



The view of the AutoGraph™ can be changed by use of the following soft keys:

- **Zoom In Channel**
- **Zoom Out Channel**
- **Zoom In Power**
- **Zoom Out Power**
- **Center**

The view soft keys can be pressed repeatedly to change the view of the AutoGraph™.

Pressing the **Save To Disk** soft key will store the test results to disk with a file name corresponding to the mobile/portable ESN.

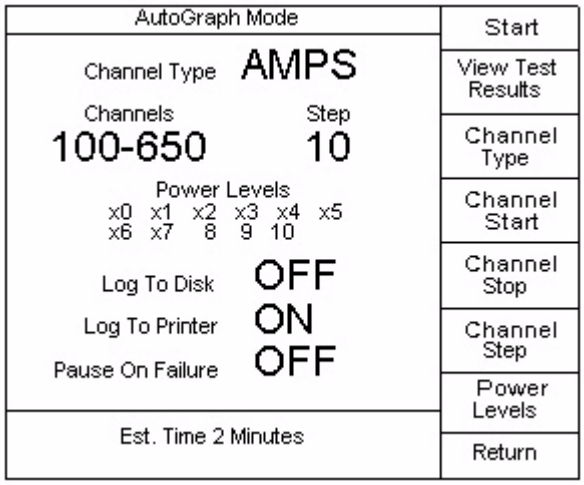
Pressing the **Save To Printer** soft key will print the test results on the attached printer for hard copy review.

Default setup

Automatically sets the start and stop channels, step size, and power level selections to default values.

Setup

Press the **Setup** soft key to edit AutoGraph parameters as shown in the following figure:



To edit the parameter, press the associated soft key and then continue to use the soft key or the up and down arrow keys until the desired value is obtained. The following parameters can be changed in the Setup menu:

- Channel Type - AMPS, NAMPS, TDMA

CDMA is not supported.

- Channel Stop
- Channel Step
- Power Levels - An "X" indicates that the power level will be tested. Use the **LEFT** and **RIGHT** arrow keys to move the cursor between the different power levels. Press **ENTER** or the **UP** and **DOWN** arrows to toggle the "X".

Log To Disk

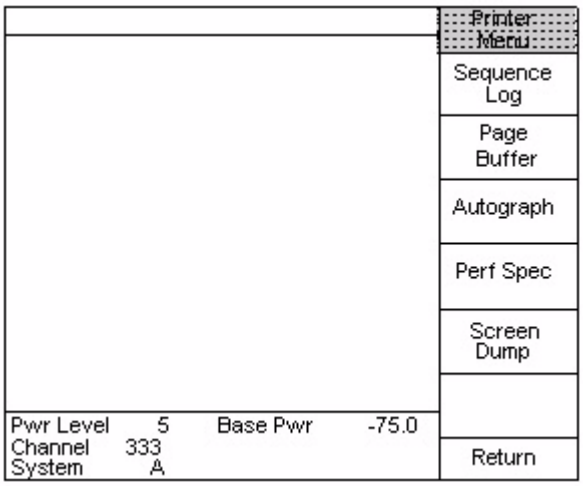
When the Log to Disk function is turned on, the test results will automatically be saved to the disk drive. Ensure a formatted disk is inserted into the drive prior to commencing test. All Autograph files are saved as *.AGR files.

Log To Printer

When turned on, the test results will print at the conclusion of the test. Ensure that a suitable printer is attached to the 4300 prior to commencing test.

Printing

When the **PRINT** key is pressed, the following screen is displayed:



Sequence Log

When a test sequence is being performed, all measurement results are automatically logged in sequential order and displayed on the screen. At the completion of the test sequence, the **Sequence Log** soft key can be used to print out the non-formatted test results.

Page Buffer

When a test sequence is being performed, all print and format commands are sent to a print buffer. At the completion of the test sequence, the **Page Buffer** soft key can be used to print out the formatted test results.

AutoGraph

At the completion of an AutoGraph test, the **AutoGraph** soft key can be used to print out the AutoGraph results.

Perf Spec

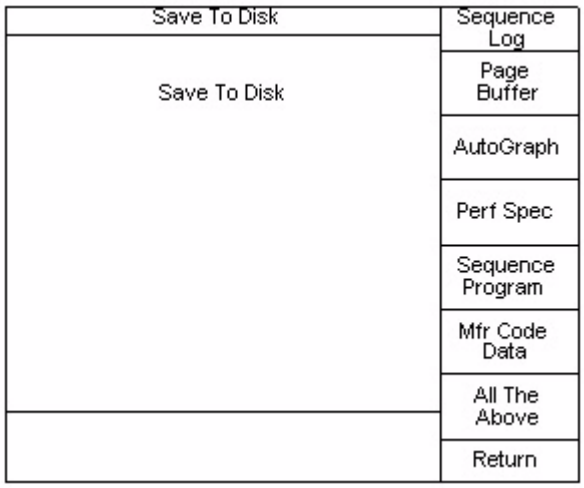
The **Perf Spec** soft key is used to print the selected performance specification table.

Screen Dump

Use the **Screen Dump** soft key to print the current screen. The printout will look exactly as it appears on the display.

Saving test results

When the **Save** key is pressed, the following screen is displayed:



The Save feature allows the user to save various types of files used by the 4300 to a diskette. The types of files that can be saved are as follows:

- Sequence Log - Non-formatted test results from the most recent test sequence
- Page Buffer - Formatted test results from the most recent test sequence
- AutoGraph - Test results from the most recent AutoGraph
- Perf Spec - Selected performance specification table
- Sequence Program - Selected test sequence program
- Mfr Code Data - Manufacturer Codes recognized by the 4300

The **All The Above** soft key can be used to save all of the above currently stored files.

It is good practice to save all files prior to performing a software upgrade.

File types

Press **SETUP** > **File Utilities** > **File Type** soft key to list the various file types associated with the 4300. The following is a list of file types that the 4300 can process:

- *.LOG - Non-formatted test results output from test sequence
- *.AGR - formatted test results output from Autograph
- *.LIM - performance specification limits table
- *.PRG - test sequence program

- *.PAG - formatted test results output from test sequence
- *.HDR - header information file

There are two more file types recognized by the 4300 but not listed under the File Type menu. These are *.CAL and *.BIN. These files must be loaded using the Upgrade Software setup feature.

To only list files of a specific type, press the file type associated soft key.

Deleting files

Use the **Delete** soft key to delete unwanted files. Use the **up** and **down** arrow keys to scroll to the file to be deleted. When the file to be deleted is highlighted, press the **Delete** soft key. A confirmation screen will appear, press the **Yes** soft key to delete the file, or the **No** soft key to cancel the action.

Formatting floppy disks

Press the **Format** soft key to format disks. The screen will prompt you to insert the disk to be formatted. Insert the disk and press the **Format** soft key.

Loading data from disk

Load From Disk loads a file that has been stored on a disk. The disk that accompanies the unit contains a sample quick, auto and custom test sequence. When the Load From Disk soft key is pressed, the unit will provide a list of where the sequence program is to be loaded. Press the corresponding soft key to commence the load from disk action. The Load From Disk key can load many different file types, not only test sequences. The following files will be loaded without any further prompting: *.HDR, *.PAG, and *.LOG. The following files will be loaded after the user selects the location: *.PRG, and *.LIM.

Entering text

The **Alpha** key provides a way to enter alphabetical characters for certain parameters. While editing alphanumeric parameters, a letter may be entered by pressing the **Alpha** key followed by one of the **TEST**, **FUNCTION**, or **DATA ENTRY** keys.

To enter `A-Z`, press the **Alpha** key followed by key below the desired letter. If the previous letter was lowercase, then press the **Alpha** key followed by the **up** arrow key, then the key below the desired letter.

To enter `a-z`, press the **Alpha** key followed by key below the desired letter. If the previous letter was uppercase, then press the **Alpha** key followed by the **down** arrow key, then the key below the desired letter.

To enter a `space`, press the **RIGHT** arrow key. There is no need to press the **Alpha** key.

To enter `0-9, +/-, #,` or `period`, simply press the corresponding DATA ENTRY key. There is no need to press the **Alpha** key.

To enter any other character, use the **up / down** arrow keys. These keys allow you to toggle through all 256 characters defined by the 7-bit ASCII Code.

To erase the previously entered character, press the **Back Space** key. There is no need to press the **Alpha** key.

To start over, press the **Clear** key. Pressing the **Clear** key again will restore the previously entered data.

To terminate the entry, press the **Enter** key. Pressing the **Enter** key again will return you to the edit mode.

Note that the **Alpha** key followed by the **up** or **down** arrow key will select uppercase or lowercase mode. When an alphanumeric entry is started, uppercase mode is automatically selected. All letters entered will be in uppercase. Pressing the **Alpha** key followed by the **down** arrow key will toggle the mode to lowercase. All subsequent letters will be in lowercase. Pressing the **Alpha** key followed by the **up** arrow key will toggle the mode back to uppercase.

An alternative way to enter alphanumeric data is to use only the **up**, **down**, **LEFT**, and **RIGHT** arrow keys. Press the **RIGHT** or **LEFT** arrow keys to select the character to change, then press the **up** or **down** arrow keys to toggle through all 256 available characters until you find the desired character. Then press the **LEFT** or **RIGHT** arrow key to select another character to change or press the **Enter** key to terminate the alpha entry mode and complete the entry.

Obtaining help

The **Help** key provides assistance to the operator on operation of the 4300. Each **HELP** screen lists the chapter of the manual where additional information can be obtained. If additional assistance is required, contact Willtek at any of the addresses given in section "Technical assistance" on page xvi.

Controlling the 4300 via GPIB

Using the GPIB Operation Mode, the 4300 can be controlled externally via the IEEE STD 488 Port. This allows for automating the cellular phone testing process by an external controlling device. The external controlling device is connected to the 4300 via the IEEE STD 488 Port.

GPIB system constraints

The 4300 is compliant to IEEE 488.2. The following interface functions are implemented:

SH1	Complete source handshake capability
AH1	Complete acceptor handshake capability
T6	Basic talker (no talk only mode)
TE6	Basic extended talker
L4	Basic listener (no listen only mode)
LE4	Basic extended listener
SR1	Complete service request capability
RL1	Complete remote/local capability
PP1	Remote parallel poll capability
DC1	Complete device clear capability
DT0	No device trigger capability
C0	No controller capability
E2	Three-state drivers used for driving bus lines

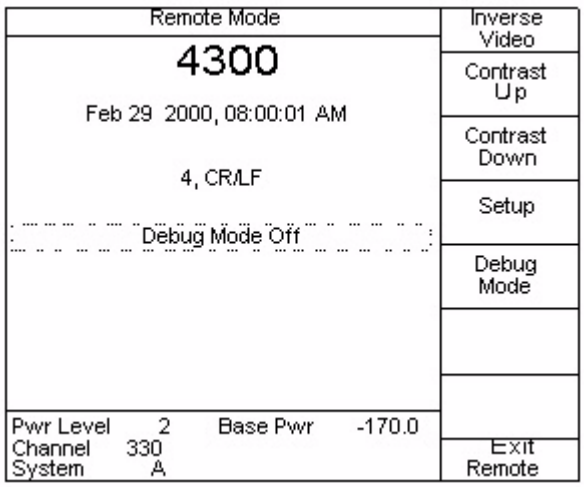
The input buffer size is 8192 characters in length, and the output buffer is 20000 characters in length. It is recommended that the user read any response data requested before sending another command, to prevent loss of data. Any

command received following a command terminator (linefeed or EOI) of a query command will clear the output buffer and signal a QUERY INTERRupTED error. Commands should only follow queries when placed on the same command line.

If a query command is received, the response is evaluated and generated at the time the command is parsed, rather than deferred until data is read.

Remote mode screen

When operating in the remote mode, the following screen is displayed:



Inverse Video Press the **Inverse Video** soft key to toggle between inverse video on and inverse video off.

Contrast Up/Contrast Down Use the **Contrast Up** and **Contrast Down** soft keys to adjust the contrast level of the display.

Setup Refer to “Remote Setup” on page 38.

Debug Mode The Debug Mode allows the user to view various errors, characters, and commands executed while in the remote mode. Press the **Debug Mode** soft key until the desired function is displayed. The following is a list of available functions:

- Error Queue
- Characters Received
- Commands Executed
- Debug Mode Off
- –Last Error In Queue
- Characters Sent
- Responses

Debug Mode Off: No information is reported in the remote message window in this mode.

Error Queue: When the ERROR status indicator is displayed above the remote communication parameters, it indicates that a remote command error has occurred, and the error has been logged to the remote error queue. If the Error Queue debug mode is selected, the remote command error messages are placed in the remote message window beginning with the oldest message at the top. A maximum of 3 messages can be displayed in the window, although the error queue can hold a maximum of 10 messages. As the errors are read from the remote port using the **SYST:ERR?** command, they are read out from the queue from the oldest message to the most recent. As they are read out, they are deleted from the queue. A device clear will clear out the error queue.

Last Error In Queue This is similar to the previously explained debug mode, except that it only displays the most recent error in the error queue.

Characters Received This mode displays the last 210 characters received from the remote port. This does not indicate how much of the input has been executed, simply what has been received. Control characters will be displayed using the IBM mode standard character set. The total input buffer length is 8192 characters in length. A device clear will clear out the input buffer, as well as this message window.

Characters Sent This mode displays the last 210 characters output to the remote port. Control characters will be displayed using the IBM mode standard character set. The total output buffer length is 20000 characters in length. A device clear will clear out the output buffer, as well as this message window.

Commands Executed This mode displays the last commands executed by the 4300. It can display up to 7 commands if they are less than 31 characters in length. Longer commands use up more than 1 line in the message window. The characters are placed in this window as they are parsed. Terminator characters are not displayed in this window. A completed command indicates that the command has begun execution. A device clear will clear out this message window.

Responses This mode displays the last response messages that were generated by the 4300 for output to the remote port. It can display up to 7 responses if they are less than 31 characters in length. Longer responses use up more than 1 line in the message window. The characters are placed in this window as they are generated. This window does not indicate that the characters have been output to the remote port. Terminator characters are not displayed in this window. A completed response indicates that the message available flag (MAV = bit 4) in the serial poll register has been set and that the message is ready for reading by the remote device. A device clear will clear out this message window.

GPIB address selection

The GPIB talk and listen addresses of the 4300 are always the same. It retains the last address setting when the unit is powered up unless power-up settings were invalid, in which case it is set to the default value of 4.

The SYSTem:COMMunicate:GPIB:ADDRess command can be used to change the address across the bus, or it can be set through the front panel under the **SETUP** hard key, **Remote Setup/GPIB** soft key selection. The valid address range is 0 - 30.

Secondary addressing is supported by the 4300, but is disabled at power up. The secondary address can only be enabled through the remote command by specifying the optional secondary address parameter. If the front-panel is used to set the address, secondary addressing will be disabled again.

GPIB terminator selection

The Input terminator is not selectable. A carriage return character, line feed character, or an EOI inserted on the last character of a message (or any combination of the above) will terminate a command. The only exception is if a string parameter is being defined. When the leading quote character (") is found for a parameter description, the terminator character will be inserted as part of the string, rather than terminate the command. A closing quote (") must be received prior to the terminator character. The OUTPUT terminator is selectable through the SYSTem:COMMicate:GPIB:TERMinator command. Three selections are possible: carriage return, linefeed, or carriage return followed by linefeed. An EOI is always inserted on the last character sent.

Service request and instrument status

The service request (SRQ) is a special hardware line on the IEEE 488 bus that is used to signal the GPIB controller that a certain event or condition has occurred, without requiring the controller to continuously perform queries to the 4300. When the system controller receives an SRQ, its response should be to determine which instrument is requesting service. This may be accomplished by performing a serial poll of each instrument on the bus. When a serial poll is performed on the 4300, the response is an 8-bit status value, with bit 6 representing its SRQ status. If the 4300 was issuing a service request, this bit will be set to a 1. The status value also indicates the type of event that caused the 4300 to issue the SRQ, and is the same as the value returned from the common command *STB?. When the serial poll is performed on an instrument, it no longer asserts its SRQ. If an SRQ condition still exists, it may be due to another instrument on the bus also issuing an SRQ, or another SRQ-enabled event has occurred on this instrument. The conditions that generate an SRQ are programmable, and are explained in detail in the “Reference Manual”.

Service requests and serial polls

It is not necessary to implement service request interrupt handling in the system controller in order to perform a serial poll. Serial polling is also an efficient method of synchronizing the controller with an instrument. Input commands are buffered in the 4300 in order to speed communication with the bus. This prevents the controller from knowing how many of the commands that have been sent to the 4300 have been executed. By performing serial polls, the controller can determine whether a response is ready to be read, or an error condition has occurred, or an overlapped command has completed.

IEEE special signals

These signals are sent as GPIB bus signals (interface clear) or as GPIB Universal Command Group (UCG) or Addressed Command Group (ACG) commands, requiring the bus ATN line be asserted with the command. These functions are defined by the IEEE 488.1 specification.

INTERFACE CLEAR

This command is used to reset the remote port and make it ready to receive new input, aborting any pending remote operations. This is one of the pins on the GPIB bus (IFC) and is sent to all devices that are connected to the bus. This is generally performed once at the beginning of a remote session. The following actions are executed on the 4300:

- clear the remote input buffer
- clear the remote output buffer
- clear the remote error queue
- reset the STATUS reporting system (see *CLS common command)
- reset the remote port hardware

DEVICE CLEAR

This command is used to reset the GPIB remote operation of one or more instruments connected to the bus. It can be sent as a Universal Command (DCL) that will affect all instruments on the bus, or as an Addressed Command (SDC) that only affects specified GPIB addresses. This command performs the same actions as the INTERFACE CLEAR described previously. The Data Accepted (DAC) handshake signal on the bus will be held off until the command has completed to prevent possible loss of data if commands are sent to the 4300 prior to completing this command.

GO TO LOCAL

This is an Addressed GPIB command that allows the remote port the ability to put the instrument back in local mode. Normally, front panel operations are prohibited while the remote port has control of the instrument. The only front panel key that is functional is the **EXIT REMOTE** soft key, which can be locked out by the LOCAL LOCKOUT command. When the GO TO LOCAL signal is received, all front panel operation is restored, even if LOCAL LOCKOUT is enabled. Remote mode will again be entered when any remote command is received.

LOCAL LOCKOUT This is a Universal GPIB command that allows the remote port to lock out all front panel functionality until either a GO TO LOCAL command is subsequently received, or the power is recycled on the instrument. This is useful if the controller is running an extensive remote program that may take a long time to run and the user wishes to guarantee that no one will accidentally press a front panel key that could hinder the program.

CDMA2000 Option

4

This chapter provides task-based instructions for using the 4300 Series Mobile Service Tester features for cdmaOne and CDMA2000. Topics discussed in this chapter are as follows:

Testing 800 MHz CDMA mobile phones using a 4300 with CDMA2000 option

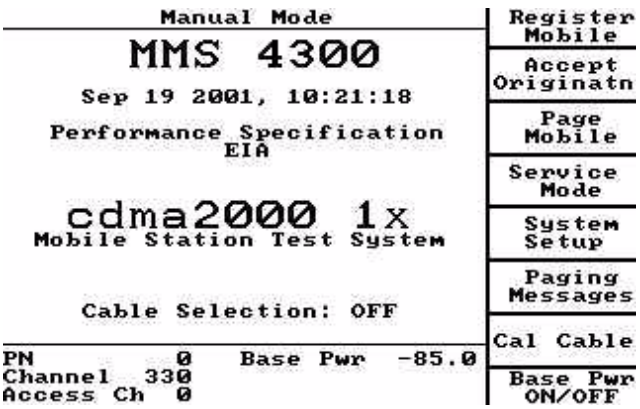
The 4300 tests all cdmaOne and CDMA2000 1X-compatible devices and mobile phones. All screens shown in this section indicate an initial or preset condition.

1 Power up the 4300. Connect the power cord and turn on the 4300 by pressing the power button in the lower left corner of the front panel.

2 Prepare the phone for test. Connect the CDMA phone to be tested to the 4300 RF IN (lower right) using the test cable supplied by the phone manufacturer or the RF cable that came with the 4300.

Do not turn on the phone at this time.

3 Prepare 4300 to test CDMA phones. (This is a one-time setup sequence.) After the 4300 successfully completes self test, the Manual Mode screen is displayed.



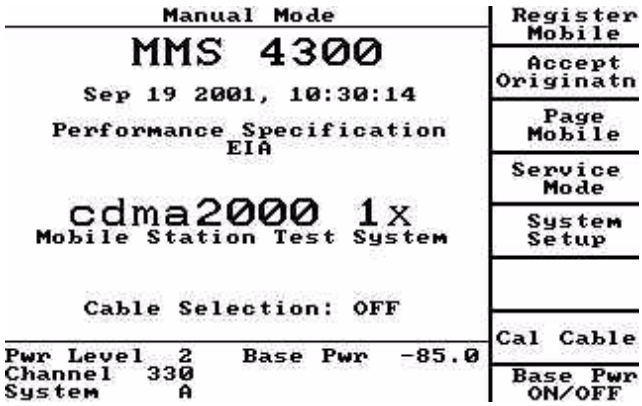
General CDMA setup

Prior to performing tests on a cellular handset, specific CDMA channel parameters must be set up. These parameters are loaded with factory default values suitable for an 800 MHz CDMA2000 cellular system. Several parameters may be set to values consistent with your wireless network.

The following text refers to mobiles not up on a call.

Preset System

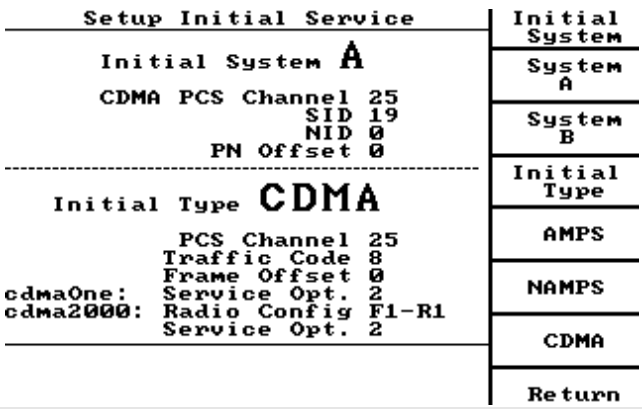
Press the SETUP key >**More** soft key > **Preset** to return the unit to the initial factory preset condition. Press **Return > Return**.



Setup Initial Service

Press SETUP >**System Setup** to access the Setup Initial Service menus.

This path to the **System Setup** soft key is available from any menu at any time. Another way to access this menu is from the Manual Mode menu using the **System Setup** soft key available there.



This path to the **System Setup** soft key is available from any menu at any time. Another way to access this menu is from the Manual Mode menu using the **System Setup** soft key available there.

Initial System

Press the **Initial System** soft key to toggle between System A and System B control channels.

A summary of the setup parameters and type (analog NAMPS or CDMA) of the control channel are also displayed.

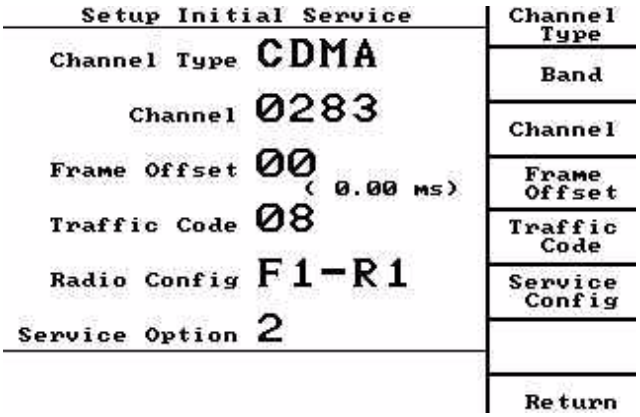
Setup of control channel variables for AMPS and analog NAMPS is covered in Chapter 3 of this manual.

System A or B

Continue with initial setup (Initial Type, CDMA) prior to setting up System A or B. See "Control Channel setup" on page 94.

Initial Type Toggle the **Initial Type** soft key until the CDMA initial type is displayed.

CDMA Press the **CDMA** soft key to set up CDMA parameters.



Channel Type

The CDMA channel type is displayed.

Band

Toggle the **Band** soft key to display either KOR, PCS, or Cellular

Channel

Press the **Channel** soft key to highlight the channel number. Use the **up** and **down** arrow keys or numeric keypad to select the channel number.

The primary System A control Channels is 283, the secondary is 691.

The primary System B control channel is 384, the secondary is 777.

While any valid channel number can be entered for the Channel, selection of one of the preceding numbers results in better operation.

Frame Offset

Press the **Frame Offset** soft key to set up **Frame Offset** parameters. Use the **up** and **down** arrow keys or the numeric keypad to select the desired value. Any value between 0 and 15 may be selected.

Frame Offset is a time skewing of traffic channel frames from system time in integral multiples of 1.25 ms.

The maximum Frame Offset is 15 x 1.25 ms = 18.75 ms.

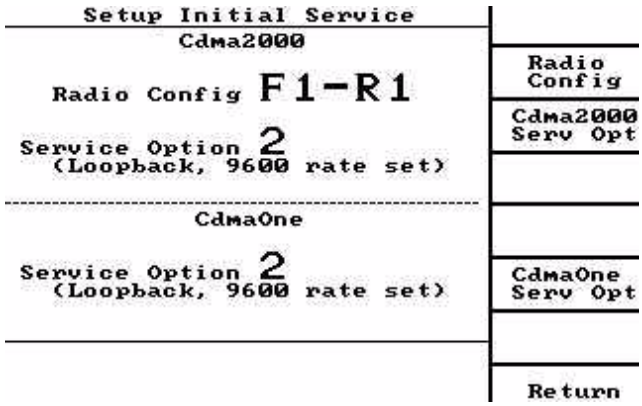
Traffic Code

Press the **Traffic Code** soft key to highlight the Traffic (Walsh) Code. Use the **up** and **down** arrow keys or the numeric keypad to select the desired code.

Select any Walsh Code from 0 - 63 (other than code 32 which is reserved for the Sync Channel, and code 1 which is reserved for the Paging Channel).

Service Config

Press **Service Config** soft key to set up service configuration parameters.



For CDMA2000 mobile phones, press the **Cdma2000 Serv Opt** soft key to cycle through the service options.

For CDMAOne mobile phones, press the **CdmaOne Serv Opt** soft key to cycle through the service options.

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.

Radio Config

Toggle the **Radio Config** soft key to select a Radio Config value.

Selecting a radio configuration causes a corresponding change in the service option.

The following table lists the service options available for a radio configuration.

Table 2 Radio configurations and service options

Radio configuration	Supported service options
F1-R1	1, 2, 3, 55
F2-R2	9, 17, 55, 32768
F3-R3	1, 2, 3, 32, 55

Table 2 Radio configurations and service options

Radio configuration	Supported service options
F4-R3	1, 2, 3, 32, 55
F5-R4	9, 17, 55, 32768

Cdma2000ServOpt

Press the **Cdma2000ServOpt** soft key to toggle through the service options available for the selected radio configuration.

RC = 1, 3, 4	1, 2, 3, 32, or 55	RC = 2, 5	9, 17, 55, or 32768

CdmaOneServOpt

Press the **CdmaOneServOpt** soft key to toggle through the available service options.

1, 2, 3, 9, or 32768

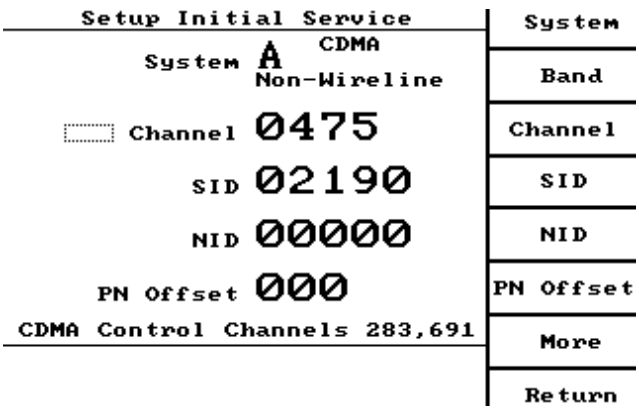
Return

Press the **Return** soft key > **Return** soft key > **System A** soft key to access another Setup Initial Service screen.

Control Channel setup

Press the **More**> **Type** soft key to set the channel type to CDMA.

Press **Return** to continue setting up the control channel.



Band

Toggle the **Band** soft key to select either Cellular, KOR, or PCS.

Channel

Press the **Channel** soft key to highlight the channel number. Use the **up** and **down** arrow keys or numeric keypad to select the initial channel number.

This channel is the same as the control channel selection made in the "Setup Initial Service" on page 91 to assure that a hard handoff is not required to move from the paging channel to the traffic channel.

The primary System A control Channels is 283, the secondary is 691.

The primary System B control channel is 384, the secondary is 777.

SID

Press the **SID** soft key to highlight the SID (System IDentification) number. Use the **up** and **down** arrow keys or numeric keypad to select the SID number. Using your local system SID allows operation with phones that are programmed for home-only operation.

NID

Press the **NID** soft key to highlight the NID (Network Identification) number. Use the **up** and **down** arrow keys or numeric keypad to select the NID number.

A network is a subset of a cellular system (area-wide cellular network, a private group of basestations, or a group of basestations) setup to handle a special requirement.

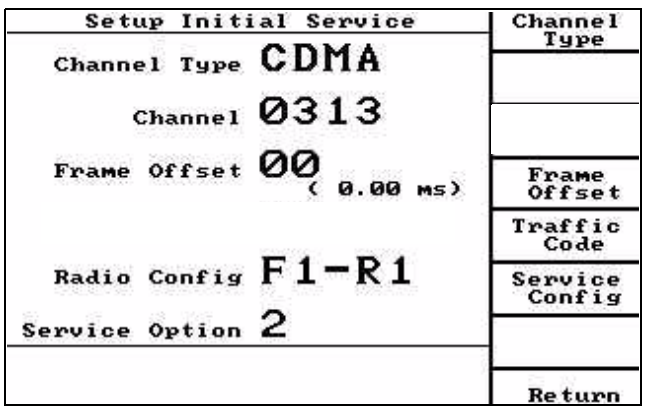
PN Offset

Press the **PN** Offset soft key to highlight the PN Offset (Pilot PN Sequence Offset Index) value. Use the **up** and **down** arrow keys or numeric keypad to select the PN Offset value.

The PN Offset value is in units of 64 PN chips of a pilot.

More

Press the **More** soft key to set up additional parameters.



Channel Setup

Press the **Channel Setup** soft key to display additional setup parameters.

See "CDMA Channel Setup screen" on page 97.

Type

The Type was previously selected.

Access Setup

Press the **Access Setup** soft key to display additional setup parameters.

See "CDMA Access Probe Setup screen" on page 102.

Base ID

Press the **Base ID** soft key to display additional setup parameters.

See "CDMA Base Station ID screen" on page 100.

Power Report

Press the **Power Report** soft key to display additional setup parameters.

See "CDMA Power Report Setup screen" on page 104.

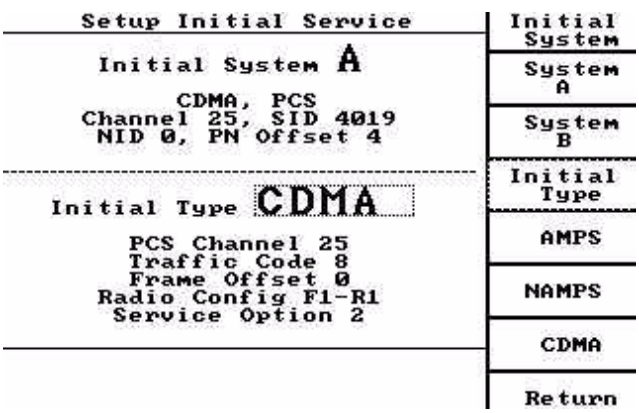
Search Criteria

Press the **Search Criteria** soft key to display additional setup parameters.

See "CDMA Search Criteria screen" on page 105.

Return

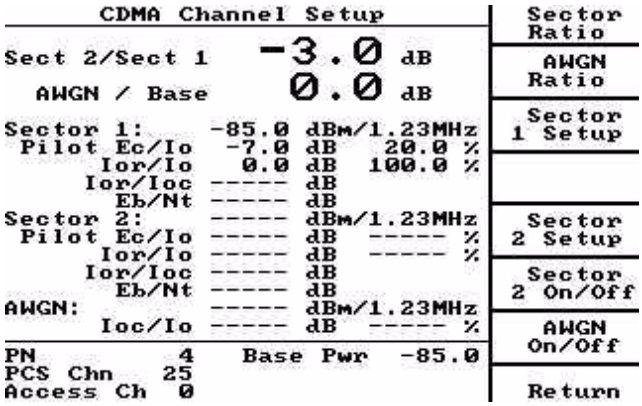
Press the **Return** soft key twice to return to the Setup Initial Service screen.



At this Setup Initial Service screen, press the **System A** or **System B** soft key > **More** soft key > **Channel Setup** soft key.

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.

CDMA Channel Setup screen



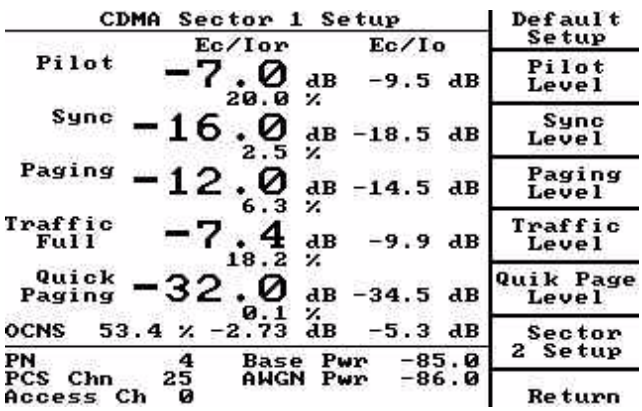
Sector Ratio Press the **Sector Ratio** soft key to highlight the Sector 2/Sector 1 ratio value. Use the **up** and **down** arrow keys or numeric keypad to change the ratio.

The default value is -3.0 dB.

This changes the ratio of the Sector 1 power (pilot, sync, paging,quick paging, traffic, ocns channels) to the Sector 2 power (pilot, traffic, and OCNS channels).

AWGN Ratio Press the **AWGN Ratio** soft key to highlight the AWGN/Base ratio. Use the **up** and **down** arrow keys or numeric keypad to change the AWGN ratio.

Sector 1 Setup Press the **Sector 1 Setup** to display additional setup parameters.



Default Setup

Press the **Default Setup** soft key to load the default values for Sector 1 channel levels:

Parameter	Value
Pilot Ec/Ior	-7.0
Sync Ec/Ior	-16.0

Paging Ec/Io	r-12.0
Traffic Ec/Ior	-7.4
Quick paging Ec/Ior	-32.0

Pilot Level

Press the **Pilot Level** soft key to highlight the Pilot Level value. Use the **UP** and **DOWN** arrow keys or numeric keypad to enter the Pilot Level value.

Sync Level

Press the **Sync Level** soft key to highlight the Sync Level value. Use the **UP** and **DOWN** arrow keys or numeric keypad to enter the Sync Level value.

Paging Level

Press the **Paging Level** soft key to highlight the Paging Level value. Use the **UP** and **DOWN** arrow keys or numeric keypad to enter the Paging Level value.

Traffic Level

Press the **Traffic Level** soft key to highlight the Traffic Level value. Use the **UP** and **DOWN** arrow keys or numeric keypad to enter the Traffic Level Ec/Ior value.

Pressing **Traffic Level** key while on a CDMA call in a loopback service option (2 or 9), replaces the **Traffic Level** key with a **Data Rate** key and displays the data rate setting beneath Traffic on the left side of the main screen in inverse video.

Pressing the **Data Rate** key toggles through the current data rate selections.

This affects the channel power levels.

Full rate is displayed if not on a loopback mode CDMA call, and this key will not change function.

Quik Page Level

Press the **Quik Page Level** soft key to highlight "same as paging".

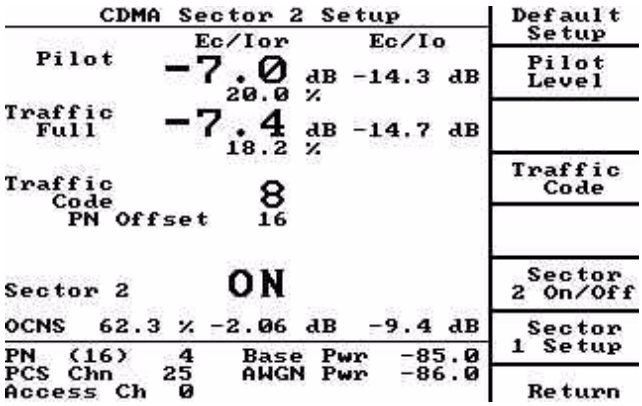
Sector 2 Setup

Press **Sector 2 Setup** soft key to edit the Sector 2 channel levels.

Return

Press the **Return** soft key to return to the CDMA Channel Setup screen.

Sector 2 Setup Press the **Sector 2 Setup** to display additional setup parameters.



Default Setup

Press the **Default Setup** key to load the default values for the Sector 2 channel levels:

Parameter	Value
Pilot Ec/Ior	-7.0
Traffic Ec/Ior	-7.4

This does not change the traffic code or PN offset value.

Pilot Level

Press the **Pilot Level** soft key to highlight the Pilot Level value. Use the UP and DOWN arrow keys or numeric keypad to enter the Pilot Level value.

This affects the channel power levels.

Traffic Code

Press the **Traffic Code** soft key to highlight the Traffic (Walsh) Code. Use the UP and DOWN arrow keys or the numeric keypad to select the desired code.

Select any Walsh Code from 0 - 63 (other than code 32 which is reserved for the Sync Channel, and code 1 which is reserved for the Paging Channel).

Sector 2 On/Off

Press **Sector 2 On/Off** soft key to toggle between Sector 2 on/off state.

Return

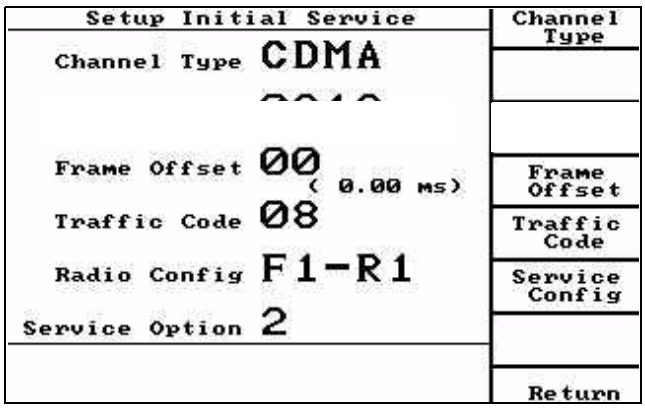
Press the **Return** soft key to return to the CDMA Channel Setup screen.

AWGN ON/OFF Press the **AWGN On/Off** soft key to toggle AWGN between the on/off state.

Return Press the **Return** soft key to return to Additional Parameters screen.

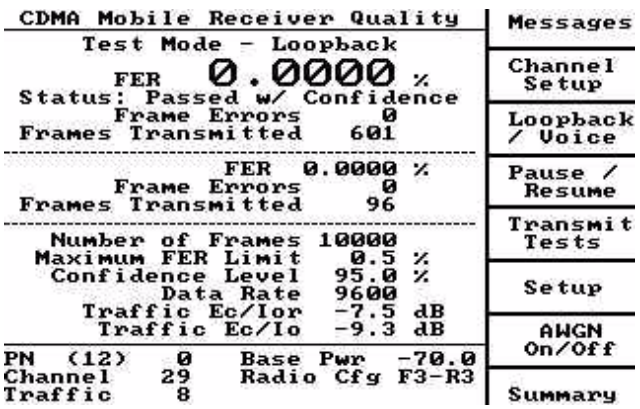
Press the **Return** soft key again to return to the Setup Initial Service screen.

AT the Setup Initial Service screen, press the **Base ID** soft key to access the CDMA Base Station ID screen.

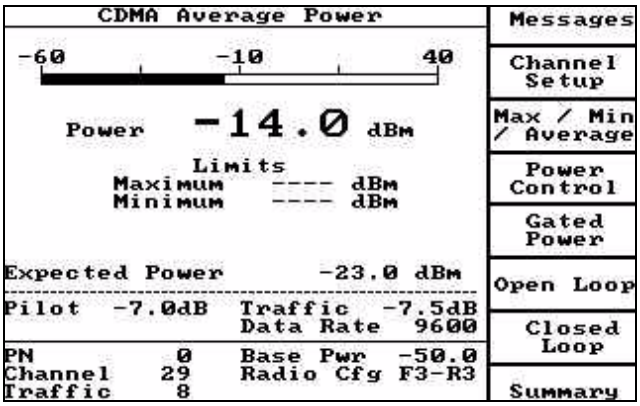


CDMA Base Station ID screen

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.



Base IMSI Press the **Base IMSI** soft key to set up base station IMSI parameters.



MCC

Press the **MCC** soft key to change MCC field of IMSI.

MNC

Press the **MNC** soft key to change digits 11 and 12 of the IMSI.

Return

Press the **Return** soft key twice to display the Setup Initial Service screen.

Base ID Press the **Base ID** soft key to highlight the Base ID (base station identification) number. Use the UP and DOWN arrow keys or numeric keypad to enter the Base ID number.

Zone ID Press the **Zone ID** soft key to highlight the Zone ID (Registration Zone) number. Use the UP and DOWN arrow keys or numeric keypad to enter the Zone ID number.

Latitude Press the **Latitude** soft key to highlight the Latitude (base station latitude) number. Use the UP and DOWN arrow keys or numeric keypad to enter the Latitude number.

Use the **+/–** key on the numeric keypad to toggle to the minus sign of the number.

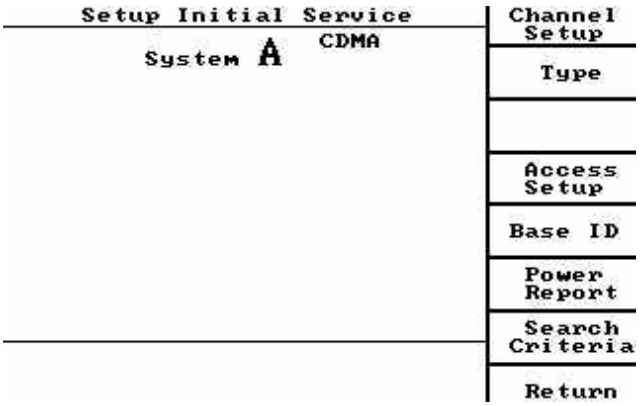
The units are entered in increments of 0.25 seconds with positive numbers representing north latitudes.

Longitude Press the **Longitude** soft key to highlight the Longitude (base station longitude) number. Use the UP and DOWN arrow keys or numeric keypad to select the Longitude number.

Use the **+/–** key on the numeric keypad to toggle to the minus sign of the number.

The units are entered in increments of 0.25 seconds with positive numbers representing east longitude.

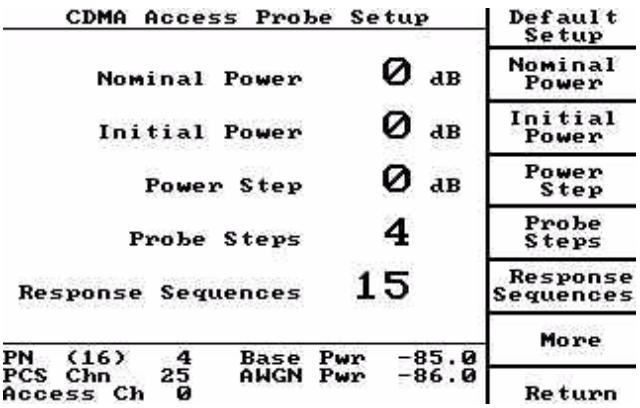
Return Press the **Return** soft key to return to previous screen.



CDMA Access Probe Setup screen

Press the **Access Setup** soft key.

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.



Default Setup Press the **Default Setup** soft key to load the default values in the Access Probe Setup fields.

Nominal Power Press the **Nominal Power** soft key to highlight the Nominal Power (Nominal Transmit Offset Power) value. Use the UP and DOWN arrow keys or numeric keypad to select the Nominal Power value.

Use the **+/-** key on the numeric keypad to toggle sign of the number.

The unit increments in steps of 1 dB. The default value is 0 dB.

Initial Power

Press the **Initial Power** soft key to highlight the Initial Power (Initial Power Offset for Access) value. Use the UP and DOWN arrow keys or numeric keypad to select the Initial Power value.

Use the **+/-** key on the numeric keypad to toggle sign of the number.

The units increment in steps of 1 dB. The default value is 0 dB.

Power Step

Press the **Power Step** soft key to highlight the Power Step (increment to increase between successive access probes) value. Use the UP and DOWN arrow keys or numeric keypad to select the Power Step value.

The unit increments in steps of 1 dB. The default value is 0 dB.

Probe Steps

Press the **Probe Steps** soft key to highlight the Probe Steps (number of access probes to transmit in a single access probe sequence) value. Use the UP and DOWN arrow keys or numeric keypad to select the Probe Steps value.

The default value is 4.

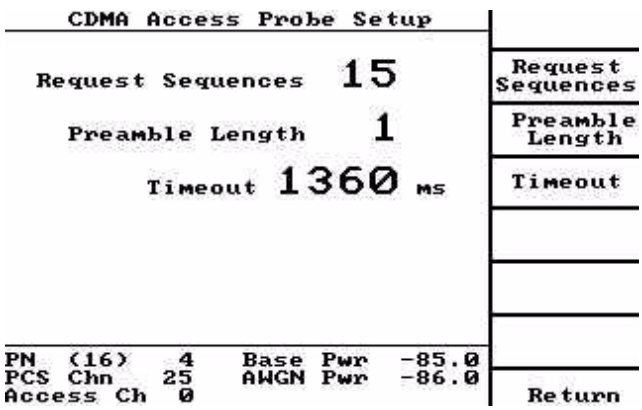
Response Sequences

Press the **Response Sequences** soft key to highlight the Response Sequences (maximum number of response access probe sequences) value. Use the UP and DOWN arrow keys or numeric keypad to select the Response Sequences value.

The default value is 15.

More

Press the **More** soft key on the initial **CDMA Access Probe Setup**.



Request Sequences

Press the **Request Sequences** soft key to highlight the Request Sequences (maximum number of request access probe sequences) value. Use the UP and DOWN arrow keys or numeric keypad to select the Request Sequences value.

The default value is 15.

Preamble Length

Press the **Preamble Length** soft key to highlight the Preamble Length (number of access channel frames the mobile is to transmit in each access channel preamble) value. Use the UP and DOWN arrow keys or numeric keypad to select the Preamble Length value.

The default value is 1.

Timeout

Press the **Timeout** soft key to highlight the Timeout (Acknowledgement Timeout) value. Use the UP and DOWN arrow keys or numeric keypad to select the Timeout value.

The Timeout value is changed in increments of 80 ms. The default value is 1360.

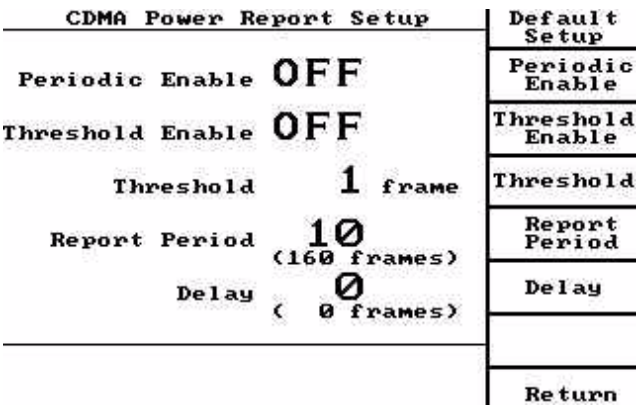
Return

Press the Return soft key twice to access the Setup Initial Service screen. See "More" on page 95.

CDMA Power Report Setup screen

At the Setup Initial Service screen, press the **Power Report** soft key.

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.



Default Setup Press the **Default Setup** soft key to load the following default values in the CDMA Power Report fields:

Periodic Enable Press the **Periodic Enable** soft key to toggle the Periodic Enable state between on/off state.

When Periodic Enable = On mobile stations are instructed to generate periodic Power Measurement Report Messages.

The default state is OFF.

Threshold Enable Press the **Threshold Enable** soft key to toggle the Threshold Enable between the on/off state.

When Threshold Enable = On mobile stations are instructed to generate threshold Power Measurement Report Messages.

The default state is OFF.

Threshold Press the **Threshold** soft key to highlight the Threshold (number of bad frames to receive in a period before generating a Power Measurement Report Message) value. Use the **up** and **down** arrow keys or numeric keypad to select the Threshold.

The default value is 1.

Report Period Press the **Report Period** soft key to highlight the Report Period value. Use the UP and DOWN arrow keys or numeric keypad to select the Report Period.

The default value is 10.

Delay Press the **Delay** soft key to highlight the Delay (number of frames to wait following a Power Measurement Report Message before restarting bad frame counter) value. Use the UP and DOWN arrow keys or numeric keypad to select the Delay.

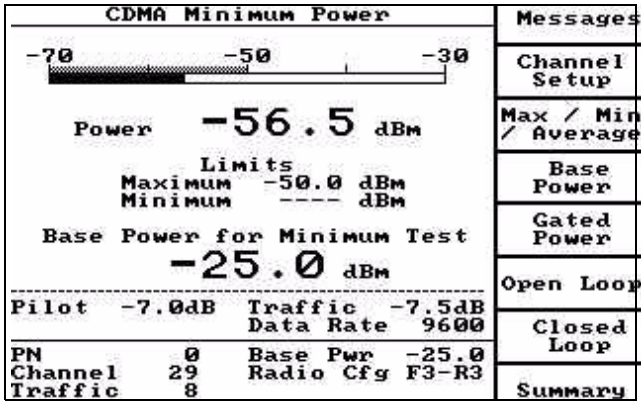
The default value is 0.

Return Press the **Return** soft key to access the Setup Initial Service screen.

CDMA Search Criteria screen

At the At the Setup Initial Service screen, press the **Search Criteria** soft key.

Setup for both systems is the same. Some parameter values may differ. Only System A is discussed here.



Default Setup Press the **Default Setup** soft key to load default values in the CDMA Search Criteria fields.

Add Threshold Press the **Add Threshold** soft key to highlight the Add Threshold (pilot detection threshold) value. U the UP and DOWN arrow keys or numeric keypad to select the Add Threshold.

Use the **+/-** key on the numeric keypad to toggle the sign of the number.

The units increment in steps of 0.5 dB. The default value is -14.0 dB.

Drop Threshold Press the **Drop Threshold** soft key to highlight the Drop Threshold (pilot drop threshold, starts drop timer) value. Use the UP and DOWN arrow keys or numeric keypad to select the Drop Threshold.

The unit increment in steps of 0.5 dB. The default value is -16.0 dB.

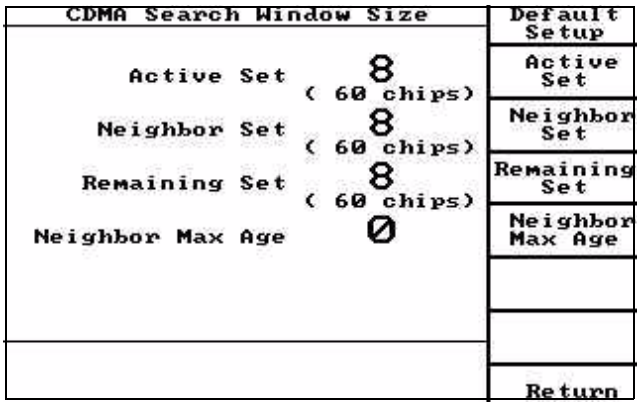
Comp Threshold Press the **Comp Threshold** soft key to highlight the Comp Threshold (Active Set versus Candidate Set comparison threshold) value. Use the UP and DOWN arrow keys or numeric keypad to select the Comp Threshold.

The units increments in steps of 0.5 dB. The default value is 2.5 dB.

Drop Timer Press the **Drop Timer** soft key to highlight the Drop Timer value. Use the UP and DOWN arrow keys or numeric keypad to select the Drop Timer.

The values are found in IS-95. The default value is 3 (4 seconds).

Window Size Press the **Window Size** soft key to display the CDMA Search Window Size screen:



Default Setup

Press the **Default Setup** soft key to load the following default values in the CDMA Search Window fields:

Active Set

Press the **Active Set** soft key to highlight the Active Set value. Use the UP and DOWN arrow keys or numeric keypad to select the Active Set.

The values are found in IS-95-A. The default value is 8.

Neighbor Set

Press the **Neighbor Set** soft key to highlight the Neighbor Set value. Use the UP and DOWN arrow keys or numeric keypad to select the Neighbor Set.

The values are found in IS-95-A. The default value is 8.

Remaining Set

Press the **Active Set** soft key to highlight the Remaining Set value. Use the UP and DOWN arrow keys or numeric keypad to select the Remaining Set.

The values are found in IS-95. The default value is 8.

Neighbor Max Age

Press the **Neighbor Max Age** soft key to highlight the Neighbor Max Age value. Use the UP and DOWN arrow keys or numeric keypad to select the Neighbor Max Age.

The values are found in IS-95. The default value is 0.

Return

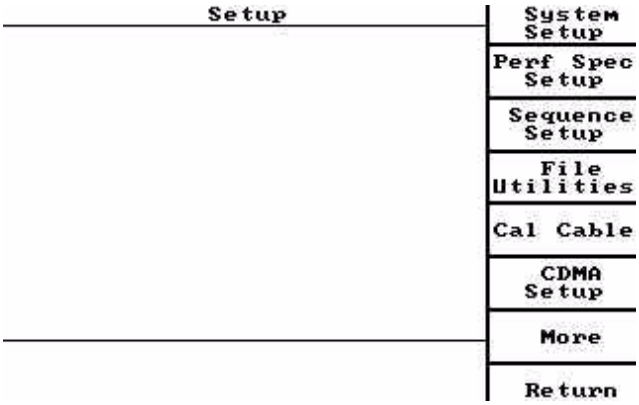
Press the **Return** soft key to return to the CDMA Search Criteria screen.

Return

Press the **Return** soft key to return to the Setup Initial Service screen.

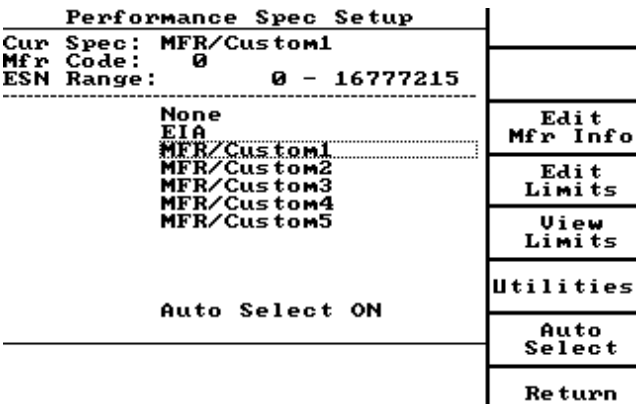
Setup screen

Press the MANUAL key > **Setup** key to display the Setup screen.



System Setup See "Setup Initial Service" on page 91.

Perf Spec Setup At the Setup screen, press the **Perf Spec Setup** soft key:



To view the **Next** and **Previous** soft keys, set Auto Select to OFF.

Edit Mfr Info

Press the **Edit Mfr Info** soft key to update the manufacturer information.

Use the **Edit Next** and **Edit Previous** soft keys.

Edit Limits

Press the **Edit Limits** soft key to change the status.

Use the soft keys to cycle through the selections.

View Limits

Press the **View Limits** soft key to view the status.

Use the soft keys to cycle through the selections.

Utilities

Press the **Utilities** soft key to load, save and print data.

Auto Select

Press the **Auto Select** soft key to toggle this function ON and OFF.

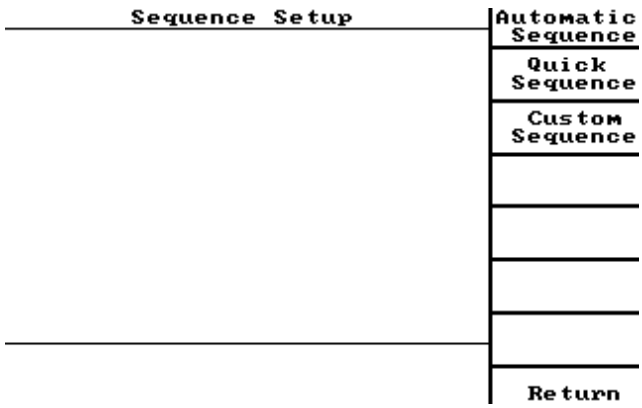
Turn this function off to enable the **Next** and **Previous** soft keys.

Return

Press the **Return** soft key until the Setup screen is displayed.

Sequence Setup

At the Setup screen, press the **Sequence Setup** soft key:



Automatic Sequence

Press the **Automatic Sequence** soft key to set up the automatic test sequence.

Quick Sequence

Press the **Quick Sequence** soft key to set up the quick test sequence.

Custom Sequence

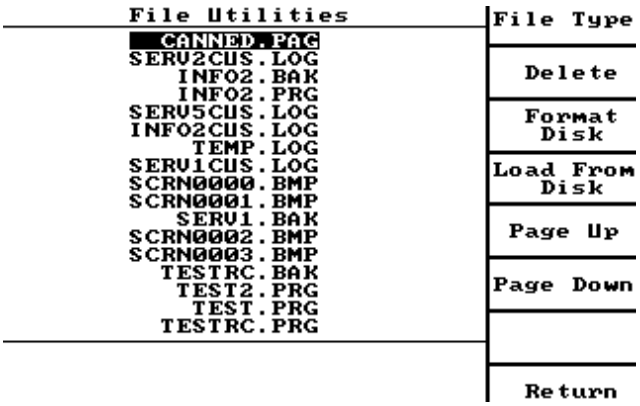
Press the **Custom Sequence** soft key to set up the custom test sequence.

Return

Press the **Return** soft key until the Setup screen is displayed.

File Utilities

At the Setup screen, press the **File Utilities** soft key to access the disk directory.

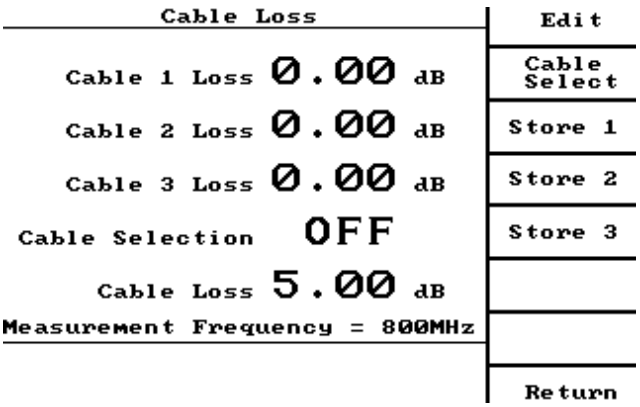


Use the soft keys to delete, format and load files.

Return

Press the **Return** soft key until the Setup screen is displayed.

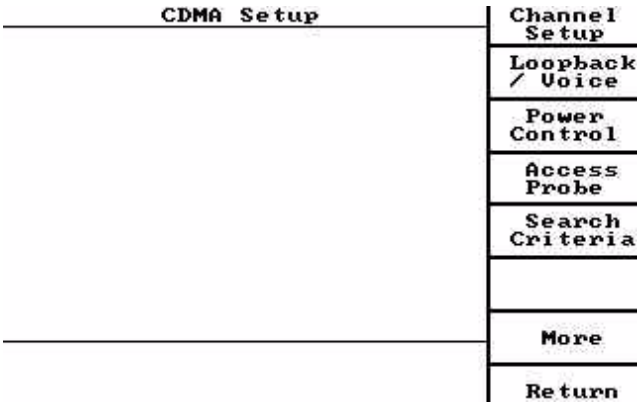
Cal Cable Press the Cal Cable soft key to select cable loss values for up to three cables. Use the up and down arrow keys to change the values.



Return

Press the **Return** soft key until the Setup screen is displayed.

CDMA Setup Press **CDMA Setup** soft key on the Setup screen to access CDMA setup screen:



Channel Setup

See "CDMA Channel Setup screen" on page 97."

Loopback / Voice

See "CDMA Loopback/Voice Setup screen" on page 137.

Power Control

Refer to "CDMA Power Control screen" on page 138.

Access Probe

Refer to "CDMA Access Probe Setup screen" on page 102.

Search Criteria

Refer to "CDMA Search Criteria screen" on page 105.

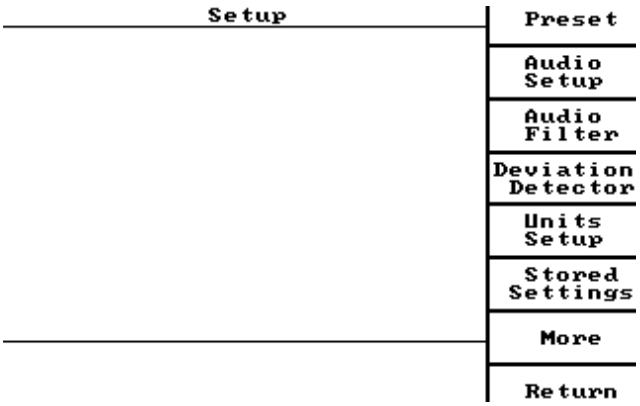
More

Press the **More** soft key to advance to *second* CDMA setup screen. See Refer to "Second CDMA Setup screen" on page 112.

Return

Press the **Return** soft key to return to the *initial* CDMA Setup screen.

More At the Setup screen, press the **More** soft key to access additional parameters for AMPS only.



Preset

See "Preset System" on page 90.

Audio Setup

This is AMPS only.

Audio Filter

This is AMPS only.

Deviation Detector

This is AMPS only.

Units Setup

Press the **Units Setup** soft key to set up 4300 transmission power, frequency and phase.

Stored Settings

Press the **Stored Settings** soft key . Use the UP and DOWN arrow keys to select which setting to save.

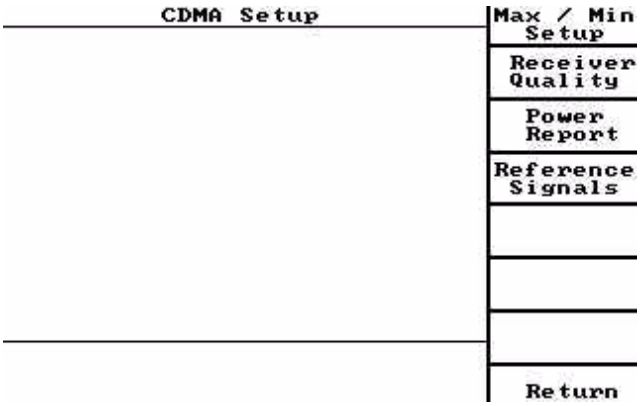
More

Press the **More** soft key to set up 4300 screen options.

Return At the Setup screen, press the **Return** soft key until the Manual Mode screen is displayed.

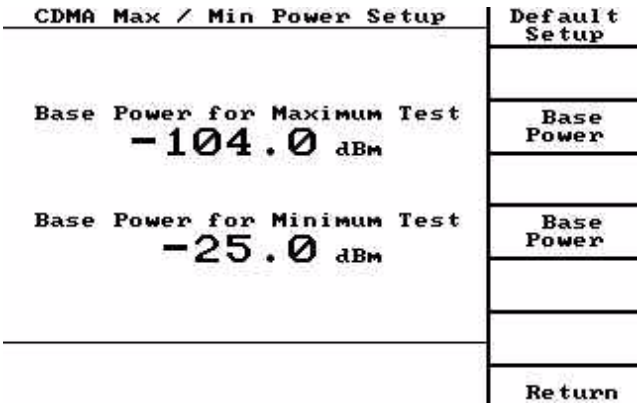
Second CDMA Setup screen

Press the SETUP key > **CDMA Setup** soft key > **More** soft key:



Max / Min Setup Press the **Max / Min Setup** soft key to access the CDMA Max/Min Power Setup screen.

This screen allows the user to set the base power levels.



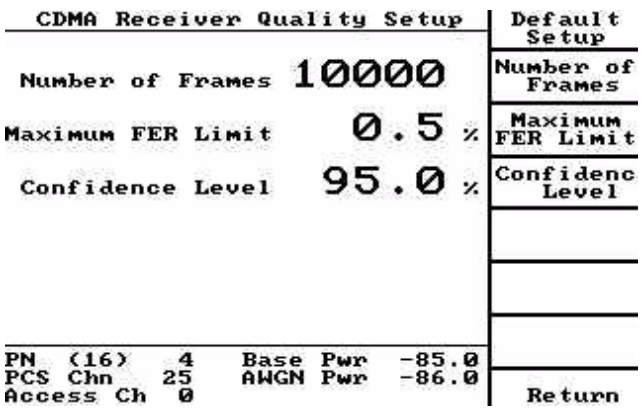
Base Power

Press the **Base Power** soft keys to set the maximum and minimum parameters.

Return

Press the **Return** soft key to return to the second CDMA Setup screen.

Receiver Quality At the second CDMA Setup screen, press the **Receiver Quality** soft key to access the Receiver Quality Setup screen. \



Default Setup

Allows the user to set all values to default values.

Number of Frames

Press the **Number of Frames** soft key. Use the UP and DOWN arrow keys to set the frame parameter.

Maximum FER Limit

Press the **Maximum FER Limit** soft key. Use the UP and DOWN arrow keys to set the FER limit parameter.

Confidence Level

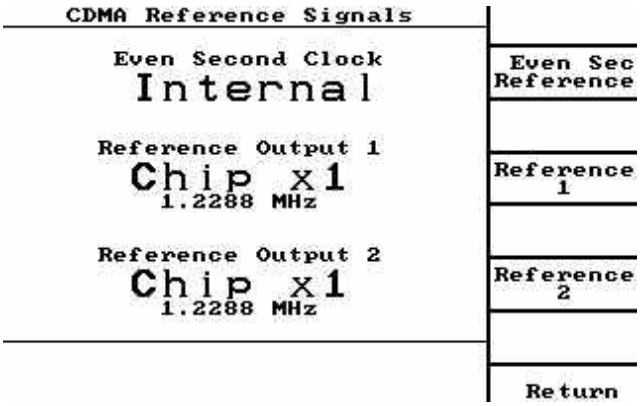
Press the **Confidence Level** soft key. Use the UP and DOWN arrow keys to set the Confidence limit parameter.

Return

Press the **Return** soft key to return to the second CDMA setup screen.

Power Report At the second CDMA Setup screen, press the **Power Report** soft key. See "CDMA Power Report Setup screen" on page 104.

Reference Signals Press the **Reference Signals** soft key to access the setup screen for the even second clock and reference outputs.



These signals are available on the 9-pin D-sub connector on the rear of the unit.

Even Sec Reference

Toggle the **Even Sec Reference** soft key to select the internal or external even second clock reference (if external try to sync to a signal supplied by user).

Reference 1

Toggle the **Reference 1** soft key to select one of the following output values:

Chip x1, Chip x4, Chip x8, Chip x16, Power Control Group, PN Clock, Frame, Super Frame.

Reference 2

Toggle the **Reference 2** soft key to to select one of the following output values:

Chip x1, Chip x4, Chip x8, Chip x16, Power Control Group, PN Clock, Frame, Super Frame.

Return

Press the **Return** soft key to return to the second CDMA setup screen.

Manual mode testing

To perform the following basic tests on a CDMA cellular phone, ensure that the 4300 has been set up for CDMA operation.

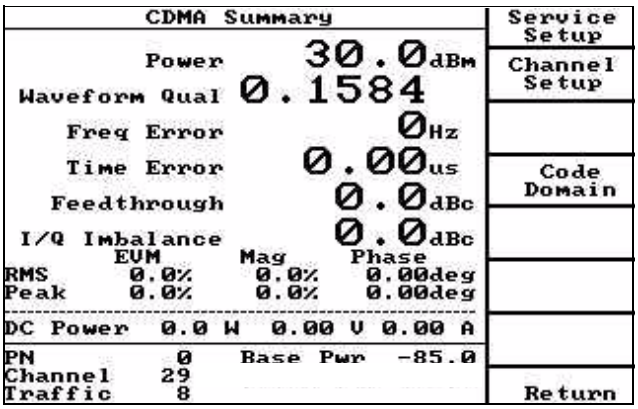
See "Testing 800 MHz CDMA mobile phones using a 4300 with CDMA2000 option" on page 90.

For information on testing AMPS and NAMPS phones and connection information, refer to Chapter 3 of this manual or to the Getting Started Manual.

The 4300 tests all CDMA One and CDMA2000 1X-compatible mobile phones.

Do not turn on the mobile at this time.

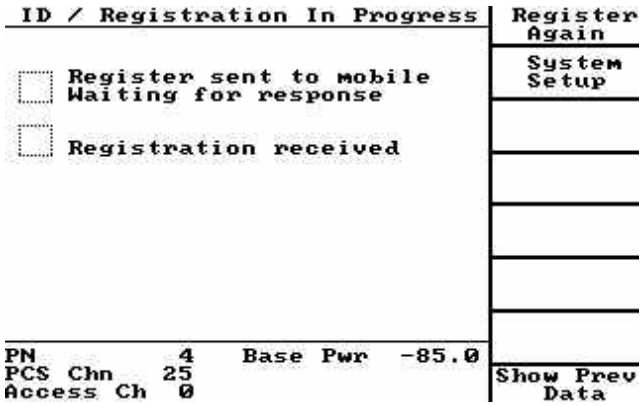
After completing the initial setup, press the **Return** soft key until the Manual Mode screen appears:



The CDMA Manual Mode menu and display is similar to the AMPS (analog) Manual Mode with following differences: Soft key **S7** is Paging Messages, the information elements in the lower left of the display are **PN, Channel**, and **Access Ch**(annel) and CDMA-specific status messages appear below the Base Pwr information element.

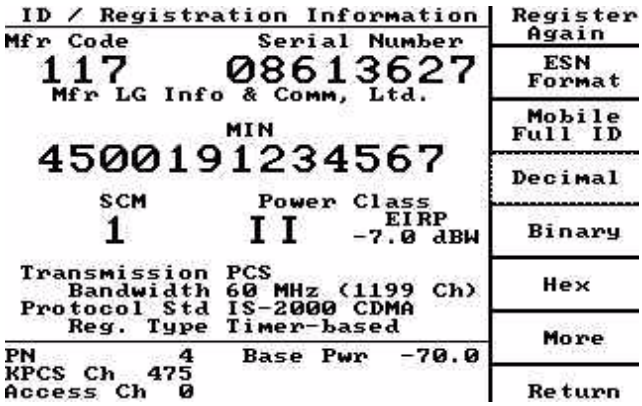
ID/Registration screens

At the Manual Mode screen, press the **Register Mobile** soft key to retrieve registration information from the mobile:



The ID / Registration In Progress menu and display are identical to those of an AMPS display. Refer to Chapter 3.

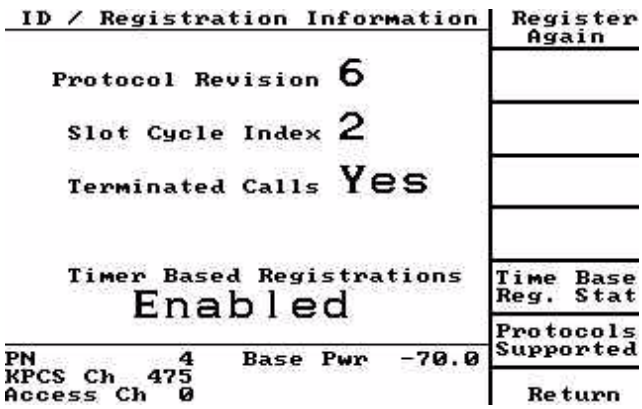
Successful mobile registration displays the following:



The functions of the keys and the displayed information are the same as that described in Chapter 3 for AMPS except for the information displayed by pressing the **More** soft key on the ID / Registration Information screen.

More

Press the **More** soft key on the ID / Registration Information for the following display:



ID/Registration Information screen

Protocol Revision indicates the protocol revision of the personal station.

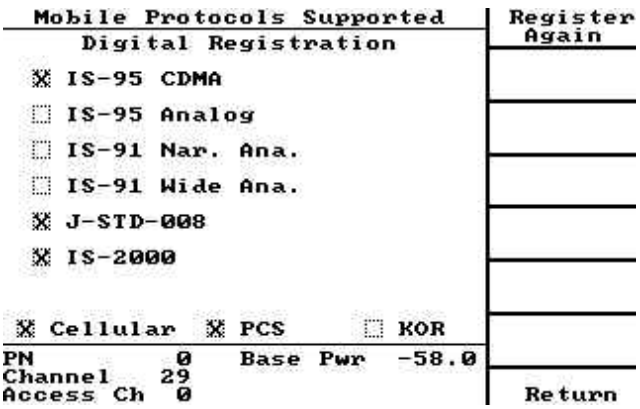
Slot Cycle Index indicates whether the personal station is configured for slotted mode operation. If the personal station is configured for slotted mode operation, this field indicates the preferred slot cycle index. If the personal station is not configured for slotted mode operation this field is "0".

Terminated Calls indicates whether the personal station is configured to accept calls while operating with the current roaming status. If the personal station is configured to accept calls, the personal station sets this bit to "1". Otherwise, the bit is set to "0".

Time Base Reg. Stat The **Time Base Reg. Stat** soft key is used to enable/disable timer based registrations.

The default is "enabled".

Protocols Supported The **Protocols Supported** soft key displays which protocols are supported by the phone:

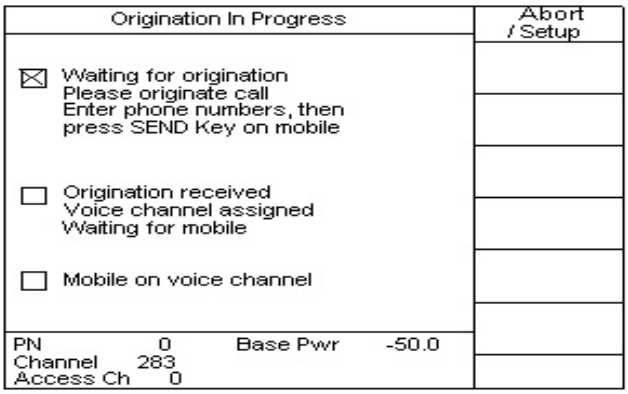


Return

Press **Return** until the Manual Mode screen is displayed.

Origination screen

Accept Origination At the Manual Mode screen, press the **Accept Originatn** soft key to begin origination of a CDMA call from the mobile phone.

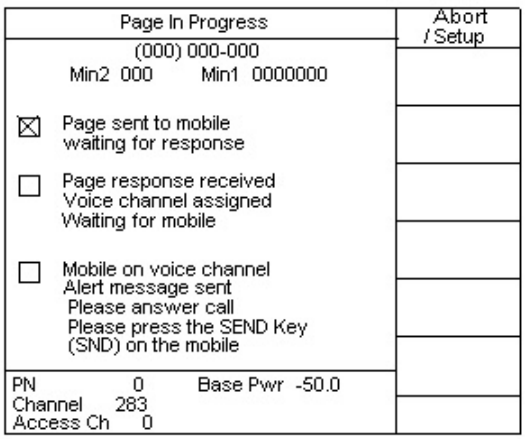


The previous menu and display are identical to those of an AMPS display (Chapter 3). Successful completion of the Origination results in the display of the CDMA Summary screen ("CDMA Summary screen" on page 120).

Page Mobile screen

At the Manual Mode screen, press the **Page Mobile** soft key to call the CDMA mobile phone from the 4300.

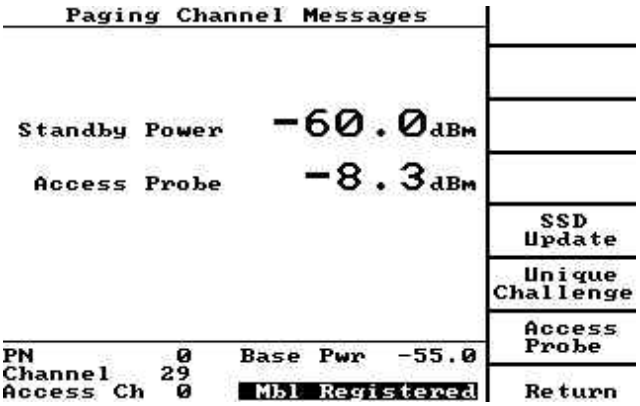
Phone registration or origination must first be completed.



The previous menu and display are identical to those of an AMPS display (Chapter 3). Successful completion of the Page results in the display of the CDMA Summary screen ("CDMA Summary screen" on page 120).

Paging Channel Messages screen

From the Manual Mode screen, press the **Paging Messages** soft key:



Standby Power indicates the mobile station output power when its transmit functions are disabled.

Performance limit and test information are found in IS-98 10.4.7.

Access Probe indicates the Access Probe (Output) Power is the mobile station output power during an Access Channel transmission.

Performance limit and test information are contained in IS-98 10.4.3

SSD Update Press the **SSD Update** soft key to initiate the SSD Update procedure.

See "SSD Update Procedure screen" on page 134.

Unique Challenge Press the **Unique Challenge** soft key to initiate the Unique Challenge procedure.

See "Unique Challenge Procedure screen" on page 136.

Access Probe Press the **Access Probe** soft key to display the CDMA Access Probe Setup screen.

See "CDMA Access Probe Setup screen" on page 102.

Return Press the **Return** soft key to return to the Manual Mode screen.

CDMA Summary screen

When initiating a call to a CDMA channel, one of two screens is displayed, depending on whether the mobile is in a loopback service option or voice service option is selected.

The screens show how the FER measurements are reported in the Mobile Receiver.

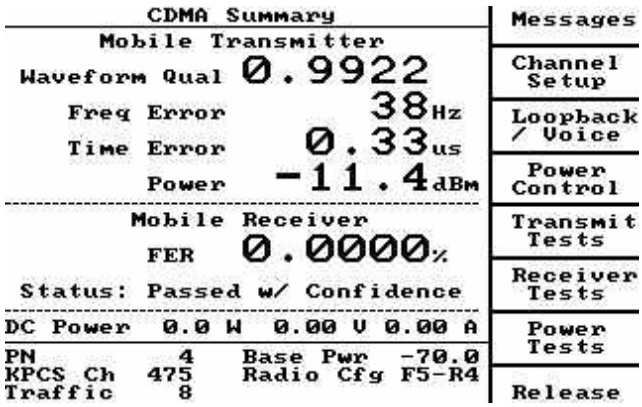
The following text refers to mobiles up on a call. For mobiles not up on a call, refer to page 90.

To change the service option while on a call (Accept Origination only) and on the CDMA Summary screen, press **Messages** > **Service Option** > **Send Message**.

Loopback Service Option

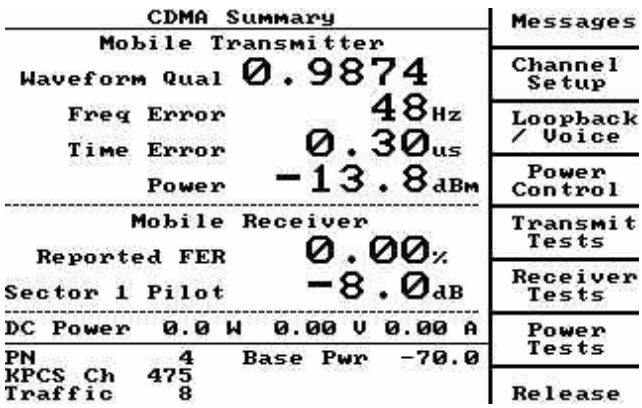
In loopback mode, the 4300 determines the frame errors and calculates the Frame Error Rate (FER).

After a successful page or origination, the CDMA Summary screen is displayed:



Voice Service Option

In voice mode, the mobile measures pilot strength, counts frame errors, and reports them to the 4300.



Mobile Transmitter Measurements

Waveform Qual indicates the waveform quality (modulation accuracy) in terms of the waveform quality factor p (Rho).

It is defined as the normalized correlated power between the actual waveform and the ideal waveform sampled at the decision points. A value of 1 indicates perfect waveform quality.

IS-98 10.3.2.3 specifies that Rho must be greater than 0.944.

Freq Error indicates the frequency error measurement and is displayed as the estimate of the carrier frequency error obtained in the computation of Rho.

IS-98 10.3.2.3 specifies that the frequency error be within +/- 300 Hz.

Time Error indicates the transmit time error (Tau) measurement and is displayed as the estimate of the time error obtained in the computation of Rho and Frequency error.

IS-98 10.3.2.3 specifies that the transmit time error be within ± 1 ms.

Power indicates the power measurement and is displayed as the mean closed loop output power of the mobile stations transmitter with alternating "1" and "0" power control bits being sent.

Transmitter output power control in the CDMA system is complex and critical. Refer to the appropriate IS specification for testing the various components of CDMA power control. Refer to also “CDMA Gated Output Power (loopback)” on page 154, “Return” on page 156, and “CDMA Closed Loop Power screen” on page 158 tests later in this chapter.

Mobile Receiver Measurements

Loopback Mode

FER indicates the Frame Error Rate calculated on looped back voice frames.

When any loopback service option is selected, the mobile returns the frames received from the base station to the base station so that the base station may determine the ratio of bad frames (incorrectly decoded by the mobile) to good frames (correctly decoded).

This FER is used to determine the sensitivity and dynamic range of the mobiles receiver.

IS 98 specifies that the mobile's FER shall not exceed 0.005 (0.5%) with 95% confidence (confidence is a statistical measure of the completeness of information obtained about a statistical process.)

Status indicates the pass/fail status of the last completed FER measurement.

Refer to “Receiver tests (voice)” on page 147 for a complete description of the meaning of each of the possible status messages that can be displayed here.

Voice Mode

Reported FER indicates that the mobile can, if instructed, report to the base site the number of bad frames (Frame Errors) it has received and the number of good frames allowing the 4300 to construct the FER.

This occurs only when the service option is set to 1 or 32768.

Sector 1 Pilot indicates the pilot strength reported by the mobile for the first entry in the Active Set.

This is always the pilot for either Sector 1 or Sector 2 transmitted by the 4300.

CDMA Summary soft keys

Messages Press the **Messages** soft key to access the Messages menu.

See "CDMA Messages screen" on page 124.

Channel Setup Press the **Channel Setup** soft key to display the Channel Setup menu.

See "CDMA Channel Setup screen" on page 97.

Loopback/Voice Press the **Loopback / Voice** soft key to display the Loopback / Voice menu.

See "CDMA Loopback/Voice Setup screen" on page 137.

Power Control Press the **Power Control** soft key to display the Power Control menu.

See "CDMA Power Control screen" on page 138.

Transmit Tests Press the **Transmit Tests** soft key to display the Transmitter Tests menu.

See "CDMA Mobile Transmit Quality screen (RC < 3)" on page 139.

Receiver Tests Press the **Receiver Tests** soft key to display the Receiver Test menu.

See "Receiver tests (loopback)" on page 144.

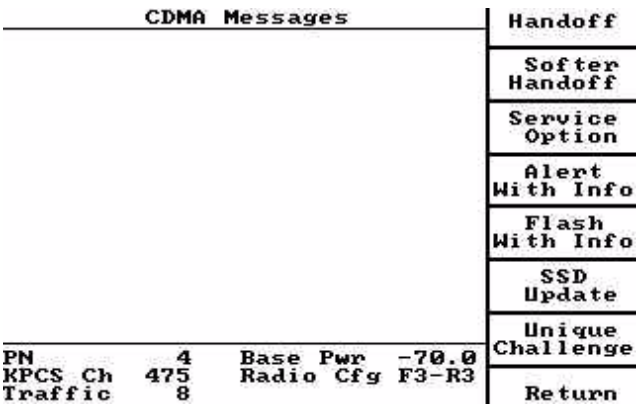
Power Tests Press the **Power Tests** soft key to display the Power Test menu.

See "CDMA Average Power (voice) screen" on page 151.

Release Press the **Release** soft key to send a base release message from the 4300 to the mobile phone, which causes the call to be terminated.

This message directs the mobile to the Control Channel selected in the System A or System B Setup.

CDMA Messages screen



Handoff Press the **Handoff** soft key to display the Handoff screen. See "Handoff screen" on page 125.

Softer Handoff Press the **Softer Handoff** soft key to display the Softer Handoff Setup screen. See "CDMA Softer Handoff screen" on page 126.

Service Option Press the **Service Option** soft key to display the Service Option screen. See "CDMA Service Option screen" on page 129.

Alert With Info Press the **Alert With Info** soft key to display the Alert With Info screen. See "Alert With Info Message screen" on page 129.

Flash With Info Press the **Flash With Info** soft key to display the Flash With Info screen. See "Flash With Info Message screen" on page 131.

SSD Update Press the **SSD Update** soft key to display the SSD Update screen. See "SSD Update Procedure screen" on page 134.

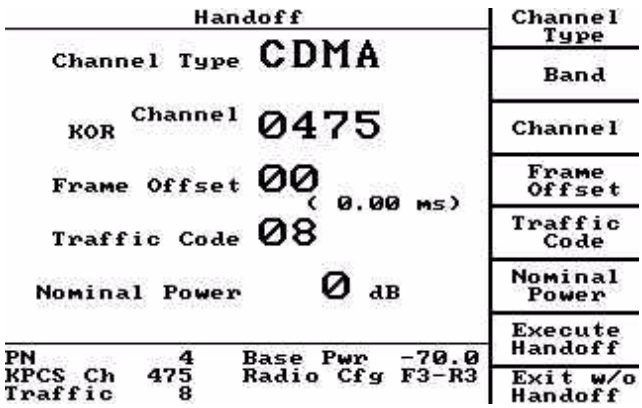
Unique Challenge Press the **Unique Challenge** soft key to display the Unique Challenge screen. See "Unique Challenge Procedure screen" on page 136.

Return Press the **Return** soft key to return to the CDMA Summary screen.

Handoff screen

The Handoff screen allows the user to perform a handoff to any of the allowable traffic channels. When the desired parameters have been selected, press the **Execute Handoff** soft key to perform the handoff. Upon completion of the handoff, the 4300 and mobile will be on the desired channel and the **CDMA Messages** screen is displayed.

The current channel is displayed in the information box at the bottom of the screen.



Channel Type Press the **Channel Type** soft key to select CDMA, AMPS or NAMPS (if the mobile is AMPS of NAMPS capable) voice channel.

Enter the desired channel and power level using the numeric keypad or the arrow keys. The remaining parameters depend on the channel type selected.

For AMPS voice channel, the desired SAT Frequency may be selected using the **SAT Frequency** soft key or the UP and DOWN arrow keys.

For NAMPS voice channel, the desired Offset and DSAT Vector may be selected using these soft keys or the UP and DOWN arrow eys.

AMPS and NAMPS setup screens are the same as for the base unit.

Band Press the **Band** soft key to set the band to be handed off to.

Channel Press the **Channel** soft key to select the RF channel to handoff to.

Frame Offset Press the **Frame Offset** soft key to allow the user to set the frame offset of the CDMA channel to handoff to.

Traffic Code Press the **Traffic Code** soft key to allow the user to set the traffic Walsh code value for the CDMA channel to handoff to.

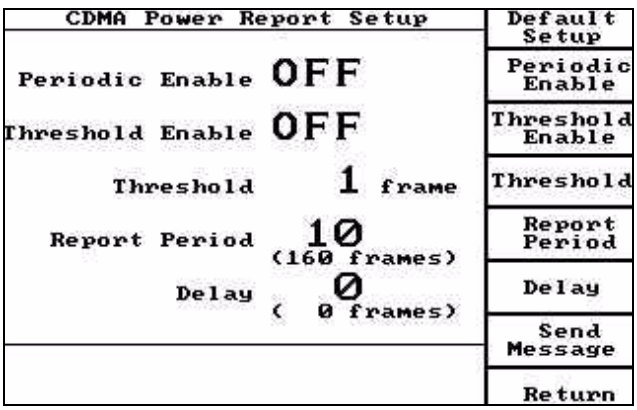
Nominal Power Press the **Nominal Power** soft key to allow the user to set the nominal power for the CDMA channel to handoff to.

Execute Handoff Press the **Execute Handoff** soft key to return to the CDMA Messages screen after performing a handoff.

Exit w/o Handoff Press the **Exit w/o Handoff** soft key to return to the CDMA Messages screen without performing a handoff.

CDMA Softer Handoff screen

At the CDMA Messages screen, press the **Softer Handoff** soft key to display the CDMA Softer Handoff screen:



The mobile is required to report the pilot information for all of the pilots in its Active Set (specified by the handoff direction message sent by the 4300). Also, it may report pilots that exceed a certain pilot strength threshold.

When a call is established, the Active Set consists of a single pilot transmitted by the 4300 (Sector 1). Another CDMA signal consisting of a pilot, traffic and OCNS channels can be transmitted by the 4300 to simulate a second sector from a base station (Sector 2).

Perform a softer handoff to both Sectors, and then back to either Sector 1 or Sector 2.

Change to a measurement screen to make measurements when in any of these states.

A hard handoff can be performed at any time; the softer handoff sector selection is retained after a hard handoff.

The CDMA Softer Handoff screen is divided into two sections.

The upper half displays information from the most recent pilot strength report sent by the mobile. This report consists of information on ≤ 3 pilots the mobile is monitoring.

PN Offset identifies the pilot signal being reported.

PN Chip indicates the phase error (in chips) of the specified pilot based on a reference pilot signal. The reference pilot is identified by the characters 'Ref' placed in this column. The reference is chosen by the mobile from the Active Set (always either sector 1 or sector 2 transmitted by the 4300).

Keep indicates whether the drop timer has expired for the specified pilot due to its strength falling below the T_DROP threshold.

Ec/Io indicates the mobile's perception of the pilot strength in 0.5 dB increments.

At the bottom of this section is the report number received from the mobile since the call has been established.

This reference value determines if the reported data changes when a new report is received.

The value increments from 0 to 32767 and wraps back around to 0.

The lower half of the display indicates the current 4300 transmit settings for Sector 1 and Sector 2 pilots along with the current setting for the sector ratio and measurement update mode that can be changed using the soft key selections on this screen.

Handoff to Both Press the **Handoff to Both** soft key to perform a softer handoff that places both Sector 1 and Sector 2 in the Active Set.

This key is not displayed if both Sector 1 and Sector 2 are already in the Active Set.

The Status entries for Sectors 1 and 2 (in the lower half of the display) are Active for both sectors (unless Sector 2 is disabled, in which case it displays OFF).

Handoff to Sect 1 Press the **Handoff to Sect 1** soft key to perform a softer handoff. This places only Sector 1 in the Active Set.

This key is not displayed if the Active Set currently consists of Sector 1 only.

The Status entries for Sectors 1 and 2 (in the lower half of the display) are Active for Sector 1 and either ON or OFF for Sector 2.

Handoff to Sect 2 Press the **Handoff to Sect 2** soft key to perform a softer handoff. This places only Sector 2 in the Active Set.

This soft key is not displayed if the Active Set currently consists of Sector 2 only.

The Status entries for Sectors 1 and 2 (in the lower half of the display) are ON for Sector 1 and Active for Sector 2.

If Sector 2 is not enabled prior to pressing this key, the call is dropped.

Channel Setup Press the **Channel Setup** soft key to display a menu that allows completion of Sector 1 and 2 setup along with AWGN power levels and individual channel power levels in each sector.

Sector 2 traffic code channel can also be set here.

See "CDMA Channel Setup screen" on page 97.

Search Criteria Press the **Search Criteria** key to display a menu that allows the user to specify the pilot strength add/drop threshold values used following the handoff.

See "CDMA Search Criteria screen" on page 105.

Sector 2 On/Off Press the **Sector 2 On/Off** soft key to enable/disable Sector 2. When off, the Sector 2 Status indicator (in the lower half of the displa)y indicates OFF (in inverse video). When on, the Sector 2 Status indicator (in the lower half of the display) indicates ON or Active.

Sector 2 can be turned off when both sectors are in the Active Set, but if it is disabled when Sector 1 is not in the Active Set, the call is dropped.

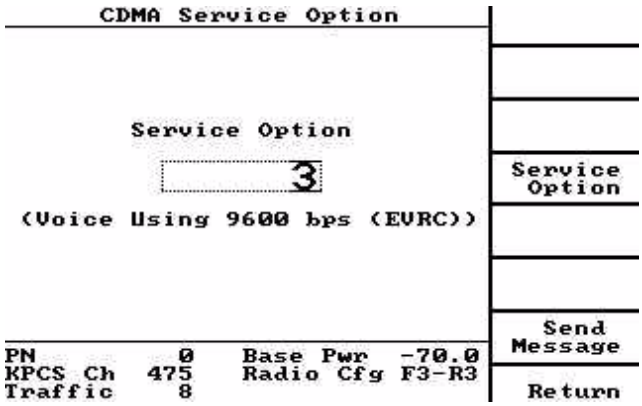
Sector Ratio Press the **Sector Ratio** key to adjust the power level of Sector 2 relative to Sector 1.

Meas Update Press the **Meas Update** key to select whether pilot strength measurements are continuously requested (indicated by Continuous Measurements displayed at the bottom of the screen) or are not requested at all, so that only the reports sent autonomously by the mobile are reported (indicated by Autonomous Measurements).

Return Press the **Return** soft key to return to the **CDMA Summary** screen.

CDMA Service Option screen

At the **CDMA Messages** screen, press the **Service Option** soft key to display the **Service Option** screen:

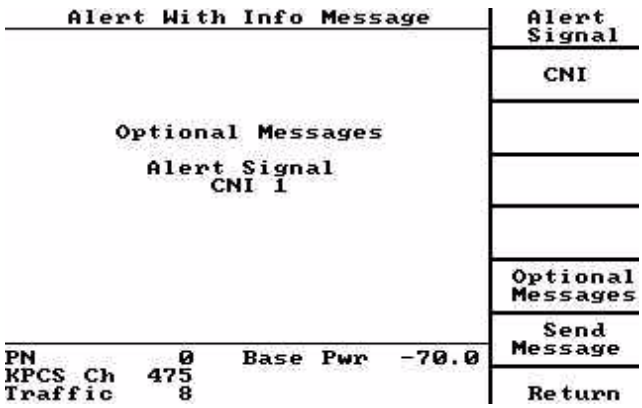


Service Option Press the Service Option soft key to toggle through the service option selections.

Return Press the **Return** soft key to return to the **CDMA Messages** screen.

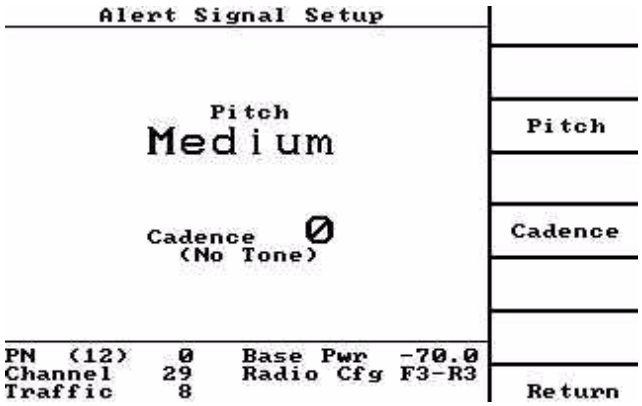
Alert With Info Message screen

At the CDMA Summary screen, press the Alert With Info soft key:



Alert Signal The Alert Signal tests the mobile's ability to provide distinctive ringing.

Press the **Alert Signal** soft key to set up the desired distinctive ring. Set the desired distinctive ring by selecting the Pitch (a distinction between tones) and Cadence (on/off pattern of the tones)



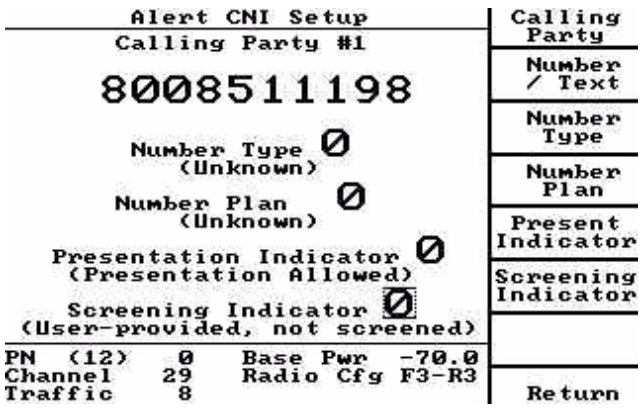
The standard alert is medium pitch and a cadence of 1 (single long tone).

Return

Press the **Return** soft key to return to the **Alert With Info Message** screen.

CNI CNI 1 (and CNI 2) test the mobile's ability to display one (or two) caller ID information.

Press the **CNI** soft key to set up the caller ID information.Set the calling number indicator, or caller ID, number by selecting the parameters in this screen.



Return

Press the **Return** soft key to return to the **Alert With Info Message** screen.

Optional Messages Press the **Optional Messages** soft key to set up messages (Alert Signal, CNI 1, CNI 2).

Return

Press the **Return** soft key to return to the **Alert With Info Message** screen.

Send Message Press the **Send Message** soft key to send the Alert With Info message to the mobile phone.

On a CDMA traffic channel, this message is sent with any of three optional parameters:

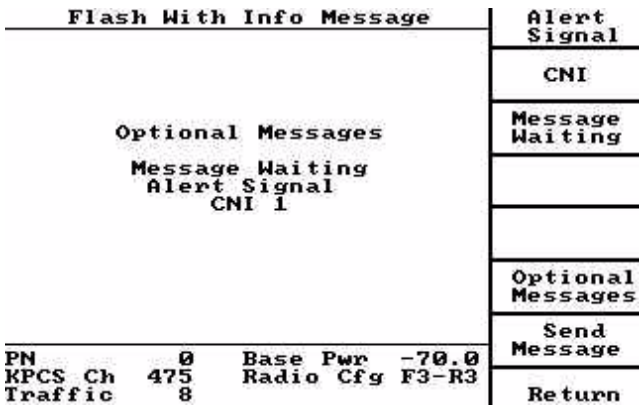
- Alert Signal
- CNI 1
- CNI 2

If the mobile is not a dual-mode phone or if no optional parameters are selected when the **Send Message** key is pressed, then the Alert message is sent instead of the Alert With Info message.

Return Press the **Return** soft key to return to the **CDMA Messages** screen.

Flash With Info Message screen

At the **CDMA Messages** screen, press the **Flash With Info** soft key:



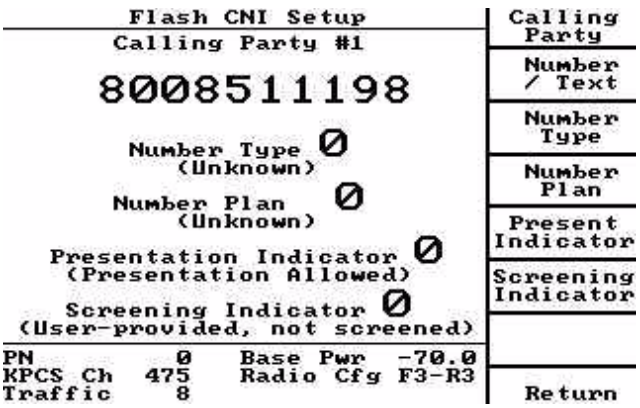
Alert Signal Alert Signal tests the mobile's ability to provide distinctive ringing.

Press the **Alert Signal** soft key to set up the desired distinctive ring. Set the desired distinctive ring by selecting the Pitch (a distinction between tones) and Cadence (on/off pattern of the tones).

The standard alert is medium pitch and a cadence of 1 (single long tone).

The operation of this screen is the same as described in "CDMA Service Option screen" on page 129.

CNI Press the CNI soft key to access the **Flash CNI Setup** screen.



Calling Party

The **Calling Party** soft key selects which caller ID is to be set up. On a CDMA traffic channel, two caller IDs may be sent with one message.

On an AMPS voice channel, this soft key does not appear because only one caller ID may be sent.

Number/Text

Press the **Number/Text** soft key to enter the caller ID number and/or text (up to 15 alphanumeric characters or numeric digits).

Use the numeric keypad to enter numbers.

Press the **Alpha** key followed by the key with the desired letter for alphabetical characters.

Press the **Alpha** key followed by the **up** and **down** arrow keys to toggle between uppercase and lowercase characters.

The **Alpha** key followed by the **RIGHT** arrow key enters a space.

Select any 7-bit ASCII character using the **LEFT** and **RIGHT** and **up** and **down** arrow keys.

Press **ENTER** to terminate the entry and toggle between editing and entry modes.

Number Type

Press the **Number Type** soft key to enter the Type of Number as defined in ANSI T1.607.

A description of the current type appears on the screen. This indicates the type of calling number.

Number Plan

Press the **Number Plan** soft key to enter the Numbering Plan Identification as defined in ANSI T1.607.

A description of the current plan used for the calling number appears on the screen.

Present Indicator

Press the **Present Indicator** soft key to enter the Presentation Indicator as defined in ANSI T1.607.

A description of the current selection appears on the screen. This indicates whether or not the calling number should be displayed.

Screening Indicator

Press the **Screening Indicator** soft key to enter the Screening Indicator as defined in ANSI T1.607.

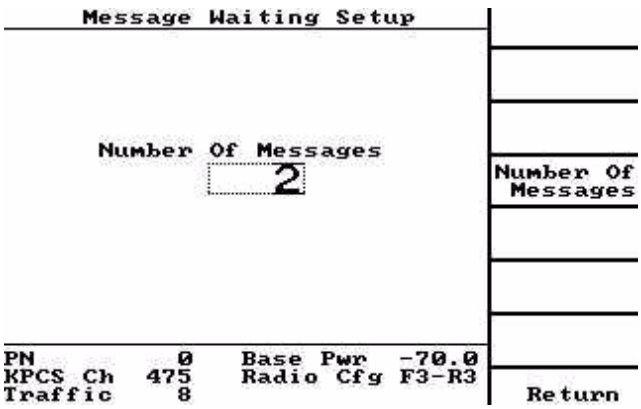
A description of the current selection appears on the screen. This indicates how the calling number was screened.

Return

Press the Return soft key to return to the **Flash with Info Message** screen.See "Press the Return soft key to return to the CDMA Messages screen." on page 134.

Message Waiting

The Message Waiting tests the mobile's ability to display the number of messages waiting. At the **Flash With Info** screen, press the **Message Waiting** soft key:



Number of Messages

The desired number of messages may be entered using the numeric keypad or the arrow keys. For a CDMA traffic channel, the maximum number of messages is 63. For an AMPS voice channel, the maximum number of messages is 31. If this

number is greater than 31 when the **Send Message** soft key is pressed while on an AMPS voice channel, the 4300 sends that number minus 32 as the number of messages waiting.

Return

Press the **Return** soft key to return to the **Flash with Info Message** screen.

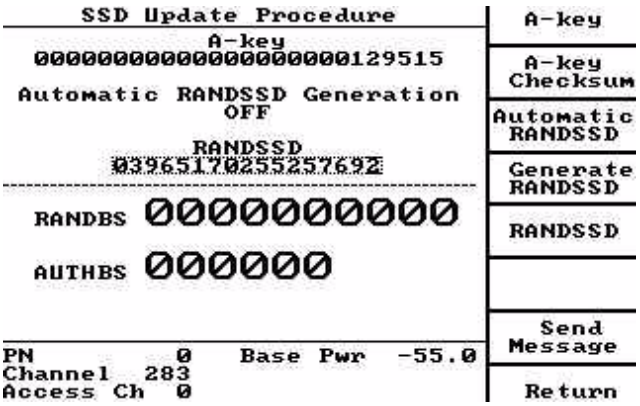
Optional Messages At the **Flash with Info screen,** press the **Optional Message** soft key to set up the messages (Message Waiting, Alert Signal, CNI 1, CNI 2).

Send Message At the **Flash with Info screen,** press the **Send Message** soft key to send the Flash With Info message to the mobile phone. On a CDMA traffic channel, this message may be sent with any of four optional parameters: Message Waiting, Alert Signal, CNI 1, and CNI 2.

Return Press the **Return** soft key to return to the **CDMA Messages** screen.

SSD Update Procedure screen

At the **CDMA Messages** screen, press the **SSD Update** soft key:



The SSD Update procedure consists of the following steps:

1 The A-Key is checked to verify that it is valid. If it is invalid, the procedure stops and the Invalid A-Key message is displayed on the screen.

2 The 4300 sends the SSD Update Order (including the RANDSSD value) to the mobile. The mobile should respond with the Base Station Challenge Order (including the RANDBS value). If the mobile fails to respond with this order, the procedure stops and **Base Station Challenge Order Not Received** is displayed on the screen.

3 The 4300 calculates the AUTHBS value and send the Base Station Challenge Order Confirmation message to the mobile. The mobile responds with the SSD Update Order Confirmation message (including a pass/fail status). If the mobile fails to respond with this message, the procedure stops and **SSD Update Order Confirmation Not Received** is displayed on the screen.

4 If the procedure completes, the pass/fail status ia displayed. The RANDBS number sent by the mobile and the AUTHBS number calculated by the 4300 is also displayed.

A-key Press the **A-key** soft key to enter the 26-digit A-key.

The first 20 digits represent the unique A-key as stored internal to the mobile and the last 6 digits represent the check sum value.

A-key Checksum Press the **A-key Checksum** soft key to enable the automatic calculation of the last 6 digits of the A-key.

Automatic RANDSSD Press the **Automatic RANDSSD** soft key to enable/disable the automatic generation of a new RANDSSD random number each time the SSD Update procedure is started.

Generate RANDSSD Press the **Generate RANDSSD** soft key to generate a new RANDSSD random number.

RANDSSD Press the **RANDSSD** soft key to enter a RANDSSD value with the numeric keypad or arrow keys.

Send Message Press the **Send Message** soft key to initiate the SSD Update Procedure to test the mobile's authentication capability.

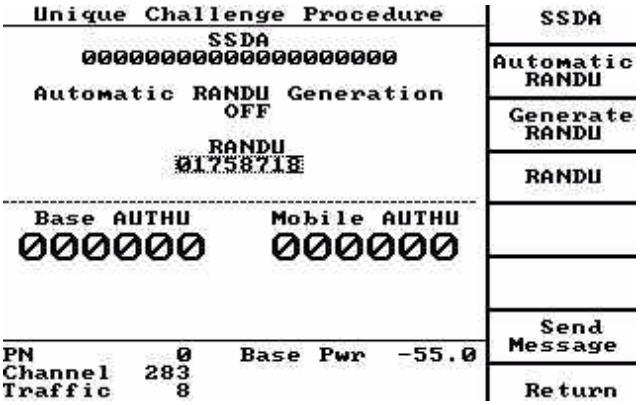
Return Press the **Return** soft key to return to the **CDMA Messages** screen.

The 4300 requires a valid A-key prior to successfully performing this procedure. The A-key must be entered by the user and must match the A-key assigned to the mobile. If no A-key has been assigned to the mobile, then the default A-key value may be entered by entering 0 and then pressing the A-key Checksum soft key.

If the phone's A-key is not known, the authentication process may still be tested by performing the SSD Update Procedure and verifying that the procedure fails.

Unique Challenge Procedure screen

At the **CDMA Messages** screen, press the **Unique Challenge** soft key:



The 4300 sends the Unique Challenge Order (including the RANDU value) to the mobile. The mobile responds with the Unique Challenge Order Confirmation message (including its AUTHU value). If the mobile fails to respond with this message, the procedure stops and **Unique Challenge Order Confirmation Not Received** is displayed on the screen.

The 4300 compares the mobile's AUTHU value with the expected AUTHU value. If they match, the authentication procedure passed. If they do not match, the authentication failed. The pass/fail status is displayed on the screen along with the expected Base AUTHU and the Mobile AUTHU sent by the mobile.

SSDA Press the **SSDA** soft key to enter the 20-digit SSDA value.

If the SSD Update Procedure passed successfully, do not enter the SSDA value.

Automatic RANDU Press the **Automatic RANDU** soft key to enable/disable the automatic generation of a new RANDU random number each time the Unique Challenge procedure is started.

Generate RANDU Press the **Generate RANDU** soft key to generate a new RANDU random number.

RANDU Press the **RANDU** soft key to enter a RANDU value with the numeric keypad or arrow keys.

Send Message Press the **Send Message** soft key to initiate, the Unique Challenge Procedure.

This is the second step in testing the mobile's authentication capability.

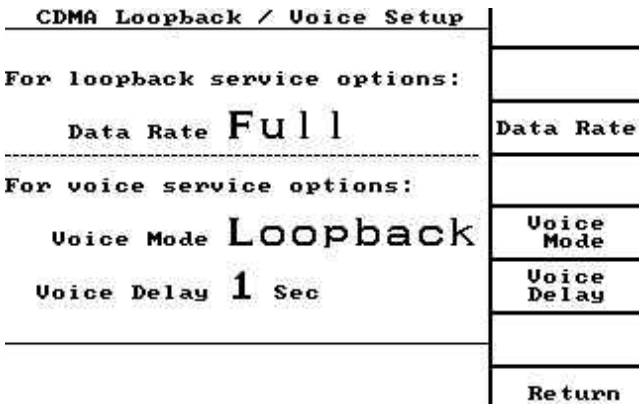
The 4300 requires a valid SSDA value prior to successfully performing this procedure. Normally, the SSDA value is automatically generated as part of the SSD Update procedure (Refer to "SSD Update Procedure screen" on page 134.). Alternatively, the SSDA may be entered by pressing the **SSDA** soft key and using the numeric keypad or arrow keys.

Return Press the **Return** soft key to return to the **CDMA Messages** screen.

If the phone's SSDA value is not known, the authentication process may still be tested by performing the Unique Challenge Procedure and verifying that the procedure fails.

CDMA Loopback/Voice Setup screen

At the **CDMA Summary** screen, press the **Loopback/Voice** soft key. See "CDMA Summary screen" on page 120.



Data Rate Press the **Data Rate** soft key to scroll to the next Data Rate value.

The values are 1/8, 1/4, 1/2, FULL.

The bps (bits per second) are determined by what service option is selected.

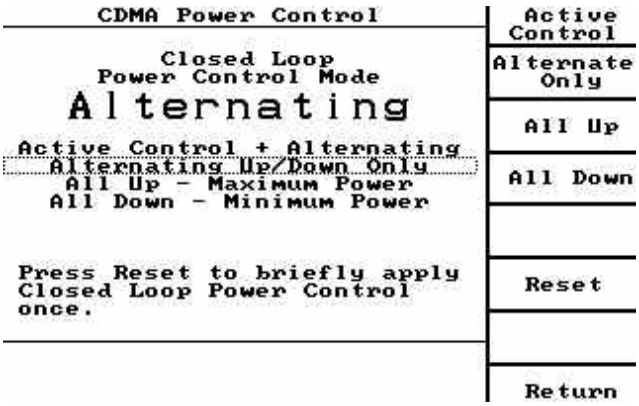
Voice Mode Press the Voice Mode soft key to scroll to the next Voice Mode type (Loopback, Silent, Receiver).

Voice Delay Press the **Voice Delay** soft key to highlight the Voice Delay value. When highlighted, use the **up** and **down** arrow keys or numeric keypad to select the Voice Delay value. The Voice Delay sets the delay between speaking and hearing for the **Normal Voice** Mode. The range of Voice Delay available is 0 to 5 seconds, set in 0.001 second increments.

Return Press the **Return** soft key to return to the **CDMA Summary** screen.

CDMA Power Control screen

At the **CDMA Summary** screen, press the **Power Control** soft key. See "CDMA Summary screen" on page 120.



Active Control Press the **Active Control** soft key to activate the current **power control** mode (the base station adjusts mobile power). See "CDMA Access Probe Setup screen" on page 102.

The unit cannot be set to Active mode without valid calibration data, (after a software upgrade) . Active mode requires accurate power measurements, based on correct calibration data.

Alternate Only Pressing the **Alternate Only** soft key causes the current power control mode to be alternating 1's and 0's. This will cause the mobile's Closed loop output to be constant when averaged over the period of a frame.

All Up Pressing the **All Up** soft key causes the power control bits to command maximum closed loop mobile output power.

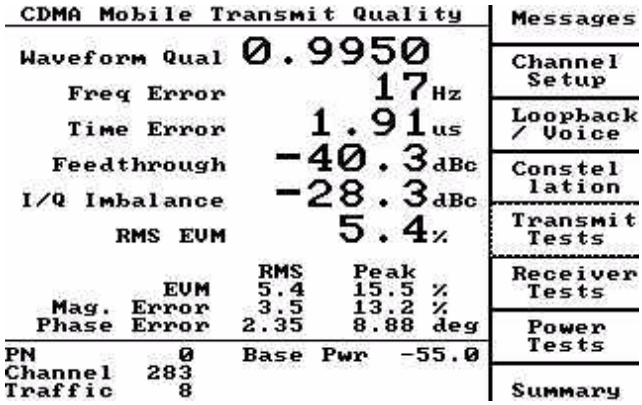
All Down Pressing the **All Down** soft key causes the power control bits to command minimum closed loop mobile output power.

Reset Press the **Reset** soft key to return to clear the selections.

Return Press the **Return** soft key to return to the **CDMA Summary** screen.

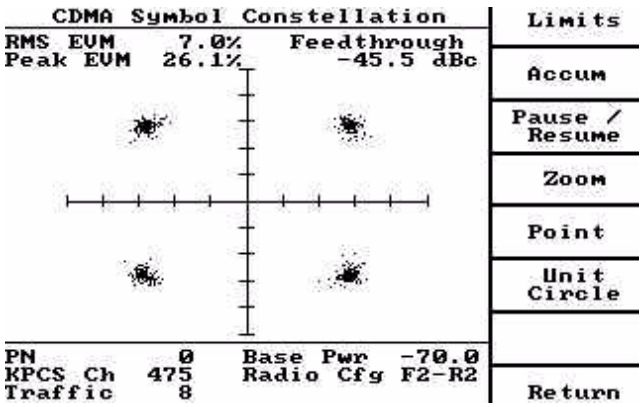
CDMA Mobile Transmit Quality screen (RC < 3)

At the **CDMA Summary** screen, press the **Transmit Tests** soft key:



Constellation

Press the **Constellation** soft key on the **CDMA Mobile Transmit Quality** screen:



Feedthrough indicates the accuracy of the I/Q modulators DC setup.

The units displayed are dBc, which is a relative measurement between 10x the logarithm of the ratios of the power in the desired sideband carrier produced and the undesired carrier leakage produced due to a DC offset in the I/Q modulator.

The displayed values are negative.

On the CDMA Symbol Constellation screen, the value is an offset of the centering of the symbols from the origin (crossing of the I an Q axis).

Limits

Press the **Limits** soft key to toggle the display of circles (drawn around the four Ideal Symbol locations) between on/off.

The diameter of these circles represents the Peak EVM limits selected in the Performance Specifications Setup.

Accum

Press the **Accum** soft key to toggle the display between the normal and accumulate modes.

In Normal mode, the display is refreshed after each sample set is processed by the DSP (Digital Signal Processor).

In the Accumulate mode, each new processed sample set is added to those already displayed.

An Accum On message appears in the lower left portion of the display, when the Accumulate mode is active.

Pause/Resume

Press the **Pause/Resume** soft key to "freeze" the display.

A Pause message appears in the lower right portion of the display, when the pause mode is active.

Zoom
Point

The **Zoom** and **Point** soft keys work in conjunction to view individual clusters of symbols.

Press the **Point** soft key to select the desired cluster (a square box appears around the selected cluster) and the **Zoom** soft key to zoom in on it.

Unit Circle

Press the **Unit Circle** soft key to place a unit circle on the display.

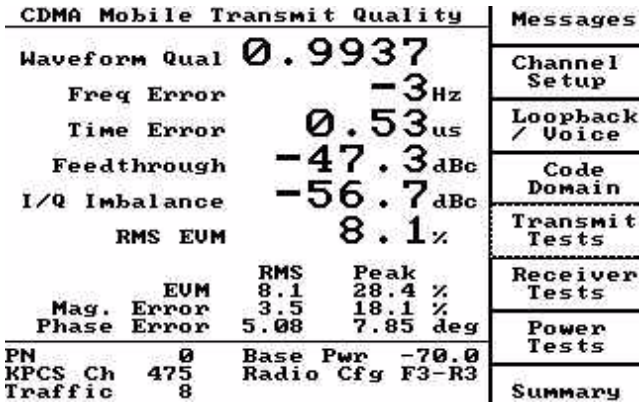
This is helpful when evaluating the modulation performance in terms of Magnitude and Phase errors. See “CDMA Summary screen (RC < 3)” on page 161 and “CDMA Summary screen (RC > 2)” on page 161 for graphical definitions of Magnitude and Phase error.

Return

Press the **Return** soft key to return to the **Mobile Transmit Quality** screen.

CDMA Mobile Transmit Quality screen (RC > 2)

At the **CDMA Summary** screen, press the **Transmit Tests** soft key:



Waveform Qual displays the waveform quality (modulation accuracy) measurement in terms of the waveform quality factor Rho.

It is defined as the normalized correlated power between the actual waveform and the ideal waveform sampled at the decision points.

A value of 1 indicates perfect Waveform Quality.

IS-98 10.3.2.3 specifies that Rho must be greater than 0.944.

Freq Error indicates the frequency error measurement as an estimate of the carrier frequency error obtained in the computation of Rho.

IS-98 10.3.2.3 specifies that the frequency error shall be within +/- 300 Hz.

Time Error indicates the transmit time error (Tau) measurement as an estimate of the time error obtained in the computation of Rho and Frequency error.

IS-98 10.3.2.3 specifies that the transmit time error shall be within +/- 1 us.

Feedthrough indicates the accuracy of the I/Q modulators DC setup.

The units displayed are dBc, which is a relative measurement between 10x the logarithm of the ratios of the power in the desired sideband carrier produced and the undesired carrier leakage produced due to a DC offset in the I/Q modulator.

The displayed values are negative.

I/Q Imbalance indicates the I/Q Imbalance measurement displayed is an indication of the accuracy of the I/Q modulator's modulating signal amplitude balance The units displayed are dBc, which is a relative measurement between 10 times the logarithm of the ratios of the power in the desired sideband carrier produced and the undesired sideband carrier produced due to an amplitude difference between the input signals to the I/Q modulator. The values displayed will always be negative and the larger the magnitude of the negative number the better.

RMS EVM (Root Mean Squared Error Vector Magnitude) measures modulation accuracy.

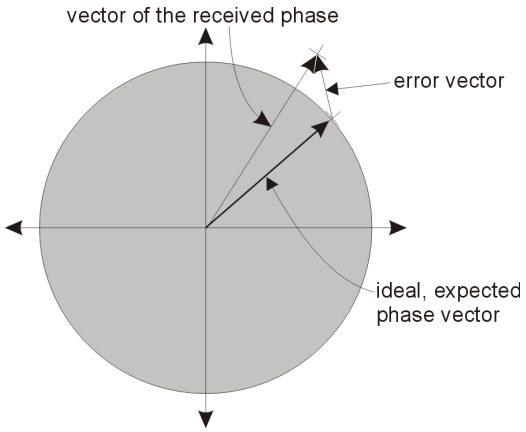
In vector arithmetic terms, the EVM is the difference between the vector of the received carrier phase term and that of the ideal (expected carrier phase).

$$(\text{Magnitudeoftheerrorvector})/(\text{Magnitudeoftheidealvector}) \times 100 = \text{EVM}$$

EVM can be computed for a block of received bits and the block average.

RMS computes the averages of the magnitudes of the error vectors while ignoring their sign.

Since EVM is a normalized measurement, RMS EVM has no units.



EVM (Error Vector Magnitude) is displayed as an averaged RMS value and a Peak (largest measured) value.

In vector arithmetic terms, the EVM is the difference between the vector of the received carrier phase term and that of the ideal, or expected carrier phase.

$$(\text{Magnitudeoftheerrorvector})/(\text{Magnitudeoftheidealvector}) \times 100 = \text{EVM}$$

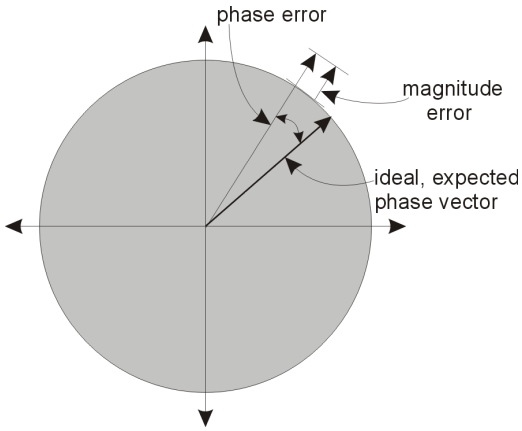
Since EVM is a normalized measurement it has no units, it is expressed as a percentage of the expected vector.

Mag. Error (magnitude error) is a measurement of the power error of the mobiles transmitted signal. It is displayed as both an unsigned average (RMS) and as a Peak (largest measured) value.

The Magnitude Error is a normalized measurement, it is expressed as a percentage with no other units.

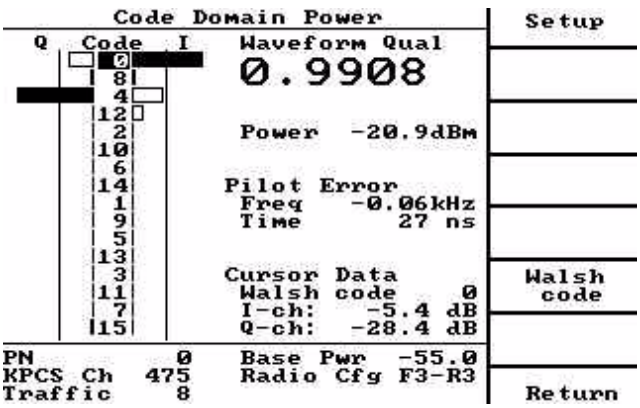
Phase Error is a measurement of the phase or small timing errors of the mobiles transmitter. These errors are a result of oscillator phase noise, filters, and amplifier phase responses. It is displayed as both an unsigned average (RMS) and as a Peak (largest measured) value.

The units are degrees or radians.



Code Domain screen

At the **Mobile Transmit Quality (RC > 2)** screen, press the **Code Domain** soft key:



The display shows the rho measurements (in dB) for each I and Q Walsh Code channel, along with the composite rho and total power for the mobile signal, and time and frequency errors in the pilot signal.

Walsh Codes are arranged from top to bottom in inverted-bit order, to preserve channel groupings.

The I channels are plotted to the right, Q channels to the left ; a smaller bar represents less power and a larger bar indicates more power. The range is from -40.0 to 0.0 dB. Values less than -40.0 will appear to display the same as -40.0 dB. Each pixel of the bar display indicates a change of 1.0 dB, although the measurement accuracy is 0.1 dB.

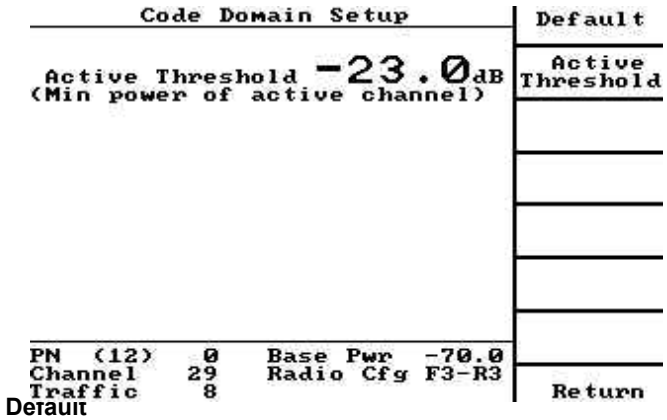
The vertical bars represent the IQ Channel Inactive Power limits, indicating whether inactive channels are exceeding the maximum limit. The bars are not displayed if the limit is disabled. Solid black bars represent active channels the

mobile is transmitting. Hollow (white) bars represent inactive channels that are less than this limit value, and are therefore acceptable. Inactive channels that exceed this limit are shaded (grey) to indicate the failure.

The current Walsh code selection is displayed in inverse video on the graph and on the bottom right of the display, to the left of the soft key.

The numeric measurements values for the selected code are displayed below the Walsh Code.

Setup Press the **Setup** soft key to access the Code Domain Setup screen.



Press the **Default** soft key to set the parameters to default values.

Active Threshold

Press the Active Threshold soft key to set the power threshold. Use the up and down arrow keys or numeric keypad to select a value from -40.0 to 0.00 dB.

Return

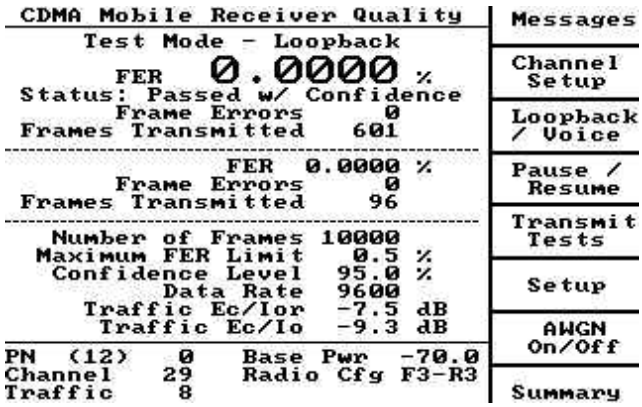
Press the **Return** soft key to return to the Code Domain Power screen.

Press the **Return** soft key again to access the CDMA Mobile Transmit Quality screen.

Walsh Code Press the **Walsh Code** soft key to open the Walsh code value numeric editor on the Main screen. Use the UP and DOWN arrow keys to select either the next or previous numeric value displayed on the graph (inverse bit order).

Receiver tests (loopback)

At either **CDMA Mobile Transmit Quality** screen, press the **Receiver Tests** soft key:



The screen has four regions separated by dotted horizontal lines. The first region displays the results of the last completed measurement with pass/fail status. The second region displays the results of the last completed FER measurement. The third region shows the current FER setup conditions. The fourth region displays channel status.

Status indicates the pass / fail status of the last FER measurement completed as follows:

Passed with confidence. This means the frame error rate passed with the specified confidence level before reaching maximum number of frames. Confidence level is a statistical means of determining the error rate from a number of samples given an assumption of the distribution of the errors. Refer to Appendix A of IS-98A for more detail. The maximum FER limit, maximum number of frames and confidence level are entered in the "CDMA Receiver Quality Setup screen (loopback)" on page 146.

Failed with confidence. This means the frame error rate failed with the specified confidence level before reaching the maximum number of frames.

Passed. This means the ratio of the frame errors detected to the frames received was less than the specified maximum FER, and that the test reached the maximum number of frames specified without meeting confidence criteria.

Failed. This means the ratio of the frame errors detected to the frames received was greater than the specified maximum FER, and that the test consisted of the maximum number of frames specified without meeting confidence criteria. If FER = 100% and frame errors and frames transmitted are both 0, this indicates that the error rate was so large that the received data could not be synchronized with the data transmitted.

Messages Press the **Messages** soft key to return to the **Messages** menu. See "CDMA Messages screen" on page 124.

Channel Setup Press the **Channel Setup** soft key to return to the **Channel Setup** menu. See "Setup Initial Service" on page 91.

Loopback/Voice Press the **Loopback/Voice** soft key to return to the **Loopback/Voice** menu. See "CDMA Loopback/Voice Setup screen" on page 137.

Pause/Resume Pressing the **Pause/Resume** soft key will cause the FER test to temporarily pause if it was previously running and will restart the FER test if it was paused.

Transmit Tests Press the **Transmit Tests** soft key to return to the **Transmitter Tests** menu. See "CDMA Mobile Transmit Quality screen (RC < 3)" on page 139.

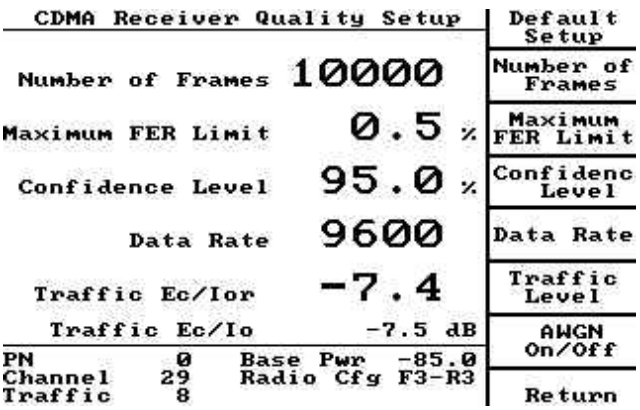
Setup Press the **Setup** soft key to access to the **CDMA Receiver Quality Setup** (Loopback) screen. See "CDMA Receiver Quality Setup screen (loopback)" on page 146.

AWGN On/Off Press the **AWGN On/Off** soft key to enable/disables the AWGN noise source.

Summary Press the **Summary** soft key to return to the **CDMA Summary** screen. See "CDMA Summary screen" on page 120.

CDMA Receiver Quality Setup screen (loopback)

At either **CDMA Mobile Receiver Quality** screen, press the **Setup** soft key:



Default Setup Press the **Default Setup** soft key to load default values.

Number of Frames Press the **Number of Frames** soft key to highlight the Number of Frames value. Use the **up** and **down** arrow keys or numeric keypad to select the Number of Frame, which is used to calculate FER.

The default value is 10000.

Maximum FER Limit Press the **Maximum FER Limit** soft key to highlight the Maximum FER Limit value. Use the **up** and **down** arrow keys or numeric keypad to select the Maximum FER Limit.

IS 98 specifies that the mobile's FER shall not exceed 0.005 (0.5%) with 95% confidence level. The default value is 0.5%.

Confidence Level Press the **Confidence Level** soft key to highlight the Confidence Level value.Use the **up** and **down** arrow keys or numeric keypad to select the Confidence Level. Confidence Level is a statistical measure of the completeness of information obtained about a statistical process.

IS 98 specifies that the mobile's FER shall not exceed 0.005 (0.5%) with 95% confidence level.

The default value is 95.0%. When set to 100%, a true FER test is performed.

Data Rate Press the **Data Rate** soft key to toggle the selection (full, half, quarter and eighth rate) for the current rate set specified by the service option.

For rate set 1 (service option 2) the selections are 9600, 4800, 2400, 1200.

For rate set 2 (service option 9) the selections are 14400, 7200, 3600, 1800.

This key is accessible only when on a CDMA call in loopback mode and the **Traffic Level** key is pressed. Changing this value also changes the selection in the CDMA Loopback / Voice Setup screen ("CDMA Loopback/Voice Setup screen" on page 137).

The default value for this parameter is 9600.

Traffic Level The ratio of traffic channel power to total sector 1 channel power in dB.

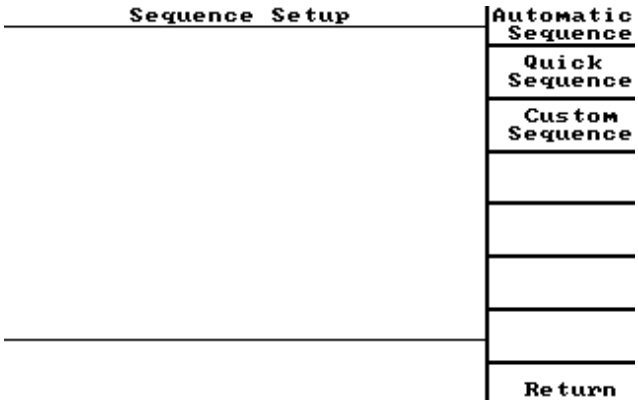
AWGN On/Off Press the **AWGN On/Off** soft key to change Traffic EC/Io values to Traffic Eb/Nt values.

Return Press the **Return** soft key to return to the **CDMA Mobile Receiver Quality** screen.

Press the **Return** soft key again to return to the **CDMA Summary** screen.

Receiver tests (voice)

At the **CDMA Summary** screen, press the **Receiver Tests** soft key:



The screen has three regions separated by dotted horizontal lines. The top region contains results of the last completed FER measurement. The second region displays the status of the current test (when completed, the results appear in Region 1). The third region shows the current FER setup conditions.

Test Mode indicates the origin of the information displayed in the **Receiver Quality** screen.

In the Loopback Test Mode, measurements are made by the 4300 on speech frames looped back to the 4300.

Reported FER is calculated on looped back voice frames.

When Service Option 2 or 9 is selected, the mobile returns the frames received from the base station to assist the base station in determining the ratio of bad frames (incorrectly decoded by the mobile) to good frames (correctly decoded).

Reported FER determines the sensitivity and dynamic range of the mobile's receiver.

IS 98 specifies that the mobile's FER shall not exceed 0.005 (0.5%) with 95% confidence level.

Frame Errors indicates the total number of Frame Errors found in the current computational cycle.

Frames Transmitted indicates the total number of Frames Transmitted in the current computational cycle.

Messages Press the **Messages** soft key to access the **CDMA Message** screen.

Channel Setup Press the **Channel Setup** soft key to access the **CDMA Channel Setup** screen.

See "CDMA Channel Setup screen" on page 97.

Loopback/Voice Press the **Loopback/Voice** soft key to access the **CDMA Looback/Voice Setup** screen.

See "CDMA Loopback/Voice Setup screen" on page 137.

Transmit Tests Press the **Transmit Tests** soft key to access the **CDMA Mobile Transmit Quality** screen.

See "CDMA Mobile Transmit Quality screen (RC > 2)" on page 140 or "CDMA Mobile Transmit Quality screen (RC < 3)" on page 139.

Setup Press the **Setup** soft key to access the **CDMA Power Report Setup** screen.

See "CDMA Power Report Setup (voice)" on page 149.

Power Tests Press the **Power Tests** soft key to access the **CDMA Average Power** screen.

See "CDMA Average Power (voice) screen" on page 151.

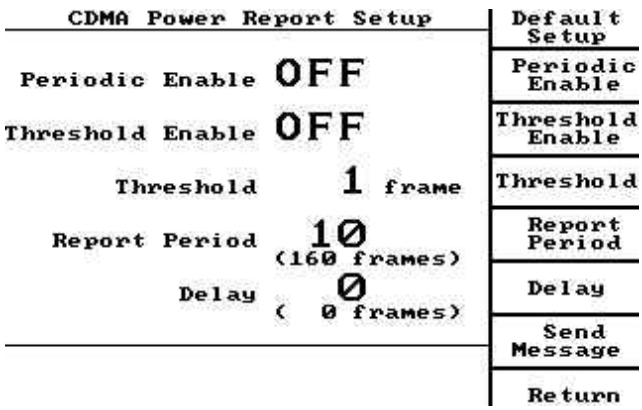
Summary Press the **Summary** soft key to return to the **CDMA Summary** screen.

Press the **Setup** key > **System Setup** soft key > **System A** soft key > **More** soft key > **Power Report** soft key to access the **CDMA Power Report Setup** screen.

CDMA Power Report Setup (voice)

To determine frame error rate, the mobile tracks two parameters: TOT_FRAMES (each frame received by the mobile), and BAD_FRAMES (only the bad frames).

Adjust mobile reports using the Threshold, Report Period, and Delay parameters.



Default Setup Press the **Default Setup** soft key to load default values:

Period Enable	OFF
Threshold Enable	OFF
Threshold	01
Report Period	10
Delay	0

Periodic Enable Press the **Periodic Enable** soft key to instruct the mobile to send a report on a periodic basis. The report occurs every Report Period frames.

This parameter has no effect in the CDMA Summary and CDMA Mobile Receiver Quality screens – it is always enabled in these screens.

Threshold Enable Press the **Threshold Enable** soft key to instruct the mobile to send a report when a specified Threshold number of frame errors is received within a Report Period.

Threshold is used to set the number of frame errors to receive in the reporting period before sending a threshold report, only if Threshold Enable is set to ON.

If a report is sent, the TOT_FRAMES and BAD_FRAMES are both set to 0 and a new report is started (even if Report Period not completed).

Threshold Press the **Threshold** soft key to select the number of frames in the range (1-31).

Report Period Press the **Report Period** soft key to select the number of frames per report using the equation: frames = 5 * 2 (ReportPeriod / 2), where ReportPeriod = 0 to 15.

This is used for both periodic and threshold reporting.

When the selected number of frames have been reached, both the TOT_FRAMES and BAD_FRAMES values are reset to 0.

Delay Press the **Delay** soft key to select the delay between sending a power measurement report and beginning the next report period.

The delay can be specified from 0 to 31, each value representing a delay of 4 frames.

This parameter is used for both threshold and periodic reporting.

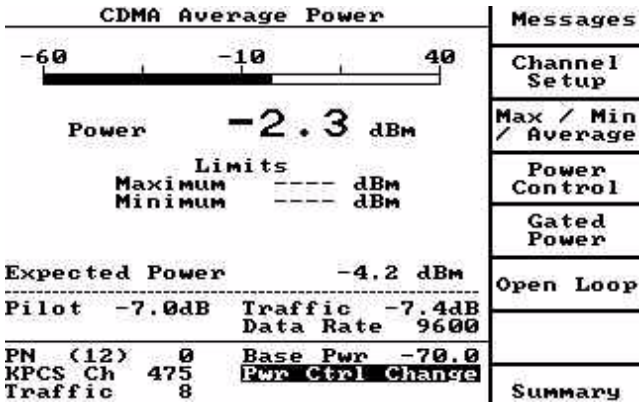
Send Message Press the **Send Message** soft key to send a message to the mobile to change its settings to the new specifications.

The settings do not automatically change when exiting this screen.

Return Press the **Return** soft key until the **CDMA Summary** screen is displayed.

CDMA Average Power (voice) screen

At the CDMA Summary screen, press the **Power Tests** soft key and cycle through Max/Min/Average:



Power indicates the mobile's open loop transmitter output power numerically on a horizontal bar graph.

Limits indicates the maximum and minimum transmitter output powers for the current open loop power parameters and the limits selected in "Performance Specification Setup" on page 22.

Expected Power is calculated using the following formula found in IS-98 section 10.4.

> The approximate formula is mean output power (dBm) = -Base Pwr (dBm) -73 +Nominal Power + Initial Power, where Nominal and Initial powers are variables passed to the mobile during Access. See "CDMA Access Probe Setup screen" on page 102.

Pilot indicates the actual Pilot channel power (versus total channel power, in dB) generated by the 4300.

Traffic indicates the actual Traffic channel power (versus total channel power, in dB) generated by the 4300.

Data Rate indicates the actual rate (full, half, quarter, or eighth).

Messages Press the **Messages** soft key to display the **Messages** menu. See "CDMA Messages screen" on page 124.

Channel Setup Press the **Channel Setup** soft key to display the **Channel Setup** menu.

See "CDMA Channel Setup screen" on page 97.

Max / Min / Average

Press the **Max / Min / Average** soft key to toggle the menu through power modes.

Power Control Press the **Power Control** soft key to display the **Power Control Setup** Menu. See "CDMA Power Control screen" on page 138.

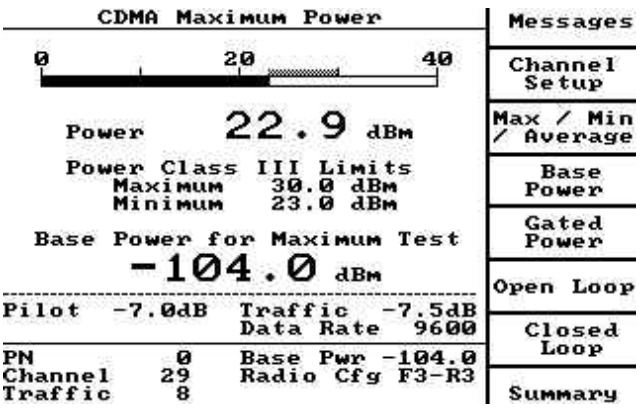
Gated Power Press the **Gated Power** soft key to display the **Gated Power Test** menu. See "CDMA Gated Output Power (loopback)" on page 154.

Open Loop Press the **Open Loop** soft key to display the **Open Loop Power Test** menu. See "CDMA Open Loop Power screen" on page 156.

Summary Press the **Summary** soft key to return to the **CDMA Summary** screen.

CDMA Maximum Power (loopback) screen

At the **CDMA Summary** screen, press the **Power Tests** soft key > cycle through Max/Min/Average:



Power displays the mobile's open loop transmitter output power numerically on a horizontal bar graph.

Power Class III Limits for the current mobile under test are displayed in this information element.

Messages Press the **Messages** soft key to display the **Messages** screen. See "CDMA Messages screen" on page 124.

Channel Setup Press the **Channel Setup** soft key to display the **Channel Setup** screen. See "CDMA Channel Setup screen" on page 97.

Max / Min / Average Press the **Max / Min / Average** soft key to toggle the menu through **Max / Min / Average** modes.

Base Power Press the **Base Power** soft key to highlight the Base Power for Maximum Test level. Use the **up** and **down** arrow keys or numeric keypad to select the Base Power for Maximum Test level.

Gated Power Press the **Gated Power** soft key to display the **Gated Power Test** menu. See "CDMA Gated Output Power (loopback)" on page 154.

Open Loop Press the **Open Loop** soft key to display the **Open Loop Power Test** menu. See "CDMA Open Loop Power screen" on page 156.

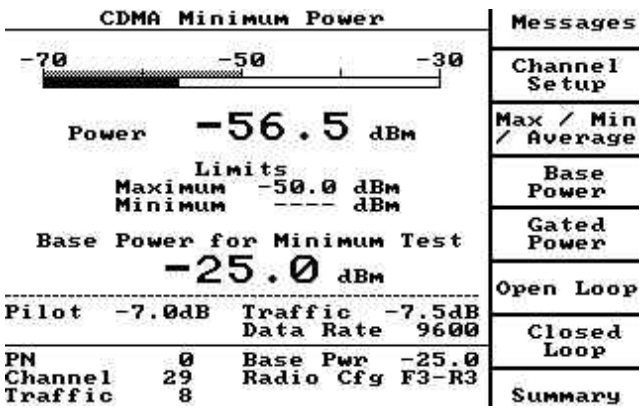
Closed Loop (Loopback only) Press the **Closed Loop** soft key to display the **Closed Loop Power Test** menu. See "CDMA Closed Loop Power screen" on page 158.

Summary Press the **Summary** soft key to return to the **CDMA Summary** screen.

Press the **Power Tests** soft key and toggle the **Max/Min/Average** soft key until the **CDMA Minimum Power** screen is displayed.

CDMA Minimum Power (loopback) screen

At the CDMA Summary screen, press the Power Tests soft key > cycle through Max/Min/Average:



Power displays the mobile's open loop transmitter output power numerically on a horizontal bar graph.

Limits displays the minimum output power limits for the current mobile under test.

Messages Press the **Messages** soft key to display the **Messages** menu. See "CDMA Messages screen" on page 124.

Channel Setup Press the **Channel Setup** soft key to display the **Channel Setup** screen. See "CDMA Channel Setup screen" on page 97.

Max / Min / Average Press the **Max / Min / Average** soft key to toggle the menu through the power modes.

Base Power Press the **Base Power** soft key to highlight the Base Power for Minimum Test level. Use the **up** and **down** arrow keys or numeric keypad to select the Base Power for Minimum Test level.

Gated Power Press the **Gated Power** soft key to display the CDMA **Gated Output Power** screen. See "CDMA Gated Output Power (loopback)" on page 154.

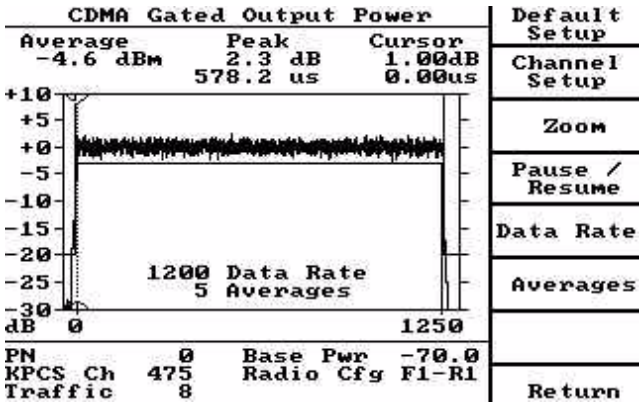
Open Loop Press the **Open Loop** soft key to display the **Open Loop Power** Test menu. See "CDMA Open Loop Power screen" on page 156.

Closed Loop Press the **Closed Loop** soft key to display the **Closed Loop Power Test** menu. See "CDMA Closed Loop Power screen" on page 158.

Summary Press the **Summary** soft key to return to the **CDMA Summary** screen.

CDMA Gated Output Power (loopback)

At the **CDMA Average Power** screen, press the **Gated Power** soft key:



Average indicates the average power over a number of power control groups (bursts).

The number of power control groups to include in the Average Power is set by the **Averages** soft key.

Peak indicates the peak power measured during an ensemble of power control groups.

Peak values are given in microseconds (1 x 10-6 seconds).

Cursor indicates the power at the current cursor location.

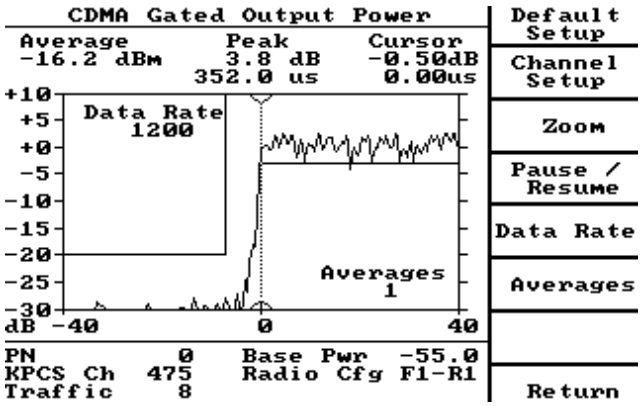
The cursor location is given in microseconds (1 x 10-6 seconds).

Change cursor location by pressing the arrow keys: the **LEFT** and **RIGHT** keys move the cursor 1 unit at a time; the **up** and **down** keys move it 10 units at a time.

Default Setup Press the **Default Setup** soft key to load default Data Rate and Averages values.

Channel Setup Press the **Channel Setup** soft key to display the **Channel Setup** menu. "CDMA Channel Setup screen" on page 97.

Zoom Press the **Zoom** soft key to toggle the display between the Full, Rise, and Fall displays to adjust the resolution on the rising and falling edges of the power control group (burst).



Pause / Resume

Press the **Pause / Resume** soft key to freeze the display update. Press the **Pause / Resume** soft key again to resume the update.

Data Rate

This soft key function is only shown for RC1 and RC2 in Loopback mode.

This soft key function is <u>not</u> shown for any radio configurations in Voice mode.

Averages

Press the **Averages** soft key to highlight the Averages value. Use the **up** and **down** arrow keys or numeric keypad to select the Averages value.

The Averages value controls the number of power control groups to include in the ensemble for the calculation of the average.

The default value is 100.

Return

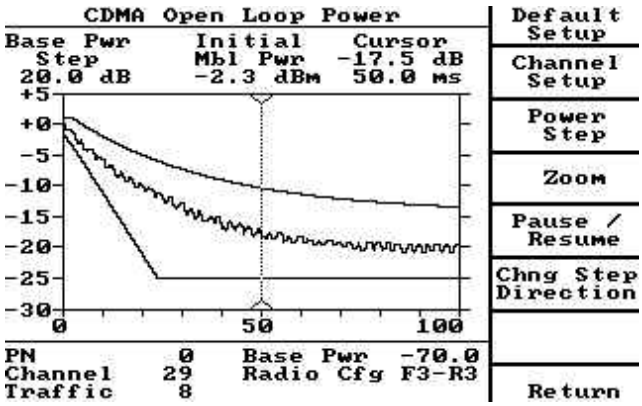
Press the **Return** soft key to return to the **CDMA Gated Output Power** screen.

Return Press the **Return** soft key to return to the **CDMA Average Power** screen.

CDMA Open Loop Power screen

The Open Loop Power screen displays the mobile transmitter power versus time response to an abrupt change in mobile input level.

At the **CDMA Average Power** screen, press the **Open Loop** soft key:



Base Pwr Step displays the step change in base power used to cause the mobile to exhibit an open loop response.

Initial Mbl Pwr displays the Initial power of the mobile transmitter.

Cursor indicates the power at the current cursor location.

The cursor location is given in milliseconds (1 x 10-3 seconds).

Change the cursor location by pressing the arrow keys. The **LEFT** and **RIGHT** keys move the cursor 1 unit at a time; the **up** and **down** keys move it 10 units at a time.

Default Setup Press the **Default Setup** soft key to set up the 4300 parameters.

Channel Setup Press the Channel Setup soft key to display the CDMA Channel Setup screen.

See "CDMA Channel Setup screen" on page 97.

Power Step Press the **Power Step** soft key to highlight the Step value (Base).Use the **up** and **down** arrow keys or numeric keypad to select the Step value (Base).

Power Step controls the magnitude and polarity of the change in base power.

Zoom Press the **Zoom** soft key to toggle the view between a normal and 2X-expanded view centered at the current cursor position.

Pause / Resume Press the **Pause / Resume** soft key to freeze the display update. Press the **Pause / Resume** soft key again to resume the update.

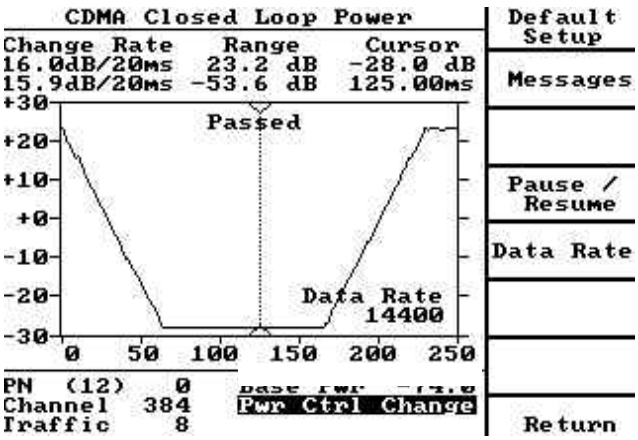
Chng Step Direction Press the **Chng Step Direction** soft key to toggle the base power to increase/ decreased the power step value.

Return Press the **Return** soft key to return to the CDMA Average Power screen.

CDMA Closed Loop Power screen

The Closed Loop Power screen displays the closed loop power timing characteristics of the mobile phone in a power change versus time graph.

At the CDMA Maximum Power screen, press the **Closed Loop** soft key:



Change Rate displays the falling and rising edge change rate.

Range displays the power response range of the mobile phone (maximum and minimum).

Cursor displays the power offset from the initial power at the cursor position with cursor time from the beginning of the test.

The cursor can be moved with the arrow keys if no editors are active.

Default Setup Press the **Default Setup** key to set up the 4300 parameters.

This allows the user to run the closed loop power timing test according to IS-98A testing specifications.

Messages Press the **Messages** soft key to access the CDMA Messages screen. See "CDMA Messages screen" on page 124.

Pause / Resume Toggle the **Pause / Resume** soft key to either freeze the closed loop power timing information update or resume the update.

Data Rate Press the **Data Rate** key to change the test data rate.

For rate set 1 (service option 2) the selections are 9600, 4800, 2400, 1200.

For rate set 2 (service option 9) the selections are 14400, 7200, 3600, 1800.

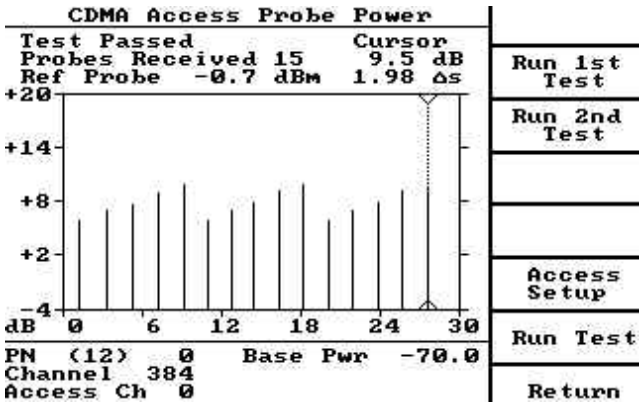
Return Press the **Return** soft key to return to the CDMA Average Power screen.

Press the **Return** soft key again to return to the CDMA Summary screen.

CDMA Access Probe Power screen

The Access Probe Power screen displays the power of the mobile's attempts to gain access to the system and is dynamically updated. Each probe is displayed as it is received.

At the Manual Mode screen press **Paging Messages** soft key > **Access Probe** soft key:



Test Status indicates whether the Test Passed, Test Failed, Probes Missing, or Test Time Remaining X s.

> Test Time Remaining is an estimate of how long it will take the test to run under worst case scenarios.

Probes Received displays the number of access probes that have been received.

For test 1 the expected number of probes is 5.

For test 2 the expected number of probes is 15.

> If the user presses Run test the number of probes expected is determined by the settings in the **Access Setup** screen.

Ref Probe indicates reference probe power prior to testing.

> The reference probe is not shown on the graphical display.

Cursor indicates the difference between the power of the probe at the current cursor location and the reference probe.

The cursor time is the difference in time between the probe at the cursor and the previous probe. If the cursor is at the first probe, the cursor time is the difference in time between the first probe and the reference probe. The cursor can be moved with the Arrow keys.

Abort The **Abort** soft key is only shown when a test is currently running. It allows the user to abort the test.

Run 1st Test Press the **Run 1st Test** soft key to run the first test defined by IS-98A.

In this test, 5 probes are expected, and are all at approximately the same power as the reference probe.

IS-98A limits allow a maximum difference of 2 dB between the minimum power and maximum power probes.

Run 2nd Test Press the **Run 2nd Test** soft key to run the second test defined by IS-98A.

In this test, 3 sequences of 5 probes each are expected (15 probes total).

The first probe of each sequence should be 6 $\pm$ 1.2 dB greater than the reference probe.

The remaining probes in the sequence should each be 1 $\pm$ 0.5 dB greater than the probe before it.

Access Setup Press the The **Access Setup** key to display the access setup screen which allows the user to define custom parameters (number of probes that should be received and the power of each of these probes). See "CDMA Access Probe Setup screen" on page 102.

Run Test Press the **Run Test** soft key to run the test as set up in the Access Setup screen.

Return Press the **Return** soft key to abort any test that may be running and return to the **Paging Messages** screen.

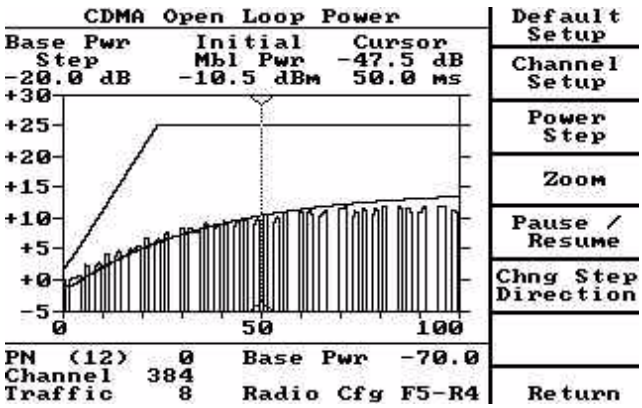
Service mode

CDMA service mode allows mobile power and IQ measurements to be performed without placing the mobile phone on a call.

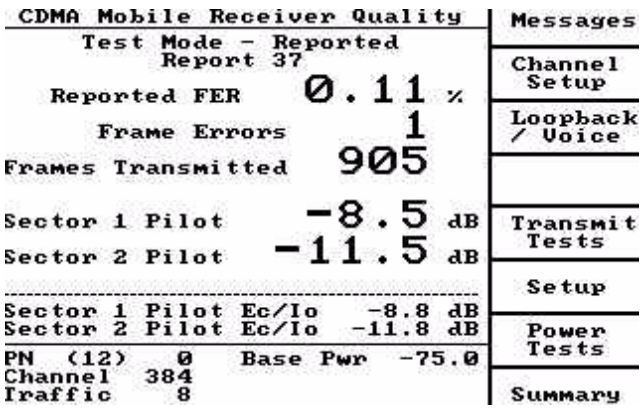
The 4300 is configured for a CDMA control channel (no traffic channel is transmitted).

Ensure that the mobile is set for the same control channel selections prior to testing.

CDMA Summary screen (RC < 3)



CDMA Summary screen (RC > 2)



Service Setup Press the **Service Setup** soft key to display the **Service Setup** screen. CDMA service mode parameters are set at this screen. See "Service Setup" on page 162.

Channel Setup Press the **Channel Setup** soft key to display the **Channel Setup** screen. See "CDMA Channel Setup screen" on page 97.

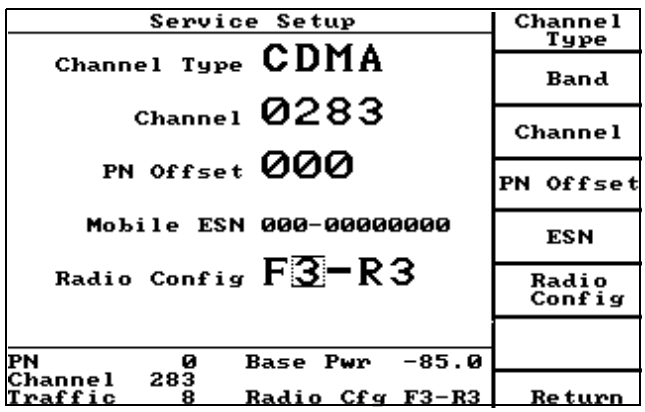
Constellation (RC < 3) Press the **Constellation** soft key to display the **CDMA Constellation** screen. See "Constellation" on page 139

Code Domain (RC > 2) Press the **Code Domain** soft key to display the Code Domain Power screen. See "Code Domain screen" on page 143.

Return Press the **Return** soft key to exit service mode and return to the Manual Mode screen.

Service Setup

At the Manual Mode screen, press the **Service Mode** soft key> Service Setup soft key:



Channel Type Press the **Channel Type** soft key to toggle between CDMA, AMPS, or NAMPS service mode.

Band Press the **Band** soft key to highlight a hidden band selection on the Service Setup screen. Use the UP and DOWN arrow keys or the numeric keypad to select the desired band.

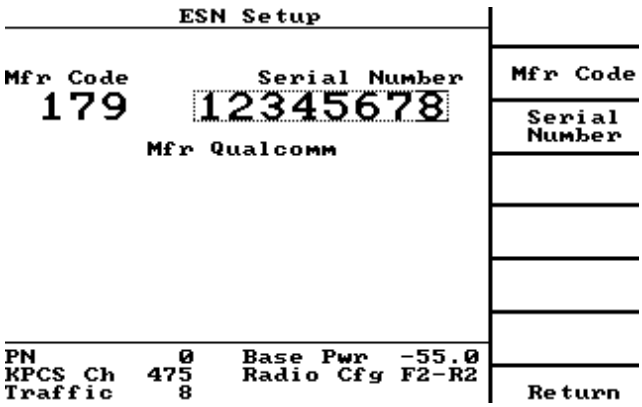
Channel Press the **Channel** soft key to highlight the Channel value on the Service Setup screen. Use the UP and DOWN arrow keys or the numeric keypad to select the desired value.

The range of permissible values is 1-799 and 990-1023.

PN Offset Press the **PN Offset** soft key to highlight the PN Offset value on the Service Setup screen. Use the UP and DOWN arrow keys or the numeric keypad to select the desired value.

The range of permissible values is 0 to 511.

ESN Press the **ESN** soft key to display the ESN setup screen. Use the **up** and **down** arrow keys or the numeric keypad to select the desired value.



Return

Press the **Return** soft key to return to the **Service Setup** screen.

Radio Config Press the **Radio Config** soft key to highlight the Radio configuration on the **Service Setup** screen. Use the **up** and **down** arrow keys or the numeric keypad to select the desired value.

Return Press the **Return** soft key to return to the **CDMA Summary** screen.

Setting up the 4300 for TDSO

Basic concept of TDSO TDSO stands for Test Data Service Option and is also referred to as Service Option 32. It is an optional feature in the mobile phone that eases testing of both transmitter and receiver at high data rates.

TDSO provides for the generation of an arbitrary (preselected or random) data source for transport over forward and reverse traffic channels while following an arbitrary (preselected or random) transmission frame activity. The test is performed at a fixed data rate.

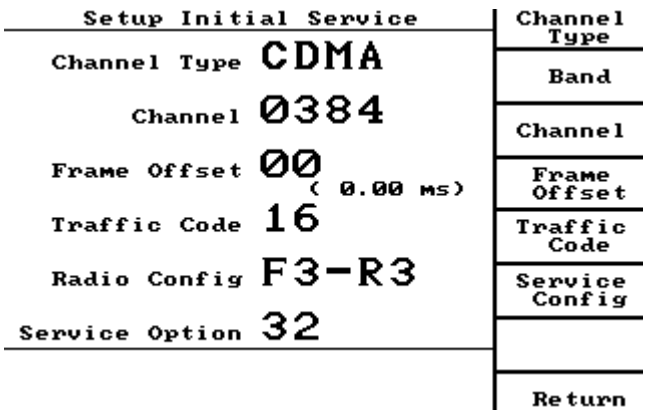
The mobile station and the tester generate TDSO data frames for the configured and allocated traffic channels. The content of each frame is generated per a selectable byte pattern or by employing a hybrid approach consisting of pseudo-randomly generated data together with a circular buffer.

The frame generation processes are synchronized between the mobile station and the tester. This permits the receiving station to reproduce the transmitted frames and compare them to the received frames. The tester counts the number of various frame types that were transmitted on a particular traffic channel. The tester also counts the number of various frame types received on the traffic channel according to the information provided by the multiplex sublayer and the result of the comparison between the frame received and the locally generated replica. Frame error and bit error statistics can be calculated from these counts.

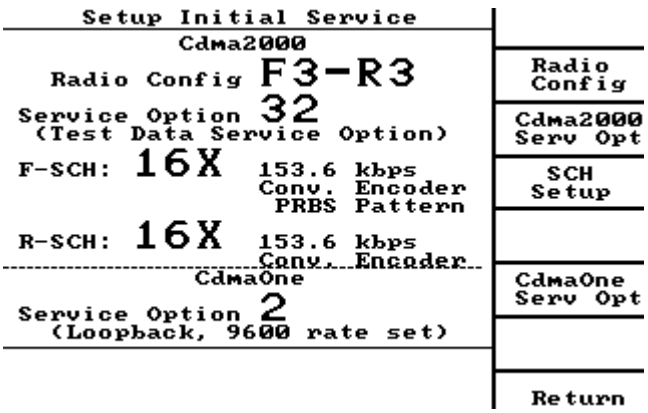
Setting up the supplemental channel

To perform any testing with a supplemental channel, the service option must be set to 32 by setting up the initial channel conditions.

1 Press **System Setup > CDMA**.
This will place in the screen shown below.

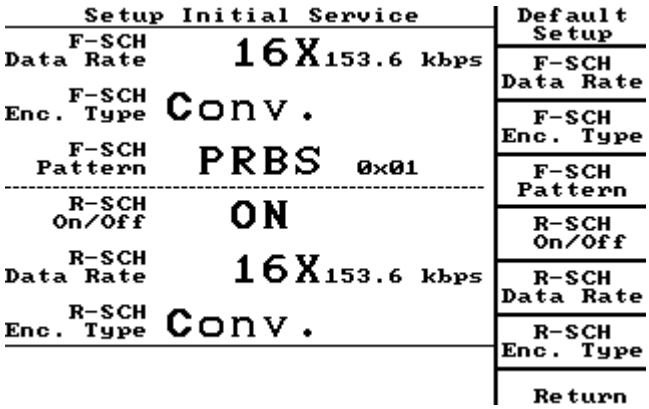


2 Press **Service Config** to set up radio configuration and service option.
The following screen will be displayed.



3 Set Radio Config to "F3-R3" to allow the service option to be set to 32. Both the Radio Configuration and cdma2000 Service Option Configuration may be set by pressing the corresponding soft keys.

4 Press **SCH Setup** on the screen above and select the forward supplemental data rate, Encoder type, Reverse supplemental channel state, data rate and encoder type.
The screen below will be displayed allowing the supplemental channel to be configured according to user test requirement.



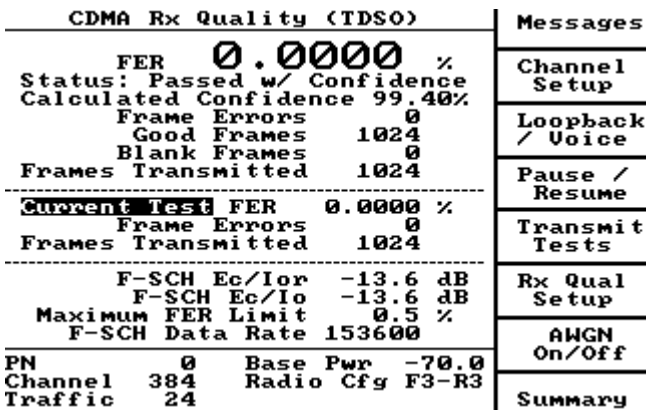
Measuring FER

TDSO enables you to measure the receiver sensitivity or the dynamic range by means of frame error rate (FER) measurements. This requires a traffic channel with fundamental and supplemental channels.

1 Return to the main screen.

2 Page the mobile device to establish a traffic channel with fundamental and supplemental channels enabled.

3 When the call is established, press **FER**.
The below screen appears.



There are three sections to this screen: previous test results (top section), current test results (middle section), test configuration (lower section).

Previous test results

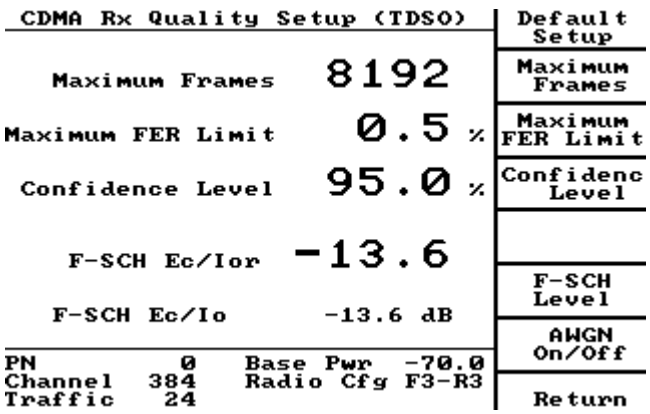
This section displays the frame information which was reported by the mobile. This information is then compared against user-defined limits and a pass/fail status indication is provided. See "Test Configuration" for how to configure user-defined limits.

Current results

This section displays the status of the current test. This is the number of frames transmitted, the number of frame errors reported by the mobile device and the calculated FER based on the previous two parameters.

Test Configuration

This section displays the test configuration parameters which will have a direct impact on the FER rate test or correlate to the IS-98D test specification. These test parameters may be modified by pressing the **Rx Quality Setup** soft key. The subsequent Rx Quality Setup screen is shown below.



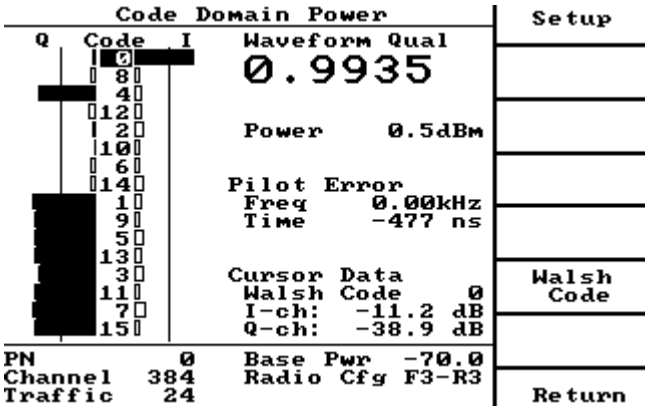
Code domain power measurements

TDSO allows you to measure the code domain power of a supplemental channel. This requires a traffic channel with fundamental and supplemental channels.

1 Return to the main screen.

2 Page the mobile device to establish a traffic channel with fundamental and supplemental channels enabled.

3 When the call is established, press **Transmitter Test > Code Domain**. The 4300 will now be displaying the following screen. The bars in the graph indicate the various logic channels that make up the traffic channel.



The following table provides the channel definitions for each logical channel.

Table 3 Code domain channel definitions

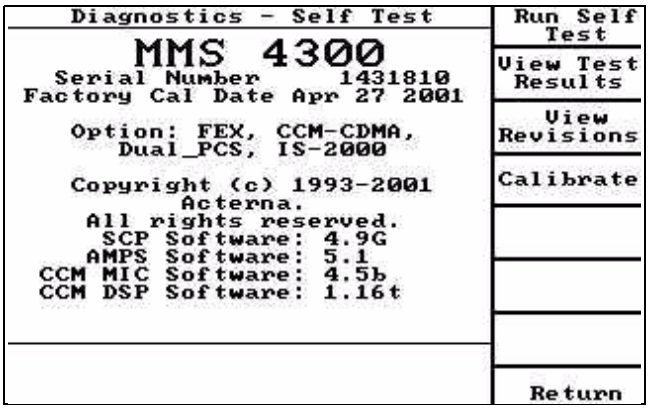
Channel	Walsh function	Data rates	I or Q	Walsh codes
R-PICH	W_0^{32}	NA	I	0
R-DCCH	W_8^{16}	NA	I	8
R-SCH2	W_6^8 W_2^4	NA	I	6, 142, 10, 6, 14
R-FCH	W_4^{16}	NA	Q	4
R-EACH or R-CCCH	W_2^8	NA	Q	2, 10
R-SCH1	W_2^4	19.2 kbps	Q	2
R-SCH1	W_2^4	38.4 kbps	Q	2, 10
R-SCH1	W_2^4	76.8 kbps	Q	2, 10, 6, 14
R-SCH1	W_1^2	153.6 kbps	Q	1, 9, 5, 13, 3, 11, 7, 15

Verifying the PCS option installation

The following information provides detailed instructions on how to perform various operations on a PCS product with the PCS module installed in the 4300.

To verify that the PCS option is enabled in your unit, press the **DIAG** key to display information on the unit.

The FEX option indicates the PCS band.



If the PCS option is not displayed as an option, contact a Willtek Technical Assistance Center; see page xvi for details.

Setting up the CDMA software for PCS

General CDMA Setup

Prior to performing tests on a PCS handset, specific CDMA channel parameters must be set up. These parameters are loaded with factory default values suitable for an 800 MHz AMPS cellular system. The parameters, which may be set to values consistent with your system, include:

- Channel
- Paging Data Rate
- Longitude
- SID
- Base ID
- Type
- NID
- Zone ID
- Band
- PN Offset
- Latitude

Setup Initial Service and Selection

This section provides a general guide to the Setup Initial Service menu and the Initial System selection.

Press the **Setup** key, then the **System Setup** soft key to access the Setup Initial Service menus. This path to the **System Setup** soft key is available from any menu at any time. Another way to access this menu is from the Manual menu using the **System Setup** soft key available there.

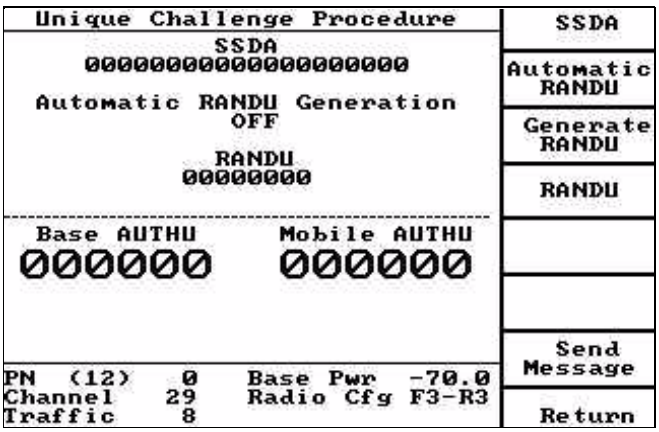
Initial System

Pressing the **Initial System** soft key toggles the Initial System selection between System A and System B control channels. A summary of the setup parameters and type (AMPS, NAMPS or CDMA) of the control channel are also displayed. Setup of control channel variables for CDMA follows.

System A or System B Parameters

The following text describes the set up of the Initial System when the CDMA type (Control Channel) is selected. Setup for the AMPS and NAMPS (Control Channel) is covered in Chapter 3 "Operation".

Press the **Setup** key, then the **System Setup** soft key to access the Setup Initial Service menu. Press the **System A** or the **System B** soft key. (Setup for both systems is the same except that different parameter values are normally selected. Only System A will be discussed here. Where System A is discussed System B can be substituted except as noted in the following text.)



System

Pressing the **System** soft key causes the System selected to toggle between System A and System B.

Band

Use the **Band** soft key to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a PCS band selection.

Channel

Press the **Channel** soft key to highlight the channel number. When highlighted use the **up** and **down** arrow keys or numeric keypad to select the control channel number. Valid channels are from 25-1175 in increments of 25 (i.e. 25, 50, 75, 100,.... 1175).

SID

Press the **SID** soft key to highlight the SID (System Identification) number. When highlighted, use the **up** and **down** arrow keys or numeric keypad to select the SID number. Using the SID of your local system will allow operation with phones that are programmed for home only operation

NID

Press the **NID** soft key to highlight the NID (Network Identification) number. When highlighted, use the **up** and **down** arrow keys or numeric keypad to select the NID number. A network is a subset of a cellular system, such as an area-wide cellular network, a private group of basestations, or a group of basestations setup to handle a special requirement.

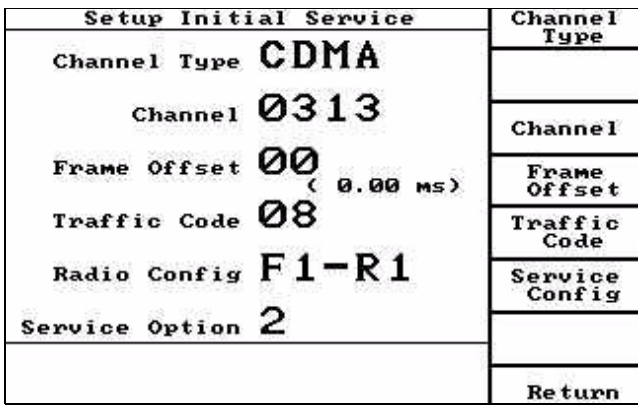
PN Offset

Press the **PN Offset** soft key to highlight the PN Offset (Pilot PN Sequence Offset Index) value. When highlighted, use the **up** and **down** arrow keys or numeric keypad to select the PN Offset value. The PN Offset value is in units of 64 PN chips of a pilot.

More

Press the **More** soft key to display additional setup parameters.

The resulting menu follows:



Channel Setup

Press the **Channel Setup** soft key to display additional setup parameters.

Type

Pressing the **Type** soft key causes the control channel type for System A to change from analog AMPS to CDMA. When the Type selected is CDMA "CDMA" is displayed in the upper right of the screen. See the following **CDMA Initial Service Setup** screen.

Paging Data Rate

Pressing the **Paging Data Rate** soft key causes the Paging (Channel) Data Rate to toggle between Half (4800 bps) and Full (9600 bps)

Access Setup

Press the **Access Setup** soft key to display additional setup parameters.

Base ID

Press the **Base ID** soft key to display additional setup parameters.

Power Report

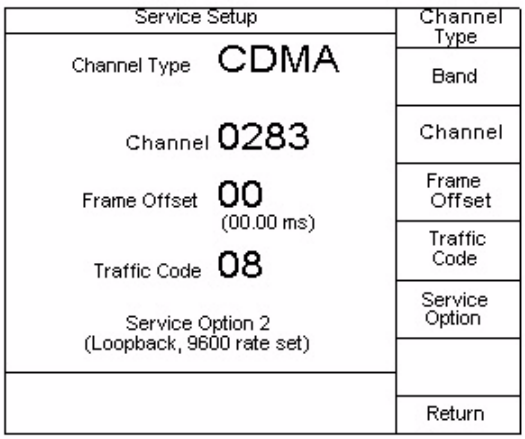
Press the **Power Report** soft key to display additional setup parameters.

Search Criteria

Press the **Search Criteria** soft key to display additional setup parameters.

At the Manual Mode screen, press the **Setup** key >**System Setup** soft key to access the setup initial service menus.

Press the **CDMA** soft key to access the CDMA setup parameters:



Band

Use the **Band** soft key to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a PCS band selection.

Channel

Press the **Channel** soft key to highlight the channel number. When highlighted, use the **up** and **down** arrow keys or numeric keypad to select the initial channel number. This channel should normally be the same as the control channel selection you will make in the System A section. This will assure that a hard handoff is not required to move from the paging channel to the traffic channel. Valid channels are 1-1199.

Frame Offset

Press the **Frame Offset** soft key to highlight the Frame Offset value. When highlighted, use the **up** and **down** arrow keys or the numeric keypad to select the desired value. Any value between 0 and 15 may be selected. The Frame Offset is a time skewing of Traffic Channel frames from System Time in integral multiples of 1.25 ms. The maximum Frame Offset is 15 x 1.25 ms = 18.75 ms.

Traffic Code

Press the **Traffic Code** soft key to highlight the Traffic Code (Walsh Code). When highlighted use the **up** and **down** arrow keys or the numeric keypad to select the desired code. Any Walsh code from 2 to 63 other than code 32 (reserved for the Sync Channel) may be selected.

For CDMA2000 traffic channel, selectable range is limites to Walsh Codes 1-63.

Service Option

Press the **Service Option** soft key to highlight the Service Option value. When highlighted, use the **up** and **down** arrow keys or the numeric keypad to select the desired Service Option value. The service options available are: 1-9600 bps, 2-9600 bps Loopback, 3-9600 bps EVRC, 9-14.4 kbps Loopback, 32768-14.4 kbps voice.

Operating the CDMA option on PCS channels

Once setup operations are complete, testing of the mobile is performed in accordance with this and the previous section. Refer to these sections for detailed information on how to perform a mobile registration, origination, or page.

TDMA Option

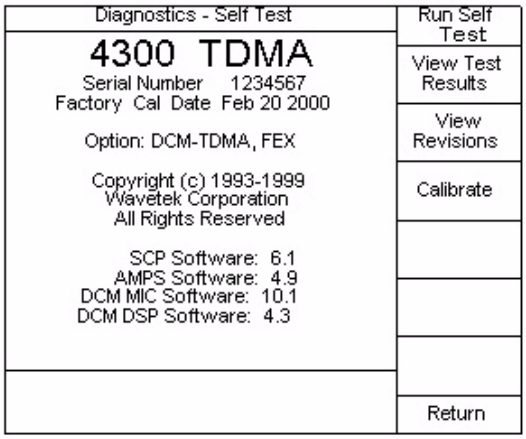
5

This chapter provides task-based instructions for using the 4300 Series Mobile Service Tester features for TDMA. Topics discussed in this chapter are as follows:

Operating the TDMA option

Apply power to the 4300 and the mobile under test. When the unit powers up it automatically performs a self test diagnostic on all the modules installed in the unit. Once completed, the 4300 will display a "Passed" message next to the module name. The TDMA module is referred to as the DCM module on the 4300 display. If a failed test message is displayed for the DCM module, contact Willtek at one of the addresses given on page xvi.

To display the screen in a quick way, press the **DIAG** key.



The screen shows the mode, protocol supported, serial number, last calibration date, installed options and installed software versions.

General Setup

Prior to performing any tests on a cellular product, specific TDMA testing parameters must be set up. These parameters include:

- Channel
- Time Slot & Rate
- DVCC
- Power Level
- Time Alignment
- Shortened Burst

IS-136 (Digital Control Channel)

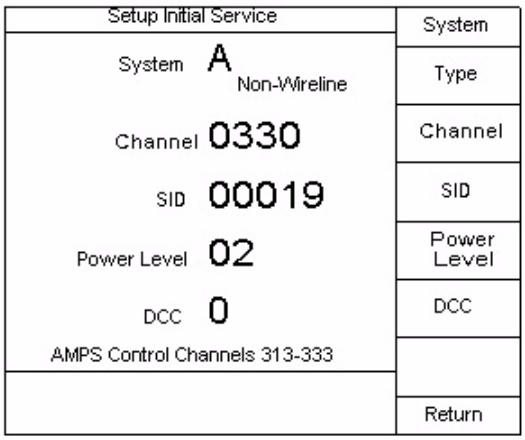
The IS-136 is standard with TDMA option.

The digital control channel parameters are:

- DVCC
- Time Slot & Rate
- Time Alignment
- Access Burst

Setup

Press the **SETUP** key, then the **System Setup** soft key to access the setup initial service menus. Press the **System A** or **System B** soft key to access the control channel parameters. If the control channel type is not Digital, then press the **Type** soft key to select the Digital control channel parameters. The following Initial Service Setup screen is displayed:



System

The **System** soft key can be used to toggle between System A or B. Separate setups are required for the A and B systems.

Type

The **Type** soft key can be used to toggle between Digital control channel (IS-136) and AMPS control channel (IS-54)The word Digital next to the system indicates that the digital control channel type is selected.

Channel

The user can select the digital traffic channel number. The desired channel can be selected by entering the desired value on the numeric keypad. The arrow keys or the **CHANNEL** keys can also be used to select the desired channel.

SID

The SID (system identification number) is a number which identifies the customer's "Home" system. The desired SID can be selected by entering the desired value on the numeric keypad or by using the arrow keys.

Power Level

The mobile/portable's power level may be selected by entering the desired value on the numeric keypad. The arrow keys or the **MBL PWR** keys can also be used to enter the desired power level. Digital power levels are from 0-10, whereas analog systems power levels are from 0-7.

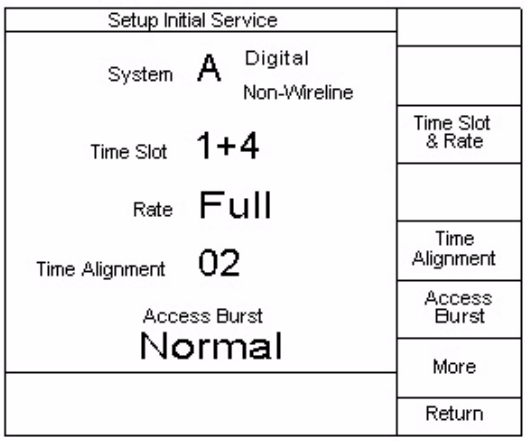
If the power level is greater than 7 and the Type is changed to AMPS control channel, the power level is automatically set to 7, which is the minimum power level allowed for the AMPS control channel.

DVCC

The DVCC (Digital Verification Color Code) is a digital 8-bit code that is sent by the base station to the mobile station and is used to indicate that the correct rather than co-channel data is being decoded. The desired DVCC may be selected by entering the desired value on the numeric keypad or by using the arrow keys.

More

Press the **More** soft key to display the following additional setup parameters:



Time Slot & Rate

The frame length on each digital control channel is 40 milliseconds. Each frame consists of six equally sized time slots (1-6), exactly 162 symbols in length. Each full rate traffic channel utilizes two equally spaced time slots of the frame (1&4, 2&5, or 3&6)Each half rate traffic channel utilizes one time slot of the frame.

To select the desired time slot and rate, press the **Time Slot & Rate** soft key until the desired setup is displayed.

At this time, the 4300 only supports FULL RATE phones.

Time Alignment

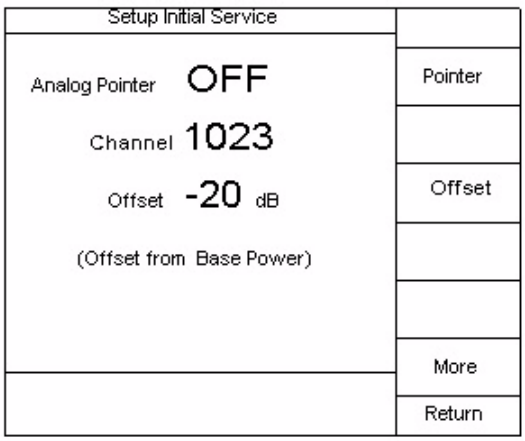
The time alignment parameter specifies how the mobile's burst on the reverse channel are aligned in time with the base station's (4300) slot clock, referenced to a standard 45 symbol offset. The valid range for the time alignment parameter is 0-31Each increment (except 31) represents a 1/2 symbol adjustment in time alignment. The desired time alignment may be selected by entering the desired value on the numeric keypad or by using the arrow keys.

Access Burst

The access burst specifies which burst size (normal or abbreviated) the mobile/portable should use. The desired access burst size may be selected by pressing the **Access Burst** soft key until the desired size is displayed.

More

Press the **More** soft key to display the following additional setup parameters:



Pointer

The **Pointer** soft key toggles the Analog Pointer **ON** and **OFF** (default is **OFF**).

Channel

The Channel displays the analog control Channel that the Analog Pointer is pointing to.

The DCCH chosen on the first screen must be 33 channels above a valid Analog Control Channel for the Analog Pointer to function properly.

Offset

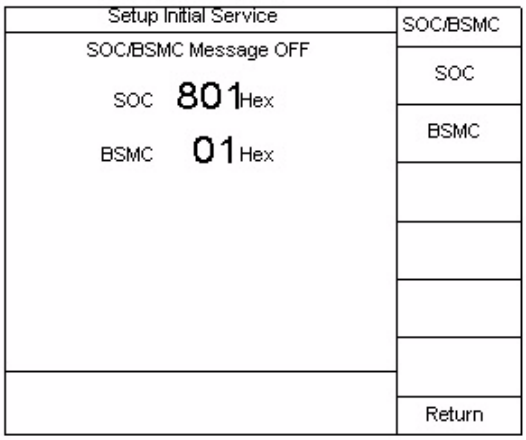
The offset is the base power level difference between the Analog Control Channel and the Digital Control Channel that the Analog Pointer is pointing to.

More

Press the **More** soft key to display the following additional setup parameters:

SOC/BSMC

The SOC/BSMC screen is accessed from the Manual Mode screen by pressing **System Setup > System A/B > More > More > More**.



SOC/BSMC

This button selects and toggles the associated field between ON and OFF. This also allows editing using the arrow keys on the keypad. With the message ON, the optional SOC/BSMC message is added to the F-BCCH stream when the DCCH is being transmitted. The values set for the system operator code (SOC) and base station manufacturer code (BSMC) fields are contained in the message as mandatory information elements.

SOC

Selects the associated value field for editing within the range of acceptable values using the arrow and numeric keys.

BSMC

Selects the associated value field for editing within the range of acceptable values using the arrow and numeric keys.

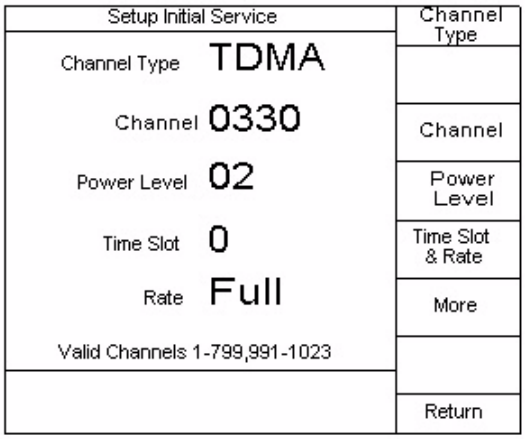
Entry is made in hexadecimal format to match those published by the governing body. Hex entry is possible by using the arrow keys as normal or by using the [**ALPHA**] key to access digits A through F for direct hexadecimal entry.

A complete list of current System Operator Codes is available at the following web site: http://www.tiaonline.org/standards/soc

Setup Initial Service

At the Manual Mode screen, press **SETUP > System Setup** to access the setup initial service menus.

Press the **TDMA** soft key to access the TDMA setup parameters:



Channel

Press the **Channel** soft key to highlight the channel number. When highlighted use the **UP** and **DOWN** arrow keys or numeric keypad to select the initial voice channel. A statement at the bottom of the display indicates the valid TDMA channels.

Time Slot

The frame length on each digital TDMA RF channel is 40 milliseconds. Each frame consists of six equally sized time slots (1-6), exactly 162 symbols in length. Each full rate traffic channel utilizes two equally spaced time slots of the frame (1&4, 2&5, OR 3&6). Each half rate traffic channel utilizes one time slot of the frame.

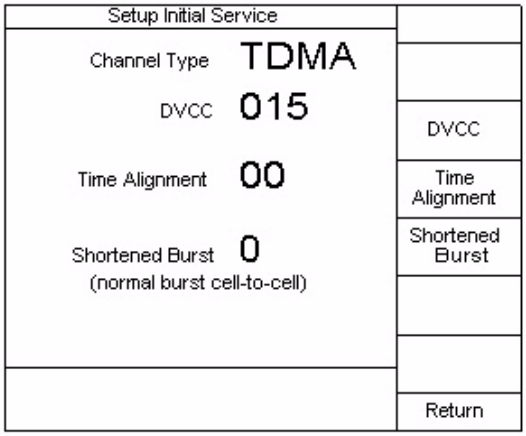
To select the desired Time Slot, press the **Time Slot & Rate** soft key. Continue to press the soft key until the desired Time Slot & Rate is displayed.

As of this time, the 4300 only supports FULL RATE phones.

Power Level

Press the **Power Level** soft key to highlight the power level. When highlighted use the **UP** and **DOWN** arrow keys or the numeric keypad to select the desired power level. TDMA power levels are from 0-10, whereas analog type systems power levels are from 0-7.

Press the **More** soft key to display the following additional setup parameters:



DVCC

DVCC (Digital Verification Color Code) is a digital 8-bit code that is sent by the base station to the mobile station and is used for the generation of the CDVCC. CDVCC is a 12-bit data field containing the 8-bit DVCC and 4 protection bits, sent in each time slot to and from mobile stations and base stations. It is used to indicate that the correct rather than co-channel data is being decoded.

Press the **DVCC** soft key to highlight the DVCC number. When highlighted use the **up** and **down** arrow keys or the numeric keypad to select the desired DVCC.

Time Alignment

The Time Alignment parameter specifies how the mobile's burst on the reverse channel are aligned in time with the base station's (4300) slot clock, referenced to a standard 45 symbol offset. The user may enter a specific time alignment parameter that will be used when the initial traffic channel (call) is established. The valid range for the time alignment parameter is 0-31. Each increment represents a 1/2 symbol adjustment in time alignment.

Press the **Time Alignment** soft key to highlight the time alignment number. When highlighted use the **up** and **down** arrow keys or the numeric keypad to select the desired time alignment.

Shortened Burst

This parameter describes the initial type of Burst that the mobile is directed to use either for handoffs or when a voice channel is initially established. The selections are:

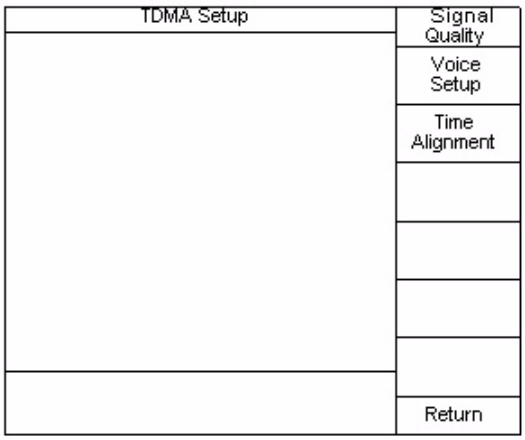
- (0) normal burst for cell-to-cell handoffs
- (1) normal burst within cell
- (2) shortened burst for cell-to-cell handoffs
- (3) reserved

Press the **Shortened Burst** soft key to highlight the burst number. When highlighted use the **up** and **down** arrow keys to select the desired burst.

Signal Quality Setup

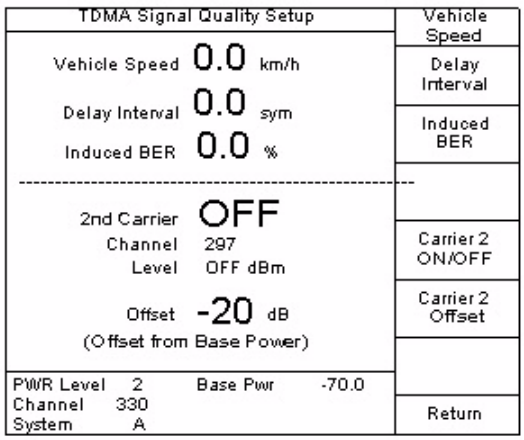
Additional TDMA parameters may be set up in the **TDMA Setup** screen. This can be accessed by pressing the **SETUP** key > **TDMA Setup** soft key.

The following screen is displayed:



These TDMA parameter groups can be adjusted by selecting the appropriate soft key.

From the **TDMA Setup** Screen, select the **Signal Quality** soft key to set the following parameters:



Vehicle Speed

Simulating vehicle speed is important in RF Sensitivity testing, specifically faded type. When a nonzero value is entered for the vehicle speed, the 4300 conditions the transmitted signal to simulate fading that occurs as the phone moves at the selected velocity. Typical testing speeds are 8 & 100 km/h. Use the **up** and **down** arrow keys or the numeric entry keys to enter the desired speed. The BER (Bit Error Rate) at certain speeds and RF Level is an important indicator of mobile performance.

Delay Interval

Delay interval is the time difference between the primary burst and a delayed version of the same burst. Transmitting a delayed burst tests the phone's ability to demodulate the primary burst in the presence of a delayed, faded version of the same signal, much like is seen in the real-world environment (see IS-55A, 2.3.2.7). The user can select delay values in 1/4 symbol increments, up to a 1 symbol delay. If the fading simulation is not already active when a nonzero delay value is entered, the 4300 will automatically activate the fading simulation, which is indicated by the highlighted vehicle speed.

To activate delay interval, use either the **UP** and **DOWN** arrow keys.

Induced BER

The 4300 has the ability to introduce bit errors in its transmitted data stream. This feature is essential in order to test the phone's ability to detect and correct bit errors in the received burst. It is also used to test the phone's ability to correctly measure and report its received BER (via a channel quality message).

The user can set the BER by pressing the **Induced BER** soft key and using either the **up** and **down** arrow keys or the numeric keypad to enter a value. The valid range of values is between 0% and 11%.

Carrier 2 ON/OFF

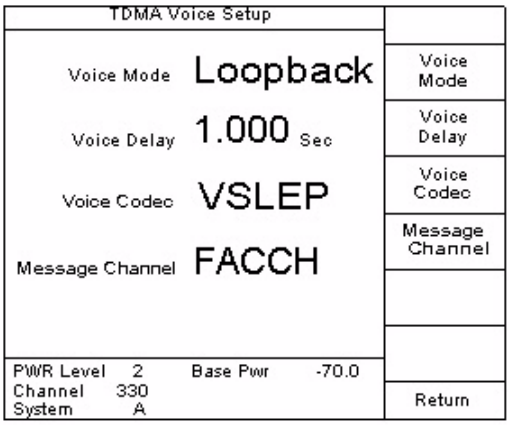
The 4300 provides a 2nd RF carrier which can be used to perform mobile assisted handoff (MAHO) testing with the phone. Press the **Carrier 2 ON/OFF** soft key until the desired state is displayed. The 2nd carrier has a fixed frequency offset of 33 channels below the main channel.

Carrier 2 Offset

The user can select the power level offset (from the main channel power) of the 2nd carrier by pressing the **Carrier 2 Offset** soft key and then using either the **up** and **down** arrow keys or the numeric keypad to enter a value between 0 and -20 dB.

Voice Setup

From the TDMA Setup screen, select the **Voice Setup** soft key to set the following parameters:



When the Voice Setup screen is accessed from the TDMA Summary screen it will also include speech frame energy measurements.

Voice Mode

When the mobile is up on a call, the Voice mode feature allows the user to select several different voice processing modes which are useful for testing the phone's audio paths.

When **Normal** mode is selected, the user may speak into the handset microphone, and the transmitted audio is heard on 4300's speaker. This is useful for testing the phone's audio path.

When **Loopback** mode is selected, the user can speak into the handset microphone and hear his speech retransmitted to the phone with a delay. The delay is selectable (refer to "Voice Delay" described on page 183).

When **Receiver** mode is selected, the 4300 transmits a pre-stored speech sequence to the phone, thereby testing the phone's receive audio path.

When **Silent** mode is selected, no audio processing is performed by the 4300.

Voice Delay

The Voice Delay feature works in conjunction with the Loopback voice mode. A specific delay value for the audio signal generated by the user can be selected. This value can be between 0 and 5 seconds, in 1 millisecond increments.

Voice Codec

Use this key to select the Voice Codec type. The selections toggle between VSELP and ACELP. If ACELP is selected, the Voice Mode selection will be limited to Loopback mode only. The mobile phone will receive notification from the 4300 as to the voice codec selection when on a digital control channel (through the Service Menu message and the Digital Traffic Channel Designation message). Because the voice codec selection is only communicated when on a control channel, this parameter can not be changed if currently on a voice channel.

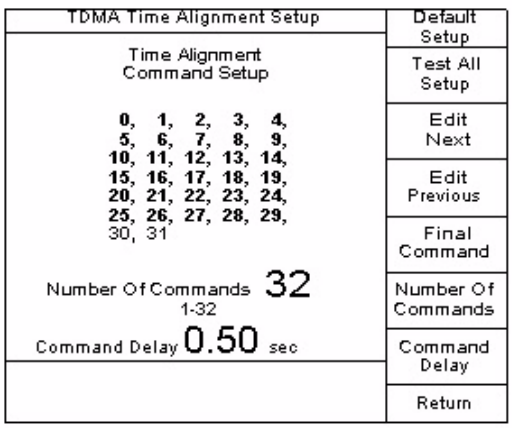
In order to get full ACELP functionality, the ACELP Voice Codec option must be installed.

Message Channel

The user can select the type of message channel to be used during mobile testing. The FACCH is a signaling channel for the transmission of control and supervision messages between the base station and mobile. The FACCH replaces the voice data block whenever system considerations deem it appropriate to do so. The SACCH is a signaling channel in parallel with the speech path used for the transmission of control and supervision messages between the base station and the mobile. Certain messages may be sent over either the SACCH or the FACCH. The information field structure for the messages is identical, however, the forward error correcting methods differ.

Time Alignment Setup

From the TDMA Setup Screen, select the **Time Alignment** soft key to set the following parameters:



Default Setup

IS-55-A (3.6.2) requires as a minimum the testing of the following TA Commands:

5, 9, 16, 19, 24, 30, 25, 18, 11, 4, and 0

The **Default Setup** soft key automatically programs the unit to perform the required testing of these TA Commands.

Test All Setup

The **Test All Setup** soft key defaults to testing all TA Commands.

Edit Next/Edit Previous

Use the **Edit Next/Edit Previous** soft keys to move the edit cursor around the TA Commands. This allows the user to vary the sequence of the TA Commands.

Final Command

Press the **Final Command** soft key to enter the last TA Command for the test sequence.

Number Of Commands

Use the **Number Of Commands** soft key to enter the maximum number (up to 32) of TA Commands that are tested.

Command Delay

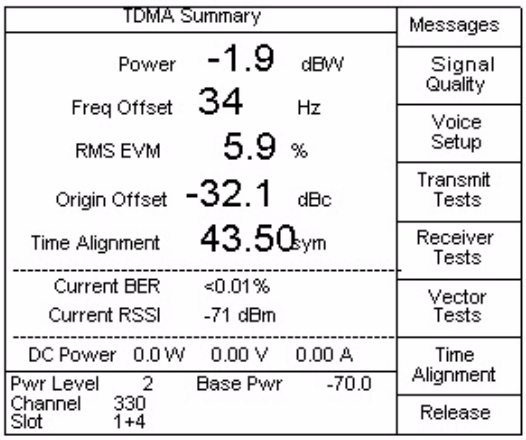
Use the **Command Delay** soft key to enter the amount of time delay after a TA command is sent to the mobile and before the time alignment is measured.

TDMA Testing

The following information describes how to perform some basic tests on a TDMA cellular product. Installation of the unit and connection of the mobile is identical to an AMPS or NAMPS type product. For information on installation or basic 4300 setup, refer to the appropriate chapter of this user's guide.

TDMA Summary

From the Base mode menu perform a Mobile Registration followed by a Mobile page or an Accept Origination. This will simulate the mobile being up on a call. Following a successful page or origination, the **TDMA summary** screen is displayed. The following information is displayed on the **TDMA Summary** screen:



Power

The digital RF power output of the transmitter is the mean burst power, computed using symbols 6 through 162.

Frequency Offset

Frequency Offset provides the user with an indication of the mobile transmitter's ability to maintain an assigned carrier frequency. The frequency offset in any burst should be within $\pm$200 Hz. Frequency offset is determined with respect to a frequency value 45 MHz lower than the frequency of the corresponding base station transmit signal.

RMS EVM

The RMS EVM (Error Vector Magnitude) is an indication of the mobile transmitter's ability to generate the ideal transmitted signal. Modulation accuracy is measured by determining the RMS difference between the actual transmitted signal and the ideal signal, over symbols 6 through 162.

Origin Offset

Another indication of modulation accuracy is Origin Offset. Origin Offset is also an indication of the transmitters ability to generate the ideal transmitted signal. Origin Offset values are presented in dBc values.

Time Alignment

Time Alignment is the process by which the mobile station adjusts its transmit burst timing. The process is required in order to prevent bursts from multiple mobile stations occupying the same channel from colliding at the base station. The measured Time Alignment should be equal to the Time Alignment specified in the TDMA System Setup $\pm$0.25 symbol periods.

Current BER

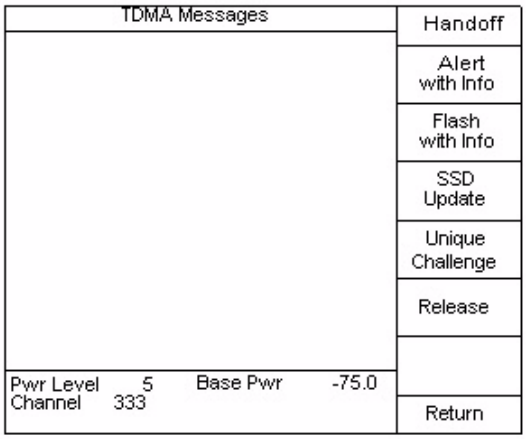
BER (Bit Error Rate) is an estimate of bit error rate on the forward traffic channel, as measured by the mobile receiver and reported in a channel quality message. The following table provides the minimum standard for Rx reported BER, with a TX induced BER. Refer to the Signal Quality menu in order to adjust the current TX induced BER.

TX Induced BER (%)	RX	Reported BER interval (%)
0		less than 0.01
0.013 to 0.08	0.01	to less than 0.1
0.133 to 0.4	0.1	to less than 0.5
0.667 to 0.8	0.5	to less than 1.0
1.333 to 1.6	1.0	to less than 2.0
2.667 to 3.2	2.0	to less than 4.0
5.333 to 6.4	4.0	to less than 8.0
10.667		greater than 8.0

Current RSSI

RSSI (Received Signal Strength Indicator) is the mobile's measurement of the base station's signal power as measured by the mobile. The RSSI will increase monotonically with received RF signal strength. The range for the measured RSSI is -113 to -53 dBm in increments of 2 dB.

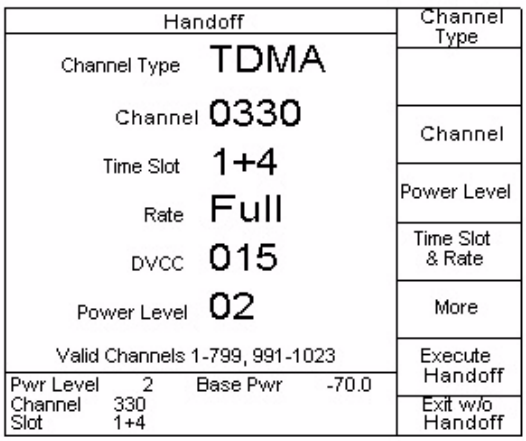
Messages



One means of verifying operational performance of a mobile is to test the ability of the mobile to perform various call processing procedures. The following call processing procedures may be performed by selecting the appropriate soft key: Handoff, Alert With Info, Flash With Info, SSD Update, and Unique Challenge

The ability to perform a handoff allows the user to test the mobile's performance on any of the allowable voice channels. Pressing the **Return** soft key returns to the previous measurement screen.

Handoff

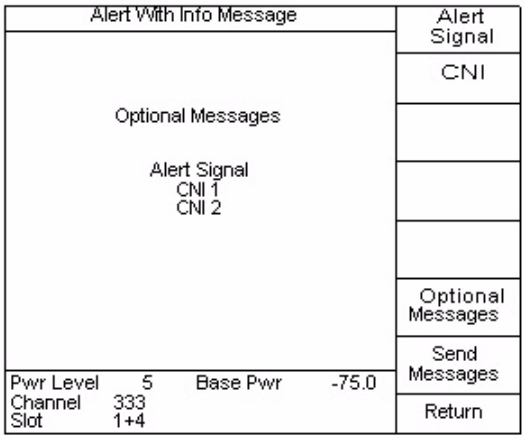


The **Handoff** screen allows the user to perform a handoff to any of the allowable traffic channels. When the desired parameters have been selected, press the **Execute Handoff** soft key to perform the handoff. Upon completion of the handoff, the 4300 and mobile will be on the desired channel and the previous screen will be displayed. The **Exit w/o Handoff** soft key returns to the previous screen without performing a handoff. The current channel is displayed in the information box at the bottom of the screen.

Press the **Type** soft key to select TDMA, AMPS or NAMPS (if the mobile is AMPS or NAMPS capable) voice channel.

The desired channel and power level may be entered using the numeric keypad or the arrow keys. The remaining parameters will depend on the channel type selected. For AMPS voice channel, the desired **SAT Frequency** may be selected using the **SAT Frequency** soft key or the **up** and **down** arrow keys. For NAMPS voice channel, the desired **Offset** and **DSAT Vector** may be selected using these soft keys or the **up** and **down** arrow keys. For TDMA traffic channel, the desired **Time Slot & Rate**, **DVCC vector**, **Time Alignment**, and **Shortened Burst** may be selected using the **up** and **down** arrow keys or the numeric key pad.

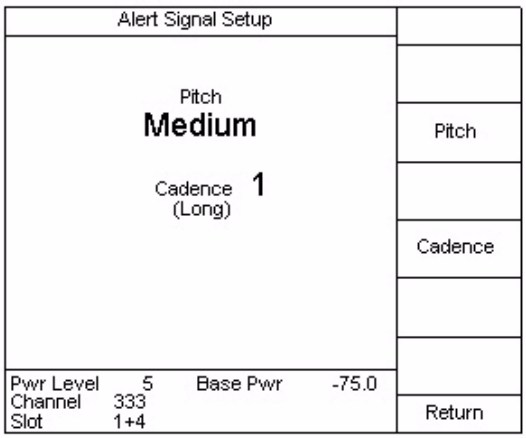
Alert With Info Message



When the **Send Message** soft key is pressed, the Alert With Info message is sent to the mobile phone. On a TDMA traffic channel, this message may be sent with any of three optional parameters: Alert Signal, CNI 1, and CNI 2If the mobile is not a dual-mode phone or if no optional parameters are selected when the **Send Message** key is pressed, then the Alert message is sent instead of the Alert With Info message.

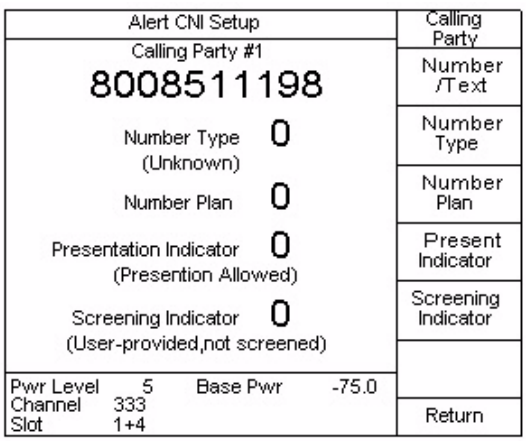
The Alert Signal tests the mobiles ability to provide distinctive ringing. Press the **Alert Signal** soft key to set up the desired distinctive ring. The CNI 1 (and CNI 2) test the mobile's ability to display one (or two) caller ID information. Press the **CNI** soft key to set up the caller ID information.

Alert Signal Setup



The desired distinctive ring can be set by selecting the Pitch and Cadence. Pitch represents a distinction between tones. Cadence is the on/off pattern of the tones. The standard alert is medium pitch and a cadence of 1 (single long tone).

Alert CNI Setup



The calling number indicator, or caller ID, number may be set by selecting the parameters in this screen.

Calling Party

The **Calling Party** soft key selects which caller ID is being set up. When on a TDMA traffic channel, two caller Ids may be sent with one message. When on an AMPS voice channel, this soft key will not appear because only one caller ID may be sent.

Number / Text

Pressing the **Number / Text** soft key allows the entry of the caller ID number and/or text. This may be up to 15 alphanumeric characters or numeric digits. Use the numeric keypad to enter numbers. Press the Alpha key followed by the key with

the desired letter for alphabetical characters. Press the Alpha key followed by the **up** and **down** arrow keys to toggle between uppercase and lowercase characters. The Alpha key followed by the right arrow key enters a space. Any 7-bit ASCII character may be selected by using the left/right and **up** and **down** arrow keys. Pressing ENTER terminates the entry and toggles between editing and entry mode.

Number Type

Pressing the **Number Type** soft key allows entry of the Type of Number as defined in ANSI T1.607A description of the current type appears on the screen. This indicates the type of calling number.

Number Plan

Pressing the **Number Plan** soft key allows entry of the Numbering Plan Identification as defined in ANSI T1.607A description of the current plan appears on the screen. This indicates the numbering plan used for the calling number.

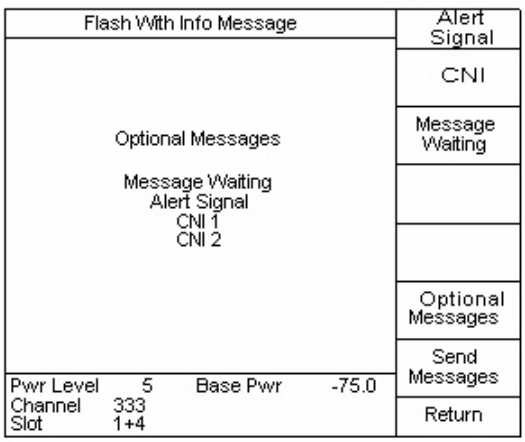
Present Indicator

Pressing the **Present Indicator** soft key allows entry of the Presentation Indicator as defined in ANSI T1.607A description of the current selection appears on the screen. This indicates whether or not the calling number should be displayed.

Screening Indicator

Pressing the **Screening Indicator** soft key allows entry of the Screening Indicator as defined in ANSI T1.607A description of the current selection appears on the screen. This indicates how the calling number was screened.

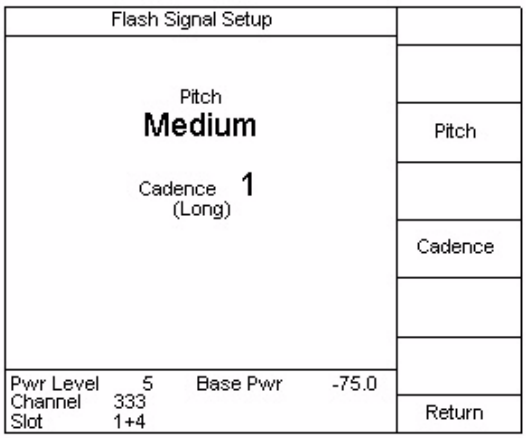
Flash With Info Message



When the **Send Message** soft key is pressed, the Flash With Info message is sent to the mobile phone. On a TDMA traffic channel, this message may be sent with any of four optional parameters: Message Waiting, Alert Signal, CNI 1, and CNI 2

The Alert Signal tests the mobiles ability to provide distinctive ringing. Press the **Alert Signal** soft key to set up the desired distinctive ring. The CNI 1 (and CNI 2) test the mobile's ability to display one (or two) caller ID information. Press the **CNI** soft key to set up the caller ID information. The Message Waiting tests the mobiles ability to display the number of messages waiting. Press the **Message Waiting** soft key to enter the number of messages.

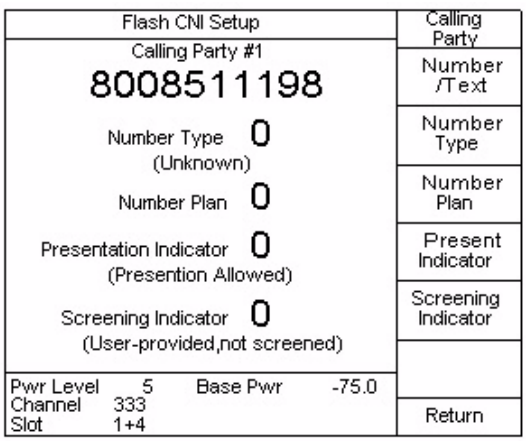
Alert Signal



The desired distinctive ring can be set by selecting the Pitch and Cadence. Pitch represents a distinction between tones. Cadence is the on/off pattern of the tones. The standard alert is medium pitch and a cadence of 1 (single long tone).

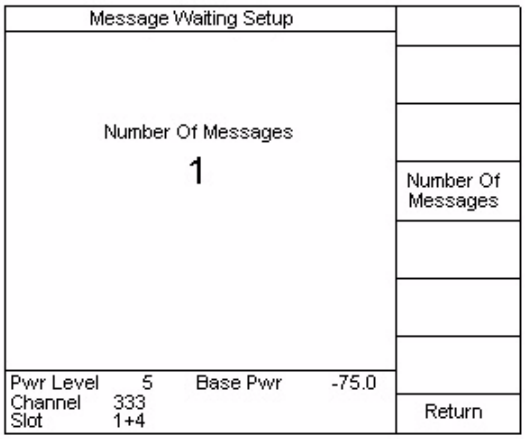
The desired distinctive ring can be set by selecting the Pitch and Cadence. Pitch represents a distinction between tones. Cadence is the on/off pattern of the tones. The standard alert is medium pitch and a cadence of 1 (single long tone). The operation of this screen is the same as described in "Alert With Info Message" described on page 189.

CNI



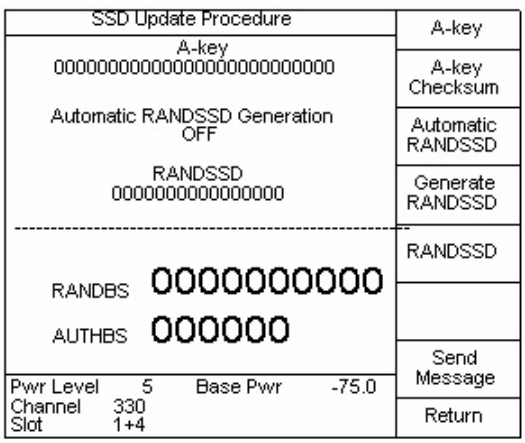
The calling number indicator, or caller ID, number may be set by selecting the parameters in this screen. The operation of this screen is the same as described in "Alert With Info Message" described on page 189.

Message Waiting



The desired number of messages may be entered using the numeric keypad or the arrow keys. For a TDMA traffic channel, the maximum number of messages is 63For an AMPS voice channel, the maximum number of messages is 31. If this number is greater than 31 when the **Send Message** soft key is pressed while on an AMPS voice channel, then the 4300 sends that number minus 32 as the number of messages waiting.

SSD Update



When the **Send Message** soft key is pressed, the SSD Update Procedure is initiated. This is the first step in testing the mobile's authentication capability

The 4300 requires a valid A-key prior to successfully performing this procedure. The A-key must be entered by you and must match the A-key assigned to the mobile. If no A-key has been assigned to the mobile, then the default A-key value may be entered by entering 0 and then pressing the A-key Checksum soft key. If

the phone's A-key is not known, then the authentication process may still be tested by performing the SSD Update Procedure and verifying that the procedure fails.

The SSD Update procedure consists of the following steps:

1 The A-Key is checked to verify that it is valid. If it is invalid, the procedure will stop and the **Invalid A-Key** message will be displayed.

2 The 4300 sends the SSD Update Order (including the RANDSSD value) to the mobile. The mobile should respond with the Base Station Challenge Order (including the RANDBS value). If the mobile fails to respond with this order, the procedure will stop and display **Base Station Challenge Order Not Received**.

3 The 4300 will calculate the AUTHBS value and send the Base Station Challenge Order Confirmation message to the mobile. The mobile should respond with the SSD Update Order Confirmation message (including a pass/fail status). If the mobile fails to respond with this message, the procedure will stop and display **SSD Update Order Confirmation Not Received**.

4 If the procedure completes, then the pass/fail status will be displayed. The RANDBS number sent by the mobile and the AUTHBS number calculated by the 4300 is also be displayed.

A-key

Pressing the **A-key** soft key allows entry of the 26-digit A-key. The first 20 digits represent the unique A-key as stored internal to the mobile and the last 6 digits represent the checksum value.

A-key Checksum

Pressing the **A-key Checksum** soft key allows the automatic calculation of the last 6 digits of the A-key.

Automatic RANDSSD

Pressing the **Automatic RANDSSD** soft key enables/disables the automatic generation of a new RANDSSD random number each time the SSD Update procedure is started.

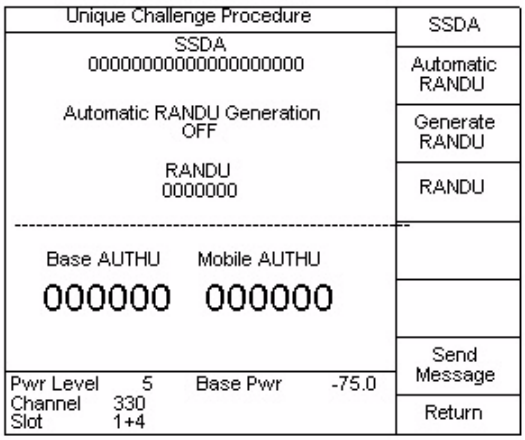
Generate RANDSSD

Pressing the **Generate RANDSSD** soft key causes the immediate generation of a new RANDSSD random number.

RANDSSD

Pressing the **RANDSSD** soft key allows entry of a RANDSSD value with the numeric keypad or arrow keys.

Unique Challenge



When the **Send Message** soft key is pressed, the Unique Challenge Procedure is initiated. This is the second step in testing the mobile's authentication capability

The 4300 requires a valid SSDA value prior to successfully performing this procedure. Normally, the SSDA value is automatically generated as part of the SSD Update procedure (Refer to "Alert With Info Message" on page 189.). Alternatively, the SSDA may be entered by pressing the **SSDA** soft key and using the numeric keypad or arrow keys. If the phone's SSDA value is not known, then the authentication process may still be tested by performing the Unique Challenge Procedure and verifying that the procedure fails.

The Unique Challenge procedure consists of the following steps:

1 The 4300 sends the Unique Challenge Order (including the RANDU value) to the mobile. The mobile should respond with the Unique Challenge Order Confirmation message (including its AUTHU value). If the mobile fails to respond with this message, the procedure will stop and display Unique Challenge Order Confirmation Not Received.

2 The 4300 compares the mobile's AUTHU value with the expected AUTHU value. If they match, then the authentication procedure passed. If they do not match, then the authentication failed. The pass/fail status will be displayed along with the expected Base AUTHU and the Mobile AUTHU sent by the mobile.

SSDA

Pressing the **SSDA** soft key allows entry of the 20-digit SSDA value. If the SSD Update Procedure passed successfully, then there is no need to enter the SSDA value.

Automatic RANDU

Pressing the **Automatic RANDU** soft key enables/disables the automatic generation of a new RANDU random number each time the Unique Challenge procedure is started.

Generate RANDU

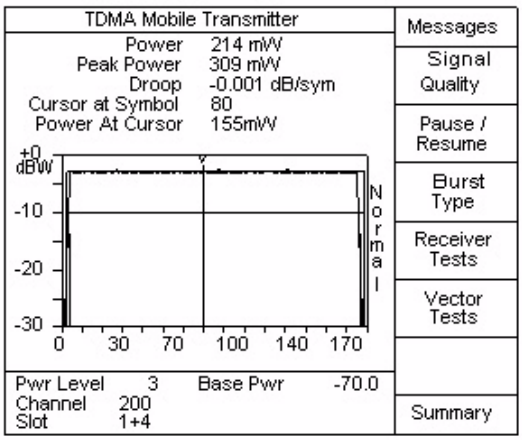
Pressing the **Generate RANDU** soft key causes the immediate generation of a new RANDU random number.

RANDU

Pressing the **RANDU** soft key allows entry of a RANDU value with the numeric keypad or arrow keys.

Transmitter Tests

When the **Transmitter Tests** soft key is pressed, the 4300 performs several tests relating to the performance of the mobile's transmitter. These tests provide essential information on the quality of the transmitter's performance. When the **Transmitter Tests** soft key is pressed, the following screen is displayed:



The graph depicts the mobile's burst envelope over 162 symbols. Use the **RIGHT** and **LEFT** arrow keys to position the cursor at the desired symbol.

Power

The **Power** value is the measured power level at each symbol averaged over the entire burst. The ramp up and ramp down period of the burst is not a factor in the calculation of this value.

Peak Power

The **Peak Power** is the maximum power level measured over the entire burst period.

Droop

Droop is the average change in amplitude per symbol measured over symbols 6 through 162.

Cursor At Symbol

This represents the position of the cursor. One time slot is exactly 162 symbols in length. Use the **RIGHT** and **LEFT** and **up** and **down** arrow keys to change the position of the cursor.

Power At Cursor

The **Power At Cursor** is the measured power level at the symbol where the cursor is positioned.

Handoff

The user may elect to perform a **Handoff** to further evaluate Transmitter performance. Refer to "Handoff" described on page 188 on how to perform a Handoff.

View

The view of the specific burst can be varied by pressing the **View** soft key. By pressing the **View** soft key, the following views are displayed:

- Normal - displays complete burst
- Normal - zoomed to view symbols 0-12
- Normal - zoomed to view symbols 155-170

Zoomed views are not available with the IS-136 or CUSTOM-136 options.

Pause / Resume

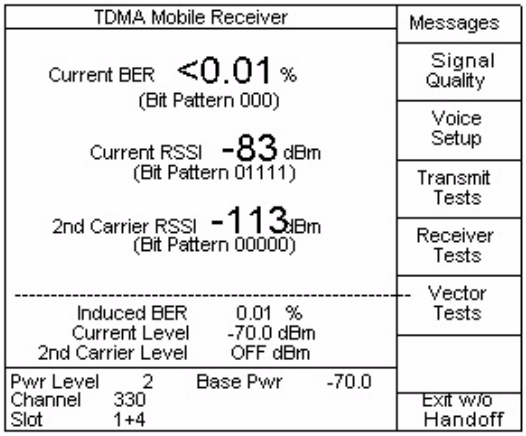
The **Pause/Resume** soft key is used to "freeze" the display to evaluate the response curve. When the **Pause/Resume** soft key is pressed the display will not update until the **Pause/Resume** soft key is pressed.

Burst Type

Use the **Burst Type** soft key to toggle between normal and shortened burst types.

Receiver Tests

When the **Receiver Tests** soft key is pressed, the 4300 performs several tests relating to the performance of the mobile's receiver. These tests provide essential information on the quality of the receiver's performance. When the **Receiver Tests** soft key is pressed, the following screen is displayed:



Much of the information displayed on this screen is the same as the **TDMA Summary** screen with the exception of the following additional information:

- Bit Patterns associated with the BER, RSSI, and 2nd Carrier RSSI
- Induced BER
- Current Base Power Level
- 2nd Carrier Level

This information provides a means of determining the overall performance of the Mobile's Receiver.

Current BER

BER (Bit Error Rate) is an estimate of bit error rate on the forward traffic channel, as measured by the mobile receiver and reported in a channel quality message. The following table provides the minimum standard for Rx reported BER, with a TX induced BER. Refer to the Signal Quality menu in order to adjust the current TX induced BER.

TX Induced BER (%)	RX	Reported BER interval (%)
0		less than 0.01
0.013 to 0.08	0.01	to less than 0.1
0.133 to 0.4	0.1	to less than 0.5
0.667 to 0.8	0.5	to less than 1.0
1.333 to 1.6	1.0	to less than 2.0
2.667 to 3.2	2.0	to less than 4.0
5.333 to 6.4	4.0	to less than 8.0
10.667		greater than 8.0

Current RSSI

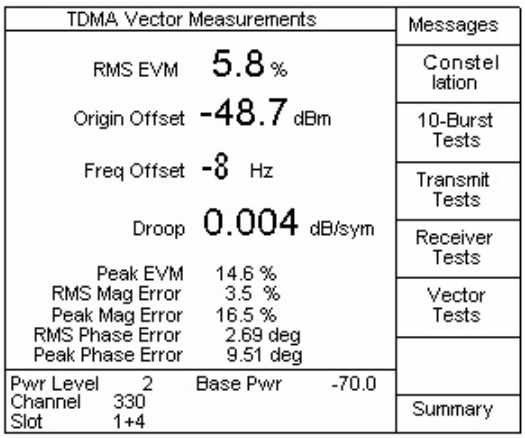
RSSI (Received Signal Strength Indicator) is the mobile's measurement of the base station's signal power as measured by the mobile. The RSSI will increase monotonically with received RF signal strength. The range for the measured RSSI is -113 to -53 dBm in increments of 2 dB.

2nd Carrier RSSI

2nd Carrier RSSI is the mobile's measurement of the 2nd RF Carrier's power as measured by the mobile. The RSSI will increase monotonically with received RF signal strength. The range for the measured RSSI is -113 to -53 dBm in increments of 2 dB. The 2nd Carrier power may be defined using the TDMA Signal Quality Setup screen.

Vector Tests

The Vector Tests provide a graphical analysis of the modulation and signal processing performance of a TDMA product. The Constellation and 10-Burst displays allow the user to quickly evaluate a mobile's performance. When the **Vector Tests** soft key is pressed, the following screen is displayed:



RMS EVM

The RMS EVM (Error Vector Magnitude) is an indication of the transmitters ability to generate the ideally modulated signal. Modulation accuracy is measured by determining the RMS difference between the actual transmitted signal and the ideal signal, measured over symbols 6 through 162 of a burst.

Origin Offset

Another indication of modulation accuracy is Origin Offset. Origin Offset is also an indication of the transmitters ability to generate the ideally modulated signal. Origin Offset values are presented in dBc.

Frequency Offset

Frequency Offset provides the user with an indication of the transmitters ability to maintain an assigned carrier frequency. The frequency offset in any burst should be less than $\pm$200 Hz. Frequency offset is determined with respect to a frequency value 45 MHz lower than the frequency of the corresponding base station transmit signal, as measured at the mobile receiver.

Droop

Droop is the average change in amplitude per symbol measured over symbols 6 through 162 of the burst.

Peak EVM

The maximum EVM measured over an entire burst.

RMS Magnitude Error

The RMS EVM can be broken down into its components of magnitude and phase. The RMS Mag Error is computed by taking the magnitude error for each of symbols 6 through 162 and calculating the root-mean-square value.

Peak Mag Error

The maximum Mag Error measured over an entire burst.

RMS Phase Error

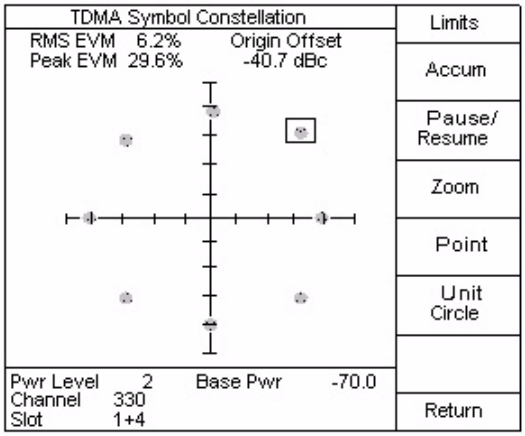
This value represents the root-mean-square phase error computed over symbols 6 through 162 of a burst.

Peak Phase Error

The maximum Phase Error measured over an entire burst.

Constellation

Press the **Constellation** soft key to view a graphical representation of a burst. The graph depicts a 162 symbol burst distribution. The symbols are distributed as shown due to the $\pi/4$ DQPSK signal.



Limits

Press the **Limits** soft key to place circles on the graph that correspond to the peak vector error limit. These limit circles are centered around the ideal symbol points. These limit circles can be used to evaluate the mobile's deviation from the perfect mobile. Refer to the Performance Specification Setup menu to set the limits.

Accumulation

In normal operations of this test mode, the graph will update upon subsequent bursts. By pressing the **Accum** soft key, the 4300 does not clear the displayed burst when updating with new burst data. This will cause an accumulation of the symbols displayed on the graph. An Accum On message will appear in the lower left portion of the display when the Accum mode is active.

Pause/Resume

The **Pause/Resume** soft key can be used to "freeze" the display to temporarily prevent any updating from occurring. This is helpful when closely evaluating a specific burst. A Pause message will appear in the lower right portion of the display when the Pause mode is active.

Zoom/Point

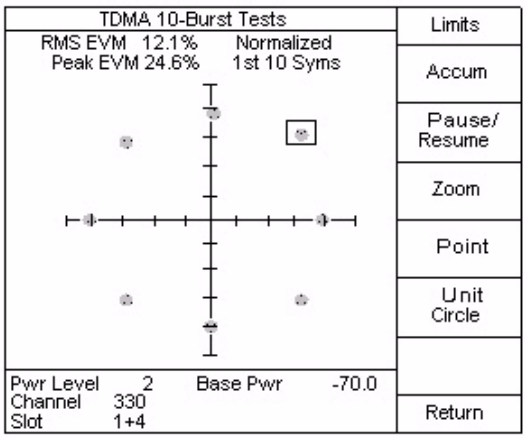
The **Zoom/Point** soft keys work in conjunction to view individual clusters of symbols. Use the **Point** soft key to select the desired cluster and the **Zoom** soft key to zoom in on it.

Unit Circle

Press the **Unit Circle** soft key to place a unit circle on the display. This is helpful when evaluating modulation performance. Press the **Return** soft key to return to the **TDMA Vector Measurements** screen.

10–Burst Tests

The normalized error vector magnitude during the first 10 symbols (20 bits) of a burst following ramp-up, must have an RMS value of less than 25% when averaged over 10 bursts within a 1 minute interval. The 10-Burst Test provides this data in numerical and graphical form. Press the **10–Burst Tests** soft key to view this information.

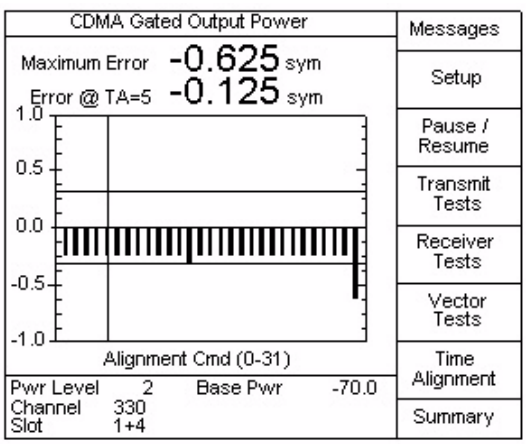


The operation of the associated soft keys is identical to the Constellation mode. Refer to the previous Constellation test information.

10-Burst Tests is not available with the IS-136 or CUSTOM-136 options.

Time Alignment

Time Alignment is the process by which the Mobile Station adjusts its transmit burst timing. The process is required in order to prevent bursts from multiple Mobile Stations occupying the same channel from colliding at the Base Station. Press the **Time Alignment** soft key to view the **Time Alignment test** screen.



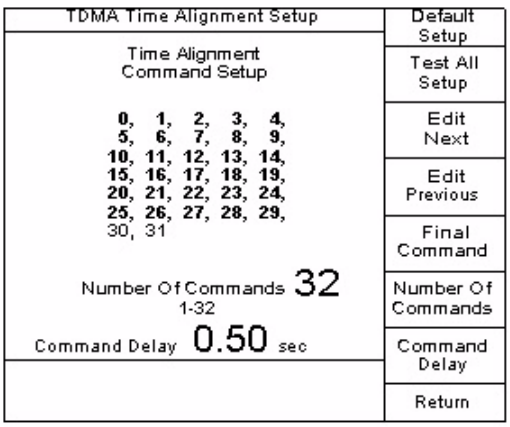
The graph displays the Time Alignment Error associated with the alignment command. There are a possible 31 alignment commands that can be issued. Each command corresponds to an alignment shift of 1/2 symbol. For example; if an alignment command of 1 is issued, the mobile will adjust its timing 1/2 symbol, an alignment command of 24 corresponds to a timing adjustment of 12 symbols.

Pause/Resume

The **Pause/Resume** soft key is used to "freeze" the display to temporarily prevent any updating from occurring. A Pause message will appear in the lower left portion of the display when the Pause mode is active. Press the **Pause/Resume** soft key again to resume the test.

Setup

Press the **Setup** soft key to select the Time Alignment testing parameters.



Default Setup

IS-55-A (3.6.2) requires as a minimum the testing of the following Time Alignment Commands:

5, 9, 16, 19, 24, 30, 25, 18, 11, 4, and 0

The **Default Setup** soft key automatically programs the unit to perform the required testing of these Time Alignment Commands.

Test All Setup

The **Test All Setup** soft key defaults to testing all Time Alignment Commands.

Edit Next/Edit Previous

Use the **Edit Next/Edit Previous** soft keys to move the edit cursor around the Time Alignment Commands. This allows the user to vary the sequence of the Time Alignment Commands.

Final Command

Press the **Final Command** soft key to limit the number of Time Alignment commands to be tested. The currently selected Time Alignment command becomes the last command in the sequence to be tested. All commands to the right of this final command are removed.

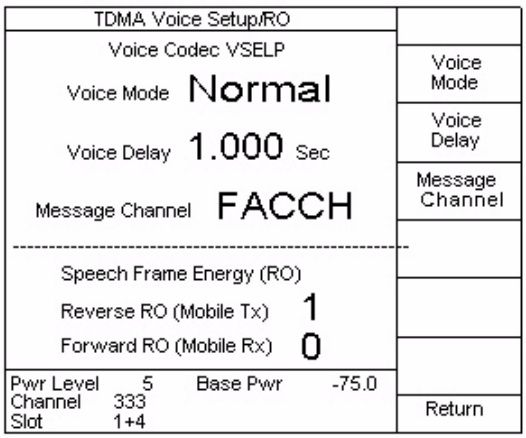
Number Of Commands

Use the **Number Of Commands** soft key to enter the number (up to 32) of Time Alignment Commands that are tested.

Command Delay

Use the **Command Delay** soft key to enter the amount of time delay between when the mobile is commanded to change its Time Alignment and when the Time Alignment is measured.

Voice Tests



When the **Voice Setup** soft key is pressed, the 4300 reports the speech frame energy for both the forward and reverse TDMA traffic channels. The TDMA voice testing parameters may also be set up from this screen. (Refer to "Voice Setup" on page 182.)

Reverse RO (Mobile Tx)

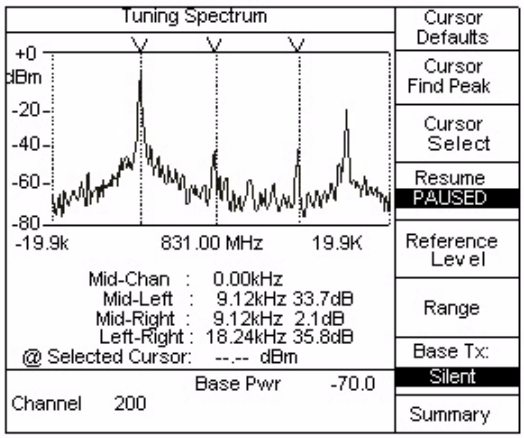
This encoded value represents the energy value for one frame as transmitted by the mobile. This reflects the average signal power in the input speech over a 20 millisecond interval.

Forward RO (Mobile Rx)

This encoded value represents the energy value for one frame as received by the mobile. This reflects the average signal power in the received speech over a 20 millisecond interval.

Tuning Spectrum Monitor

This function, when used with a mobile manufacturer's service software, supports tuning a mobile transmitter's I. Q. modulation. The service software is used for placing the mobile into a special tuning mode and changing the tuning parameters. The 4300 Tuning Spectrum Monitor is then used to monitor the power output at specific frequencies. Tuning is accomplished by minimizing the power at these frequencies through changing the mobile's tuning parameters. All the measurements necessary for tuning the mobile are available via the remote serial and GPIB ports of the 4300.



Press the soft key **7** in the **Service Mode Summary** screen to access the **Tuning Spectrum** screen. A description of the soft key functions follows:

Cursor Defaults / [S1]

Moves all the cursors to their default locations at the channel frequency and ± 9.12 kHz.

Cursor Find Peak / [S2]

Moves the selected cursor to the highest peak within a 9.12 kHz search band centered about the selected cursor's starting position. If ALL cursors are selected, then the search will be performed about each cursor from left to right.

Cursor Select / [S3]

The selected cursor is shown by a downward pointing arrow at the top of the cursor. Press Cursor Select to toggle between; ALL, LEFT, RIGHT and MID. When ALL is selected, the '@ Selected Cursor:' measurement field will be dashes, "——".

RESUME/PAUSED / [S4]

Toggles the measurement update state between ACTIVE and PAUSED. The key will always show the current state in capital letters. The action that will be performed next when pressed is shown in normal sentence case.

During measurements, 'ACTIVE' is shown highlighted with dashed line encircling it. Otherwise, 'PAUSED' is shown highlighted in reverse video.

Reference Level / [S5]

This permits the **UP** and **DOWN** arrow keys to change the upper value on the power axis of the graph. This is limited to a range between +40dBm and -60dBmThe lower limit is determined by the setting of the 'Range' value, as explained in the following text. (The power axis will never show a value greater than +40dBm or a value less than -100dBm.)

Range / [S6]

This lets the **up** and **down** arrow keys change the lower value on the power axis by increasing or decreasing the range. The up arrow increases the range from 40dB to 100dB in steps of 20dBThe range cannot be increased if the lowest power axis value is already at -100dBm(The power axis will never show a value greater than +40dBm or a value less than -100dBm.)

Base Tx / [S7]

Cycles the transmitted data stream between; Silent, Ones, Zeros and Random. The selection is indicated by the current value being highlighted on the second line of the menu-key. These correspond to: a digital traffic channel (DTC) with 0's for voice data; transmitting all 1's with no DTC; transmitting all 0's with no DTC; and transmitting a pseudo-random code respectively.

Summary

Exits to the **TDMA Summary** screen.

Tuning Procedure

1. Connect the mobile phone to a PC's serial port running a manufacturer-specific service program.
2. Connect the mobile's antenna output to the 4300.
3. Use the service program to place the mobile in the I. Q. Transmit tuning mode.
4. Place the 4300 in the TDMA service mode on the same channel as used by the mobile, and select Tuning Spectrum.
5. Using the "Cursor Find Peak" and "Cursor Select" functions, position the cursor at the channel frequency, the major peak, and the minor peak opposite from the major.

> Pressing "Cursor Find Peak" is usually sufficient.

6. Minimize the power at mobile's transmit channel center frequency. To accomplish this, first adjust the 'I' parameter in the service program, which updates the mobile's 'I' setting and changes the output power at the frequency of interest.
7. Adjust the 'Q' value similarly.

8 Compare the power at the frequency of interest to maximum peak power transmitted from the mobile, often -9.1125kHz from the channel center. If this difference is greater than some minimum value, the mobile is successfully tuned.

9 If the service software permits, tune the phase balance similarly. This will show up on a sideband on the opposite side of the channel frequency from the major power sideband.

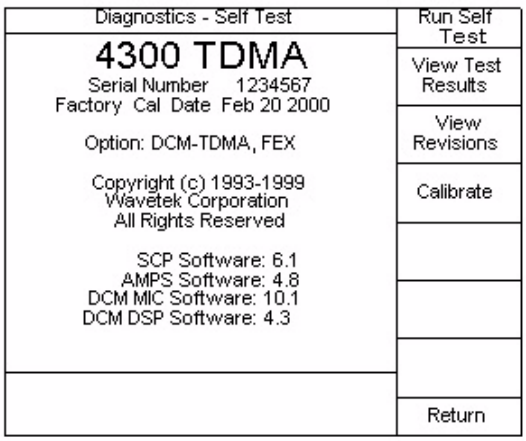
Operation

When a digital control channel is being transmitted, the slot number(s) are displayed at the bottom of the screen next to the System (A or B). While on a digital control channel, you may perform a registration, origination, or page. Refer to for more information on how to perform a mobile registration, origination, or page.

Verifying the PCS option installation for TDMA

The following information provides detailed instructions on how to perform various operations on a PCS product with the FEX module installed in the 4300.

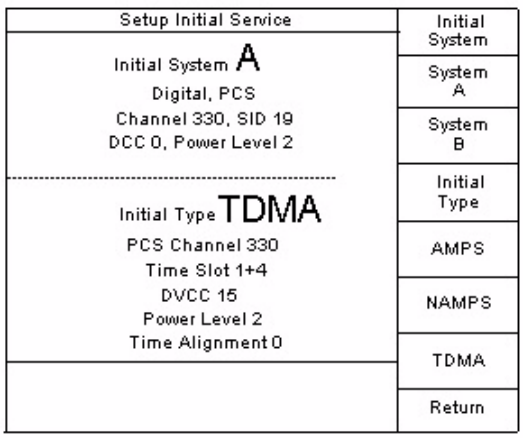
To verify that the FEX option is enabled in your unit. Press the **DIAG** key to display information on the unit.



If the PCS option is not displayed as an option, contact a Willtek Technical Assistance Center; see page xvi for details.

Setting up the TDMA option for PCS

Prior to performing any tests on a PCS product, specific testing parameters must be set up. System setup is used to define initial service parameters of the mobile under test. The following screen is displayed when the **System Setup** soft key is pressed.



None of the Control Channel initial settings take affect until the System Setup screen is exited.

Initial System

The **Initial System** soft key can be used to toggle between System A or B. Separate setups are required for the A and B systems. The UP and DOWN arrow keys can also be used to toggle between settings, providing that the **Initial System** soft key was previously pressed.

System A

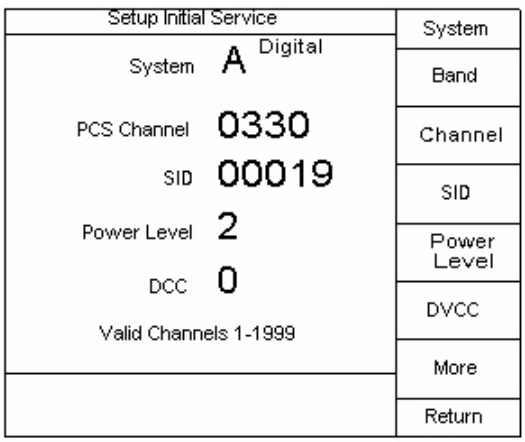
Pressing the **System A** soft key allows access to the system initial service parameters. From this screen the following control channel parameters can be set:

- System
- SID
- More
- Band
- Power Level
- Channel
- DVCC/DCC

(Digital Control Channels)

- Time Slot & Rate
- Time Alignment
- Access Burst

Most of the parameters of the local system can be verified with your local carrier contact.



Editing System Parameters

System

The **System** soft key can be used to toggle between System A or B. Separate setups are required for the A and B system.

Band

The **Band** soft key is used to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a FEX band selection.

Channel

The user can select the mobile/portable's control channel. After activating this field by pressing the **Channel** soft key, the desired channel can be selected by entering the desired value on the numeric keypad and pressing the **ENTER** key. The UP and DOWN arrow keys may also be used for setting the channel. The range of valid channels is displayed at the bottom of the screen.

SID

The SID is a number which identifies the customer's "Home" system. To edit the SID, press the **SID** soft key which places the selection box around the current SID number. Enter the desired number using the 4300's numeric keypad, followed by the **ENTER** key, or use the UP and DOWN arrow keys.

Power Level

Press the **Power Level** soft key to highlight the power level. When highlighted use the UP and DOWN arrow keys or the numeric keypad to select the desired power level. Digital Control Channel power levels are from 0-10, whereas analog channel power levels are from 0-7.

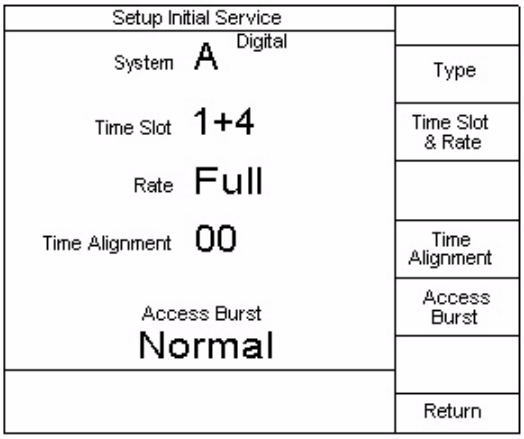
DVCC/DCC

DCC (Digital Color Code) is a 2 bit value (range 0-3) that is used to distinguish cell sites for analog systems. DVCC (Digital Verification Color Code) is an 8-bit code (range 0-255) that is sent by the base station to the mobile station for digital control channel systems and is used for the generation of the CDVCC. CDVCC is a 12-bit data field containing the 8-bit DVCC and 4 protection bits, sent in each time slot to and from mobile stations and base stations. It is used to indicate that the correct rather than co-channel data is being decoded. The meaning of this field and it's corresponding range limits are based on the Type selection (digital or analog).

Press the **DVCC** soft key to highlight the DVCC number. When highlighted use the **up** and **down** arrow keys or the numeric keypad to select the desired DVCC.

More

Press the **More** soft key to display the following additional setup parameters:



Type

The **Type** soft key can be used to toggle between Digital control channel (IS-136) and AMPS control channel (IS-54). The word Digital next to the system indicates that the digital control channel type is selected. If not displayed, the type is analog.

Time Slot

The frame length on each digital TDMA RF channel is 40 milliseconds. Each frame consists of six equally sized time slots (1-6), exactly 162 symbols in length. Each full rate traffic channel utilizes two equally spaced time slots of the frame (1&4, 2&5, or 3&6). Each half rate traffic channel utilizes one time slot of the frame.

To select the desired Time Slot, press the **Time Slot & Rate** soft key. Continue to press the soft key until the desired Time Slot & Rate is displayed.

The 4300 only supports FULL RATE phones.

Time Alignment

The Time Alignment parameter specifies how the mobile's burst on the reverse digital control channel are aligned in time with the base station's (4300) slot clock, referenced to a standard 45 symbol offset. The user may enter a specific time alignment parameter that will be used when the initial traffic channel (call) is established. The valid range for the time alignment parameter is 0-31. Each increment represents a 1/2 symbol adjustment in time alignment.

Press the **Time Alignment** soft key to highlight the time alignment number. When highlighted use the **up** and **down** arrow keys or the numeric keypad to select the desired time alignment.

Access Burst

The access burst specifies which burst size (normal or abbreviated) the mobile/portable should use for the digital control channel. The desired access burst size may be selected by pressing the **Access Burst** soft key until the desired size is displayed.

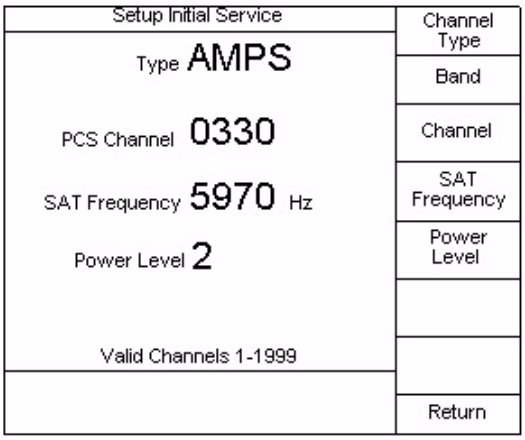
System B

Editing System B parameters is identical to "System A" described on page 209 in operation.

Initial Type

The 4300 is capable of simulating several programming formats. These formats include; AMPS, NAMPS, and TDMA (optional). The initial type and its associated parameters are used when a mobile origination or page is performed. To select an Initial Type, press the **Initial Type** soft key until the desired type is displayed. The UP and DOWN arrow keys can also be used to toggle between settings. This will be the type of voice channel assigned on the initial voice channel assignment.

To edit parameters of an AMPS mobile under test, press the **AMPS** soft key. The following screen is displayed.



Channel Type

To change to a different voice Channel Type Setup screen, press the **Type** soft key until the desired type is displayed.

Band

The **Band** soft key is used to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a PCS band selection.

Channel

The desired channel can be selected by pressing the **Channel** soft key, and then entering the desired value on the numeric keypad and pressing the **ENTER** key. The range of valid channels is displayed at the bottom of the screen.

SAT Frequency

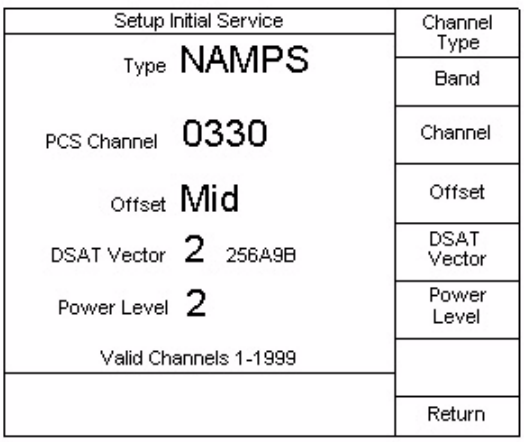
By repeatedly pressing the **SAT Frequency** soft key, this parameter can be set to one of the following frequencies: 5970 Hz, 6000 Hz, 6030 Hz.

Power Level

Press the **Power Level** soft key to highlight the power level. When highlighted use the UP and DOWN arrow keys or the numeric keypad to select the desired power level. Valid AMPS power levels are from 0-7.

NAMPS

To edit parameters of a NAMPS mobile under test, press the **NAMPS** soft key. The following screen is displayed.



Channel Type

To change to a different voice Channel Type Setup screen, press the **Type** soft key until the desired type is displayed.

Band

The **Band** soft key is used to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a PCS band selection.

Channel

The desired channel can be selected by pressing the **Channel** soft key, and then entering the desired value on the numeric keypad and pressing the **ENTER** key. The range of valid channels is displayed at the bottom of the screen.

Offset

The **UP** and **DOWN** arrow keys or the **Offset** soft key can be used to select the desired NAMPS channel offset. The selections are: Low, Mid, and High.

DSAT Vector

To edit the DSAT Vector, press the **DSAT Vector** soft key which places the selection box around the current DSAT Vector selection. Enter the desired number using the 4300's numeric keypad, followed by the **ENTER** key, or use the **UP** and **DOWN** arrow keys.

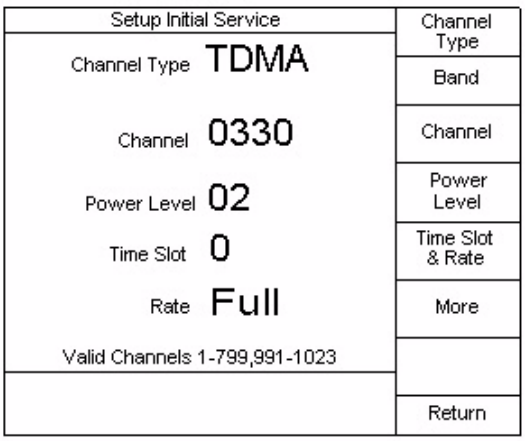
Power Level

Press the **Power Level** soft key to highlight the power level. When highlighted use the **UP** and **DOWN** arrow keys or the numeric keypad to select the desired power level. Valid AMPS power levels are from 0-7.

TDMA

Channel Type

To change to a different voice Channel Type Setup screen, press the **Type** soft key until the desired type is displayed.



Band

The **Band** soft key is used to toggle between the cellular and PCS operating bands. The word PCS is displayed in front of the channel to indicate a PCS band selection.

Channel

The desired channel can be selected by pressing the **Channel** soft key, and then entering the desired value on the numeric keypad and pressing the **ENTER** key. The range of valid channels is displayed at the bottom of the screen.

Power Level

Press the **Power Level** soft key to highlight the power level. When highlighted use the UP and DOWN arrow keys or the numeric keypad to select the desired power level. Valid TDMA power levels are from 0-10.

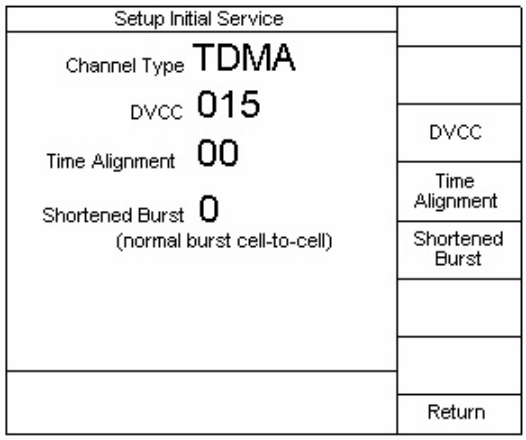
Time Slot

The frame length on each digital TDMA RF channel is 40 milliseconds. Each frame consists of six equally sized time slots (1-6), exactly 162 symbols in length. Each full rate traffic channel utilizes two equally spaced time slots of the frame (1&4, 2&5, OR 3&6). Each half rate traffic channel utilizes one time slot of the frame.

To select the desired Time Slot, press the **Time Slot & Rate** soft key. Continue to press the soft key until the desired Time Slot & Rate is displayed.

The 4300 only supports FULL RATE phones.

Press the **More** soft key to display the following additional setup parameters:



DVCC

DVCC (Digital Verification Color Code) is a digital 8-bit code that is sent by the base station to the mobile station and is used for the generation of the CDVCC. CDVCC is a 12-bit data field containing the 8-bit DVCC and 4 protection bits, sent in each time slot to and from mobile stations and base stations. It is used to indicate that the correct rather than co-channel data is being decoded.

Press the **DVCC** soft key to highlight the DVCC number. When highlighted use the UP and DOWN arrow keys or the numeric keypad to select the desired DVCC.

Time Alignment

The Time Alignment parameter specifies how the mobile's burst on the reverse channel are aligned in time with the base station's (4300) slot clock, referenced to a standard 45 symbol offset. The user may enter a specific time alignment

parameter that will be used when the initial traffic channel (call) is established. The valid range for the time alignment parameter is 0-31. Each increment represents a 1/2 symbol adjustment in time alignment.

Press the **Time Alignment** soft key to highlight the time alignment number. When highlighted use the **up**UP and DOWN arrow keys or the numeric keypad to select the desired time alignment.

Shortened Burst

This parameter describes the initial type of Burst that the mobile is directed to use either for handoffs or when a voice channel is initially established. The selections are:

- (0) normal burst for cell-to-cell handoffs
- (1) normal burst within cell
- (2) shortened burst for cell-to-cell handoffs
- (3) reserved

Press the **Shortened Burst** soft key to highlight the burst number. When highlighted use the UP and DOWN arrow keys to select the desired burst.

Operating the TDMA option with PCS

Once setup operations are complete, testing of the mobile is performed in accordance with chapter 3 and with this chapter. Refer to these chapters for detailed information on how to perform a mobile registration, origination, or page.

Custom IS-136 Option

6

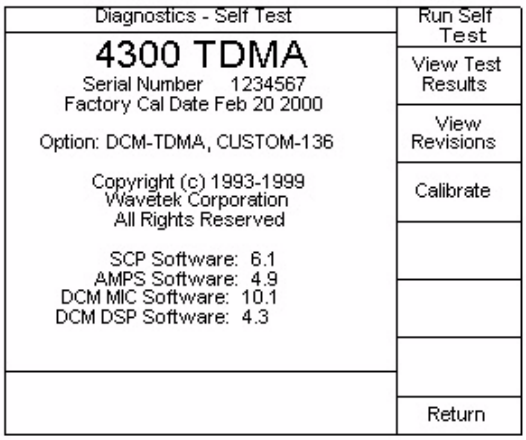
This chapter provides task-based instructions for using the 4300 Series Mobile Service Tester features for the Custom IS-136 Option. Topics discussed in this chapter are as follows:

Introduction

The following information provides detailed instructions on how to perform various operations on a cellular product with the CUSTOM-136 option enabled in the 4300.

Verifying the TDMA option installation

To verify that the CUSTOM-136 option is enabled in your unit. Press the **DIAG** key to display information on the unit.



If the CUSTOM-136 option is not displayed as an option, contact Willtek at any of the addresses given in "Technical assistance" on page xvi.

Operating the Custom-136 option

Operation of the custom digital control channel is performed using remote commands and/or the test sequence.

Overview

The CUSTOM-136 option provides the capability to perform IS-136 digital control channel data transmitter and receiver functions. The user provides the data to be transmitted by the 4300 via remote port messages (GPIB or RS-232), and queries the 4300 for a dump of the most recent data received from the phone.

Remote Mode Forward Operation (FDCCH)

The 4300 will accept user data supplied via a remote interface (GPIB or RS-232) and transmit the data to the attached mobile station. The necessary remote commands specify the physical channel parameters, the hyperframe data, and the instrument state.

Initiating DCCH Remote Mode

The user initiates the DCCH remote mode by issuing the following command:

```
CALL:CONTrol:TYPE    CUSTom
```

This command selects the type of control channel to use for system A (or B). When CUSTom is selected, the 4300 will output the hyperframe as defined by the CALL:CONTrol:DCCH:CUSTom:DATA command.

Specifying DCCH channel parameters

The user will enter commands specifying the slots to be used (1 & 4, or 2 & 5, or 3 & 6) for the DCCH (only 1 pair can be used), DCCH channel number and rate. The commands used to specify these parameters are shown below.

```
CALL:CONTrol:DCCH:SLOT <slot select>
```

This command selects the time slot to use for the digital control channel. If full rate traffic channel is selected, then a slot select value of either 1 or 4 shall be interpreted as meaning slots 1&4, 2 or 5 shall mean 2&5, and 3 or 6 shall mean 3&6.

```
CALL:CONTrol:DCCH:RATE <rate select>
```

This command selects the rate to use for the digital control channel.

```
CALL:CONTrol:DCCH:CHANnel < channel number >
```

This command selects the physical channel to be used for the digital control channel.

Entering slot data for a hyperframe

Single hyperframe

The user will initialize a complete FDCCH hyperframe by repeating the command shown below. Each data command will contain 1 slot of layer 3 data and associated layer 2 header field. The data in the command should be formatted as shown below.

```
CALL:CONTrol:DCCH:CUSTom[:DATA] <superframe
index>, <superframe phase>, <channel_type>, <data>
[, <sync>, <SCF>, <CSFP>]
```

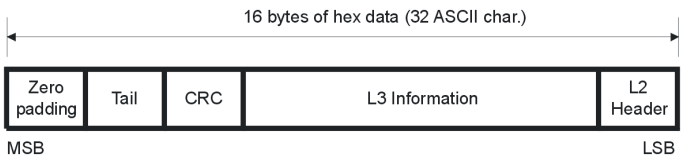


Figure 1 Slot Data Format

This command sets the data to be transmitted in the selected superframe phase of a digital control channel.

The data represents 109 bits of layer 3 data and associated layer 2 header field. Every 2 characters represent 2 hexadecimal digits, or 1 byte, or 8 bits of data. The least significant 109 bits are used.

The channel type represents the logical subchannel - FBCCh, EBCCh, SBCCh, SPACh, or reserved.

The sync represents 28 bits to be transmitted at the beginning of the slot.

The SCF represents 22 bits of Shared Channel Feedback data.

The CSFP represents 12 bits of Coded Superframe Phase data.

The sync, SCF, and CSFP are all optional. If not included, then the 4300 will determine the proper values for this data.

To create an entire hyperframe, this command must be sent 64 times, once for each superframe phase for both the primary and secondary superframe. Once the data has been set and the CALL:CONTrol:TYPE is set to CUSTom, then the CALL:FCC ON command will cause the new hyperframe to be built and transmitted after completion of the current hyperframe.

Example: `CALL:CONT:DCCH:CUST 0, 2, FBCCh, "012233445566778899AABBCCDD", DEF, #h3FF`

This sets the data in SF phase 2 of the primary superframe and sets the SCF value to hexadecimal 3FF. The 4300 will determine the proper default values for sync and CSFP.

The 4300 will take the slot data and place it into a hyperframe buffer. The slots in the buffer will be sequentially extracted, formatted into a full burst by inserting the proper sync word, SCF, CSFP, and reserved field and then transmitted.

The 4300 will repeatedly transmit the hyperframe buffer unless the user either changes the logical channel (slot) contents, or specifies a finite number of repeats for the hyperframe. The user can upload new channel (slot) contents at any time, but they will not be inserted into the hyperframe until a terminating command is issued (CALL:CONTrol:CUSTom:TRANsmit). The terminating command does not terminate DCCH transmission, but simply signals the 4300 that no more slot data is to be entered and that the new data should be inserted into the hyperframe buffer. Hence, the user may change the channel (slot) contents "on the fly". If the new slot data is received while in the midst of transmitting the current hyperframe, the new data will take effect with the next hyperframe.

The user need only enter the data for the "live" DCCH slots. For example, if the user specifies that the DCCH will use slots 1 & 4 in the physical channel, he need only supply the data for these slots (up to the number needed for an entire hyperframe). The non-DCCH slots will be filled with zeros and transmitted with the sync words appropriate to those slots.

The transmit command (call:fcc on) can be issued at anytime, regardless of the state of the transmit buffer, i.e., even if a complete set of hyperframe data has not been uploaded, transmission will be initiated upon receipt of this command. Any uninitialized logical channel slots will be transmitted with zeros in the data fields. The default sync and CSFP fields will also be inserted in the bursts.

Specifying multiple hyperframes, or changing the contents of the current hyperframe

The user can update the data for a particular slot or group of slots by issuing the slot data commands with new slot data and then the transmit command.

Example 1: (sequence of 3 hyperframes, the last transmitted continuously)

```
CALL:CONTrol:DCCH:TYPE CUSTom
CALL:CONTrol:DCCH:CUSTom:CLEar
CALL:CONTrol:DCCH:CUSTom
0,0,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,2,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,3,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"EEDDCCBBAA998877665544332211"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00000000000000000000000000"
CALL:FCC ON
```

This will cause a custom digital control channel to be transmitted for 3 hyperframes with the first 4 superframe phases identical, followed by 3 hyperframes with the superframe phase 1 reversed, followed by continuous hyperframes with the superframe phase 1 set to all 0's.

Example 2: (sequence of 3 hyperframes, then stop)

```
CALL:CONTrol:TYPE CUSTom
CALL:CONTrol:DCCH:CUSTom:CLEar
```

```
CALL:CONTrol:DCCH:CUSTom
0,0,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,2,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,3,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"EEDDCCBBAA998877665544332211"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00000000000000000000000000"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 5
CALL:FCC ON
```

This will cause a custom digital control channel to be transmitted for 3 hyperframes with the first 4 superframe phases identical, followed by 3 hyperframes with the superframe phase 1 reversed, followed by 5 hyperframes with the superframe phase 1 set to all 0's.

After terminating the entry of new slot contents with the transmit command, the updated slots are transmitted in the next hyperframe. Only the contents of the specific slots are changed. All other slots remain the same. This allows the user to do things like independently manipulate the PCH and ARCH, or change any other logical channel type without reentering the entire hyperframe buffer.

Each time the "call:fcc on" command is issued, the receive buffer is also cleared. Hence, the user should query for a data dump before changing the hyperframe contents, unless the buffer contents are of no interest.

Clearing the hyperframe buffer

The user may clear the hyperframe transmit buffer by issuing the following command:

```
CALL:CONTrol:DCCH:CUSTom:CLEar
```

This command is used to clear the custom digital control channel hyperframe data. For each of the 64 superframe phases of the custom digital control channel, the 109 bits of data are set to 0 and the sync, SCF, and CSFP are determined by the 4300.

Controlling the number of times a hyperframe is transmitted

The user may specify the number of times a hyperframe is transmitted by using the following command:

```
CALL:CONTrol:DCCH:CUSTom:TRANsmit<repeat count>
```

This command is used to define the number of times the previously defined hyperframe should be transmitted on the digital control channel. The CALL:FCC ON command will begin transmission on the digital control channel. Note that this command may be used to specify a sequence of hyperframes to be transmitted on the digital control channel.

Example 1: (1 continuous hyperframe)

```
CALL:CONTrol:TYPE CUSTom
CALL:CONTrol:DCCH:CUSTom:CLEar
CALL:CONTrol:DCCH:CUSTom
0,0,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,2,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,3,FBCCh,"00112233445566778899AABBCCDD"
CALL:FCC ON
```

This will cause the custom digital control channel hyperframe to be transmitted continuously.

Example 2: (sequence of 3 hyperframes, the last transmitted continuously)

```
CALL:CONTrol:TYPE CUSTom
CALL:CONTrol:DCCH:CUSTom:CLEar
CALL:CONTrol:DCCH:CUSTom
0,0,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,2,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom
0,3,FBCCh,"00112233445566778899AABBCCDD"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"EEDDCCBBAA998877665544332211"
CALL:CONTrol:DCCH:CUSTom:TRANsmit 3
CALL:CONTrol:DCCH:CUSTom
0,1,FBCCh,"00000000000000000000000000"
CALL:FCC ON
```

This will cause a custom digital control channel to be transmitted for 3 hyperframes with the first 4 superframe phases identical, followed by 3 hyperframes with the superframe phase 1 reversed, followed by continuous hyperframes with the superframe phase 1 set to all 0's.

Suspending DCCH transmission

The user can suspend transmission by issuing the following command:

```
CALL:FCC OFF
```

Querying for the current transmit buffer contents

The user may query for the current transmit buffer contents with the following command:

```
CALL:CONTrol:DCCH:CUSTom[:DATA]?<superframe
index>, <superframe phase>
```

This query returns the 109 bits of data in the selected superframe phase of the custom digital control channel.

Specifying access burst size

If in the hyperframe messages entered by the user, the mobile station has been commanded to use abbreviated access bursts, the user must inform the 4300 using the following command:

CALL:CONTrol:DCCH:ABURSt <access burst type>

This command selects the type of access burst to use for the reverse digital control channel.

Remote mode reverse DCCH operation

The 4300 will demodulate the received bursts on the RDCCH and perform sync detection. The data field bits will be stripped from the burst and de-interleaved. The data will then be convolutionally decoded and passed to receive buffer. The buffer holds 250 slots of received data. Only slots with actual data will be written to the buffer.

Extracting the RDCCH buffer contents

To download the contents of the RDCCH buffer, the user will query the using the remote command:

```
CALL:MDATa:DCCH:RACHannel? [<number of bursts>]
```

This query returns the information received from the mobile on the reverse digital control channel. The optional parameter indicates the maximum number of bursts of data to return.

Response: <hyperframe number>, <superframe number>, <superframe phase>, <data>

where:

<hyperframe number>= -1 if an overflow error occurred

= -2 if an underflow has occurred

= nonnegative number = the value of hyperframe counter at the time the data was received. Note the CALL:FCC ON command resets the hyperframe counter.

The hyperframe counter IS NOT themodulo 12 counter contained in the FDCCH.

The counter referred to here is internal to the 4300.

<superframe number>= 0 or 1 within the hyperframe

<superframe phase>= 0 - 31 for the phase number within the hyperframe (if an overflow error occurred, then this is the number of bursts of data missing)

<data> = 32 ASCII characters of data (0-9, A-F) representing the16 bytes of data received from the mobile. The 122 bits of data from the mobile is right justified in the 16 bytes of data.

Example: 3, 0, 23, "00112233445566778899AABBCCDDEEFF", 3, 1, 15,"00112233445566778899AABBCCDDEEFF",...

The first 16 bytes of data was received in the primary super frame, phase 23, within the 3rd hyperframe since the last CALL:FCC ON command. The second 16 bytes of data was received in the secondary super frame, phase 15, within the 3rd hyperframe since the last CALL:FCC ON command.

Example: 3, 0, 23, "00112233445566778899AABBCCDDEEFF", -1, 0, 3, "00000000000000000000000000000000", 3, 1, 15, "00112233445566778899AABBCCDDEEFF",...

This is the same as the previous example except that 3 bursts (slots) of data were received but not saved due to an overflow error.

That any data query sent to the 4300 also clears the receive buffer.

Only data from bursts actually transmitted by the phone will be buffered. The 4300 will normally look for bursts in the assigned DCCH time slot for each TDMA half frame (for example, in slots 1 and 4), but if no burst is found (sync not detected), no data will be stored.

The 4300 will buffer 250 bursts. After 250 bursts have been received, no more buffering will be done, but the number of missed bursts (i.e., bursts received after the buffer is filled) will be counted up to the point a data dump query is issued by the user (maximum count is 32K).

The slot data will be 32 characters of hexadecimal values representing 122 bits of data demodulated from the received burst and 6 bits of zero padding added to the MS bits of the output string to achieve a full 16 bytes, as shown in the figure below.

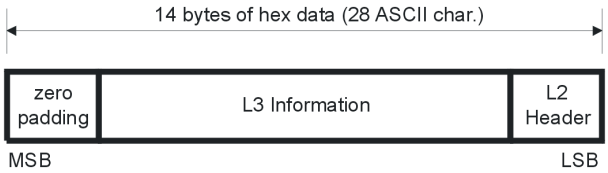


Figure 2 Format for slot data field string.

The data will be right justified, so that the first character will always be 0. The last 2 characters will be the LS byte. The last (or terminating) character in the output stream will always be a carriage return/line feed.

ACELP Vocoder Option

7

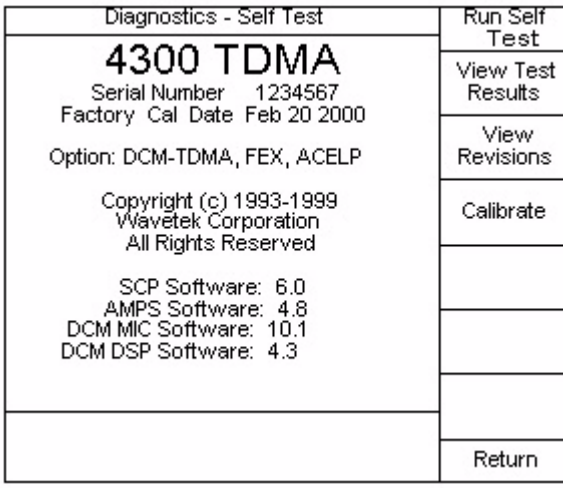
This chapter describes how to set up and use the ACELP Vocoder Option. Topics included in this chapter are as follows:

Introduction

The following information provides detailed instructions on how to perform various operations on a cellular product with the ACELP Voice option enabled in the 4300.

Verifying the ACELP option installation

To verify that the ACELP option is enabled in your unit press the **DIAG** key.



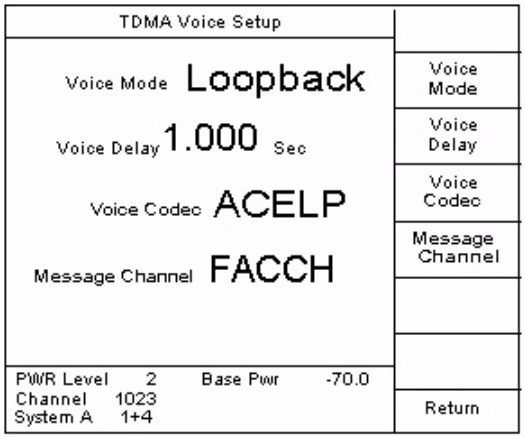
If the ACELP option is not displayed as option, contact Willtek at one of the addresses given on page xvi.

Setting up the ACELP option

Prior to performing any tests on a cellular product, specific voice codec parameters must be set up. These parameters include:

- Voice Codec
- Voice Mode
- Delay

Press the **SETUP** key, then the **TDMA Setup** soft key. Press the **Voice Setup** soft key to access the TDMA Voice Setup menu. The following TDMA Voice Setup screen is displayed:



Voice Mode

When the mobile is up on a call, the Voice mode feature allows the user to select several different voice processing modes which are useful for testing the phone's audio paths. If the unit has the ACELP option and has the Voice Codec set to VSELP, then the Voice mode will be limited to Loopback testing only. If full VSELP testing is required, then the VSELP software must be reloaded into the 4300 (contact Customer Support at 1-800-245-6356).

When **Normal** mode is selected, the user may speak into the handset microphone, and the transmitted audio is heard on the 4300's speaker. This is useful for testing the phone's audio path.

When **Loopback** mode is selected, the user may speak into the handset microphone, and the speech is retransmitted to the phone with a delay and is heard on the phone's speaker. The delay is selectable (refer to "Voice Delay" on page 229).

When **Receiver** mode is selected, the 4300 transmits a pre-stored speech sequence to the phone, thereby testing the phone's receive audio path.

When **Silent** mode is selected, no audio processing is performed by the 4300.

Voice Delay

The Voice Delay works in conjunction with the Loopback voice mode. A specific delay value for the audio signal generated by the user can be selected. This value can be between 0 and 5 seconds, in 1 millisecond increments.

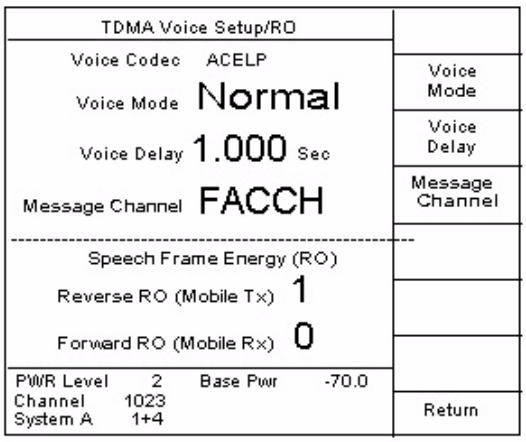
Voice Codec

The user can select the type of voice codec to be used during mobile testing. This selection is limited to ACELP or VSELP. This selection will affect parameters in the DCCH messages along with the Digital Traffic Channel type. The 4300 will automatically select the proper voice codec when establishing a call.

Message Channel

The user can select the type of message channel to be used during mobile testing. The FACCH is a signaling channel for the transmission of control and supervision messages between the base station and the mobile. The FACCH replaces the voice data block whenever system considerations deem it appropriate to do so. The SACCH is a signaling channel in parallel with the speech path used for the transmission of control and supervision messages between the base station and the mobile. Certain messages may be sent over either the SACCH or the FACCH. The information field structure for the messages is identical; however, the forward error correcting methods differ.

Performing voice tests



When the **Voice Setup** soft key is pressed from the TDMA Summary screen, the 4300 reports the speech frame energy for both the forward and reverse TDMA traffic channels. The TDMA voice testing parameters may also be set up from this screen.

Reverse RO (Mobile Tx)

This encoded value represents the energy value for one frame as transmitted by the mobile. This reflects the average signal power in the input speech over a 20 msec interval.

Forward RO (Mobile Rx)

This encoded value represents the energy value for one frame as received by the mobile. This reflects the average signal power in the received speech over a 20 msec interval.

Reloading VSELP Software

When full VSELP voice testing is required, the standard VSELP DCM software must be reloaded into the 4300. The software disk labeled MIC/DSP (VSELP) is required.

If you do not have this disk, contact Willtek at one of the addresses given on page xvi.

Follow the following instructions to reload the VSELP software.

Setup

- Disconnect all cables from the front and rear panels of the 4300, except the power cord.
- The 4300 must be in the "Manual Mode". Press the **MANUAL** key on the keypad. The title bar on the display should now read "Manual Mode". If you have difficulty setting the 4300 to the "Manual Mode" or the keys won't respond, turn the unit off, then back on.
- The 4300 defaults to the "Manual Mode" on powering up.

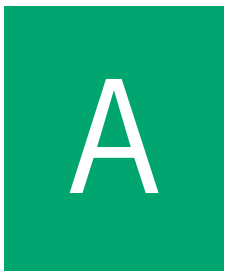
Reloading the VSELP Software

- Press the **SETUP** key, then press the **More** soft key.
- Press the **More** soft key again. Now press the **Upgrade Software** soft key.
- Insert the disk labeled TDMA into the 4300's disk drive, then press the **TDMA Module** soft key.
- Now press the **Continue** soft key. The upgrade will take approximately 7 minutes. When the upgrade is complete, press the **Return** soft key, then the **Reset** soft key. After the 4300 resets to the Manual Mode screen, remove the disk from the disk drive for safe keeping.
- Press the **Reset** soft key to return the 4300 to the Manual Mode screen.

This completes the VSELP software reload procedure.

To reload the ACELP option, follow the same procedure using the TDMA ACELP option disk.

Customer Services



This chapter describes the customer services available through Willtek. Topics discussed in this chapter include the following:

Warranty information

Willtek warrants that all of its products conform to Willtek's published specifications and are free from defects in materials and workmanship for a period of one year from the date of delivery to the original buyer, when used under normal operating conditions and within the service conditions for which they were designed. This warranty is not transferable and does not apply to used or demonstration products.

In case of a warranty claim, Willtek's obligation shall be limited to repairing, or at its option, replacing without charge, any assembly or component (except batteries) which in Willtek's sole opinion proves to be defective within the scope of the warranty. In the event Willtek is not able to modify, repair or replace nonconforming defective parts or components to a condition as warranted within a reasonable time after receipt thereof, the buyer shall receive credit in the amount of the original invoiced price of the product.

It is the buyer's responsibility to notify Willtek in writing of the defect or nonconformity within the warranty period and to return the affected product to Willtek's factory, designated service provider, or authorized service center within thirty (30) days after discovery of such defect or nonconformity. The buyer shall prepay shipping charges and insurance for products returned to Willtek or its designated service provider for warranty service. Willtek or its designated service provider shall pay costs for return of products to the buyer.

Willtek's obligation and the customer's sole remedy under this hardware warranty is limited to the repair or replacement, at Willtek's option, of the defective product. Willtek shall have no obligation to remedy any such defect if it can be shown: (a) that the product was altered, repaired, or reworked by any party other than Willtek without Willtek's written consent; (b) that such defects were the result of customer's improper storage, mishandling, abuse, or misuse of the product; (c) that such defects were the result of customer's use of the product in conjunction with equipment electronically or mechanically incompatible or of an inferior quality; or (d) that the defect was the result of damage by fire, explosion, power failure, or any act of nature.

The warranty described above is the buyer's sole and exclusive remedy and no other warranty, whether written or oral, expressed or implied by statute or course of dealing shall apply. Willtek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. No statement, representation, agreement, or understanding, oral or written, made by an agent, distributor, or employee of Willtek, which is not contained in the foregoing warranty will be binding upon Willtek, unless made in writing and executed by an authorized representative of Willtek. Under no circumstances shall Willtek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, or losses, including loss of profits, based on contract, tort, or any other legal theory.

Equipment return instructions

Please contact your local service center for Willtek products via telephone or web site for return or reference authorization to accompany your equipment. For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner's name, address, and telephone number.
- The serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, include a copy of the purchase order.)
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.
- The return authorization (RA) number or reference number.

If possible, return the equipment using the original shipping container and material. Additional Willtek shipping containers are available from Willtek on request. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. Willtek is not liable for any damage that may occur during shipping. The customer should clearly mark the Willtek-issued RA or reference number on the outside of the package and ship it prepaid and insured to Willtek.

Glossary

A

A-Key — Authentication Key.

Access Probe — On a CDMA system, the mobile station will send out a signal at a low level to see if the base station can receive the mobile unit. If the base unit does not recognize the mobile unit, the mobile unit will increase its power, and the process is repeated until the mobile unit is recognized. This will become the operating level of the mobile unit. If the base unit fails to receive the mobile unit by the time the highest power level is reached, the mobile unit will send an audible Busy signal to the operator.

ADC — American Digital Cellular. Same as USDC.

Alert — Constant 10 kHz signaling tone sent on the reverse voice channel (by the mobile) in an analog cellular conversation while the mobile phone is ringing.

AMPS — Advanced Mobile Phone Service. Uses analog FDMA (see FDMA) technology with channels of information separated by 30 kHz.

Antenna — Device which radiates or interrupts electromagnetic radiation.

ASK — Amplitude Shift Key. A type of modulation where data is transmitted by turning a radiation source on and off to transfer data over a wireless link.

Audio Deviation — The extent of modulation of a standard FM radio signal.

Authentication — A means for validating that a user on a cellular network is authorized.

AutoGraph™ — Willtek's display graph of each power level as the frequency is swept from low to high. This will show the tuning of the power amplifier stages.

AUTO TEST — A preprogrammed sequence of tests.

AWGN — Additive White Gaussian Noise.

B

Band Pass Filter — A radio frequency or audio frequency filter that allows certain frequencies to pass through while eliminating those below and above this range.

Base TX Mod — In testing a mobile unit, the test set must simulate the base station transmitter. The extent of modulation of the base station and the audio content is part of the Base TX Modulation.

BER — Bit Error Rate. Used as a measure to quantify bit error occurrences in a digital communications link.

Binary — Data format made of 1's and 0's.

BORSCHT — Battery, Over-Voltage, Ringing, Signaling, Codes, Hybrid Testing.

Breakout Box — A specialized device that allows the mobile unit's transmitter modulation input and receiver audio output to be brought out on terminals or jacks so that extra test equipment can be interconnected for detailed analysis of the mobile unit's transmitter and receiver.

BS — Base Station. A multichannel transceiver located at the center of a cell and connected via microwave links to the mobile telephone switching office (MTSO) to handle all incoming and outgoing cellular telephone traffic within the cell.

BSC — Base Station Controller

C

Cadence — An adjustable sequence of ringing cycle:duration of ring and silence.

CCITT — Consultative Committee International Telegraph and Telephone. An international forum for establishing communication system standards.

Cell — The RF coverage area in the cellular system resulting from operation of a single multiple-channel set of base station frequencies. Cell can also refer to the base site equipment servicing this area.

CDMA — Code Division Multiple Access. In a CDMA system, each voice circuit is labeled with a unique code and transmitted on a single channel simultaneously with many other coded voice circuits. The channel is typically very wide with each circuit occupying the entire channel bandwidth.

Cellular — A wireless communication system consisting of a base station, a mobile switching center, and mobile stations.

Channel — Discrete radio frequency.

Closed Loop — A method of maintaining power control on a CDMA network where a base station measures the signal quality from a CDMA mobile station and sends power control bits on the forward traffic channel causing the mobile to raise or lower its power as necessary.

CNI — Calling Number Indicator. This is the alphanumerical information, if caller ID is allowed.

Codec — An assembly comprising an encoder and a decoder in the same unit. A device that produces a digital coded output from an analog input and vice versa.

C-Message Filter — A filter that matches most people's hearing and thus enable the test equipment to more closely read what the operator hears.

Compander — A combination of a compressor and an expander. The audio signal is compressed by the transmitter, reducing the dynamic range of the transmitted signal. An expander at the receiver restores the recovered signal to its original dynamic range. Used for reducing signal to noise ratio.

Constellation — In a CDMA system, the phase between the different vectors in the radio modulator is important. A Constellation pattern lets the user see how close the actual phase is to the expected phase.

Control Channel — The channel in a CDMA system set aside to allow all the mobile units to synchronize with the base unit. In an analog system, this is the channel all the mobile units will listen to while waiting for a call to that unit.

CRC — Cyclic Redundancy Check.

CTIA — Cellular Telecommunications Industry Association.

CT2 — An old technology cellular system.

D

D-AMPS — Digital Analog Mobile Phone System.

DCC — Digital Channel Color. Describes where a bitstream is divided into 3 channels.

DECT — Digital European Cordless telephone.

Deviation — Frequency shift of a radio carrier from a center value.

DMAC — Digital Mobile Attenuation Code. One of 11 power levels dynamically selected during a cellular telephone conversation.

DMO — Direct Mode Operation. Mobile stations communicating with each other without the need for a base station.

DSAT — Digital Supervisory Audio Tone. One of six digital codes transmitted at a sub-audio tone. Used when the mobile units are in NAMPS mode.

DST — Digital Signalling Tone. A temporary change in the DSAT code used to confirm channel change orders.

DTMF — Dual-tone multi frequency commonly known as touchtones. This in-band signaling system consists of 12 audio tones, each created from two different frequencies corresponding to the digits 0 through 9 and * and # on a telephone keypad.

DTX — Discontinuous transmission. A cellular subscriber unit feature that allows the mobile unit to disable its RF power during conversation when the subscriber is not talking. This reduces the power drawn from the battery and thus increases talk time.

Dual Mode Cellular — Telephones operate in digital or analog cellular systems.

E

EAMPS — Extended Advanced Mobile Phone Service. AMPS with extended frequency allocation.

EESN — Expanded Electronic Serial Number.

ESN — Electronic Serial Number. A 32-bit code that is unique to each cellular telephone mobile unit. Used by the base station to validate the mobile unit.

ETACS — Extended Total Access Communications System.

ETSI — European Telecommunications Standards Institute.

Exchange Area — The territory telephone service is offered for a basic fee. Also called the local calling area.

Expander — In radio transmission, the dynamic range (very soft to very loud) is compressed. The Expander converts this back to the normal dynamic range.

F

FCC — Federal Communications Commission. A government agency that regulates and monitors the domestic use of the electromagnetic spectrum for communications.

FDMA — Frequency Division Multiple Access. A communications scheme where channels of information are separated by frequency and transmitted one voice circuit per channel. The channels are extremely narrow, usually 30 kHz or less and are defined as either transmit or receive channels.

FEX — Frequency Extension

FER — Frame Error Rate. The extent of noise and missed data allowed to be present in the received signal. Used for determining the sensitivity and dynamic range of the mobile unit.

FOCC — Forward Control Channel. A control channel from the cellular base station to the mobile unit. Also known as the control channel downlink.

Forward Channel — Downlink from BS to MS.

Frame Offset — Accounts for the finite travel time of radio signals.

FVC — Forward Voice Channel. A voice channel from the base station to the mobile unit. Also known as the voice channel downlink.

FSX — Frequency Shift Keying. The type of frequency modulation that uses two different audio frequencies to transmit binary ones and zeros by shifting back and forth between the two frequencies.

G

GEO — Geosynchronous Earth Orbit.

GPIB — General Purpose Interface Bus. Allows computers to control different types of equipment.

GPS — Global Positioning System. A system of pinpointing location by triangulation of satellite signals.

GSM — Global System for Mobile communications. A format for cellular communication.

H

Handoff (Inter-cell) — The process by which cellular mobile units travelling through the system coverage area are switched from one cell (and its base station) to the next cell (and to a different channel) that has better coverage for

that particular area. The handoff is often triggered by degradation of transmission quality due to the mobile unit reaching the edge of the service area or by adverse RF propagation quality in the area through which the mobile is travelling.

Handoff (Intra-cell) — The process by which cellular mobile units travelling through a cell's coverage area are switched from one sector in the cell to the next sector in the cell (and to a different channel) that has better coverage for that particular area. The handoff is often triggered by degradation of transmission quality due to the mobile unit reaching the edge of the cell's service area or by adverse RF propagation quality in the area through which the mobile is travelling.

High Pass Filter — A filter that lets all frequencies above a certain point to pass through while eliminating or attenuating all other frequencies below this frequency.

I

IFAST — International Forum on AMPS Standard Technology.

ILR — Inter-system Location Register.

IMSI — International Mobile Station Identity.

Initial Type — Determines the mode of call origination (PCS, CDMA, TDMA, AMPS, NAMPS, etc.).

IS-136 — Standard for dual-mode TDMA communication.

IS-41 — Inter-systems Operation Standard.

IS-95 — Standard for dual-mode CDMA communication.

J

JDC — Japanese Digital Cellular

JTACS — Japanese Total Access Communications System. Uses analog FDMA technology with channels of separated by 25 MHz.

L

LAN — Local Area Network.

Latitude — A number (-90 to +90 degrees) that defines the location with respect to the equator.

LEO — Low Earth Orbit, a plane around the globe used for satellite communications.

Longitude — A number (-180 to +180 degrees) that defines the location from an imaginary line running through Greenwich, England.

Loopback — The path where the received audio is sent back via the transmit audio.

Loop Current — Direct current in the local loop. Indicates that a telephone is off-hook (in use).

Low Pass Filter — A filter that lets all frequencies below a certain point to be transmitted eliminating or attenuating all other frequencies above this frequency.

M

MAHO — Mobile Assisted Hand Off.

MAC — Mobile Attenuation Code. Refers to one of power levels selected during a cellular telephone conversation.

MAP — Mobile Application Part.

MCC — Mobile Country Code.

MIN — Mobile Identification Number. 10-digit telephone number of the mobile unit. Used in the decimal format only.

MNC — Mobile Network Code.

Mobile Coverage Area — Geographical area in which two-way cellular telephone service can be expected (between the cell base station and the cellular mobile unit).

Mobile Unit — Either a hand-held or car-mounted transceiver. The mobile unit connects the user to the base station using RF transmission and reception. The mobile unit is also known as the subscriber.

MPT1327 — A signaling standard for trunked private land mobile radio systems. Prepared by the British Department of Trade and Industry.

MS — Mobile Station. May be mobile phone, data terminal equipment, fax, etc. Vehicle-mounted or hand-held.

MSA — Metropolitan Service Area. Cellular coverage, defined by the FCC, that resides in a densely populated area.

MSS — Mobile System Services.

MTS — Message Telephone Service. The official name for long distance or toll service.

Multiplexer — A device that enables simultaneous transmission of two or more signals over a common transmission medium.

Mobile-ID — The 7-digit mobile unit's telephone number. Does not include area code.

MoU — Memorandum of Understanding.

N

NADC — North American Digital Cellular.

NAMPS — Narrow-band Advanced Mobile Phone Service. An analog technology in which channels of information are separated by 10 kHz, thus providing three times the capacity over AMPS.

Network — A system of mobile switching system, base stations and mobile stations.

NID — Network Identification Number.

NPA — Number Planning Area. The area code.

NTACS — Narrow-band and Total Access Communications System. An analog technology in which channels of information are separated by 12 MHz, thus providing twice the capacity over JTACS.

O

OCNS — Orthogonally Coded Noise Source.

OQPSK — Offset Quadrate Phase Shift Keying.

OMC — Operation and Maintenance Center.

Open Loop — A means of determining a rough estimate of necessary power for a CDMA mobile station.

Origination — The process of establishing a mobile-originated call.

P

Page — The process of establishing a mobile-terminated call.

Paging Channel — A channel in a CDMA system set aside for all mobile units to listen to see if a call is directed to that unit.

PAMR — Private Access Mobile Radio.

PBX — Private Branch Exchange. A telephone exchange serving an individual.

PCG — Power Control group.

PCN — Personal Communication Network. Also known as PCS (Personal Communication Service).

PCS — Personal Communications Systems operating in the 1.8 GHz to 2.0 GHz frequency range.

Phase — Determines how radio signals synchronize with each other.

PDC — Personal Digital Communications.

Pilot Channel — A code channel in a CDMA system set aside for all mobile units to listen to synchronize with the system.

PL — The transmitting Power Level of the cellular mobile unit.

PLMN — Public Land Mobile Network.

PMR — Professional Mobile Radio.

PN Offset — A deliberate time offset introduced to the signal in a CDMA system.

Pre-Emphasis — In an FM radio system, the audio is Pre-Emphasized in the transmitter modulator and De-Emphasized in the receiver audio stages to improve signal to noise ratio.

PSK — Phase Shift Keying. A method of placing data on a carrier signal by modifying the phase of the carrier wave.

PSTN — Public Switched Telephone Network.

PTP — Point-to-point. Line of sight communication link.

PTT — Push to talk.

Q

QPSK — Quadrature Phase Shift Keying.

Quick Test — A pre-programmed series of automated tests to check the basic functions and parameters of a mobile unit.

R

Register Mobile — When a mobile unit is first turned on, its sends its unique identification code to the base unit. As the mobile unit travels, it re-sends this information so that the Mobile Telephone Switching Office can keep track.

RECC — Reverse Control Channel. The control channel that is used from the cellular mobile station direction, also known as the control channel uplink.

Rho — Waveform. Quality factor of a CDMA signal.

Roamer — A cellular mobile station that operates in a cellular system other than one from which the service is subscribed (the home system).

Rolling Code — A code that is frequently used to identify a user. The code changes every time the code is transmitted to improve system security.

RSA — Rural Service Area. A cellular coverage defined by the FCC that resides in a less populated area.

RSSI — Relative Signal Strength Indication. Used in RF circuitry to detect the strength of a received signal. In cellular telephony, this represents the received signal strength of both the cellular mobile unit and the base station. This value is used to initiate a power change or handoff.

RVC — Reverse Voice Channel. The voice channel used in the cellular mobile station to base station direction. Also known as the voice channel uplink.

S

SAT — Supervisory Audio Tone. One of three tones (5970, 6000, 6030 Hz) transmitted by the cell base station and transponded by the cellular mobile station. Used to evaluate the complete radio path, both toward and reverse voice channels. The SAT received by the mobile unit is actually regenerated by the mobile unit with the same tone associated with the actual received SAT.

SAW — Surface Acoustic Wave. Resonant devices used in many communication applications. Well suited to low power RF.

SCM — Station Class Mark. Indicates the cellular mobile station type and whether the station has DTX.

Satellite — An orbiting space entity used for providing communication relay.

SID — System Identification. A unique digital code assigned to each cellular system. The home system of each mobile is stored in its internal memory so that the mobile unit knows when it is a roamer (outside its normal service area).

SIM — A card used for validating the user of a GSM system.

SINAD — Signal to Noise and Distortion. An absolute measurement of the sensitivity of a radio receiver.

SLIC — Subscriber Line Interface Circuit. In digital transmission of voice, this circuit performs some or all of the interface functions at the central office.

SMS — Short Message Service.

Soft Keys — Buttons whose function is determined by software.

Source Cell — The RF coverage area that a cellular mobile unit is leaving during the handoff process.

SS — Spread Spectrum.

SSD — Shared Secret Data.

SSI — Short Subscriber Identity.

ST — Signaling Tone. A 10 kHz tone transmitted by the cellular mobile unit on a voice channel to confirm channel change orders, request a flash-hook by the mobile, also mobile alert and mobile ending call.

T

TACS — Total Area Coverage Systems.

Target Cell — The RF coverage area that the mobile unit is directed to during the handoff process.

TCH — Traffic Channel.

TDM — Time Division Multiplexing. A communication system technique in which each of multiple channels is sequentially connected to a single-channel transmission link.

TDMA — Time Division Multiple Access. TDMA systems are able to transmit multiple voice circuits on each channel. A TDMA channel is a single FDMA channel divided into multiple time slots. The channels can vary in bandwidth and can transmit all or part of the voice circuit.

TETRA — Terrestrial Trunked Radio. An open standard for PMR and PAMR applications defined by ETSI.

TIA/EIA — Telecommunications Industry Association in conjunction with the Electronics Industries Association.

TMO — Trunked Mode Operation. Mobile stations communicating via a base station.

TPC — Three-Party Conference Circuit. Used during every handoff so that the channel change transition can be made with less noise by connecting the audio of the source and target cells together before the handoff order is sent.

Traffic Channel — Channel on which actual conversation takes place.

Tumbling ESN — Fraudulent hardware that changes the cellular mobile unit's Electronic Serial Number every time a call is originated. Since only the first call of a roamer is screened for a bad ESN, an infinite number of fraudulent calls can be placed using a tumbling ESN.

Type — Mode of operation, analog or digital (AMPS, NAMPS, CDMA, TDMA).

U

Unique Challenge — Tests the authentication capability of a mobile station.

Uplink — Reverse Channel from MS to BS.

USDC — U. S. Digital Cellular.

UWCC — Universal Wireless Communications Consortium.

V

VMAC — Voice Mobile Attenuation Code. One of eight discrete cellular mobile unit power levels in 4 dB increments that are dynamically selected during a cellular telephone conversation.

Validation — Method of determining if a cellular mobile unit should be given service by the cellular system. Validation requires matching the ESN (Electronic Serial Number) of the mobile with its mobile ID.

W

WIN — Wireless Intelligent Network.

WDM — Wavelength Division Multiplexing.

Wide Band Deviation — The combination of voice and supervisory data/ signaling.

Wireline — When cellular radio was first introduced in the early 1980's, each town was allocated 2 cellular radio bands, the Wireline band and the Non-Wireline band. These were also called System B and System A respectively. The radio frequencies determine whether you are on System A or System B. With the advent of mergers, buyouts, and

other business agreements, the wireline telephone companies have become the owners or operators of the A systems and the non-wireline companies have become the owners and/or operators of the B systems.

Publication History

Revision	Comment
Rev. C	
0212-100-A	New format. TDSO added.

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Manual version 0212-100-A
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