User's and Programming Guide

Agilent Technologies
ESG Family Signal Generators
Option 100 - Volume 1
W-CDMA (Rev. 1.0–1.2) Personality

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Contents

1. The W-CDMA (Rev. 1.0-1.2) Personality
Ensure you have the correct guide 1-2
Overview 1-3
Revision Numbers 1-3
Block Diagrams 1-3

2. Using Functions
Table Editor Basics 2-2
Using W-CDMA (Rev. 1.0-1.2) 2-3
Accessing the W-CDMA Menu 2-3
Selecting Predefined Channel Configurations 2-4
Forward Link Predefined Channel Configurations 2-4
Reverse Link Predefined Channel Configurations 2-4
Selecting a Forward Link Predefined Channel Configuration 2-5
Selecting a Reverse Link Predefined Channel Configuration 2-6
Modifying Forward Link Channel Configurations 2-8
Inserting Additional Channels 2-8
Editing Forward Link Channel Values in the Table Editor 2-11
Modifying Reverse Link Channel Configurations 2-14
Inserting Additional Channels 2-14
Editing Reverse Link Channel Values in the Table Editor 2-17
Storing a Custom W-CDMA State to Memory 2-19
Creating, Storing, & Recalling a Custom Multicarrier W-CDMA Waveform 2-21
Opening the Multicarrier W-CDMA Setup Table Editor 2-21
Modifying a Multicarrier W-CDMA 4-Carrier Template 2-22
Activating a Custom Multicarrier W-CDMA Setup 2-23
Storing a Custom Multicarrier W-CDMA Waveform 2-24
Recalling a Custom Multicarrier W-CDMA Waveform 2-24
Identifying and Resolving Code Domain Conflicts 2-25
Identifying Conflicts 2-25
Resolving Conflicts 2-26
Outputting a W-CDMA Waveform 2-27
Setting the Carrier Frequency and Power 2-27
Generating the W-CDMA Waveform and Enabling the RF Output 2-28
Clipping the W-CDMA Waveform 2-28
Creating a User-Defined FIR Filter Using the FIR Table Editor 2-30
Accessing the Table Editor 2-30
Entering the Coefficient Values 2-31
Duplicating the First 16 Coefficients Using Mirror Table 2-32
Setting the Oversample Ratio 2-32
Displaying a Graphical Representation of the Filter 2-33
Storing the Filter to Memory 2-34
Modifying an FIR Filter Using the FIR Table Editor 2-35
Loading the Default Gaussian FIR File 2-35
Modifying the Coefficients 2-36
Storing the Filter to Memory 2-37
Applying a User-Defined FIR Filter to a W-CDMA Waveform 2-38

3. Softkey Reference
Mode Key 3-2

n ksps . . . 3-2
1 DPCH . . . 3-3
2 Carriers . . . 3-3
2.500 MHz . . . 3-3
3 Carriers . . . 3-4
3 DPCH . . . 3-4
4 Carriers . . . 3-4
8.000 MHz . . . 3-4
250 kHz . . . 3-5
Adjust Code Domain Power . . . 3-5
APCO 25 C4FM . . . 3-5
Apply Channel Setup . . . 3-5
Apply Multicarrier . . . 3-5
Apply To Waveform . . . 3-6
ARB Reference Ext Int . . . 3-6
Bus . . . 3-6
Channels . . . 3-6
Chip Rate . . . 3-7
Clip |I+jQ| To . . . 3-7
Clip |I| To . . . 3-7
Clip |Q| To . . . 3-7
Clip At PRE POST FIR Filter . . . 3-8
Clipping . . . 3-8
Clipping Type |I+jQ| |I|,|Q| . . . 3-8
Continuous . . . 3-8
Custom W-CDMA Carrier . . . 3-8
Custom W-CDMA Multicarrier . . . 3-9
Custom W-CDMA State . . . 3-9
Define User FIR . . . 3-9
Delete All Rows . . . 3-9
Delete File . . . 3-9
Delete Row . . . 3-9
Display FFT . . . 3-10
Display Impulse Response . . . 3-10
DPCCH . . . 3-10
DPCCH + 1 DPDCH . . . 3-11
DPCCH + 2 DPDCH . . . 3-11
DPCCH + 3 DPDCH . . . 3-11
DPCH . . . 3-11
DPDCH Channels . . . 3-11
Edit Channel Setup . . . 3-12
Edit Item . . . 3-12
Equal Energy per Symbol . . . 3-12
Ext . . . 3-12
Ext Delay . . . 3-13
Ext Delay Time . . . 3-13
Ext Polarity Neg Pos . . . 3-13
Filter . . . 3-13
Filter Alpha . . . 3-14
Filter BbT . . . 3-14
Filter Factor . . . 3-15

Filter Symbols 3-15
First Spread Code 3-16
Gate Active 3-16
Gated 3-16
Gaussian 3-17
Goto Bottom Row 3-17
Goto Middle Row 3-17
Goto Row 3-17
Goto Top Row 3-18
Hamming 3-18
Hann 3-18
I/Q Mapping Normal Invert 3-18
Insert DPDCH 3-18
Insert Row 3-19
IS-2000 SR3 DS 3-19
IS-95 3-19
IS-95 and IS-2000 3-19
IS-95 Mod 3-19
IS-95 Mod w/EQ 3-20
IS-95 w/EQ 3-20
Kaiser 3-20
Link Forward Reverse 3-20
Load Default FIR 3-21
Load From Selected File 3-21
Load/Store 3-21
Mirror Table 3-21
Modify All Scramble Codes 3-21
Multicarrier Define 3-22
Multicarrier Off On 3-22
Multiple Channels 3-22
None 3-23
Nyquist 3-23
Optimize FIR For EVM ACP 3-23
Oversample Ratio 3-24
Page Down 3-24
Page Up 3-24
Perch 3-24
Perch + 1 DPCH 3-25
Perch + 3 DPCH 3-25
Perch + 50 DPCH 3-25
Plot CCDF 3-26
Power 3-26
Random 3-26
Reconstruction Filter 3-27
Rectangle 3-27
Reference Frequency 3-27
Restore Default Filter 3-28
Retrigger Mode Off On 3-28
Root Nyquist 3-28
Scale To 0dB 3-29
Scramble Code 3-29

Second DPDCH I Q . . . 3-29
Select . . . 3-30
Select File . . . 3-30
Single . . . 3-30
Spread Only . . . 3-30
Store Custom Multicarrier . . . 3-30
Store Custom W-CDMA State . . . 3-31
Store To File . . . 3-32
Symbol Rate . . . 3-32
TFCI Field Off On . . . 3-32
Through . . . 3-32
Trigger . . . 3-32
Trigger Key . . . 3-33
Trigger Setup . . . 3-33
Trigger Source . . . 3-33
Type . . . 3-33
UN3/4 GSM Gaussian . . . 3-33
User FIR . . . 3-34
Waveform Statistics . . . 3-34
WCDMA . . . 3-34
W-CDMA (Rev 1.0–1.2) . . . 3-34
W-CDMA Define . . . 3-34
W-CDMA Off On . . . 3-35
W-CDMA Select . . . 3-35
Window . . . 3-36

4. Operation
W-CDMA Frame Structures . . . 4-2
Forward Link . . . 4-2
Reverse Link . . . 4-4
Understanding TPC Values . . . 4-5
Understanding TFCI, TPC, and Pilot Power Offsets . . . 4-6
Understanding Baseband Clipping . . . 4-8
How Power Peaks Develop . . . 4-8
How Peaks Cause Spectral Regrowth . . . 4-10
How Clipping Reduces Peak-to-Average Power . . . 4-11
FIR Filtering Options . . . 4-13
How Clipping Differs from Symbol Offset . . . 4-14

5. Remote Programming
W-CDMA Subsystem SCPI Command Reference . . . 5-2
Apply Waveform . . . 5-2
ARB Reference Internal External . . . 5-2
Channel Setup . . . 5-2
Chip Rate . . . 5-3
Clipping Level, |I+jQ| . . . 5-3
Clipping Level, |I| . . . 5-4
Clipping Level, |Q| . . . 5-4
Clipping, Pre/Post FIR Filter . . . 5-4
Clipping, Type . . . 5-4

Code Domain Power 5-4
External Trigger Delay State 5-5
External Trigger Delay Time 5-5
External Trigger Polarity 5-5
Filter Alpha 5-5
Filter BbT 5-6
Filter Optimization 5-6
Filter Selection 5-6
Gate Active 5-7
I/Q Mapping. 5-7
Link Direction 5-7
Multicarrier, Define. 5-8
Multicarrier, Select Setup. 5-8
Multicarrier, Store Custom. 5-9
Reconstruction Filter 5-9
Reference Frequency. 5-9
Retrigger Mode State 5-10
Scramble Code. 5-10
Second DPDCH Setup. 5-10
TFCI Field State 5-10
Trigger Source. 5-10
Trigger Type 5-11
User FIR Definition 5-11
W-CDMA Link Setup 5-11
W-CDMA State, On/Off. 5-12
W-CDMA State, Store Custom 5-12

6. Programming Command Cross-Reference

1 The W-CDMA (Rev. 1.0-1.2) Personality

This guide provides information specific to the Option 100 W-CDMA (Rev. 1.0-1.2) personality. This chapter contains an overview of Option 100.

NOTE This option requires the installation of Option UND, Dual Arbitrary Waveform Generator. Refer to the Option UND user's and programming guide for information.

Ensure you have the correct guide

The Option 100 ESG Family Signal Generator includes two different implementations of the W-CDMA personality. Therefore, two user's and programming guides (one for each implementation) are supplied for Option 100. Read the following descriptions to ensure you have the correct guide for the W-CDMA personality you require.

Volume 1 (this guide) contains information specific to the W-CDMA (Rev. 1.0-1.2) personality, which is based on the March 1999 ARIB 1.0-1.2 specification.

Volume 2 contains information specific to the W-CDMA (3GPP 3.5 03-01) personality, which implements a chip rate of 3.84 Mcps, and is based on the March 2001 3GPP 3.5 specification.

Overview

The Option 100 ESG Family Signal Generator is a multichannel, wideband code division multiple access (W-CDMA) stimulus intended for base station and mobile testing. Option 100 enables you to generate forward and reverse link signals consistent with the developing W-CDMA (Revision 1.0-1.2) system specifications. You can create user-defined custom signals using a simple table-based channel editor.

Option 100 includes:

- multichannel W-CDMA forward link 2nd reverse link signals
- multicarrier (up to 4) W-CDMA forward link signals
- OCQPSK (HPSK) spreading/modulation type used in reverse link
- baseband clipping: clip the composite I/Q waveform or I and Q separately; choose either pre- or post-FIR filter clipping
- control over power level of TFCI, TPC, and pilot symbols relative to data
- transmitted chip rates of 4.096, 8.192, and 16.384 Mcps
- select from predefined W-CDMA channels or use the table editor to fully configure a W-CDMA signal waveform per your requirements

NOTE Specifications for Option 100 are located in the technical specifications document.

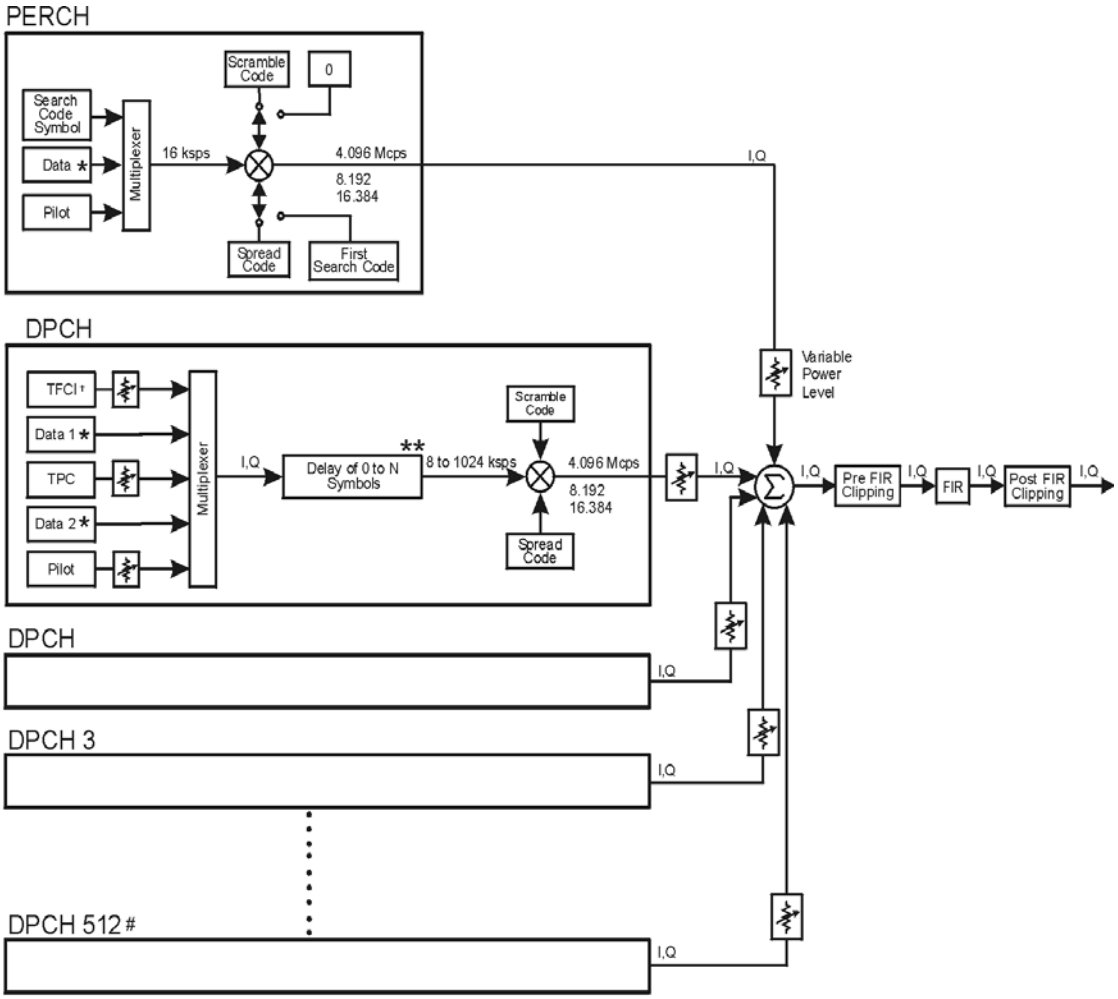
Revision Numbers

The firmware personality of the Option 100 signal generator is based on continually developing W-CDMA international standards. Therefore, the firmware is upgraded periodically to stay current with these standards. For identification purposes, a revision number is assigned to each release of the Option 100 personality. The revision number appears in softkey menus, status displays, and this guide. This guide describes the features associated with *revision 1.0-1.2* of the Option 100 W-CDMA personality.

Block Diagrams

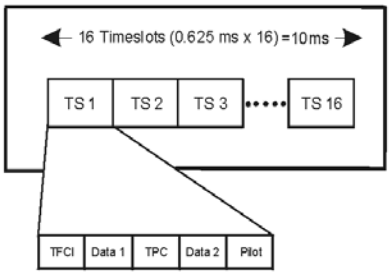
Figure 1-1 on page 1-4 and Figure 1-2 on page 1-5 show the forward and reverse link channel structures supported by Option 100.

Figure 1-1 Option 100 Forward Link Channel Structure



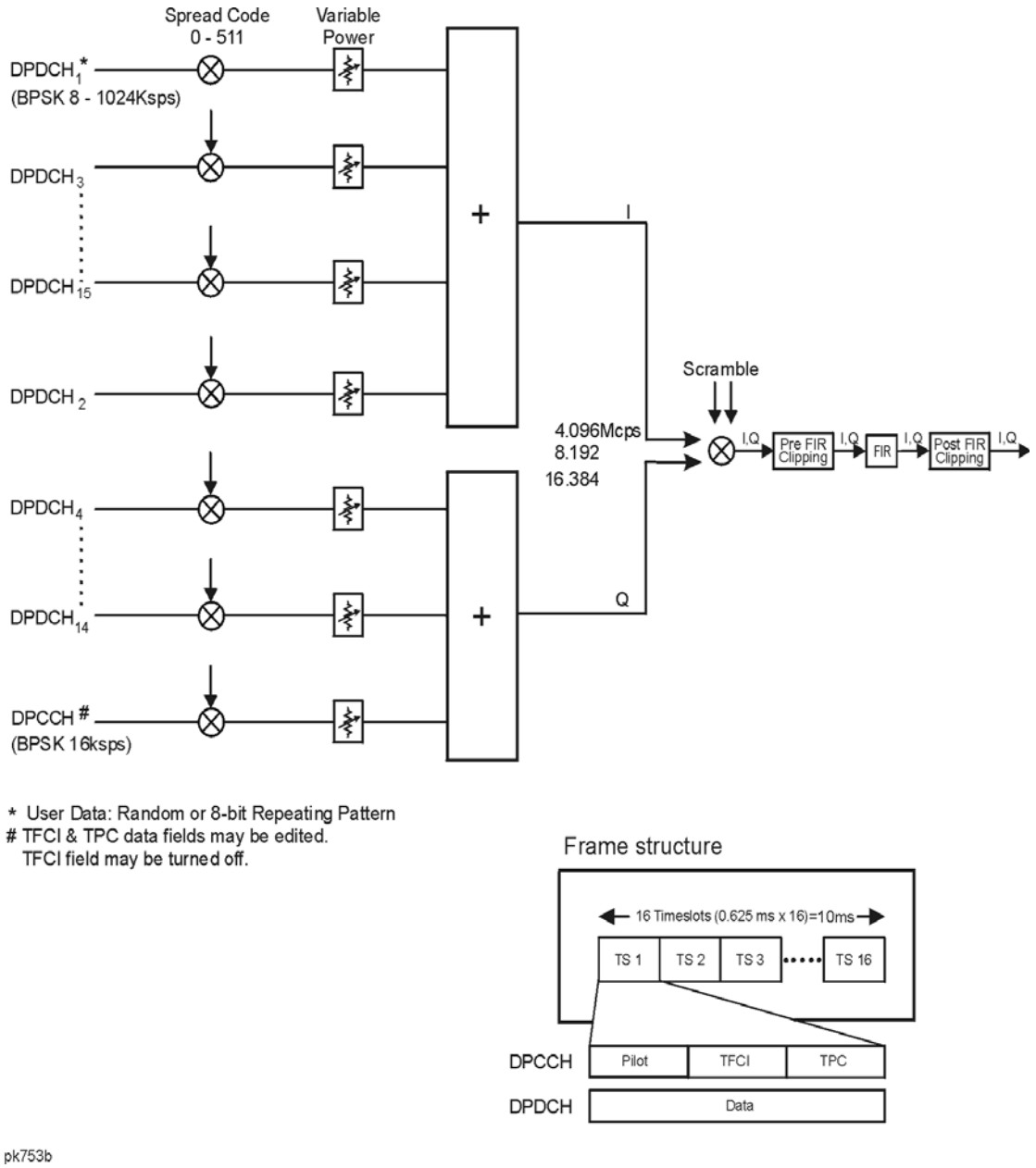
Maximum 512 Traffic Channels
** Range of symbol offsets depends on the channel symbol rate.
† Transmission can be configured with or without TFCI
* Random data or 8-bit repeating pattern

Frame structure for DPCH



pk752b

Figure 1-2 Option 100 Reverse Link Channel Structure



2 Using Functions

This chapter contains instructions for using the features associated with the Option 100 W-CDMA (Rev. 1.0-1.2) personality.

Table Editor Basics

Option 100 provides several table editors that enable you to:

- modify W-CDMA forward link channel configurations (for details, see page 2-8)
- modify W-CDMA reverse link channel configurations (for details, see page 2-14)
- create a custom multicarrier waveform (for details, see page 2-21)
- create a user-defined FIR filter (for details, see page 2-30)
- modify a user-defined FIR filter (for details, see page 2-35)

While each of these table editors performs a different function, they are all used in a similar manner, and most of the table editors have several editing softkeys in common.

Common Edit Functions

Edit Item Enables you to use the front panel knob and arrow keys to edit the value of a selected entry. After highlighting the value you want to edit, press this softkey.

Insert Row Inserts a row for data above the currently selected row.

Delete Row Deletes the currently selected row of data.

Goto Row Displays a new page of softkeys so that you can quickly move to the first, middle, or last row of data. This is especially helpful in a large table, or when using the filter table editor mirror function.

Load Default FIR Enables you to reset factory default values for a FIR filter.

Load/Store Displays a new page of softkeys that enables you to load data from a stored file, save data to a file, or delete a stored file.

Delete All Rows Clears all data from a table.

CAUTION There is no “undo” command. Once you delete data from a table, you cannot retrieve it.

Using W-CDMA (Rev. 1.0-1.2)

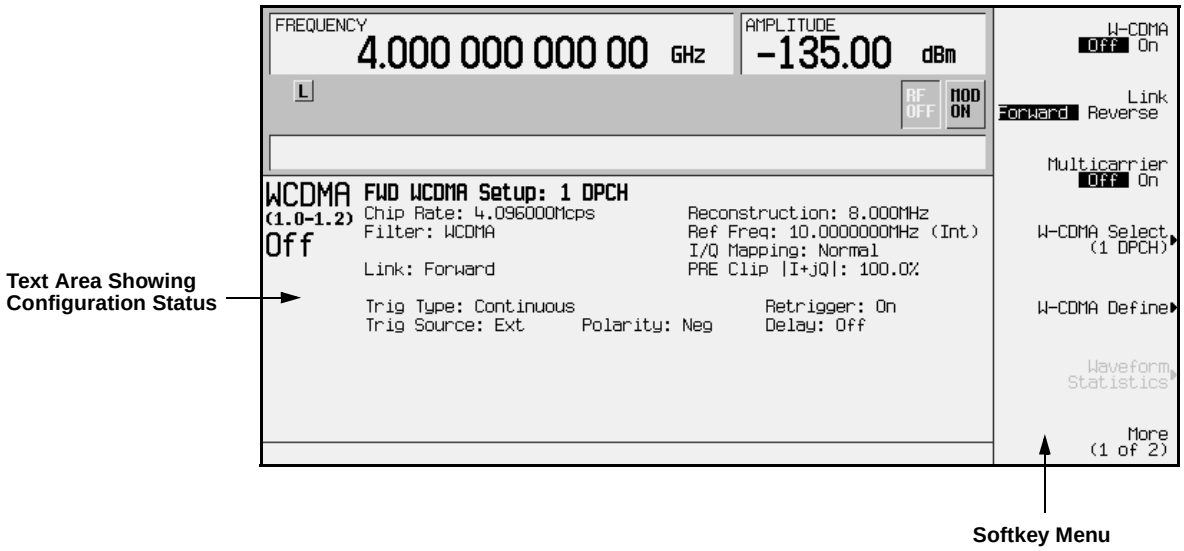
This chapter describes how to set up a waveform using predefined and user-defined channels. You will learn how to perform the following:

- select channels
- modify channels
- activate the modulation and RF output
- use multicarrier waveforms
- Identify and resolve code domain conflicts
- create filters
- modify filters

Accessing the W-CDMA Menu

Use the following procedure to access the W-CDMA personality.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu. The first page of W-CDMA softkeys is displayed on the right side of the display. The center text area of the display shows the status of W-CDMA configuration. These characteristics are immediately updated when you modify them in the softkey menus.



Selecting Predefined Channel Configurations

The ESG-D Option 100 signal generator contains predefined channel setups for both forward and reverse link waveform generation.

Forward Link Predefined Channel Configurations

There are six predefined channel configurations for forward link:

- 1 DPCH
- 3 DPCH
- Perch
- Perch plus 1 DPCH
- Perch plus 3 DPCH
- Perch plus 50 DPCH

Reverse Link Predefined Channel Configurations

There are four predefined channel configurations for reverse link:

- DPCCH
- DPCCH plus 1 DPDCH
- DPCCH plus 2 DPDCH
- DPCCH plus 3 DPDCH

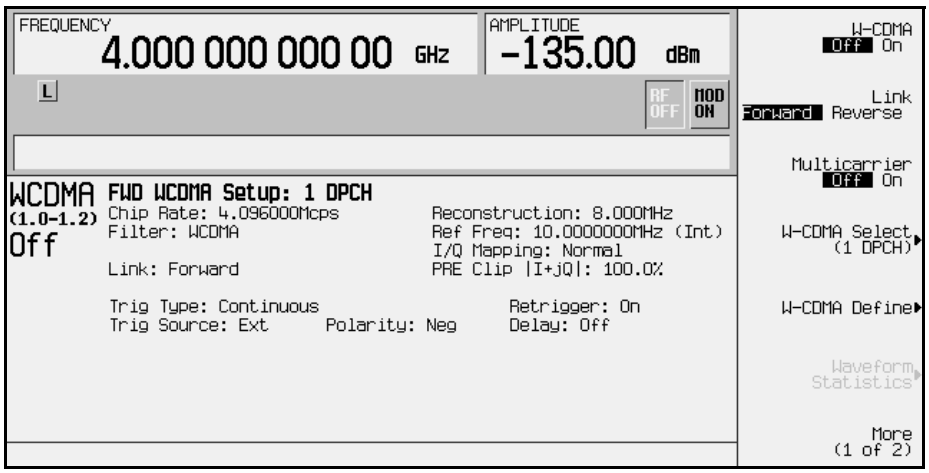
The default predefined channel configuration is one dedicated physical channel (1 DPCH) in the forward link mode. Predefined channel configurations can be used as defined, or modified using the channel table editor. See "Modifying Forward Link Channel Configurations" on page 2-8 for more information.

The following procedures explain how to select predefined channel setups for both forward and reverse link waveform configurations.

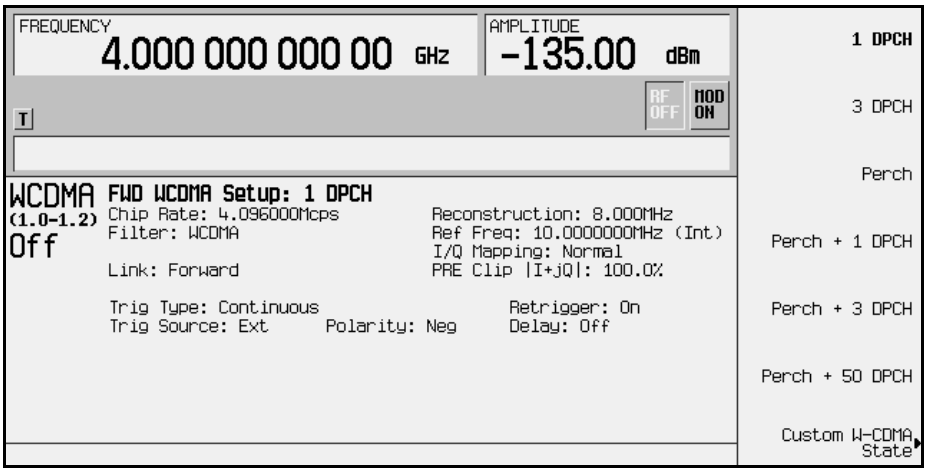
Selecting a Forward Link Predefined Channel Configuration

Perform the following procedure to select forward link predefined channel configurations.

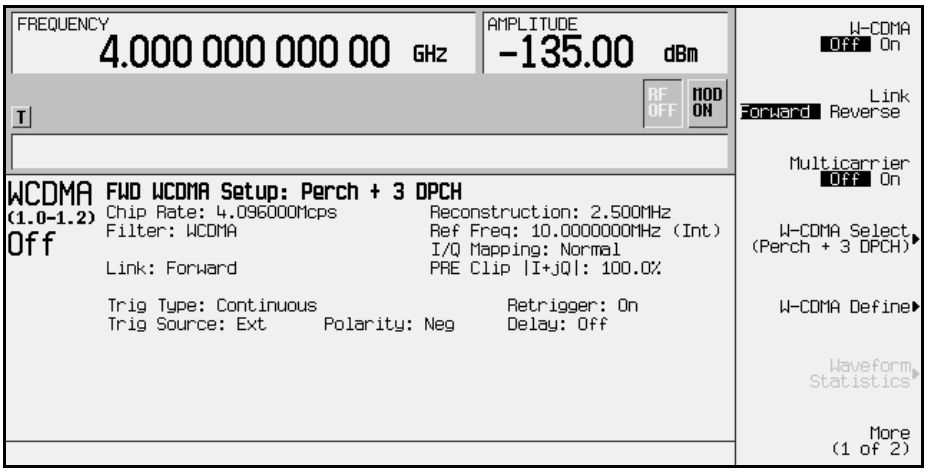
1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu. Notice that the default predefined channel selection for forward link `(1 DPCH)` appears below **W-CDMA Select** in the softkey menu. The text area displays `FWD WCDMA Setup: 1 DPCH` as the current configuration, as shown in the following figure.



5. Press **W-CDMA Select** to display the W-CDMA Setup selection menu for forward link, as shown in the following figure.



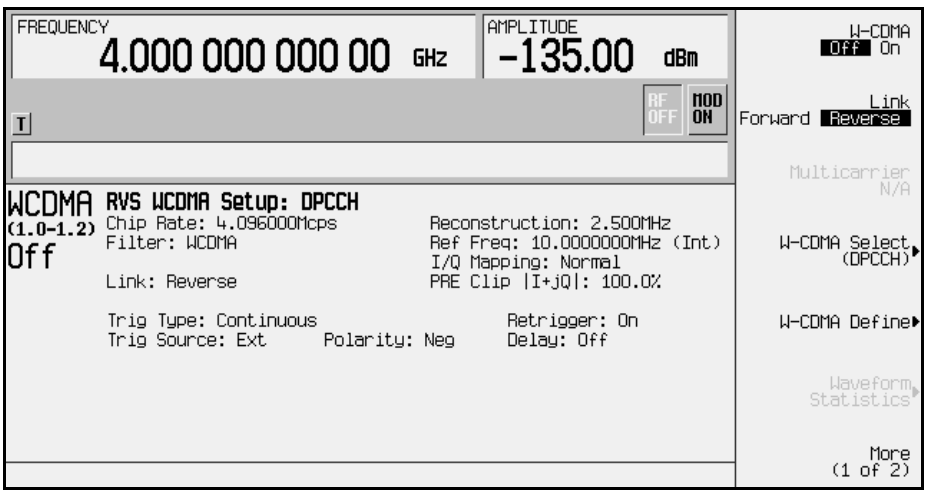
6. Press **Perch + 3 DPCH** to select perch plus three dedicated physical channels. `(Perch + 3 DPCH)` appears below **W-CDMA Select** in the softkey menu. The text area displays `FWD WCDMA Setup: Perch + 3 DPCH` as the current configuration, as shown in the following figure.



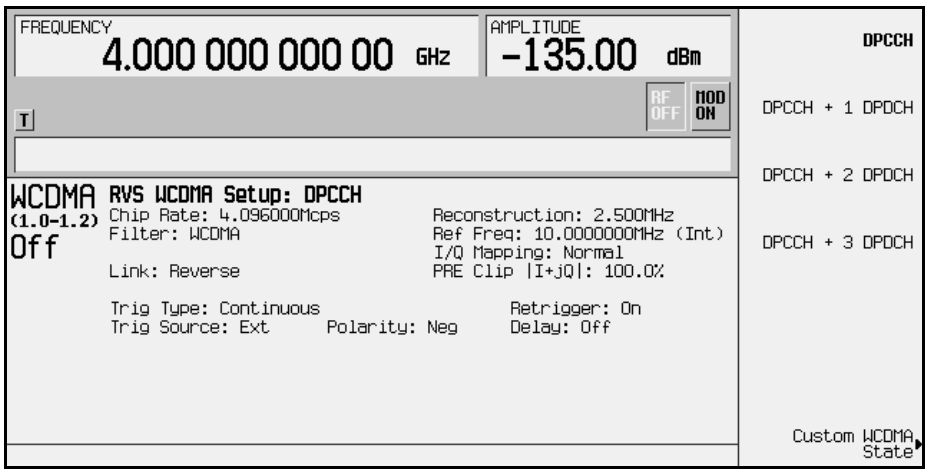
Selecting a Reverse Link Predefined Channel Configuration

Perform the following procedure to select reverse link predefined channel configurations.

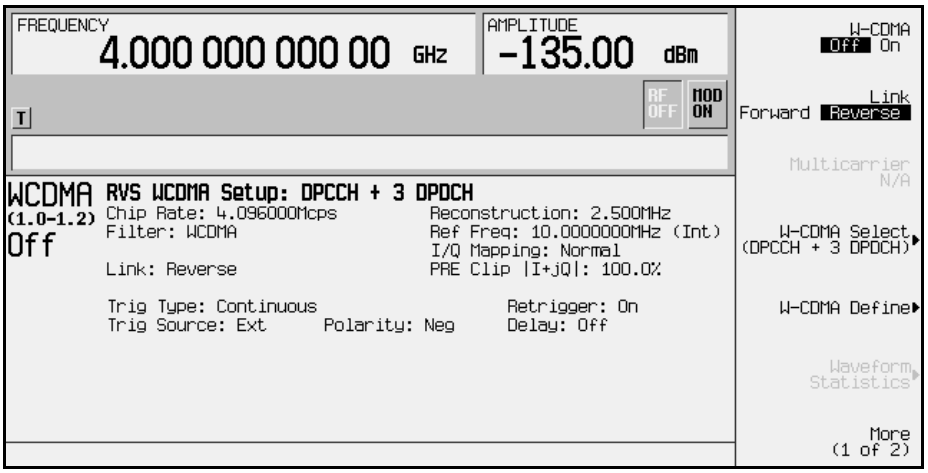
1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.
5. Press **Link Forward Reverse** until **Reverse** highlights. The default predefined channel selection for reverse link `(DPCCH)` appears below **W-CDMA Select** in the softkey menu. The text area displays `RVS WCDMA Setup: DPCCH` as the current configuration, as shown in the following figure.



6. Press **W-CDMA Select** to display the W-CDMA Setup selection menu for reverse link, as shown in the following figure.



7. Press **DPCCH + 3 DPDCH** to select a dedicated physical control channel plus three dedicated physical data channels. (`DPCCH + 3 DPDCH`) appears below **W-CDMA Select** in the softkey menu. The text area displays `RVS WCDMA Setup: DPCCH + 3 DPDCH` as the current configuration, as shown in the following figure.



Modifying Forward Link Channel Configurations

You can modify forward link channel configurations using the channel setup table editor. The following examples show you how to modify predefined channel setups for forward link waveform configurations. Refer to "Table Editor Basics" on page 2-2 for additional information about table editors.

CAUTION Unless previously saved to the signal generator's memory catalog, modifications made to predefined channel configurations are lost when changes are made to link direction.

To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

Inserting Additional Channels

The default forward link channel setup is one dedicated physical channel (1 DPCH). The maximum number of forward link channels allowed in the channel table editor is 512.

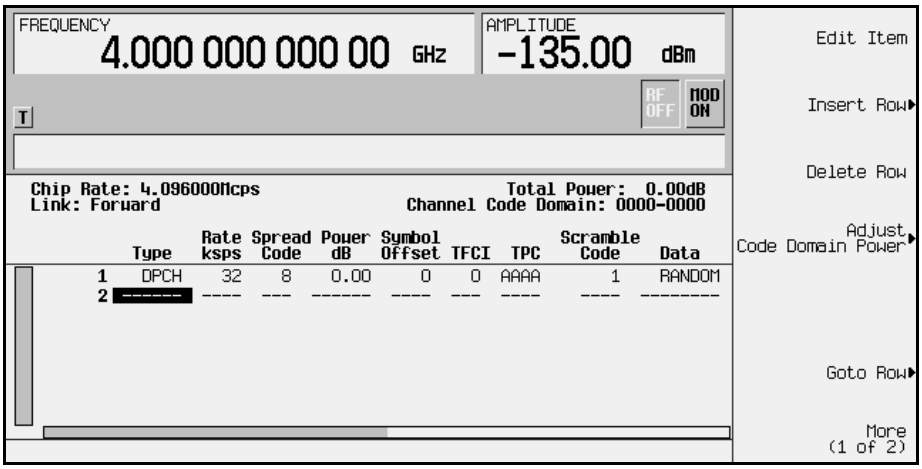
In the following sections, examples are provided for inserting DPCH and perch channels into the forward link configuration.

Inserting Additional DPCH Channels

In this example, 20 additional DPCH channels are inserted into the default predefined forward link configuration.

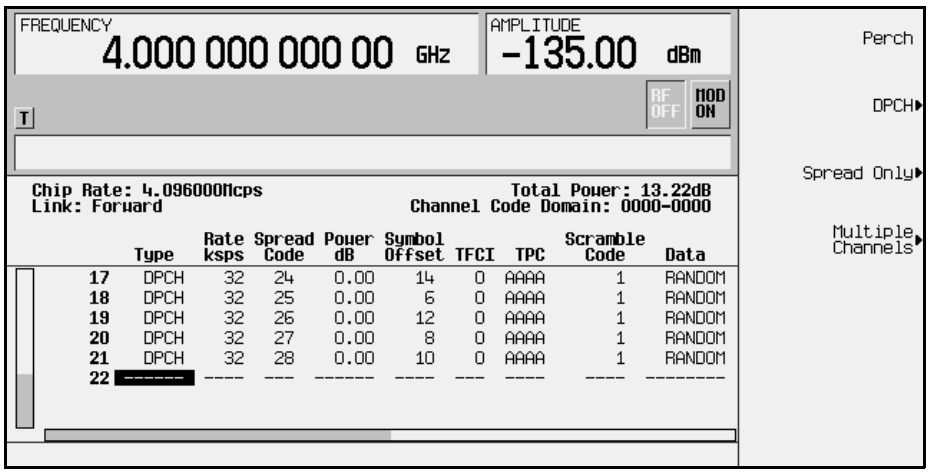
1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.

5. Press **W-CDMA Define** > **Edit Channel Setup** to display the channel table editor, as shown in the following figure. The horizontal scroll bar at the bottom of the screen indicates that there are more columns to the right of the `Data` column. Use the right arrow key to move the cursor to view the additional columns.



6. Press **Insert Row** > **Multiple Channels** > **Channels** and enter 20. Terminate the entry with the **Enter** softkey.

7. Press **Done**. The channel table editor now contains the 20 additional channels, as shown in the following figure. Notice that the page only displays six channels. To see the additional channels, press **Return** > **Goto Row** > **Page Up**.



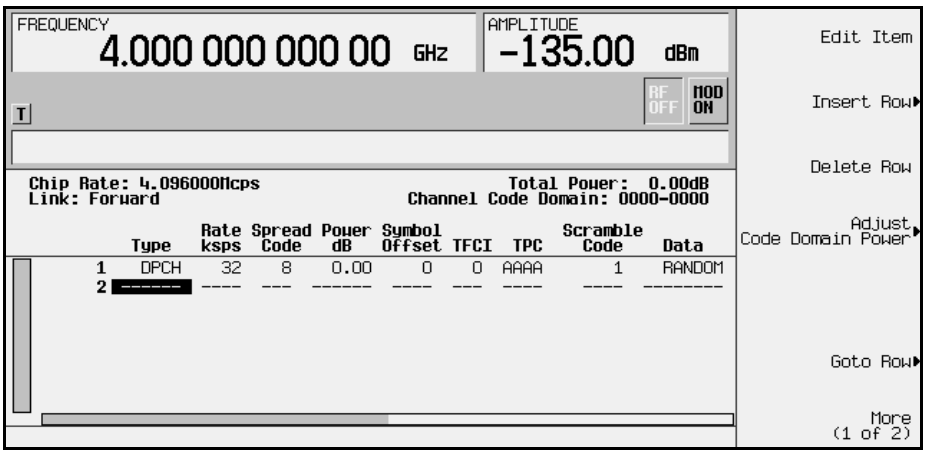
8. Press **Return** until the status screen appears. The text area displays `FWD WCDMA Setup:1 DPCH (Modified)` as the current configuration.

   To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

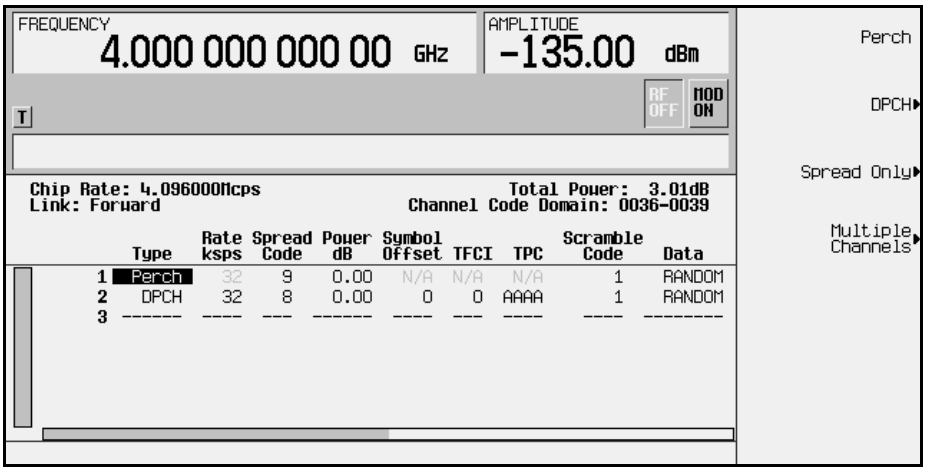
Inserting a Perch Channel

After a normal instrument preset, the W-CDMA default forward link setup consists of one DPCH channel. In this example, a perch channel is inserted before the DPCH channel.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.
5. Press **W-CDMA Define** > **Edit Channel Setup** to display the channel table editor, as shown in the following figure. Use the front panel knob or arrow keys to move the cursor to table row 1.



6. Press **Insert Row** > **Perch**. A perch channel is now inserted in the channel table editor, as shown in the following figure.



7. Press **Return** until the status screen appears. The text area displays `FWD WCDMA Setup: 1 DPCH (Modified)` as the current configuration.

   To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

Editing Forward Link Channel Values in the Table Editor

You can use the channel setup table editor to modify forward link configuration values in the following columns:

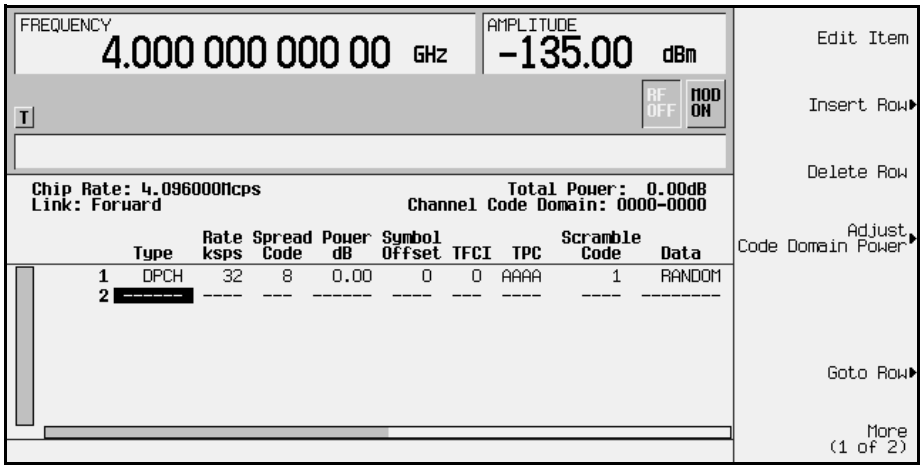
- `Rate ksps` - symbol rate in kilosymbols-per-second
- `Spread Code`
- `Power dB` - channel power in decibels
- `Symbol Offset`
- `TFCI` - transport format combination indicator
- `TPC` - transmit power control in hexadecimal
- `Scramble Code`
- `Data` - specific or random data
- `TFCI Power` - power offset in decibels
- `TPC Power` - power offset in decibels
- `Pilot Power` - power offset in decibels

Highlight the value you wish to change using the front panel arrows or knob, then enter the new value using the numeric keypad.

In the following example, you will edit the `TPC`, `TFCI Power`, `TPC Power`, and `Pilot Power` fields of the default predefined channel selection for forward link, which is one dedicated physical channel (1 DPCH).

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu. The default predefined channel selection for forward link is 1 DPCH.

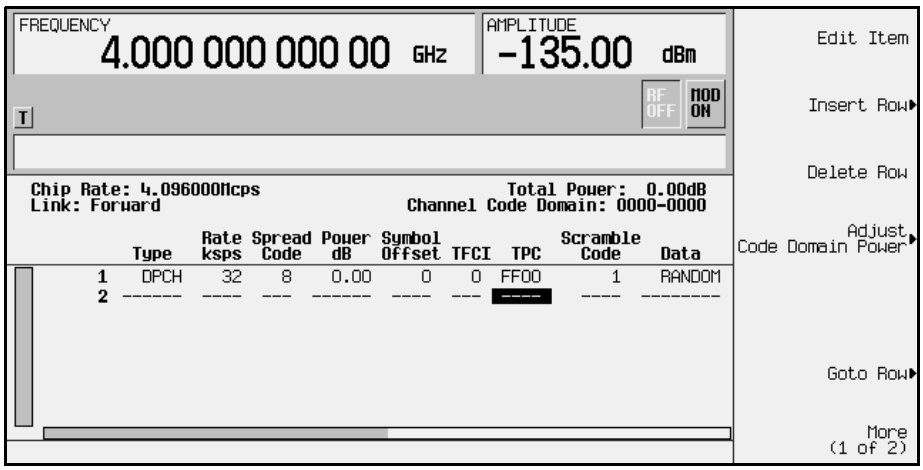
5. Press **W-CDMA Define** > **Edit Channel Setup** to display the channel table editor, as shown in the following figure. Use the front panel knob or arrow keys to move the cursor to table row 1.



6. Use the right arrow key to highlight the `TPC` value. `AAAA` should be highlighted.

NOTE TPC values are entered as hexadecimal digits (0-9, A-F). For information on what these values represent, refer to "Understanding TPC Values" on page 4-5.

7. Press **Edit Item** and enter **FF00** using the letter softkeys and numeric keypad.
8. Press **Enter**. The TPC value has now been modified and the cursor has moved to the next row in the `TPC` column, as shown in the following figure.

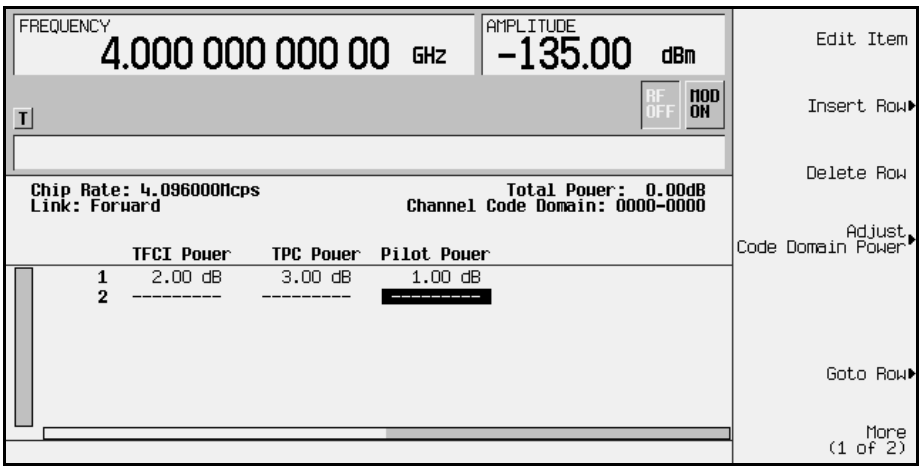


9. Use the right arrow key to move the cursor to the `TFCI Power`, `TPC Power`, and `Pilot Power` fields, which are currently hidden from view. (The horizontal scroll bar at the bottom of the screen indicates that there are columns to the right of the `Data` column.)

10. Use the arrow keys to highlight `0.00 dB` in the `TFCI Power` field and press **Edit Item** > **2** > **dB**. The TFCI power has now been offset by 2 dB and the cursor has moved to the next row in the `TFCI Power` column.

11. Use the arrow keys to highlight `0.00 dB` in the `TPC Power` field and press **Edit Item** > **3** > **dB**. The TPC power has now been offset by 3 dB and the cursor has moved to the next row in the `TPC Power` column.

12. Use the arrow keys to highlight `0.00 dB` in the `Pilot Power` field and press **Edit Item** > **1** > **dB**. The pilot power has now been offset by 1 dB and the cursor has moved to the next row in the `Pilot Power` column, as shown in the following figure.



NOTE For conceptual information on TFCI, TPC, and pilot power offsets, refer to "Understanding TFCI, TPC, and Pilot Power Offsets" on page 4-6.

13. Press **Return** until the status screen appears. The text area displays `FWD WCDMA Setup: 1 DPCH (Modified)` as the current configuration.

    To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

Modifying Reverse Link Channel Configurations

You can modify reverse link channel configurations using the channel setup table editor. The following examples show you how to modify predefined channel setups for reverse link waveform configurations. Refer to "Table Editor Basics" on page 2-2 for additional information about table editors.

CAUTION Unless previously saved to the signal generator's memory catalog, modifications made to predefined channel configurations are lost when changes are made to link direction.

To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

Inserting Additional Channels

The default reverse link channel setup after a normal instrument preset is one dedicated physical control channel (DPCCH). The DPCCH channel always occupies row 1 in the table editor and is modulated as a Q component. Any additional channels inserted into the table editor are dedicated physical data channels (DPDCH). The first DPDCH channel occupies row 2 and is modulated with an I component. The remaining channels (row 3 and greater) can be modulated with either I or Q, but no two consecutive channels are allowed to have the same component. The maximum number of reverse link channels is 16.

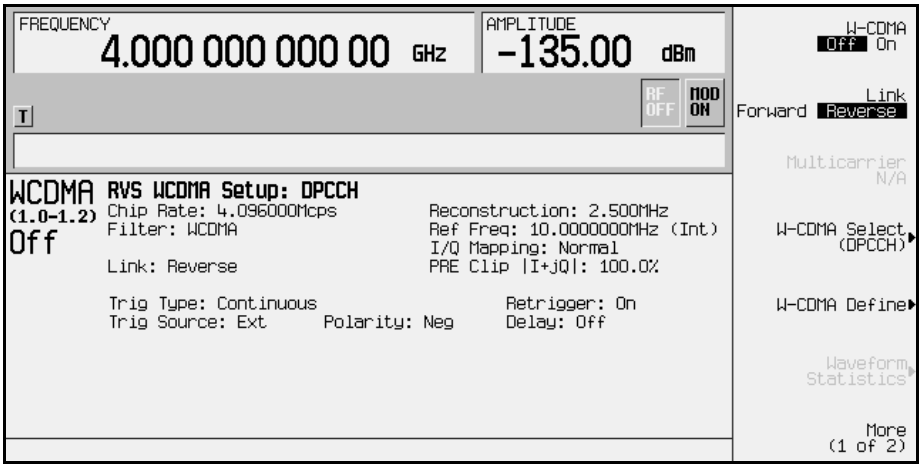
The following example explains how to insert DPDCH channels into the reverse link configuration.

Inserting Additional DPDCH Channels

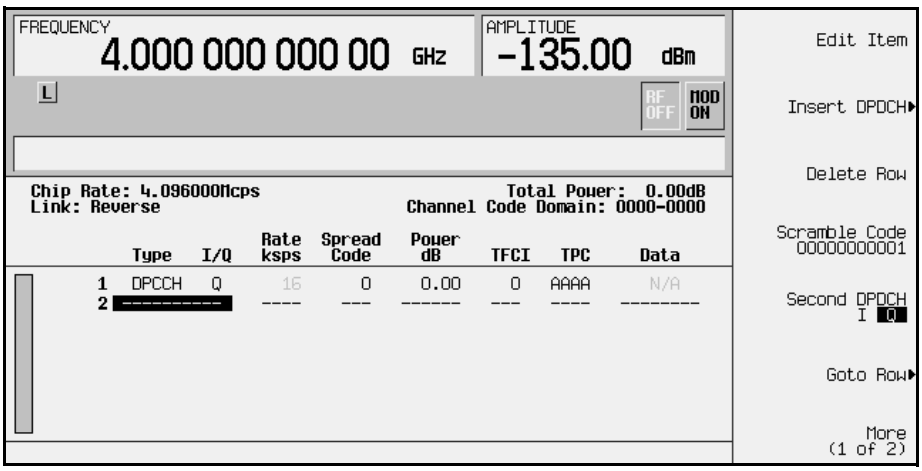
In this example, 15 additional DPDCH channels are inserted into the default predefined reverse link configuration.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.

5. Press **Link Forward Reverse** until **Reverse** highlights. The display reflects the change to reverse link mode. The text area displays `RVS WCDMA Setup: DPCCH` as the current configuration, as shown in the following figure.

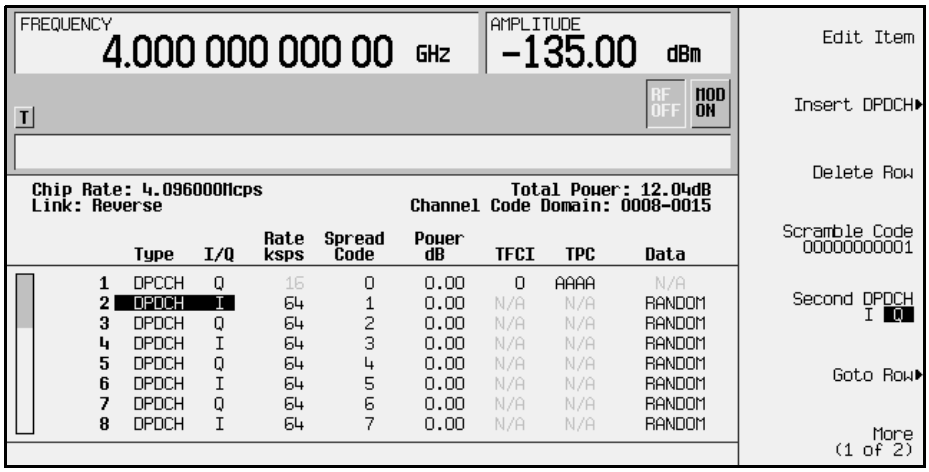


6. Press **W-CDMA Define** > **Edit Channel Setup** to display the channel table editor. Use the arrow keys to move the cursor to table row 2, as shown.

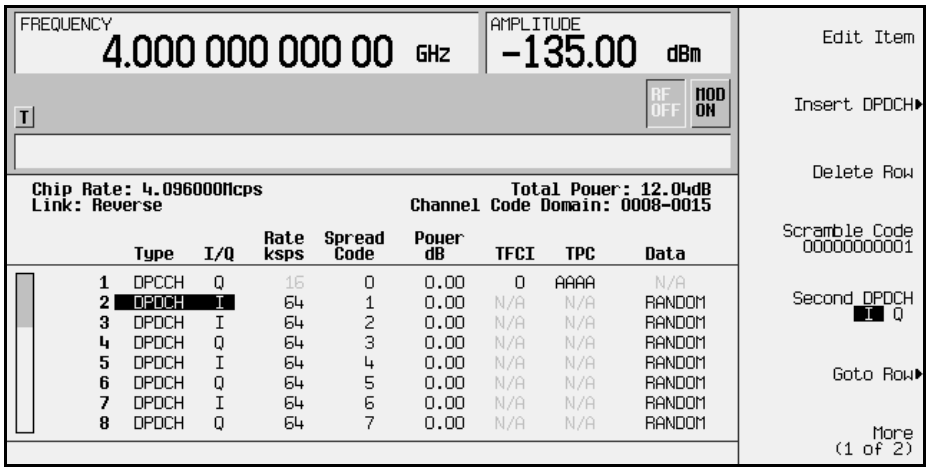


7. Press **Insert DPDCH** > **DPDCH Channels**. To enter the value, rotate the front panel knob, use the up and down arrow keys until the number 15 is displayed, or enter 15 using the numeric keypad. Terminate the entry with the **Enter** softkey.

8. Press **Done**. The channel table editor now contains the 15 additional channels, as shown in the following figure. Notice that the first page only displays channels one through eight. To see the additional channels, press **Goto Row** > **Page Down**.



9. Press **Second DPDCH I Q** until **I** highlights, as shown in the following figure. Notice that the I/Q setting for the second DPDCH channel (row 3) has changed from Q to I. Additionally, all subsequent channels have also switched I/Q settings.



10. Press **Return** until the status screen appears. The text area displays `RVS WCDMA Setup: DPCCH (Modified)` as the current configuration.

To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

Editing Reverse Link Channel Values in the Table Editor

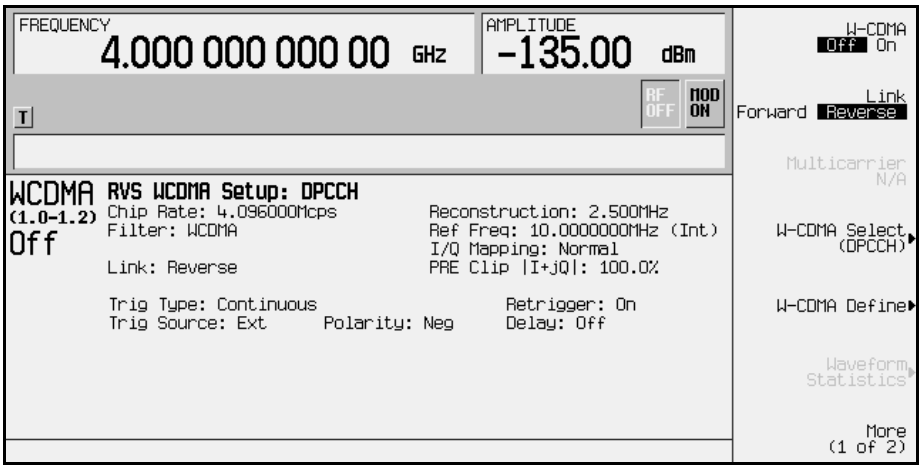
You can use the channel setup table editor to modify reverse link configuration values in the following columns:

- `Rate ksps` - symbol rate in kilosymbols-per-second
- `Spread Code`
- `Power dB` - channel power in decibels
- `TFCI` - transport format combination indicator
- `TPC` - transmit power control in hexadecimal
- `Data` - specific or random data

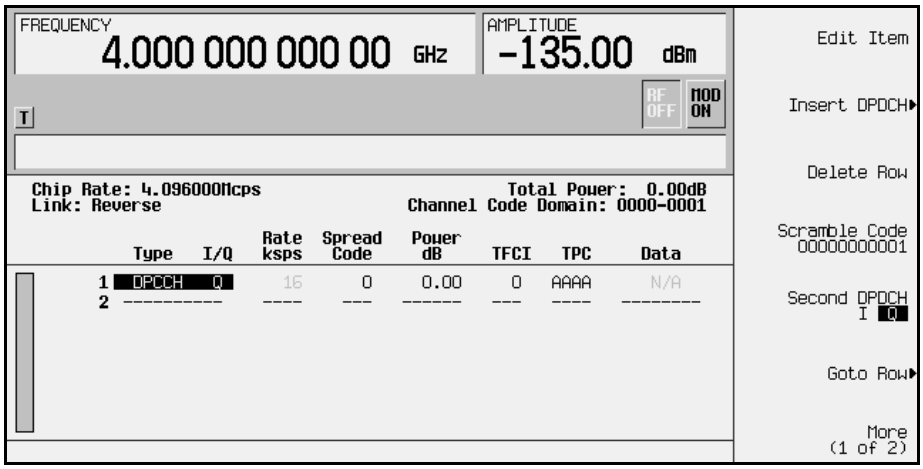
Highlight the value you wish to change using the front panel arrows or knob, then enter the new value using the numeric keypad.

In the following example, you will edit the `TPC` field of the default predefined channel selection for reverse link, which is one dedicated physical control channel (1 DPCCH).

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.
5. Press **Link Forward Reverse** until **Reverse** highlights. The display reflects the change to reverse link mode. The text area displays `RVS WCDMA Setup: DPCCH` as the current configuration, as shown in the following figure.



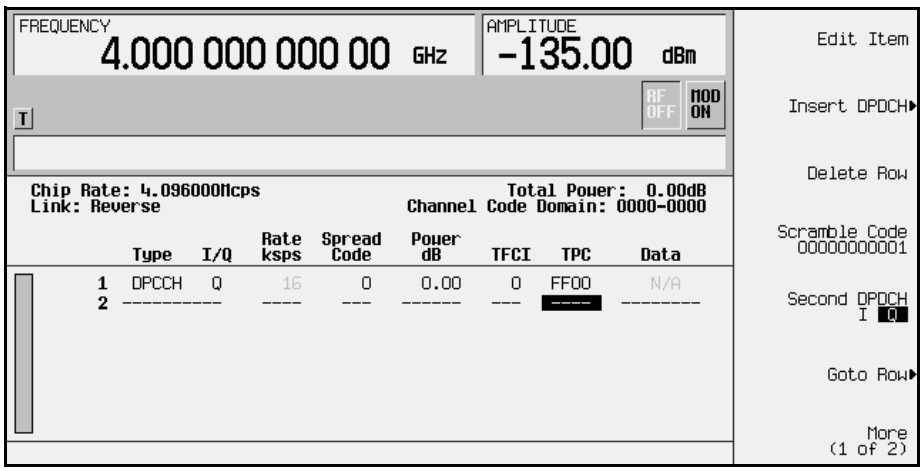
6. Press **W-CDMA Define** > **Edit Channel Setup** to display the channel table editor, as shown in the following figure.



7. Use the right arrow key to highlight the `TPC` value. `AAAA` should be highlighted.

NOTE TPC values are entered as hexadecimal digits (0-9, A-F). For information on what these values represent, refer to "Understanding TPC Values" on page 4-5.

8. Press **Edit Item** and enter **FF00** using the letter softkeys and numeric keypad. Press **Enter**. The TPC value has now been modified and the cursor has moved to the next row in the `TPC` column, as shown in the following figure.



9. Press **Return** until the status screen appears. The text area displays `RVS WCDMA Setup: DPCCH (Modified)` as the current configuration.

   To store a custom W-CDMA state, see "Storing a Custom W-CDMA State to Memory" on page 2-19.

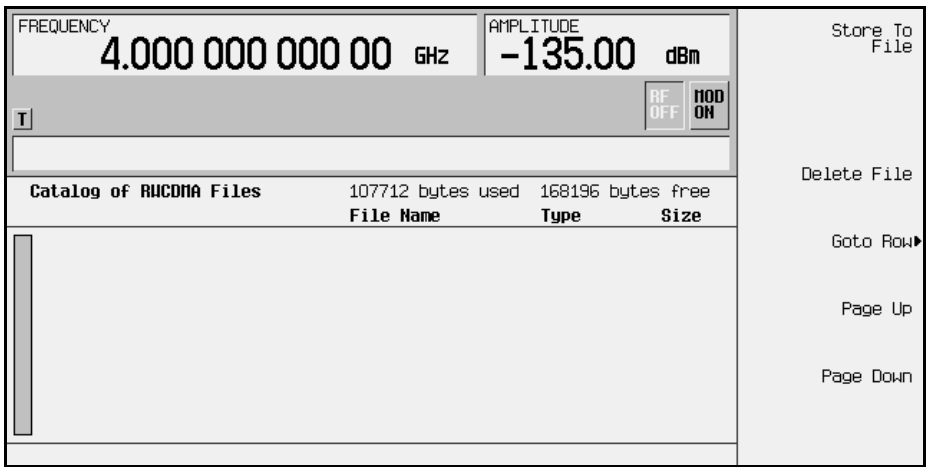
Storing a Custom W-CDMA State to Memory

In this procedure, you will store the custom W-CDMA state created in the previous procedure. If you have not performed the previous procedure, turn to "Editing Reverse Link Channel Values in the Table Editor" on page 2-17 and complete this procedure before continuing.

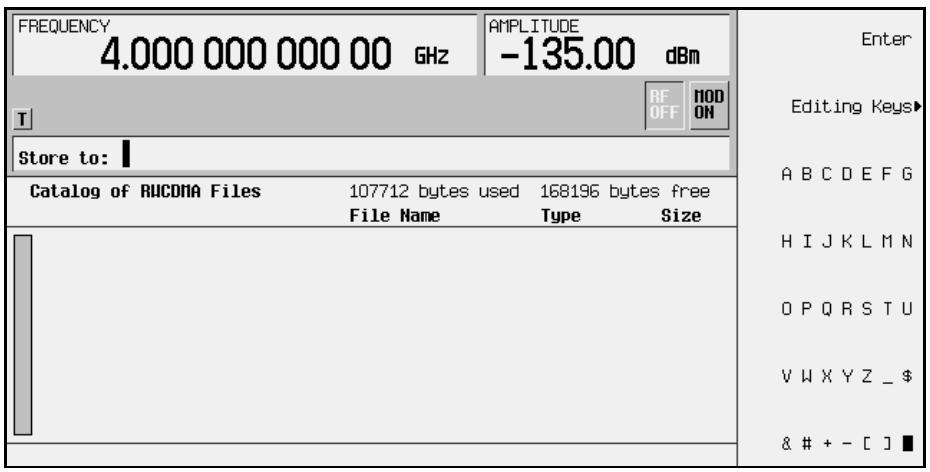
Use the following procedure to store and name the custom W-CDMA state to the signal generator's memory catalog.

1. To store the custom W-CDMA state, press **Store Custom W-CDMA State**. This opens a menu that accesses the signal generator's reverse W-CDMA (RWCDMA) memory catalog, as shown in the following figure.

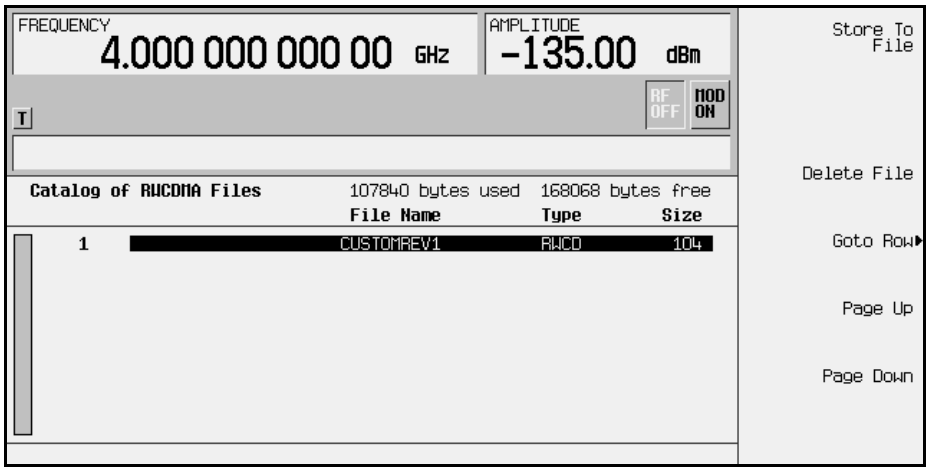
NOTE The forward link W-CDMA memory catalog is named FWCDMA.



2. To name the custom W-CDMA state, press **Store to File**. This opens a menu that allows you to name the custom W-CDMA state, as shown in the following figure.



3. If there is already a file highlighted in the catalog, press **Editing Keys** > **Clear Text**, then use the alphabetic menu and the numeric keypad to enter the file name `CUSTOMREV1`. Press **Enter**. Your custom W-CDMA state `CUSTOMREV1` is now saved to the reverse W-CDMA memory catalog, as shown.



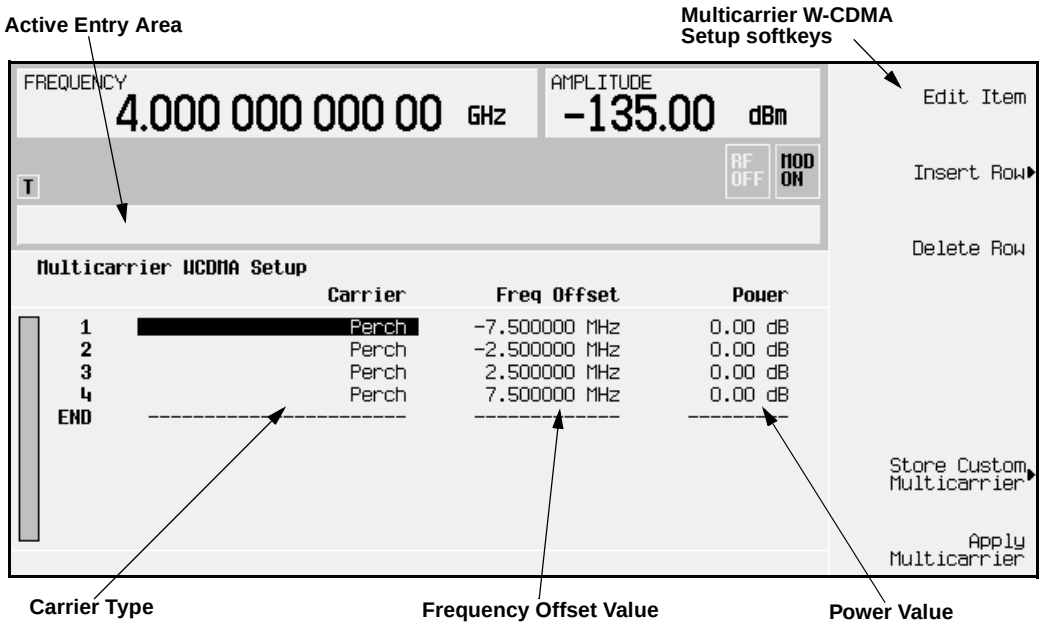
Creating, Storing, & Recalling a Custom Multicarrier W-CDMA Waveform

The signal generator provides a quick and easy way to create custom multicarrier W-CDMA waveforms: rather than building an entire 4-carrier setup from scratch, you can start with a 4-carrier W-CDMA template and modify the template's default values as desired.

Use the following procedure to create, store, and recall a custom, 4-carrier W-CDMA waveform.

Opening the Multicarrier W-CDMA Setup Table Editor

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears) > **CDMA Formats** > **W-CDMA (1.0-1.2)** > **Multicarrier Off On** (until **On** highlights).
3. Press **W-CDMA Select** > **4 Carriers** to select the template and return to the previous menu.
4. Press **Multicarrier Define** to open the Multicarrier W-CDMA Setup table editor. The 4-carrier W-CDMA template is automatically placed in the table editor, as shown in the following figure.



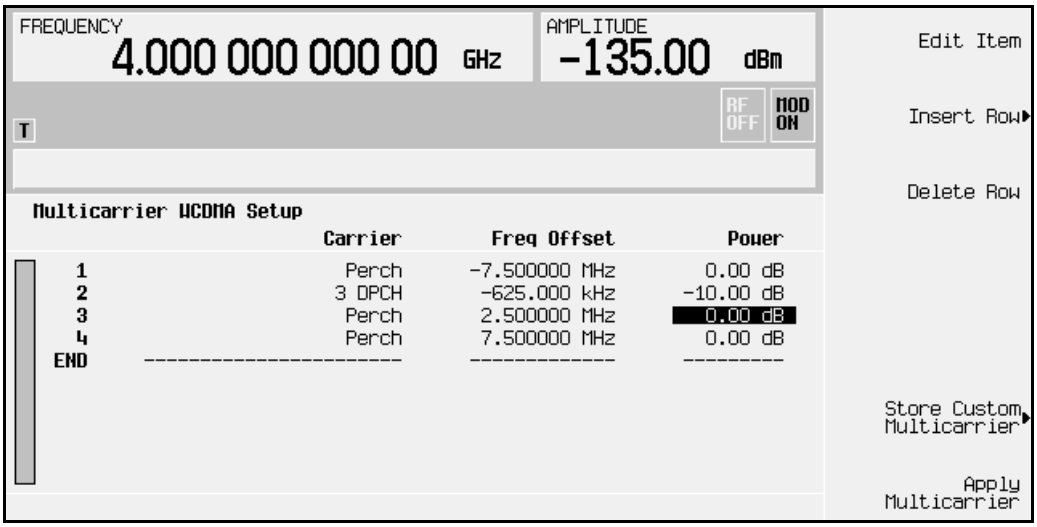
Modifying a Multicarrier W-CDMA 4-Carrier Template

Use the following steps to modify the standard 4-carrier W-CDMA template that was loaded in the previous procedure.

Edit the second carrier.

1. Highlight the second channel carrier (in table row 2), then press **Edit Item**.
2. In the menu that appears, press **3 DPCH**. This changes the carrier type.
3. Highlight the second carrier's frequency offset value and press **Edit Item**.
4. Change the offset value to –625 and press **kHz**.
5. Highlight the second carrier's power value and press **Edit Item**.
6. Change the power value to –10 and press **dB**.

   The following figure shows the edited template:

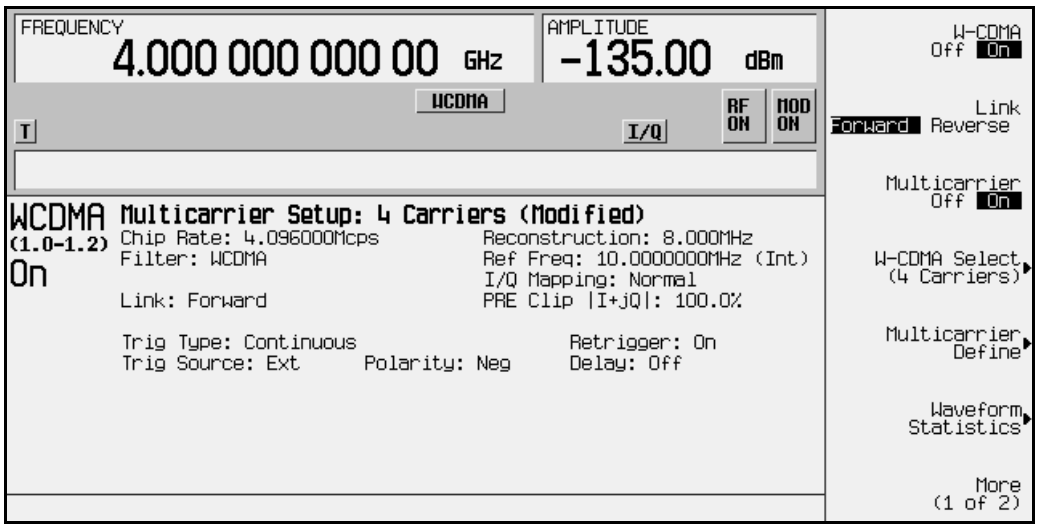


Activating a Custom Multicarrier W-CDMA Setup

Using the custom 4-carrier W-CDMA setup from the previous procedure, perform the following steps to activate the custom multicarrier W-CDMA signal.

1. Press **Return**, and note that the multicarrier setup is now displayed as `Multicarrier Setup: 4 Carriers (Modified)`.

2. Press **W-CDMA Off On** until **On** highlights. After waveform generation, the new multicarrier W-CDMA waveform is stored in volatile memory.
3. Press **RF On/Off**. The `RF ON` annunciator replaces the `RF OFF` annunciator on the signal generator's display, as shown, and the modulated signal is present at the RF output.



Storing a Custom Multicarrier W-CDMA Waveform

Use the following procedure to store a custom multicarrier W-CDMA waveform to the signal generator's memory. This example uses the custom 4-carrier W-CDMA waveform created in the previous procedure. If you have not created this custom multicarrier W-CDMA waveform, refer to "Creating, Storing, & Recalling a Custom Multicarrier W-CDMA Waveform" on page 2-21.

1. In the top-level W-CDMA menu (**W-CDMA Off On** is the top key), press **Multicarrier Define**.
2. Press **Store Custom Multicarrier** to display the signal generator's catalog of multicarrier forward W-CDMA (MFWCDMA) files.
3. Press **Store To File** to open a file naming softkey menu of letters and symbols that you can use to name the file.
4. As described in "Storing a Custom W-CDMA State to Memory" on page 2-19, name and store this file as `4CARRIER`.

Recalling a Custom Multicarrier W-CDMA Waveform

Use the following procedure to recall the custom multicarrier W-CDMA state from the MFWCDMA memory catalog. This example recalls the custom 4-carrier W-CDMA waveform stored in the previous procedure.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears) > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** (until **On** highlights).
3. Press **W-CDMA Select** > **Custom W-CDMA Multicarrier** to open the MFWCDMA memory catalog.
4. Highlight the file `4CARRIER`, then press **Select File**. The custom multicarrier W-CDMA waveform `4CARRIER` is selected

You can now use the waveform. For details, refer to "Activating a Custom Multicarrier W-CDMA Setup" on page 2-23.

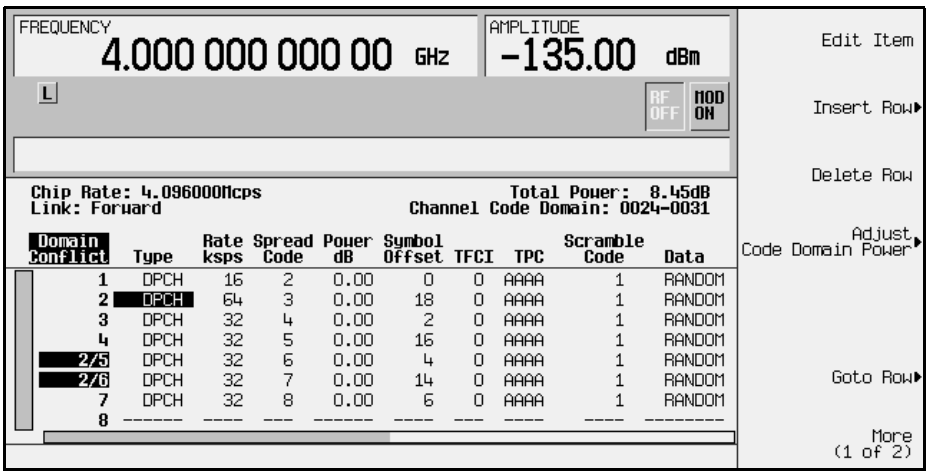
Identifying and Resolving Code Domain Conflicts

The code domain space of each channel is defined by the symbol rate and spread code. Code domain conflicts can arise when two channels of different rates map to the same code domain space. If code domain conflicts are present when the waveform is turned on, the conflicting channels are still generated.

NOTE Although the examples in this section use the forward link channel configuration, the information also applies to reverse link.

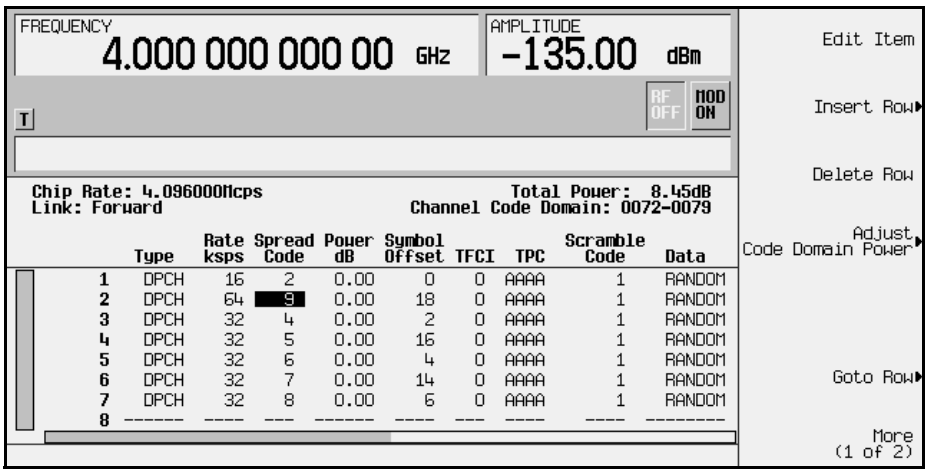
Identifying Conflicts

The following figure shows two code domain conflicts. In this example, row 2 occupies the channel code domain of 0024-0031. Row 5 conflicts with row 2 by occupying the channel code domain of 0024-0027. Row 6 also conflicts with row 2 by occupying the channel code domain of 0028-0031. The conflicting channels (rows 5 and 6) are flagged (highlighted) and each flag includes the row number of the channel it conflicts with, as shown.



Resolving Conflicts

To resolve conflicts, you can change the value of the spread code. To make changes, use the table editor functions to highlight the value you want to change, then enter the new value using the front panel keys. In the following figure, the spread code for the channel in row 2 has been changed to 9 to resolve the conflicts in rows 5 and 6.



Outputting a W-CDMA Waveform

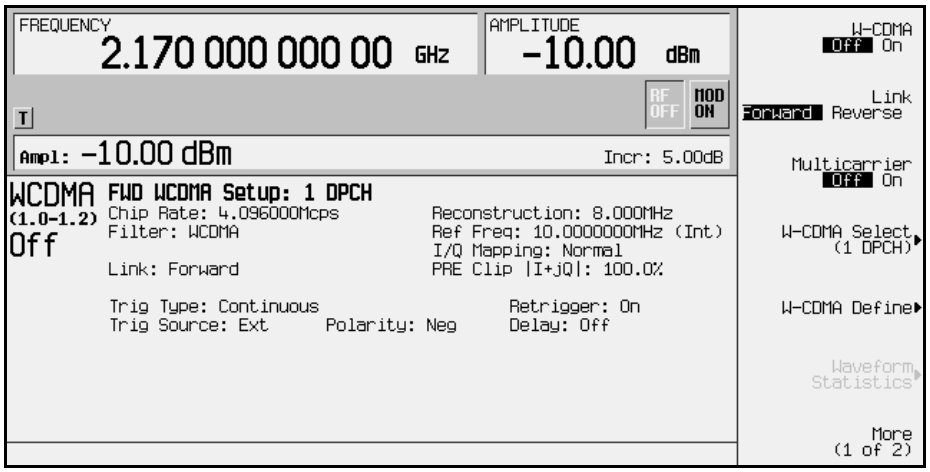
This section explains how to set the carrier frequency and power, generate a W-CDMA waveform, enable the modulation and the RF output, and set the waveform's clipping parameters.

Setting the Carrier Frequency and Power

Use the following procedure to set the carrier signal's power and frequency.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** to display the W-CDMA menu.
5. For this example, set the RF output frequency to 2.17 GHz by pressing the front panel **Frequency** key. Enter 2.17 GHz by rotating the front panel knob, using the up and down arrow keys, or entering the value using the numeric keypad. (If using the numeric keypad to enter a new value, terminate the entry with the **GHz** softkey.)
6. Set the output power to –10 dBm by pressing the front panel **Amplitude** key. Enter –10 by rotating the front panel knob, using the up and down arrow keys, or entering the value using the numeric keypad. (If using the numeric keypad to enter a new value, terminate the entry with the **dBm** softkey.)

   The carrier frequency and power are now set. The following figure shows the display with the current configuration.

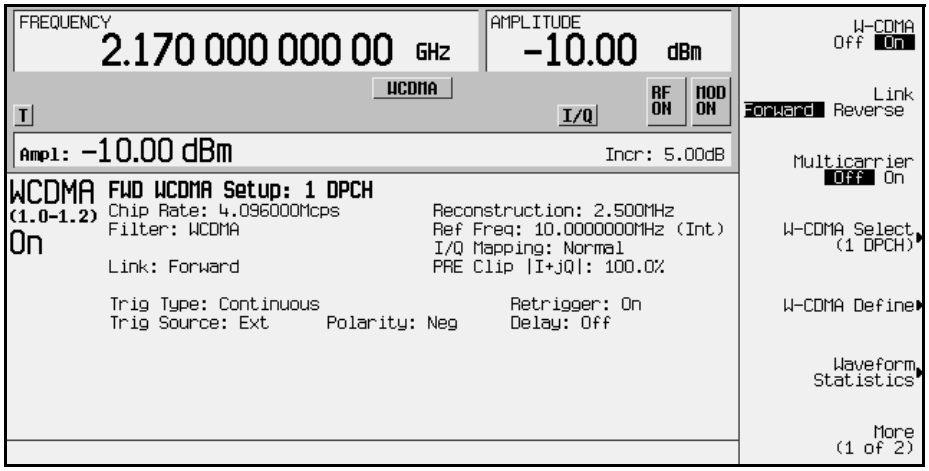


Generating the W-CDMA Waveform and Enabling the RF Output

Use the following procedure to generate a W-CDMA waveform and activate the RF output.

1. Press **W-CDMA Off On** until **On** highlights to generate the W-CDMA waveform. (The signal generator displays a message while the waveform is being generated.) The `WCDMA` and `I/Q` annunciators turn on.
2. Toggle the front panel **RF On/Off** key until the display annunciator reads `RF ON`.
3. Modulation is turned on as a default condition. (The display annunciator shows `MOD ON`.) If modulation is off, toggle the front panel **Mod On/Off** key.

   The W-CDMA signal is now present at the front panel RF OUTPUT connector. The following figure shows the display with the current configuration.



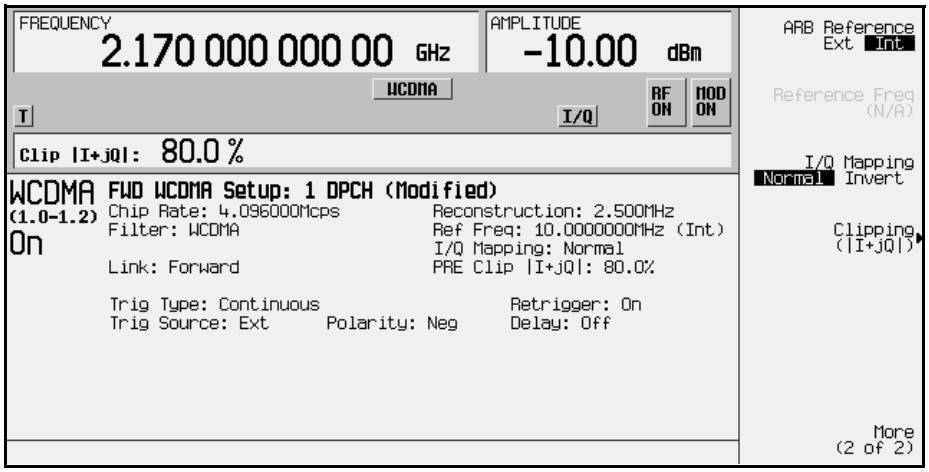
Clipping the W-CDMA Waveform

Use the following procedure to configure and apply clipping to the W-CDMA waveform.

1. Notice that in the status area of the display the current clipping setup is `PRE Clip |I+jQ|: 100.0%`. A clipping level of 100 percent is equal to no clipping.
2. Press **W-CDMA Define** > **More (1 of 2)** > **Clipping** to access the clipping setup menu.
3. The **Clipping Type |I+jQ| |I|,|Q|** softkey default is **|I+jQ|** (*circular* clipping). This selection clips the combined I and Q waveform. Alternatively, **|I|,|Q|** (*rectangular* clipping) clips the I and Q waveforms separately.

   Use the default selection for this example.
4. Press **Clip |I+jQ| To** and enter 80 percent.
5. The **Clip At PRE POST FIR Filter** softkey default is **PRE**. With **PRE** selected, the waveform is clipped prior to FIR filtering. Alternatively, when you select **POST**, the waveform is clipped after FIR filtering. Use the default selection for this example.

6. Press **Apply to Waveform**. The signal generator rebuilds the waveform and the clipping settings are updated in the status area of the display, as shown. For more information on clipping, refer to "Understanding Baseband Clipping" on page 4-8.



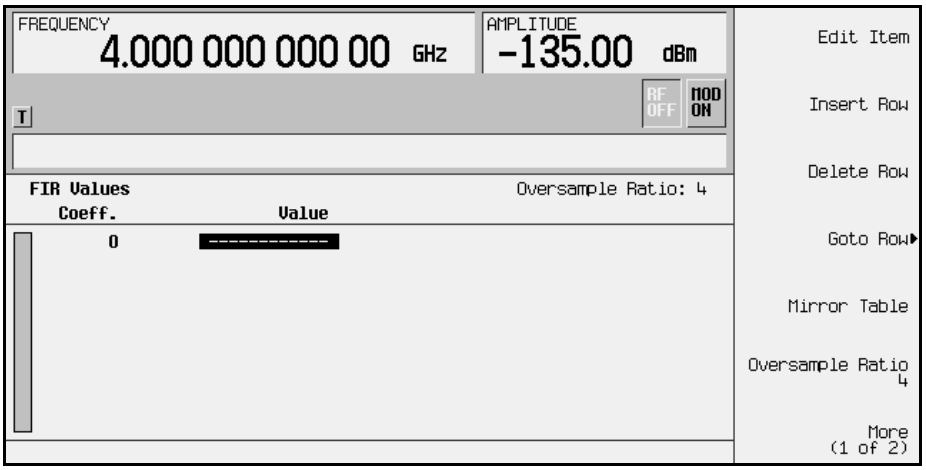
Creating a User-Defined FIR Filter Using the FIR Table Editor

Using this procedure you will create and store an 8-symbol, windowed sinc function filter with an oversample ratio of 4.

Accessing the Table Editor

Use the following procedure to access the FIR filter table editor.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR**. The FIR table editor is displayed. The following figure shows the FIR table editor.



Entering the Coefficient Values

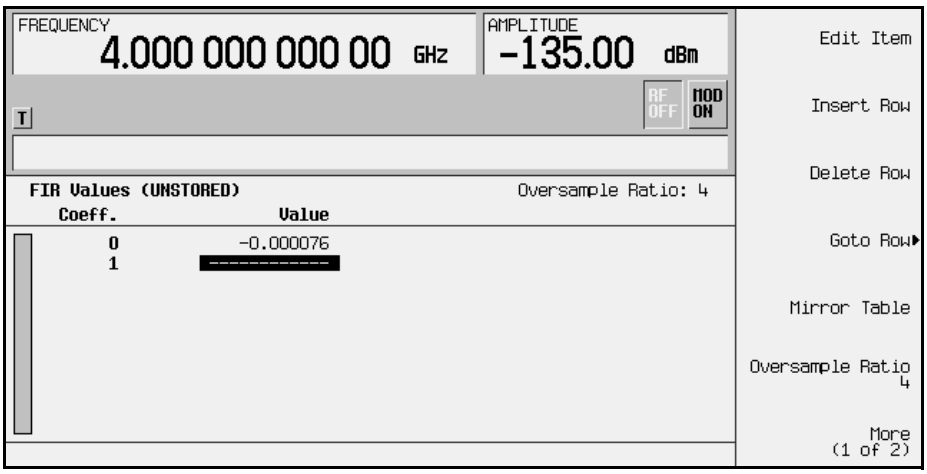
The FIR table editor creates a filter from values that you provide.

1. Use the cursor to highlight the `Value` field for coefficient 0. Use the numeric keypad to type the first value (–0.000076) from the following table. As you press the numeric keys, the numbers are displayed in the active entry area. (If you make a mistake, you can correct it using the backspace key.)

Coefficient	Value
0	–0.000076
1	–0.001747
2	–0.005144
3	–0.004424
4	0.007745
5	0.029610
6	0.043940
7	0.025852

Coefficient	Value
8	–0.035667
9	–0.116753
10	–0.157348
11	–0.088484
12	0.123414
13	0.442748
14	0.767329
15	0.972149

Press **Enter**. The value for coefficient 0 is now displayed in the `Value` field, and the cursor has moved to the second row in the `Value` column. The following figure shows the FIR table editor at this point in the process.



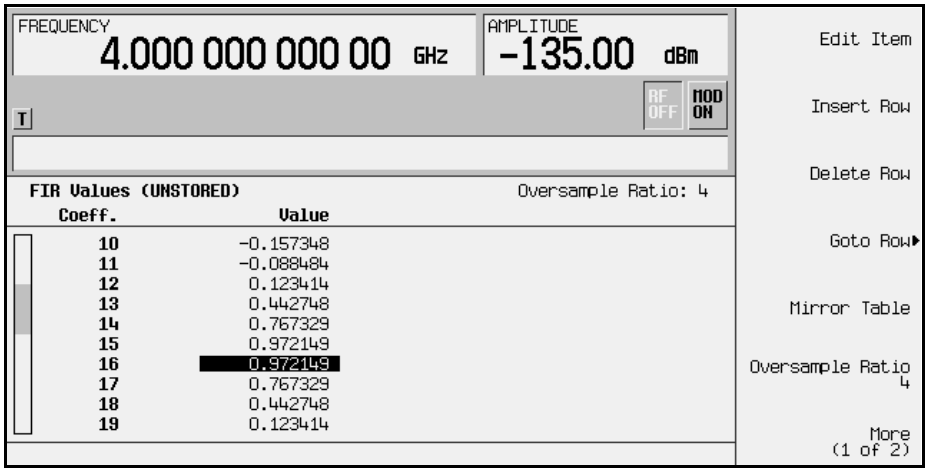
2. Continue entering the coefficient values from the table in step 1 until all 16 values are complete.

Duplicating the First 16 Coefficients Using Mirror Table

Use the following procedure to duplicate the first 16 coefficients in the FIR filter table editor.

In a windowed sinc function filter, the second half of the coefficients are identical to the first half in reverse order. The signal generator provides a mirror table function that automatically duplicates the existing coefficient values in the reverse order.

Press **Mirror Table**. The last 16 coefficients (16 through 31) are automatically generated and the first of these coefficients (number 16) highlights. The following figure shows the display at this point in the process.



Setting the Oversample Ratio

The oversample ratio (OSR) is the number of filter taps per symbol. Acceptable values range from 1 through 32; the maximum combination of symbols and oversampling ratio allowed by the table editor is 1024. The instrument hardware, however, is actually limited to 32 symbols, an oversample ratio between 4 and 16, and 256 coefficients. So if you enter more than 32 symbols or 256 coefficients, the instrument is unable to use the filter. If the oversample ratio is different from the internal, optimally selected one, then the filter is automatically resampled to an optimal oversample ratio.

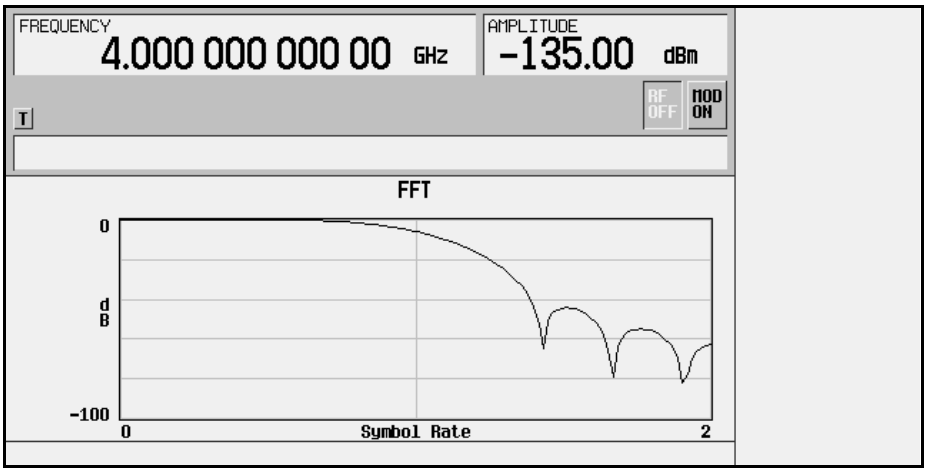
The current OSR value is shown underneath the **Oversample Ratio** softkey, as shown in the previous figure. For this example, set the OSR to 4 (if it isn't already). Press **Oversample Ratio** and use the numeric keypad to enter **4**. Press the **Enter** softkey to terminate the entry.

Displaying a Graphical Representation of the Filter

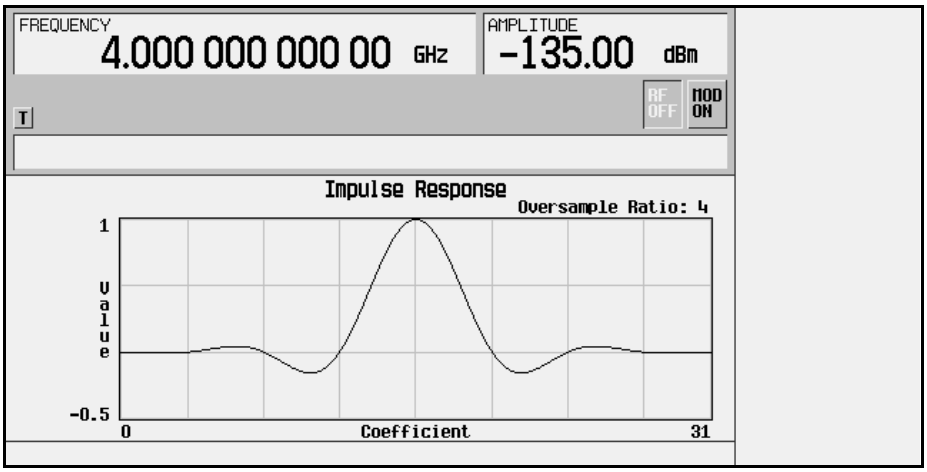
Use the following procedure to display graphical representations of the active FIR filter.

The signal generator has the capability of graphically displaying the filter in both time and frequency dimensions.

1. Press **More (1 of 2)** > **Display FFT** to view the filter frequency response (calculated using a fast Fourier transform). The following graph is displayed.



2. Press **Return** to return to the menu keys.
3. Press **Display Impulse Response** to display the filter impulse response in time. The following graph is displayed.



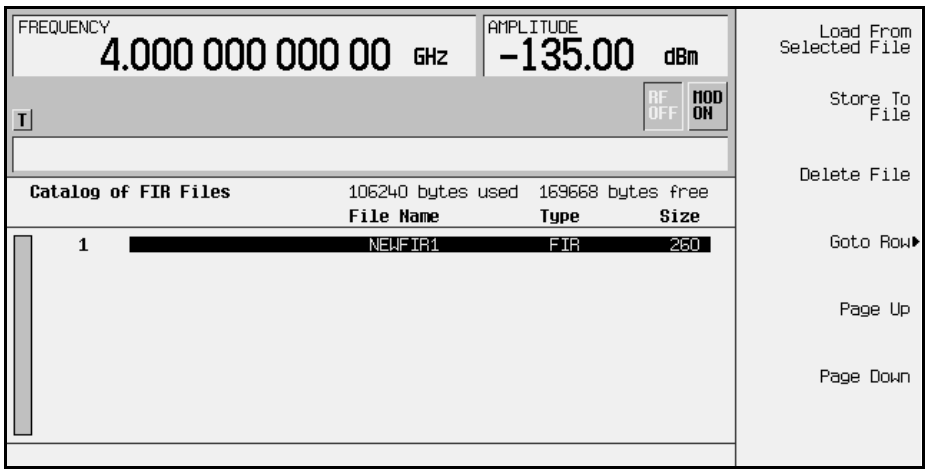
4. Press **Return** to return to the menu keys.

Storing the Filter to Memory

The filter is now complete and can be stored to non-volatile memory for future use. At any time you can check the information at the top of the FIR table editor to determine whether the current table has been stored. Your current table should display the following text: `FIR Values (UNSTORED)`. If you attempt to exit the table editor mode without first storing to a file, the signal generator first prompts you to confirm that you want to exit without storing to a file. If you do *not* want to exit after all, press **Return**.

To store the file, perform the following steps.

1. Press **Load/Store** > **Store To File**. The catalog of FIR files appears along with the amount of memory available.
2. For this example, you will title the file NEWFIR1. The file name is created by pressing the softkey containing the desired character, then selecting the softkey with that character from the subsequent menu. For example, press the **HIJKLMN** softkey. Then press the bottom softkey, **N**. `N` is displayed in the active entry area following the `Store to:` text.
3. Continue entering the characters for the file name until `NEWFIR1` is displayed in the active entry area. (Use the numeric keypad to enter the number 1.)
4. Press **Enter** when the file name is complete. The contents of the current FIR table editor are stored to a file in non-volatile memory. The following figure shows the display.



The NEWFIR1 file is the first file name listed. (If you have previously stored other FIR files, additional file names are listed below NEWFIR1.) The file type is FIR and the size of the file is 260 bytes. The amount of memory used is also displayed. The number of files that can be saved depends on the size of the files and the amount of memory used. Memory is also shared by instrument state files and list sweep files.

This filter can now be used to customize a modulation or it can be used as a basis for a new filter design. (Refer to the additional filter examples in this chapter.)

Modifying an FIR Filter Using the FIR Table Editor

FIR filters stored in the signal generator memory can easily be modified using the FIR table editor. You can load the FIR table editor with coefficient values from user-defined FIR files stored in the signal generator's memory, or from one of the default FIR filters. Then you can modify the values, and store the new files. In this example, you will load the FIR table editor with the values for a default Gaussian filter and then modify it.

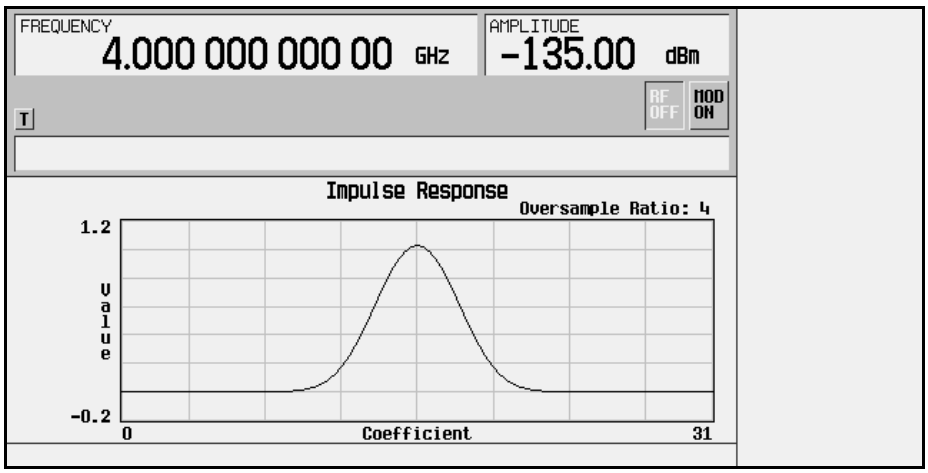
Loading the Default Gaussian FIR File

Use the following procedure to load the default Gaussian FIR filter into the FIR filter table editor.

1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define**.
4. Press **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Gaussian**.
5. Set the filter BbT to 0.300 (if **Filter BbT** is not already set to this value) by pressing **Filter BbT** and rotate the front panel knob until 0.300 is displayed.
6. Set the number of filter symbols to 8 (if **Filter Symbols** is not already set to this value) by pressing **Filter Symbols** and rotating the front panel knob until 8 is displayed.
7. Press **Generate**. The FIR table editor should now contain the coefficient values for the specified Gaussian filter.

NOTE The actual oversample ratio during modulation is automatically selected by the instrument. A value between 4 and 16 is chosen dependent on the symbol rate, the number of bits per symbol of the modulation type, and the number of symbols.

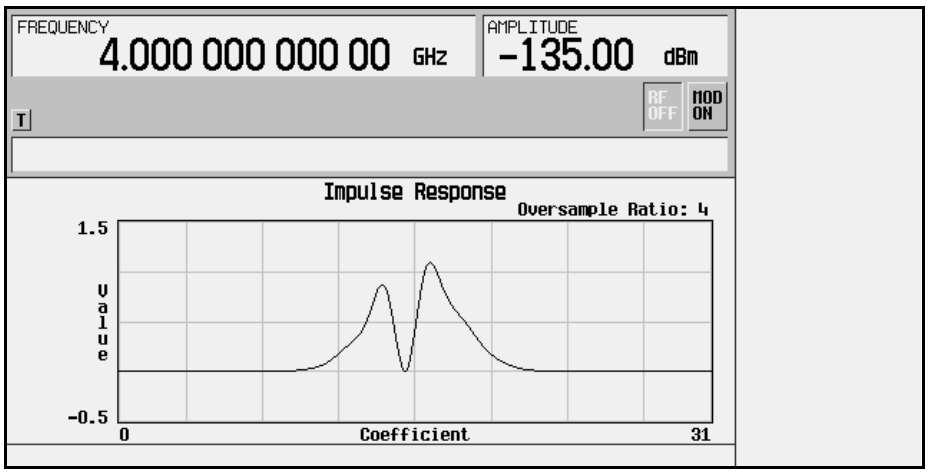
8. Press **Display Impulse Response** for a graphic representation of the filter impulse response as shown in the following figure.
9. Press **Return** to return to the menu keys.



Modifying the Coefficients

Use the following procedure to modify the filter coefficients in the FIR filter table editor.

1. Highlight coefficient 15.
2. Press **0** > **Enter** to change the value of the coefficient to 0.
3. Press **Display Impulse Response** to see the effects of the change.



The graphic display can provide a useful troubleshooting tool (in this case, it indicates that a coefficient value is missing, resulting in an improper Gaussian response).

4. Press **Return** to return to the menu keys.
5. In addition to changing existing values, you can also insert and delete rows of coefficients and change the oversample ratio. (Press **More (2 of 2)** to access these softkeys.)
6. Highlight coefficient 15.
7. Press **1** > **Enter**. This changes coefficient 15 back to its original value.

Storing the Filter to Memory

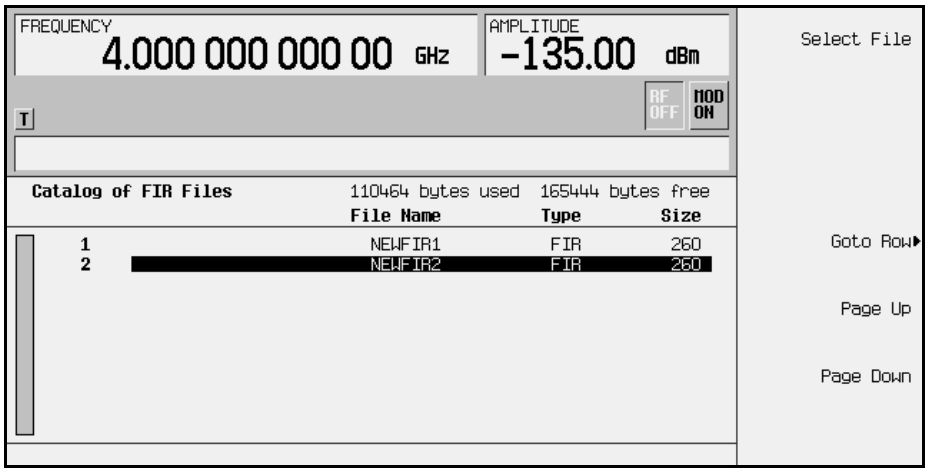
Perform the following procedure to store the modified Gaussian filter to the signal generator's memory catalog.

1. Press **Load/Store** > **Store To File**. The catalog of FIR files is displayed along with the amount of memory available.
2. Name the file NEWFIR2.
3. Press **Enter** when the file name is complete. The contents of the current FIR table editor are stored to a file in non-volatile memory, and the catalog of FIR files is updated to show the new file.

Applying a User-Defined FIR Filter to a W-CDMA Waveform

Custom FIR filters can be created using the FIR table editor feature or they can be created externally and downloaded into the signal generator memory. Once the filter is stored in memory, it can be selected for use with your custom modulation state. This example requires that at least one FIR file be already stored in memory. For an example of creating and storing a FIR filter, see "Creating a User-Defined FIR Filter Using the FIR Table Editor" on page 2-30.

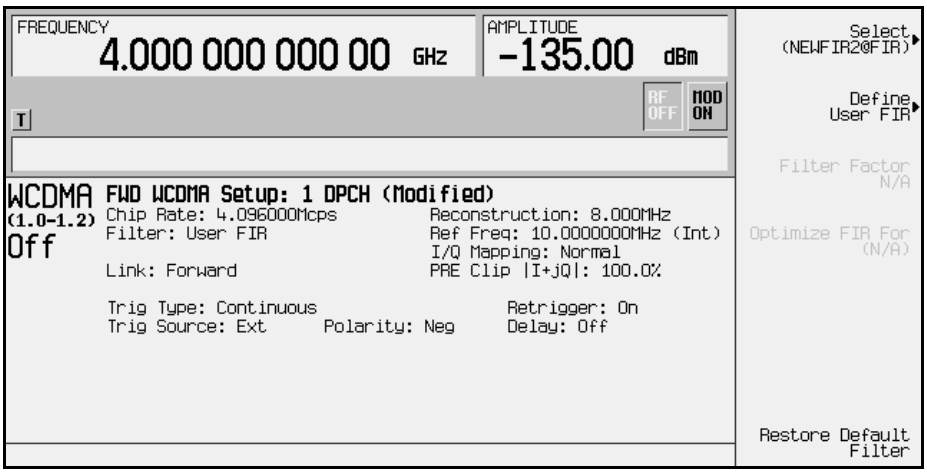
1. Press **Preset**.
2. Press **Mode** > **Arb Waveform Generator** (if it appears).
3. Press **CDMA Formats**.
4. Press **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Select** > **User FIR**. The catalog of FIR files should now be displayed. The following figure shows an example of the catalog.



In this example, there are two FIR files listed: NEWFIR1 and NEWFIR2. (These files were created in the previous examples.)

5. Scroll down in the list until the desired filter highlights. In this example, NEWFIR2 is the desired filter. You can use the front panel knob or the arrow keys as well as the GoTo Row function to highlight the filter.

6. Press **Select File**. The highlighted filter is now selected for use in your custom modulation state, as shown.



The filter you selected is NEWFIR2. You can see the name, followed by `@FIR`, displayed below the **Select** softkey. In the Filter field, near the left of the display, `User FIR` is displayed to indicate that a user-defined FIR filter has been selected.

Once you have set the other modulation parameters to your satisfaction, turn on Custom and the RF output and your user-defined filter is in use.

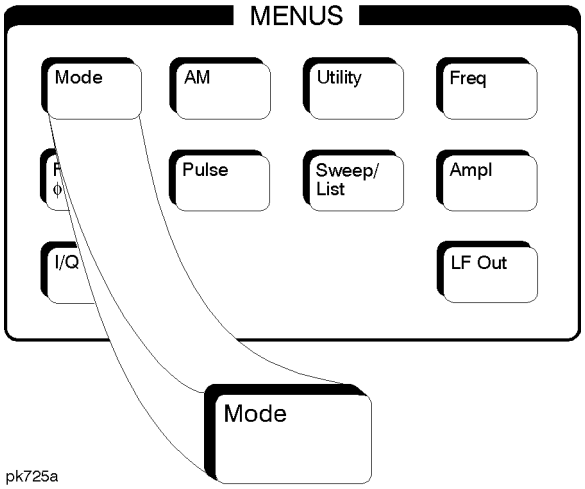
NOTE The actual oversample ratio during modulation is automatically selected by the instrument. A value between 4 and 16 is chosen dependent on the symbol rate, the number of bits per symbol of the modulation type, and the number of symbols.

3 Softkey Reference

This chapter describes the **Mode** hardkey and the associated softkeys used to configure and activate functions specific to the Option 100, W-CDMA (Revision 1.0-1.2) personality.

The softkeys are presented in alphanumeric order.

Mode Key



When you press the front-panel **Mode** key, the softkeys that appear depend on how many options are included in the instrument. When an instrument has options in addition to the UND option, the softkey **Arb Waveform Generator** provides access to all Dual Arbitrary Waveform Generator softkeys (including the optional personalities).

The softkeys described in this chapter are available only under the **W-CDMA (Rev 1.0–1.2)** softkey.

For information on the SCPI commands that duplicate these softkeys remotely, see Chapter 5, “Remote Programming,” and Chapter 6, “Programming Command Cross-Reference.”

n ksps

This key sets the symbol rate. It is used for an inserted DPCH or Spread Only forward link channel, for multiple channels in the W-CDMA Edit Channel Setup table editor, and for multiple reverse link dedicated physical data channels (DPDCH).

The values available are the following:

8 ksps	128 ksps
16 ksps	256 ksps
32 ksps	512 ksps
64 ksps	1024 ksps

Softkey Location (Forward Link): **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **DPCH** (or **Spread Only** > or **Multiple Channels** > **Symbol Rate**) > **n ksps** *(See above description of (n) ksps.)*

Softkey Location (Reverse Link): **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert DPDCH** > **Symbol Rate** > **n ksps** *(See above description of (n) ksps.)*

1 DPCH

Selects a single DPCH forward link channel for either the W-CDMA setup or the carrier in the multicarrier table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **1 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Edit Item** > **1 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Insert Row** > **1 DPCH**

2 Carriers

Selects a standard 2-carrier W-CDMA setup with the settings listed below. (See also "W-CDMA Select" on page 3-35.)

Carrier 1: Perch channel, –7.5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, 7.5 MHz frequency offset, 0 dB power

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Off On** > **W-CDMA Select** > **2 Carriers**

2.500 MHz

Selects a reconstruction filter with a cutoff frequency of 2.500 MHz.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **CDMA Define** > **Reconstruction Filter** > **2.500 MHz**

3 Carriers

Selects a standard 3-carrier W-CDMA setup with the settings listed below. (See also "W-CDMA Select" on page 3-35.)

Carrier 1: Perch channel, –5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, 0 kHz frequency offset, 0 dB power

Carrier 3: Perch channel, 5 MHz frequency offset, 0 dB power

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Off On** > **W-CDMA Select** > **3 Carriers**

3 DPCH

Selects three DPCH forward link channels for either the W-CDMA setup or the carrier in the multicarrier table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **3 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Edit Item** > **3 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Insert Row** > **3 DPCH**

4 Carriers

Selects a standard 4-carrier W-CDMA setup with the settings listed below. (See also "W-CDMA Select" on page 3-35.)

Carrier 1: Perch channel, –7.5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, –2.5 MHz frequency offset, 0 dB power

Carrier 3: Perch channel, 2.5 MHz frequency offset, 0 dB power

Carrier 4: Perch channel, 7.5 MHz frequency offset, 0 dB power

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Off On** > **W-CDMA Select** > **4 Carriers**

8.000 MHz

Selects a reconstruction filter with a cutoff frequency of 8.000 MHz.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Reconstruction Filter** > **8.000 MHz**

250 kHz

Selects a reconstruction filter with a cutoff frequency of 250 kHz.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Reconstruction Filter** > **250.0 kHz**

Adjust Code Domain Power

Accesses a menu that enables you to adjust the code domain power (the relative power in each of the channels). Select **Equal Energy per Symbol** (all channels are of equal energy per bit and the total power equals 0 dB), or **Scale to 0 dB** (scale all of the current channel powers so that the total power equals 0 dB while keeping the previous relative power ratios between the individual channels). Available in Forward Link only.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power**

APCO 25 C4FM

Press this softkey to select an APCO 25-specified C4FM filter in the Select (filter) menu. This is a Nyquist filter with an alpha of 0.2 which is combined with a shaping filter. This softkey is only available when **Multicarrier Off On** is toggled to **Off**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Select** > **APCO 25 C4FM**

Apply Channel Setup

Applies the changes made in the channel setup table editor (see "Edit Channel Setup" on page 3-12) for the current link. If the waveform is set to **On**, the new channel data generates a new modulation waveform in ARB waveform memory.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Apply Channel Setup**

Apply Multicarrier

Applies the current settings in the multicarrier table editor. (See also "Multicarrier Define" on page 3-22.)

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Apply Multicarrier**

Apply To Waveform

Use this terminator softkey to apply the current clipping settings you have selected to the waveform. Press **Return** if you do not want to apply the new settings at this time.

NOTE The settings are applied the next time you generate a waveform.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Apply To Waveform**

ARB Reference Ext Int

Selects either an internal or an external reference for the waveform clock. If you choose external, you must enter the reference frequency (as described under the **Reference Frequency** softkey on page 3-27) and apply the signal to the BASEBAND GEN REF IN connector.

Default Value: Int39

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **ARB Reference Ext Int**

Bus

Sets the trigger source to bus. When the trigger source is set to bus, the signal generator triggers an event when it receives the appropriate command via GPIB.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Bus**

Channels

Press this softkey, then enter the number of duplicate channels that you want to set up and insert into the Edit Channel Setup table editor. Press the softkey **Enter** to terminate the entry.

After you have set the channel parameters, and the number of times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: 1

Range: 1 through 511

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **Channels**

Chip Rate

Displays a menu where you can choose the chip rate for the channels in the current table editor.

Default Value: 4.096000 Mcps

Available Values (in Mcps): 4.096, 8.192, 16.384

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Chip Rate**

Clip |I+jQ| To

Use this softkey to make the modulation level of the combined I and Q waveform the active function. You can then clip (limit) the level to a percentage of full scale. A level of 100.0% equates to no clipping.

Default Value: 100.0%

Range: 10.0 through 100.0%, in 0.1% increments

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Clip |I+jQ| To**

Clip |I| To

Use this softkey to make the modulation level of the I component the active function. You can then clip (limit) the level to a percentage of full scale. A level of 100.0% equates to no clipping.

Default Value: 100.0%

Range: 10.0 through 100.0%, in 0.1% increments

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Clip |I| To**

Clip |Q| To

Use this softkey to make the modulation level of the Q component the active function. You can then clip (limit) the level to a percentage of full scale. A level of 100.0% equates to no clipping.

Default Value: 100.0%

Range: 10.0 through 100.0% in 0.1% increments

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Clip |Q| To**

Clip At PRE POST FIR Filter

Use this softkey to select whether you want the waveform clipped before (PRE) or after (POST) FIR filtering.

Default Value: PRE

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Clip At PRE POST FIR Filter**

Clipping

Press this softkey to access a menu of options for limiting the modulation level.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping**

Clipping Type |I+jQ| |I|,|Q|

Use this softkey to select either |I+jQ| or |I|,|Q| as the clipping type. If you select |I+jQ|, the combined I and Q waveform is clipped (*circular* clipping). If you select |I|,|Q|, the I and Q components of the waveform are clipped independently (*rectangular* clipping). In this case, you can clip I and Q to different levels.

Default Value: |I+jQ|

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Clipping** > **Clipping Type |I+jQ| |I|,|Q|**

Continuous

Sets the W-CDMA trigger type to continuous. In continuous trigger mode, the waveform repeats itself indefinitely.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Continuous**

Custom W-CDMA Carrier

Displays the forward link W-CDMA (FWCDMA) memory catalog. From this catalog listing, you can choose a previously stored custom carrier setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Edit Item** > **Custom W-CDMA Carrier**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Insert Row** > **Custom W-CDMA Carrier**

Custom W-CDMA Multicarrier

Displays the multicarrier forward link W-CDMA (MFWCDMA) memory catalog. From this catalog listing, you can choose a previously stored custom multicarrier setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **W-CDMA Select** > **Custom W-CDMA Multicarrier**

Custom W-CDMA State

Displays the W-CDMA Setup Select File menu for the current link, where you can choose a previously stored custom W-CDMA setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **Custom W-CDMA State**

Define User FIR

Accesses a table editor for creating and modifying FIR filters. The FIR table editor allows a maximum filter length of 1024 taps with a maximum oversampling ratio of 32. An FIR filter selected for use in W-CDMA, however, cannot have more than 256 taps so the number of symbols and the oversample ratio should be selected accordingly. Examples of using the FIR table editor are provided in the “Using Functions” chapter.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR**

Delete All Rows

Deletes all rows in the current table editor.

Deletions cannot be recovered.

Delete All Rows is located in some table editors.

Delete File

Deletes the highlighted file from the displayed catalog. You will be prompted for confirmation.

Delete File is located in catalogs of files.

Delete Row

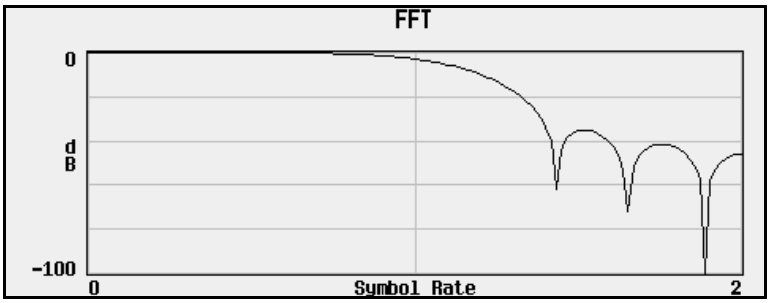
Deletes the highlighted row in the table.

Deletions cannot be recovered.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Delete Row**

Display FFT

Displays a graphical representation of the frequency response of the filter loaded into the FIR table editor (calculated using a fast Fourier transform). The following is an example of the frequency response of a root Nyquist filter with an oversample ratio of 4.

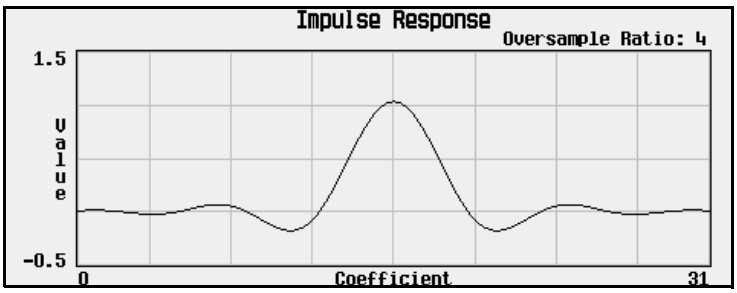


To return to the FIR table editor and the menu keys, press **Return**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Display FFT**

Display Impulse Response

Displays a graphical representation of impulse response in time of the filter loaded into the FIR table editor. The following is an example of the impulse response of a root Nyquist filter with an oversample ratio of 4.



To return to the FIR table editor and the menu keys, press **Return**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Display Impulse Response**

DPCCH

Selects a single DPCCH channel for the reverse link channel setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **DPCCH**

DPCCH + 1 DPDCH

Selects a DPCCH channel plus one DPDCH channel for the reverse link channel setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **DPCCH + 1 DPDCH**

DPCCH + 2 DPDCH

Selects a DPCCH channel plus two DPDCH channels for the reverse link channel setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **DPDCH + 2 DPDCH**

DPCCH + 3 DPDCH

Selects a DPCCH channel plus three DPDCH channels for the reverse link channel setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **DPDCH + 3 DPDCH**

DPCH

Displays a menu where you can choose the symbol rate (in ksps) of the DPCH channel that is then inserted into the forward link Edit Channel Setup table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **DPCH**

DPDCH Channels

Sets the number of DPDCH channels being inserted into the reverse link Edit Channel Setup table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert DPDCH** > **DPDCH Channels**

Edit Channel Setup

Accesses a table editor where you can define the channel parameters of the current W-CDMA signal for the current link.

Use the front-panel knob or the arrow keys to move the cursor within the table structure, and the numeric keypad to change values contained in the table.

NOTE Using the keys found beneath the **Goto Row** softkey, you can move more quickly through a large table.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup**

Edit Item

Changes the highlighted item in the displayed table.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Edit Item**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Edit Item**

Equal Energy per Symbol

Sets the selected channel powers to equal energy per symbol (referenced to 8 ksps, and increasing by 3 dB for each doubling of the symbol rate). Available in Forward Link only.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power** > **Equal Energy per Symbol**

Ext

Sets the trigger source to external triggering. When the trigger source is set to external, the signal generator will trigger an event when it receives the appropriate signal via the PATTERN TRIG IN connector.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext**

Ext Delay

Arms (On) or disarms (Off) the external trigger delay. To use external trigger delay, press this softkey until **Ext Delay On** is highlighted, and then set the external delay time by pressing the **Ext Delay Time** softkey.

Default Value: Off

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Delay Off On**

Ext Delay Time

Sets the time for the external trigger delay. External trigger delay may be adjusted to trigger a waveform at a specified length of time after an external trigger signal has been received at the PATTERN TRIG IN connector. Enter a new value and press the **Enter** terminator softkey.

To use external trigger delay, press **Ext Delay Off On** until **On** is highlighted, and then set the external delay time by pressing the **Ext Delay Time** softkey.

Default Value: 2.000 milliseconds

Range: 2.0 microseconds through 3600 seconds.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Delay Time**

Ext Polarity Neg Pos

Sets the external trigger source polarity to either a positive change or a negative change in signal level. Depending on your choice, the signal generator will trigger an event when it receives the appropriate positive or negative change in signal at the PATTERN TRIG IN connector.

Default Value: Neg

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Polarity Neg Pos**

Filter

Accesses menus for selecting a filter type, restoring the default filter, and for defining a unique FIR filter. The Filter menu also lets you adjust the filter alpha (when Nyquist or root Nyquist filters are selected) or bandwidth time product (for Gaussian filters).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter**

Filter Alpha

Changes the FIR filter's alpha parameter in either the Filter menu or the Load Default FIR menus.

In the Filter Menu

Changes the alpha parameter of the selected root Nyquist or Nyquist filter. To enter a new value, rotate the front-panel knob until the desired value is displayed, use the up and down arrow keys, or enter the value using the numeric keypad and press the **Enter** terminator softkey.

This key only appears after choosing a root Nyquist or Nyquist filter. If a Gaussian filter is in use, you will see **Filter BbT**. If any other filter is in use, you will see a grayed-out softkey: **Filter Factor N/A**.

Default Value: 0.500

Range: 0.000 through 1.000

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Filter Alpha**

In the Load Default FIR Menu

Changes the alpha parameter of the root Nyquist or Nyquist filter coefficients loaded into the FIR table editor. After entering the alpha value, press **Generate** to modify the filter coefficients in the table editor.

Default Value: 0.350

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**) > **Filter Alpha**

Filter BbT

Changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter in either the Filter menu or the Load Default FIR menu.

In the Filter Menu

In the Filter menu, **Filter Bbt** changes the BbT parameter of the selected Gaussian filter.

NOTE This key appears only *after* choosing a Gaussian filter. If a root Nyquist or Nyquist filter is in use, you will see **Filter Alpha**. If any other filter is in use, you will see a **Filter Factor N/A** softkey (grayed-out).

Default Value: 0.500

Range: 0.000 through 1.000

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **Gaussian** > **Filter BbT**

In the Load Default FIR Menu

Changes the BbT parameter of the Gaussian filter coefficients loaded into the FIR table editor. After entering the BbT value, press **Generate** to modify the filter coefficients in the table editor.

Default Value: 0.300

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Gaussian** > **Filter BbT**

Filter Factor

This grayed-out softkey is displayed when a filter is in use that doesn't contain an adjustable alpha or BbT parameter (such as the IS-95 filter selections or a user-defined FIR filter). This softkey changes to either **Filter Alpha** or **Filter BbT** if the appropriate root Nyquist, Nyquist, or Gaussian filter is selected for use.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Filter Factor**

Filter Symbols

Defines the number of symbols for the filter to be loaded into the FIR table editor. The FIR table editor allows a maximum filter length of 1024 coefficients with a maximum oversample ratio of 32 and a maximum of 32 symbols. An FIR filter selected for use in W-CDMA, however, cannot have more than 256 coefficients so the number of symbols and the oversample ratio should be selected accordingly.

To change the number of symbols, rotate the front-panel knob until the desired value is displayed, use the up and down arrow keys, or enter the value using the numeric keypad and press the **Enter** terminator softkey.

Default Value: 8

Range: 1 through 32

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**, **Gaussian**, or **Rectangle**) > **Filter Symbols**

First Spread Code

This softkey appears in the Multiple Channels menu, where you define a channel and then insert multiple entries of that channel into the Edit Channel Setup table editor.

Press the **First Spread Code** softkey, then enter the value that you want for the starting spread code for the channels that will be inserted. Press the softkey **Enter** to terminate the entry.

NOTE Check existing entries in the table editor to be sure that there will be no duplication of an existing spread code. If there is, the warning `Domain Conflict` is displayed in the table. If this happens, select any duplicate Spread Code entries and give them unique values.

After you have set the channel parameters, and the number of times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: 8

Range: 0 through 15

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **First Spread Code**

Gate Active

This softkey remains grayed-out until the trigger is set to Gated. Once the trigger has been set to Gated, press **Gate Active Low High** to toggle the polarity of the “through” or active state of a gated trigger signal. Gate Active Low will output the signal while the gate is low at the PATTERN TRIG IN connector. Gate Active High has the opposite effect, outputting the signal while the signal level at the PATTERN TRIG IN connector is in a high state.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Gate Active**

Gated

Sets the trigger type to Gated. Using a gated trigger, you can set the signal to output when a TTL high or low is present at the PATTERN TRIG IN connector. To set the gate to trigger on either high or low, press **Gated** and then press **Trigger Setup** > **Gate Active Low High**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Gated**

Gaussian

Selects the Gaussian pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (Filter) Menu

Selects this FIR filter for use in your filter setup. Use the **Filter BbT** softkey to change the filter bandwidth-multiplied-by-bit time product value.

Default Value: 0.500.

Range: 0.000 through 1.000

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **Gaussian**

In the Load Default FIR Menu

Pressing the **Gaussian** softkey followed by **Generate** loads the FIR table editor with the coefficient values for the Gaussian filter. The filter BbT and number of filter symbols are defined with the softkeys in this menu. If you change either parameter after loading the filter coefficients, press the **Generate** softkey again to reload the FIR table.

The **Display Impulse Response** and **Display FFT** softkeys in this menu graphically display the filter as it is currently defined in the FIR table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** >**Filter** > **Define User FIR** > **Load Default FIR** > **Gaussian**

Goto Bottom Row

Moves the selection bar to the bottom row in the current table editor or list of items.

Goto Bottom Row is located in table editor menus and in catalogs of files.

Goto Middle Row

Moves the selection bar to the middle row in the current table editor or list of items.

Goto Middle Row is located in table editor menus and in catalogs of files.

Goto Row

Displays softkeys that enable you to select a row or page in a table or list of items.

Goto Row is located in table editor menus and in catalogs of files.

Goto Top Row

Moves the selection bar to the top row in the current table or list of items.

Goto Top Row is located in table editor menus and in catalogs of files.

Hamming

Press this softkey to apply the Hamming windowing function to the selected filter. Windowing can be applied to any default FIR filter that you load into the Define User FIR table. Windowing improves out of band performance (ACP) by smoothing the filter's transition to zero, but simultaneously compromises passband performance (EVM).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (3GPP 3.1 12-99)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**, **Gaussian**, or **Rectangle**) > **Window**> **Hamming**

Hann

Press this softkey to apply the Hann windowing function to the selected filter. Windowing can be applied to any default FIR filter that you load into the Define User FIR table. Windowing improves out of band performance (ACP) by smoothing the filter's transition to zero, but simultaneously compromises passband performance (EVM).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (3GPP 3.1 12-99)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**, **Gaussian**, or **Rectangle**) > **Window**> **Hann**

I/Q Mapping Normal Invert

Selects whether the I/Q outputs will be normal or inverted.

Default Value: Normal

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Link Forward Reverse** > **W-CDMA Define** > **I/Q Mapping Normal Invert**

Insert DPDCH

Enables you to insert one or more DPDCH channels into the reverse link Edit Channel Setup table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert DPDCH**

Insert Row

Displays a menu that enables you to select the type of row you wish to insert into the current table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row**

IS-2000 SR3 DS

Press this softkey to select the standard IS-2000 spreading rate 3 direct spread filter. This softkey is only available when **Multicarrier Off On** is toggled to **Off**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000** > **IS-2000 SR3 DS**

IS-95

Press this softkey to select the standard IS-95 baseband filter.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000** > **IS-95**

IS-95 and IS-2000

Press this softkey to access a menu of IS-95 and IS-2000 filters in the Select Filter menu. This menu displays the following IS-95 and IS-2000 filter choices: IS-95, IS-95 w/EQ, IS-95 Mod, IS-95 Mod w/EQ and IS-2000 SR3 DS. This softkey is only available when **Multicarrier Off On** is toggled to **Off**.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000**

IS-95 Mod

Selects a modified version of the standard IS-95 baseband filter. This filter is modified for improved adjacent channel performance. The modification, however, is done in a manner that still meets the IS-95 error function criterion.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000** > **IS-95 Mod**

IS-95 Mod w/EQ

Selects a modified version of the standard IS-95 baseband filter. This filter is modified for improved adjacent channel performance, and includes the equalizer specified by IS-95. The filter modification is done in a manner that still meets the IS-95 error function criterion.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000** > **IS-95 Mod w/EQ**

IS-95 w/EQ

Selects the standard IS-95 baseband filter with an equalizer provided for phase compensation required by the base station.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **IS-95 and IS-2000** > **IS-95 w/EQ**

Kaiser

Press this softkey to apply the Kaiser windowing function to the selected filter. Windowing can be applied to any default FIR filter that you load into the Define User FIR table. Windowing improves out of band performance (ACP) by smoothing the filter's transition to zero, but simultaneously compromises passband performance (EVM). Selecting **Kaiser** also activates the Beta factor which you adjust to change the trade-off between optimized ACP or EVM. Decreasing the value improves EVM. Increasing the value improves ACP.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (3GPP 3.1 12-99)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**, **Gaussian**, or **Rectangle**) > **Window** > **Kaiser**

Link Forward Reverse

Selects a W-CDMA forward or reverse link channel configuration.

Forward Link= base to mobile

Reverse Link= mobile to base

Default Value: Forward

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Link Forward Reverse**

Load Default FIR

Accesses a menu for automatically filling the FIR table editor with coefficient values from pre-defined filters such as root Nyquist, Nyquist, Gaussian, and Rectangle. The default filter parameters can also be selected in this menu allowing you to choose the filter alpha or BbT and the number of filter symbols.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR**

Load From Selected File

Replaces the current information in a table editor with the information stored in the highlighted file.

Load From Selected File is located in catalogs of files.

Load/Store

Accesses a menu for loading a table editor with values from files previously stored in the signal generator memory, and to save to memory a user-defined signal from the table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load/Store**

Mirror Table

Mirrors the FIR table entries such that the table doubles in size, and the values in the top half of the table are duplicated in the bottom half of the table in reverse order.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Mirror Table**

Modify All Scramble Codes

Sets the scramble code field to the same value for all channels in the current table editor. After you enter the desired value, press the softkey **Enter** to terminate the entry. Available in Forward Link only.

Range: 0 to 512

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Modify All Scramble Codes**

Multicarrier Define

Accesses the Multicarrier W-CDMA Setup table, where you can define a multicarrier W-CDMA signal. This softkey is not present in the softkey menu until multicarrier mode is enabled (see **"Multicarrier Off On" on page 3-22**).

For information on using W-CDMA multicarrier, refer to "Creating, Storing, & Recalling a Custom Multicarrier W-CDMA Waveform" on page 2-21.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define**

Multicarrier Off On

Toggles the multicarrier mode off and on.

When Multicarrier is on, the **W-CDMA Define** softkey becomes the **Multicarrier Define** softkey. Also, the options under the **W-CDMA Select** softkey change (see "W-CDMA Select" on page 3-35).

For information on using multicarrier W-CDMA, refer to "Creating, Storing, & Recalling a Custom Multicarrier W-CDMA Waveform" on page 2-21.

NOTE The **Multicarrier Off On** softkey and related functions are accessible *only* when using the W-CDMA forward link setup.

Default Value: Off

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On**

Multiple Channels

Displays a menu that enables you to set up one or more identical channels to insert into the Edit Channel Setup table editor. After you have set the channel parameters, and how many times you want the channel duplicated, press **Done** to insert the information into the table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels**

None

Selects no windowing for the selected filter in the current link. The filter is optimized for maximum passband performance (EVM).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (3GPP 3.1 12-99)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**, **Gaussian**, or **Rectangle**) > **Window** > **None**

Nyquist

Selects the Nyquist (raised cosine) pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (Filter) Menu

Pressing the **Nyquist** softkey selects this FIR filter for use in the filter setup.

Default Filter Alpha: 0.220

Range: 0 through 1

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **Nyquist**

In the Load Default FIR Menu

Pressing the **Nyquist** softkey followed by **Generate** loads the FIR table editor with the coefficient values for the Nyquist filter. The filter alpha and number of filter symbols are defined with the softkeys in this menu. If you change either parameter after loading the filter coefficients, press the **Generate** softkey again to reload the FIR table.

The **Display Impulse Response** and **Display FFT** softkeys in this menu graphically display the filter as it is currently defined in the FIR table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Nyquist**

Optimize FIR For EVM ACP

Optimizes the filter for minimized error vector magnitude (select EVM) or for minimized adjacent channel power (select ACP). The EVM selection provides the most ideal pass band. The ACP selection improves stopband rejection. This feature only applies to root Nyquist, Nyquist, and Gaussian filters. The softkey is grayed out when any other filter is selected.

Default Value: EVM

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Optimize FIR For EVM ACP**

Oversample Ratio

Sets the oversampling ratio to be applied to a custom FIR filter design in the Define User FIR menu. The maximum combination of symbols and oversampling ratio is 1024. Since an FIR filter selected for use in W-CDMA cannot have more than 256 coefficients, select accordingly.

This is a persistent state that is set to 4 at the factory.

Range: 1 through 32

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Oversample Ratio**

Page Down

Views the next page of listings in a table editor or catalog of files.

Page Down is located in table editor menus and in catalogs of files.

Page Up

Views the previous page of listings in a table editor or catalog of files.

Page Up is located in table editor menus and in catalogs of files.

Perch

This softkey appears in three places: the Multicarrier Define menu, the Insert Row menu, and the W-CDMA Select menu.

In the Multicarrier Define Menu

Selects a single perch forward link channel for the multicarrier setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev1.0–1.2)** > **Multicarrier Define** > **Edit Item** > **Perch**

In the Insert Row Menu

Inserts a perch channel into the current table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Perch**

In the W-CDMA Select Menu

Selects a single perch forward link channel for the W-CDMA setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **Perch**

Perch + 1 DPCH

Selects a perch channel plus one DPCH channel for either the forward link channel setup, or the carrier in the multicarrier table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **Perch + 1 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Edit Item** > **Perch + DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Insert Row** > **Perch + DPCH**

Perch + 3 DPCH

Selects a perch channel plus three DPCH forward channels for either the forward link channel setup, or the carrier in the multicarrier table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **Perch + 3 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Edit Item** > **Perch + 3 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Insert Row** > **Perch + 3 DPCH**

Perch + 50 DPCH

Selects a perch channel plus fifty DPCH forward channels for either the forward link channel setup, or the carrier in the multicarrier table editor.

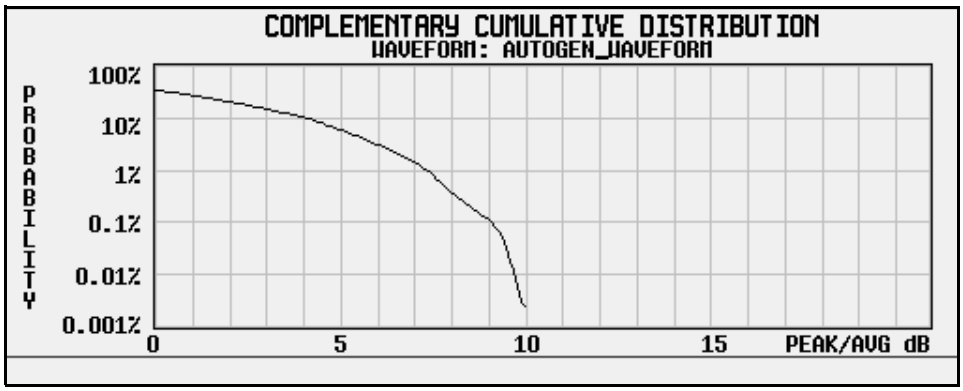
Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select** > **Perch + 50 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Edit Item** > **Perch + 50 DPCH**

Or: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Multicarrier Define** > **Insert Row** > **Perch + 50 DPCH**

Plot CCDF

Displays a plot of the Complementary Cumulative Distribution Function for the selected waveform. The plot displays the probability that the instantaneous envelope power is *x* dB above the average power, where *x* is the number on the horizontal axis.



Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Waveform Statistics** > **Plot CCDF**

Power

This softkey appears in the Multiple Channels menu for the current link, where you define a channel and then insert multiple entries of that channel into the Edit Channel Setup table editor.

Press the **Power** softkey, then enter the value that you want for the power level of the channels that will be inserted.

After you set the channel parameters, and the number times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: 0.00 dB

Range: –40.00 through 0.00

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **Power**

Random

Press this softkey while an item is highlighted in the Data column of the table editor to enter random data as the channel data. `RANDOM` appears in the `Data Table Editor` field.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > (highlight a value in the data column) > **Edit Item** > **Random**

Reconstruction Filter

Displays a menu for selecting a reconstruction filter. You can choose a filter with a cutoff frequency of 250.0 kHz, 2.500 MHz, 8.000 MHz, or no filter (**Through**).

Default Value: 2.500 MHz

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Reconstruction Filter**

Rectangle

Selects a rectangle pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (Filter) Menu

Press the **Rectangle** softkey to select this FIR filter for use in your filter setup.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **Rectangle**

In the Load Default FIR Menu

Pressing the **Rectangle** softkey followed by **Generate** loads the FIR table editor with the coefficient values for a rectangle filter.

The **Display Impulse Response** and **Display FFT** softkeys in this menu graphically display the filter as it is currently defined in the FIR table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Rectangle**

Reference Frequency

Sets the reference frequency of the external clock. This key is available only when an external ARB reference is applied to the BASEBAND GEN REF IN connector.

Default Value: 10.0000000 MHz

Range: 250.0000 kHz through 20.0000000 MHz.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Reference Freq**

Restore Default Filter

Replaces the current FIR filter with the default filter (IS-95 Mod w/EQ).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Restore Default Filter**

Retrigger Mode Off On

Toggles the operating state of the retrigger mode. When retrigger mode is on, if a trigger occurs while a waveform is playing, the waveform retriggers at the end and plays one more time. If several triggers are received during a waveform, the waveform is replayed only once. When retrigger mode is off, if a trigger occurs while a waveform is playing, the retrigger is ignored.

Default Value: Off

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Retrigger Mode Off On**

Root Nyquist

Selects the root Nyquist (root-raised cosine) pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (Filter) Menu

Pressing the **Root Nyquist** softkey selects this FIR filter and returns the Filter menu.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **Root Nyquist**

In the Load Default FIR Menu

Pressing the **Root Nyquist** softkey followed by **Generate** loads the FIR table editor with the coefficient values for the root Nyquist filter. The filter alpha and number of filter symbols are defined with the softkeys in this menu. If you change either parameter after loading the filter coefficients, press the **Generate** softkey again to reload the FIR table.

The **Display Impulse Response** and **Display FFT** softkeys in this menu graphically display the filter as it is currently defined in the FIR table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist**

Scale To 0dB

Scales all of the current channel powers so that the total power equals 0 dB while keeping the previous power ratios between the individual channels. Available in Forward Link only.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power** > **Scale to 0dB**

Scramble Code

This softkey appears in the Multiple Channels menu for the current link, where you define a channel and then insert multiple entries of that channel into the Edit Channel Setup table editor.

Press the **Scramble Code** softkey, then enter the value that you want for the scramble code for the channels that will be inserted. Press the softkey **Enter** to terminate the entry.

After you have set the channel parameters, and how many times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: 00000000001

Range:

0 through 512, Forward Link

0 through 1FFFFFFFFFF, Reverse Link

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **Scramble Code**

Second DPDCH I Q

This softkey allows you to set the second DPDCH channel to I or Q.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Link Forward Reverse** > **W-CDMA Define** > **Edit Channel Setup** > **Second DPDCH I Q**

Select

Accesses a menu for selecting the pre-modulation filter type. You can choose from:

Pre-defined filters, such as root Nyquist, Nyquist, Gaussian, several IS-95/IS-2000 baseband filters, User FIR, Rectangle, APCO 25 C4FM, and UN3/4 GSM Gaussian. When you access this menu through the W-CDMA menus, a filter optimized for W-CDMA is also available.

The standard IS-95 filter is available as well as a modified version of this filter that meets the IS-95 error function for improved adjacent channel performance. These two filters are also provided with an equalizer for phase compensation required by the base station.

A catalog of files stored in the signal generator memory.

Default Value: WCDMA

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select**

Select File

Selects a stored file.

Select File is located in catalogs of files.

Single

Sets the trigger type to single. After receiving a trigger, the waveform is output once.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Single**

Spread Only

Sets all symbols for the channel being inserted to random values, instead of having specific bit fields such as pilot, TPC, etc. This softkey also displays a menu that enables you to choose the symbol rate (in ksps) of the Spread Only forward channel that is then inserted into the Edit Channel Setup table editor.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Spread Only**

Store Custom Multicarrier

Accesses a menu where you can store the contents of the multicarrier table editor into a file.

This softkey stores the following information for each carrier:

- type of carrier
- frequency offset
- power level

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **Multicarrier Define** > **Store Custom Multicarrier**

NOTE To recall a file, press **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0-1.2)** > **Multicarrier Off On** > **W-CDMA Select** > **Custom W-CDMA Multicarrier**, and select the desired file.

Store Custom W-CDMA State

Accesses a menu where you can store the current custom W-CDMA state into a file that can be recalled for later use (as described under the softkey **Custom W-CDMA State**).

Along with the contents of the W-CDMA channel table editor, the following information is also stored:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q Mapping
- Link
- chip rate
- ARB reconstruction filter
- ARB reference clock source (internal or external)
- ARB reference clock frequency
- Clipping Level
- Forward Link TFCI state
- Reverse Link TFCI state
- Reverse Link DPDCH (second DPDCH I or Q)
- Reverse Link Scramble Code

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Store Custom W-CDMA State**

Store To File

Displays a menu where you can store the current table editor information for later use.

Store To File is located in catalogs of files.

Symbol Rate

This softkey appears in the Multiple Channels menu for the current link, where you define a channel and then insert multiple entries of that channel into the Edit Channel Setup table editor.

Press the **Symbol Rate** softkey, then enter the symbol rate that you want for the channel definition. Press the softkey **Enter** to terminate the entry.

After you have set the channel parameters, and the number of times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: 32 ksps

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **Symbol Rate**

TFCI Field Off On

Turns the TFCI (Transport Format Combination Indicator) field on or off for all the channels in the current table editor.

Default Value: On

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **TFCI Field Off On**

Through

Bypasses all reconstruction filtering. This is useful for using external reconstruction filters at frequencies different than those supplied internally.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Reconstruction Filter** > **Through**

Trigger

Displays the trigger menu, where you can select types of triggering. The menu also contains a **Trigger Setup** key that enables you to adjust the trigger source, the retrigger mode, and the gate active polarity.

Default Value: Continuous

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger**

Trigger Key

Sets the trigger source to the signal generator's front-panel **Trigger** hardkey. When the trigger source is set to **Trigger Key**, the signal generator will trigger an event when the **Trigger** hardkey is pressed.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Trigger Key**

Trigger Setup

Displays the dual setup menu. This menu enables you to adjust the trigger source, the retrigger mode, and the gate active polarity.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Setup**

Trigger Source

Displays the trigger source menu. This menu enables you to adjust the trigger source between the front panel **Trigger** key, a trigger command sent over the GPIB bus, or an external trigger applied to the PATTERN TRIG IN connector.

Default Value: Ext

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Trigger** > **Trigger Source**

Type

Displays a menu that enables you to select the type of channel that you want to set up and insert multiple times into the Edit Channel Setup table editor. After you have set the channel parameters, and how many times you want the channel duplicated, press **Done** to insert the information into the table editor.

Default Value: DPCH

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple Channels** > **Type**

UN3/4 GSM Gaussian

This key selects a UN3/4 delay compatible, GSM, Gaussian filter with a 0.300 fixed BbT.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **UN3/4 GSM Gaussian**

User FIR

Displays the catalog of FIR filter files stored in the signal generator's memory. You can select a custom filter from this catalog for your pre-modulation filter. Scroll through the listed files and when your selection is highlighted, press the **Select File** softkey. Notice that `User FIR` is shown in the `Filter` field of the display, and the file name is shown in the second line of the **Select** softkey.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **User FIR**

Waveform Statistics

This grayed-out softkey is active only when a waveform is generated. When this softkey is active statistics are available for the selected waveform.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **Waveform Statistics**

WCDMA

Selects the WCDMA pre-modulation filter in the Select (filter) menu. Pressing the **WCDMA** softkey selects this FIR filter and returns the Filter menu.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define** > **Filter** > **Select** > **WCDMA**

W-CDMA (Rev 1.0–1.2)

Opens a menu of softkeys where you can generate data patterns that are formatted into a structure defined by the W-CDMA (Revision 1.0 – 1.2) standard.

This softkey is available *only* if both Option UND and Option 100 are installed.

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)**

W-CDMA Define

Displays the W-CDMA Define menu for the current link, where you can define a W-CDMA signal. With the **Multicarrier Off On** softkey set to **On**, this softkey is replaced with the **Multicarrier Define** softkey (see "Multicarrier Define" on page 3-22).

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Define**

W-CDMA Off On

Enables W-CDMA baseband signal generation. Turning W-CDMA on sets up the internal hardware to generate the currently selected W-CDMA signal. The `W-CDMA` and `I/Q` annunciators appear on the display. The W-CDMA signal modulates the RF carrier *only* after you have set the front panel **Mod On/Off** key to **On**.

Default Value: Off

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Off On**

W-CDMA Select

The function of this softkey changes, depending on whether multicarrier mode is off (default) or on. (Refer to "Multicarrier Off On" on page 3-22.)

Multicarrier Off

Displays the W-CDMA Select menu for the current link, where you can select a predefined channel setup or a stored custom state.

Default Value: 1 DPCH

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select**

Multicarrier On

Displays the multicarrier W-CDMA Select menu, where you can select a predefined multicarrier setup or a stored custom multicarrier setup.

NOTE The **Multicarrier Off ON** softkey and related functions are accessed only when using the W-CDMA forward link setup.

Default Value: 2 Carriers

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (Rev 1.0–1.2)** > **W-CDMA Select**

Window

Pressing this softkey accesses a menu for applying a windowing function to the selected filter. The default is to use no windowing which optimizes the passband response (EVM). Several windowing selections are provided in this menu which can be applied to smooth the filter's transition to zero. Windowing improves adjacent channel power performance (ACP) but simultaneously compromises EVM.

Default Value: None

Softkey Location: **Mode** > **CDMA Formats** > **W-CDMA (3GPP 3.1 12-99)** > **W-CDMA Define** > **Filter** > **Define User FIR** > **Load Default FIR** > **Root Nyquist** (or **Nyquist** > **Gaussian** > or **Rectangle**) > **Window**

4 Operation

This chapter contains detailed information that will help you understand the operation of your Option 100 signal generator's W-CDMA (Rev. 1.0-1.2) personality.

W-CDMA Frame Structures

This section contains graphical representations of W-CDMA frame structures, with associated tables, for both forward and reverse link channels.

Forward Link

Figure 4-1 Perch Channel Frame Structure

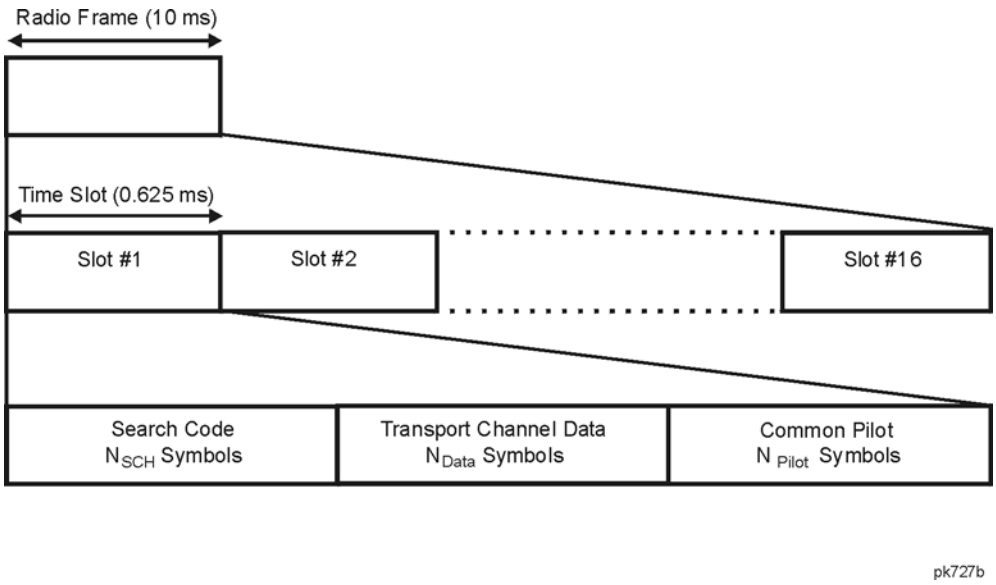


Table 4-1 Lengths of Perch Channel Fields

Parameter	Symbols Per Slot
N_{pilot}	4
N_{data}	5
N_{SCH}	1

Figure 4-2 Forward Link Frame Structure

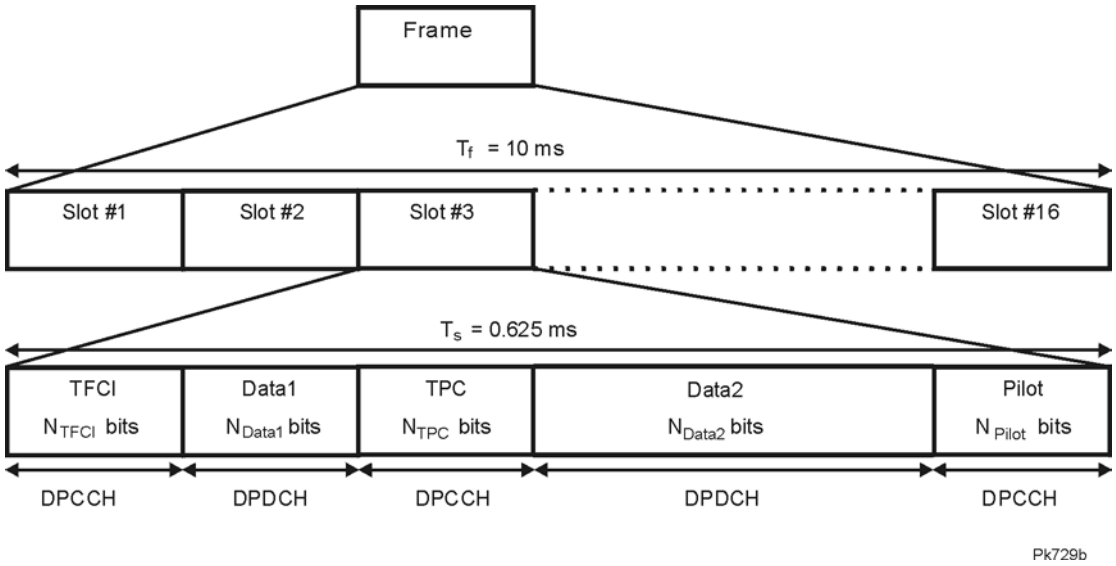


Table 4-2 Forward Link DPDCH and DPCCH Fields

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	Spread Factor	Bits/Frame			Bits/Slot	DPDCH Bits/Slot		DPCCH Bits/Slot		
			DPDCH	DPCCH	TOTAL		N_{data1}	N_{data2}	N_{TFCI}	N_{TPC}	N_{pilot}
16	8	512	64	96	160	10	2	2	0	2	4
16	8	512	32	128	160	10	0	2	2	2	4
32	16	256	160	160	320	20	2	8	0	2	8
32	16	256	128	192	320	20	0	8	2	2	8
64	32	128	480	160	640	40	6	24	0	2	8
64	32	128	448	192	640	40	4	24	2	2	8
128	64	64	1120	160	1280	80	14	56	0	2	8
128	64	64	992	288	1280	80	6	56	8	2	8
256	128	32	2400	160	2560	160	30	120	0	2	8
256	128	32	2272	288	2560	160	22	120	8	2	8
512	256	16	4832	288	5120	320	62	240	0	2	16
512	256	16	4704	416	5120	320	54	240	8	2	16
1024	512	8	9952	288	10240	640	126	496	0	2	16
1024	512	8	9824	416	10240	640	118	496	8	2	16
2048	1024	4	20192	288	20480	1280	254	1008	0	2	16
2048	1024	4	20064	416	20480	1280	246	1008	8	2	16

Reverse Link

Figure 4-3 Reverse Link Frame Structure

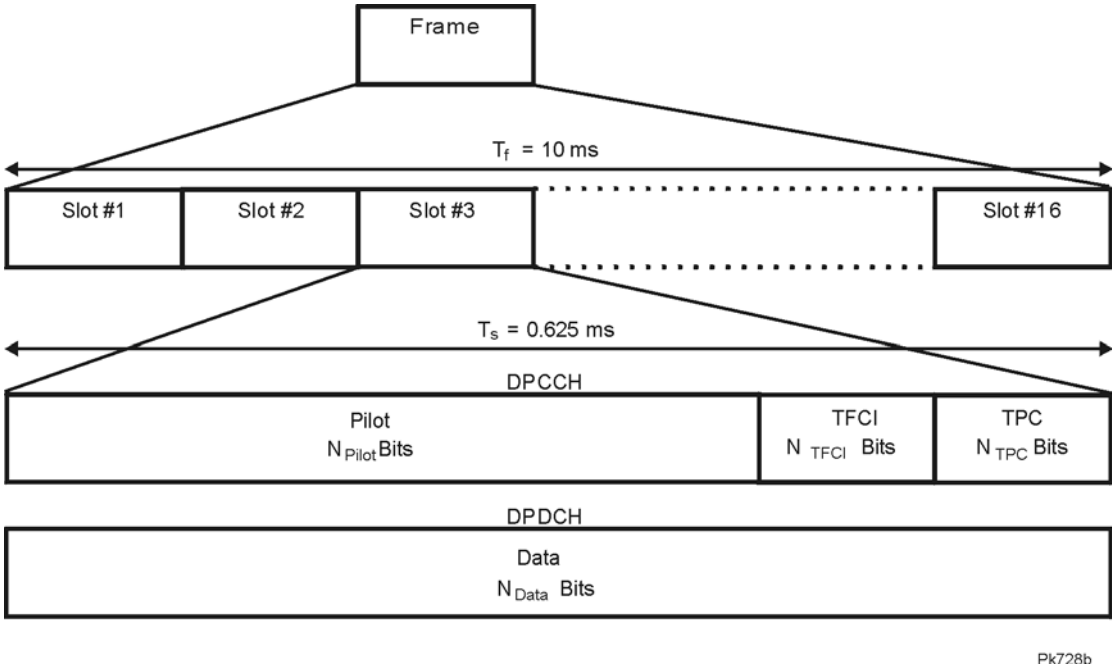


Table 4-3 Reverse Link DPDCH Fields

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	Spread Factor	Bits/Frame	Bits/Slot	N_{data}
16	16	256	160	10	10
32	32	128	320	20	20
64	64	64	640	40	40
128	128	32	1280	80	80
256	256	16	2560	160	160
512	512	8	5120	320	320
1024	1024	4	10240	640	640

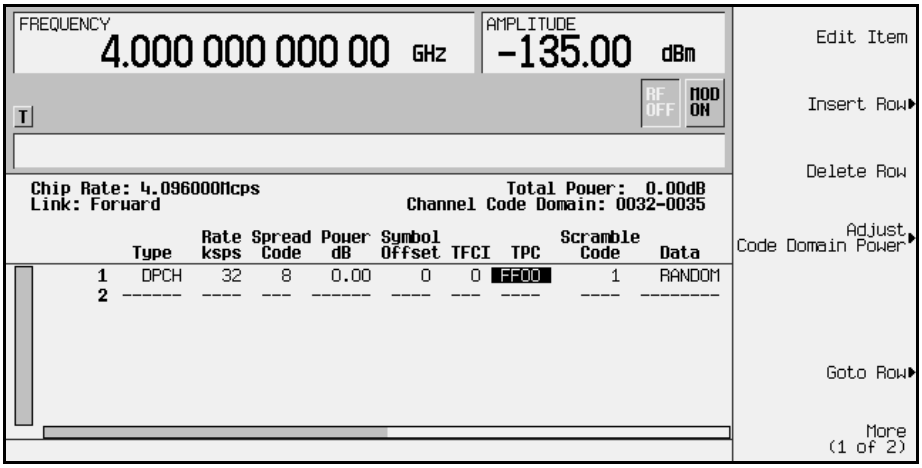
Table 4-4 Reverse Link DPCCH Fields

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	Spread Factor	Bits/Frame	Bits/Slot	N_{pilot}	N_{TPC}	N_{TFCI}
16	16	256	160	10	6	2	2
16	16	256	160	10	8	2	0

Understanding TPC Values

TPC values determine how the transmit power of the receiving base or mobile station will vary. In the channel table editor, TPC values are represented in hexadecimal format to simplify entries and modifications. Figure 4-4 shows the channel table editor with the TPC value, FF00, highlighted.

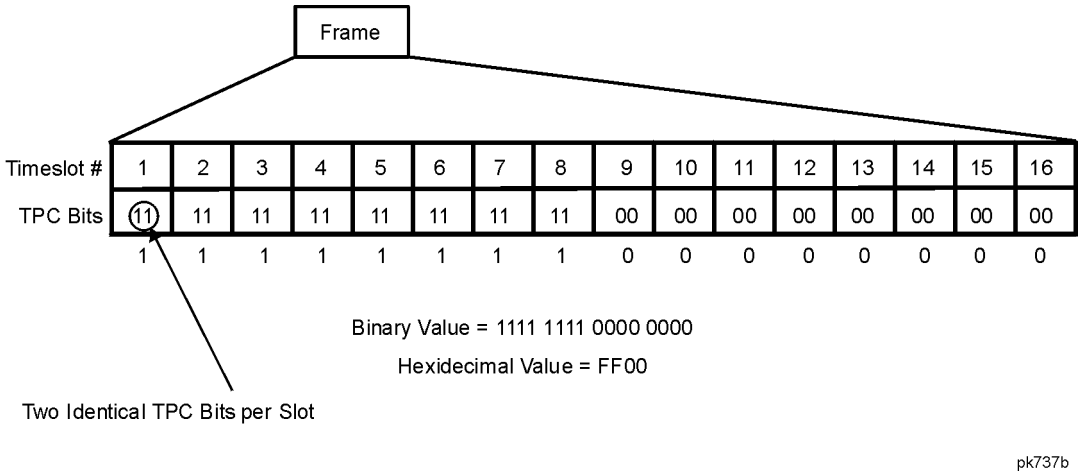
Figure 4-4 Highlighted TPC Value



Hexadecimal TPC values are converted to their binary equivalent. In this example, the value FF00 becomes 1111 1111 0000 0000. Notice that there are 16 digits in the binary TPC value. Because one frame contains 16 timeslots, one binary digit is assigned to each timeslot (see Figure 4-5). The assigned bit is then duplicated so that each timeslot contains two identical TPC bits: either 11 or 00.

The TPC bits 11 direct the receiving base or mobile station to increase its transmit power by an amount specified by the W-CDMA standard. Likewise, the TPC bits 00 cause the power to decrease by the same amount. In this example, the transmit power is increasing over timeslots 1 through 8 and decreasing over timeslots 9 through 16.

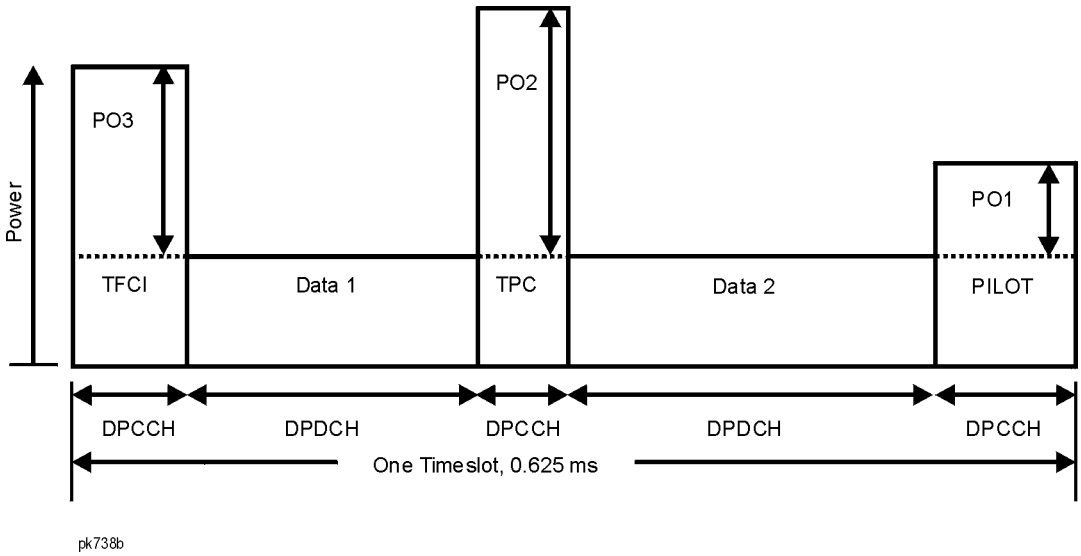
Figure 4-5 TPC Bits per Timeslot



Understanding TFCI, TPC, and Pilot Power Offsets

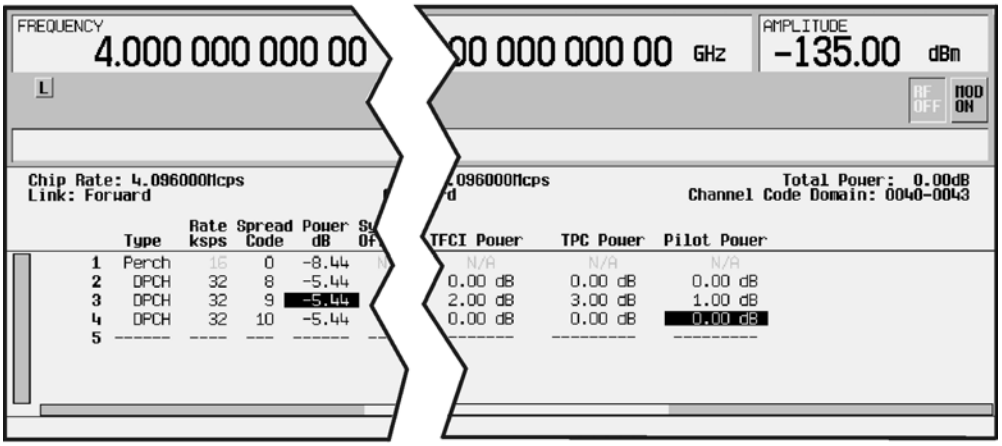
TFCI, TPC, and Pilot power offsets (PO), which are applied to forward link control channels (DPCCH), are relative to the transmit power for data channels (DPDCH). Usually, these offsets are set to a positive value (refer to Figure 4-6). The intent is to transmit control symbols at a higher level than data symbols to maintain the link between mobile and base. Because only the DPCCH transmit power is offset, the total transmit power is minimized.

Figure 4-6 TFCI, TPC, and Pilot Power



The display in Figure 4-7 shows that the channel in row 3 of the table editor has the data transmit power (Power dB) set to -5.44 dB with the following offsets: TFCI Power set to 2.00 dB, TPC Power set to 3.00 dB, and Pilot Power set to 1.00 dB. Because of these offsets, the control symbols corresponding to TFCI, TPC, and Pilot will transmit at –3.44 dB, –2.44 dB, and –4.44 dB respectively.

Figure 4-7 Table Editor Showing TFCI, TPC, and Pilot Power Offsets



pk739b

Understanding Baseband Clipping

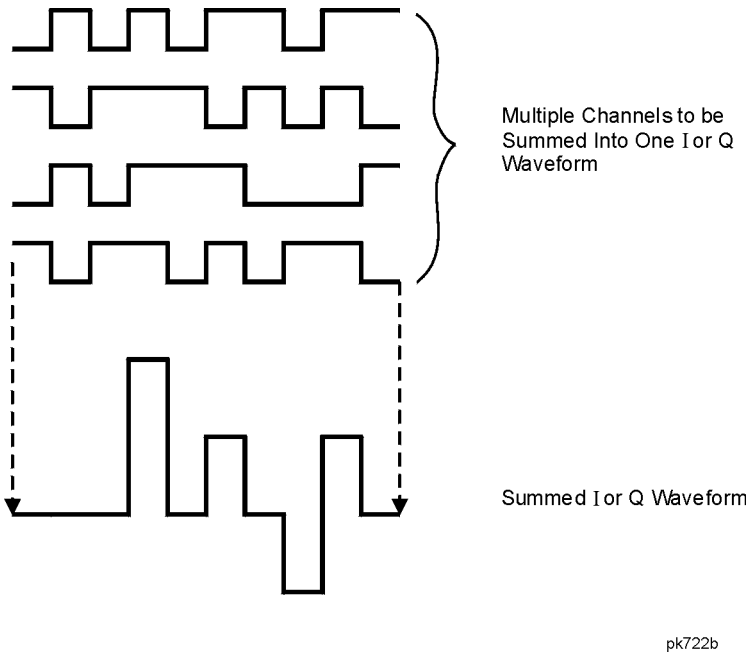
In a W-CDMA waveform, high power peaks can cause intermodulation distortion, which generates spectral regrowth (a condition that interferes with signals in adjacent frequency bands). The clipping function allows you to reduce high power peaks.

How Power Peaks Develop

To understand how clipping reduces high power peaks in a W-CDMA signal, it is important to know how the peaks develop as the signal is constructed.

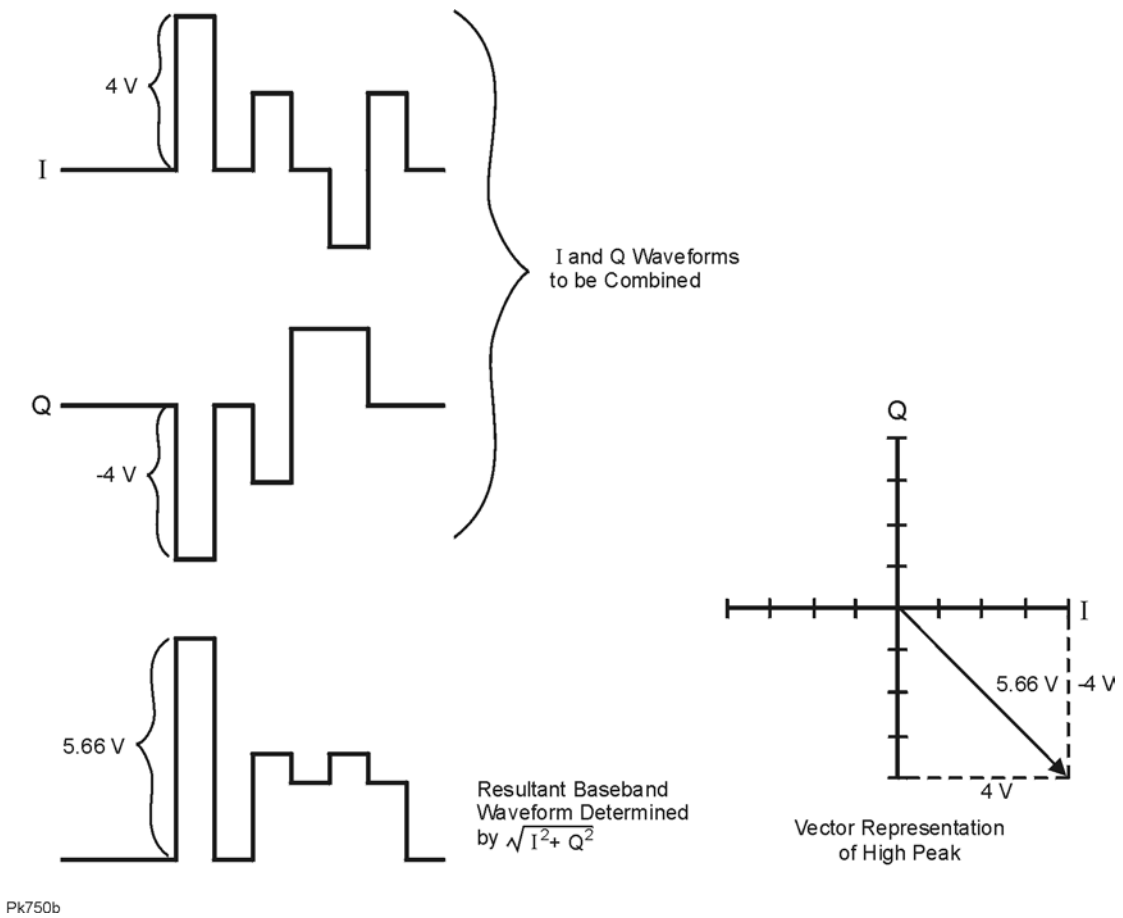
A W-CDMA waveform is composed of an I waveform and a Q waveform. Often, these waveforms are the summation of multiple channels (refer to Figure 4-8). Whenever most or all of the individual channel waveforms simultaneously contain a bit in the same state (high or low), an unusually high power peak (negative or positive) occurs in the summed waveform. This does *not* happen frequently because the high and low states of the bits on these channel waveforms are random, which causes a cancelling effect.

Figure 4-8 Multiple Channel Summing



The I and Q waveforms combine in the I/Q modulator to create an RF waveform. The magnitude of the RF envelope is determined by the equation $\sqrt{I^2+Q^2}$, where the squaring of I and Q always results in a positive value. Notice how simultaneous positive and negative peaks in the I and Q waveforms do not cancel each other, but combine to create an even greater peak (refer to Figure 4-9).

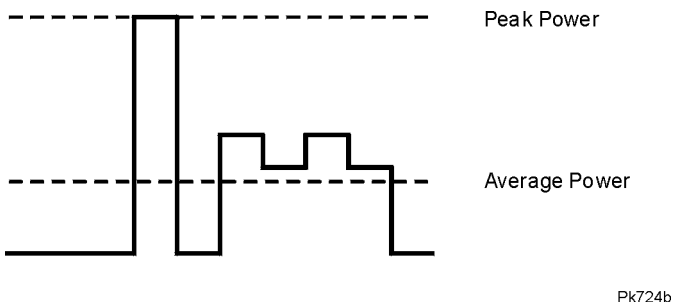
Figure 4-9 Combining the I and Q Waveforms



How Peaks Cause Spectral Regrowth

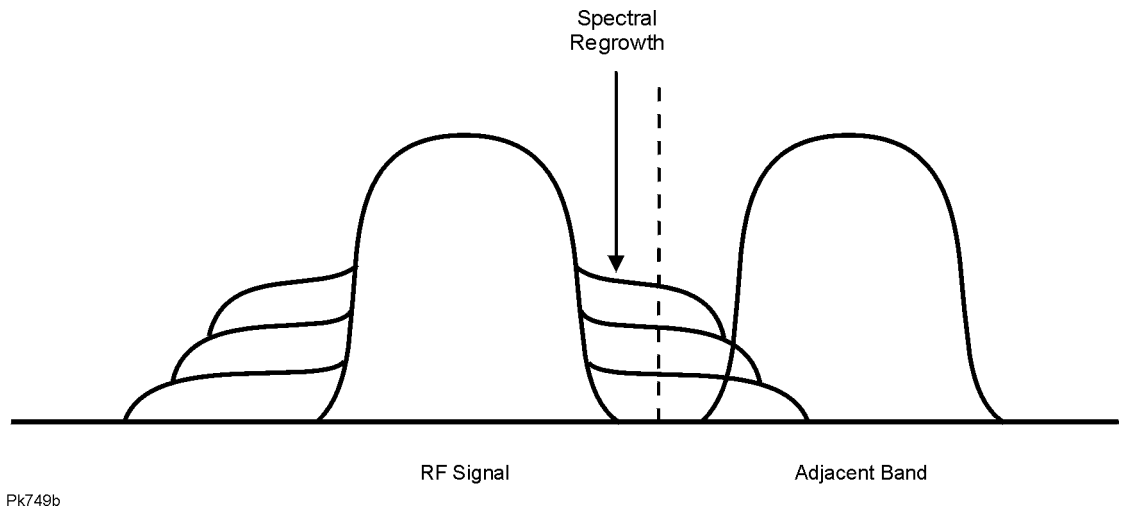
Because of the relative infrequency of high power peaks, a waveform will have a high peak-to-average power ratio (refer to Figure 4-10). Because a transmitter's power amplifier gain is set to provide a specific average power, high peaks can cause the power amplifier to move toward saturation. This causes intermodulation distortion, which generates spectral regrowth.

Figure 4-10 Peak-to-Average Power in the W-CDMA Waveform



Spectral regrowth is a range of frequencies that develops on each side of the carrier (similar to sidebands) and extends into the adjacent frequency bands (refer to Figure 4-11). Consequently, spectral regrowth interferes with communication in the adjacent bands. Clipping can provide a solution to this problem.

Figure 4-11 Spectral Regrowth Interfering with Adjacent Band



How Clipping Reduces Peak-to-Average Power

You can reduce peak-to-average power, and consequently spectral regrowth, by clipping the waveform to a selected percentage of its peak power. The ESG signal generator provides two different methods of clipping: circular and rectangular.

During *circular* clipping, clipping is applied to the combined I and Q RF waveform (|I + jQ|). Notice in Figure 4-12 that the clipping level is constant for all phases of the vector representation and appears as a circle. During *rectangular* clipping, clipping is applied to the I and Q waveforms separately (|I|, |Q|). Notice in Figure 4-13 that the clipping level is different for I and Q; therefore, it appears as a rectangle in the vector representation. With either method, the objective is to clip the waveform to a level that effectively reduces spectral regrowth, but does *not* compromise the integrity of the signal. Figure 4-14 uses two complementary cumulative distribution plots to show the reduction in peak-to-average power that occurs after applying circular clipping to an RF waveform.

The lower you set the clipping value, the lower the peak power that is passed (or the more the signal is clipped). Often, the peaks can be clipped successfully without substantially interfering with the rest of the waveform. Data that might be lost in the clipping process is salvaged because of the error correction inherent in the coded systems. If you clip too much of the waveform, however, lost data is irrecoverable. You may have to try several clipping settings to find a percentage that works well.

Figure 4-12 Circular Clipping

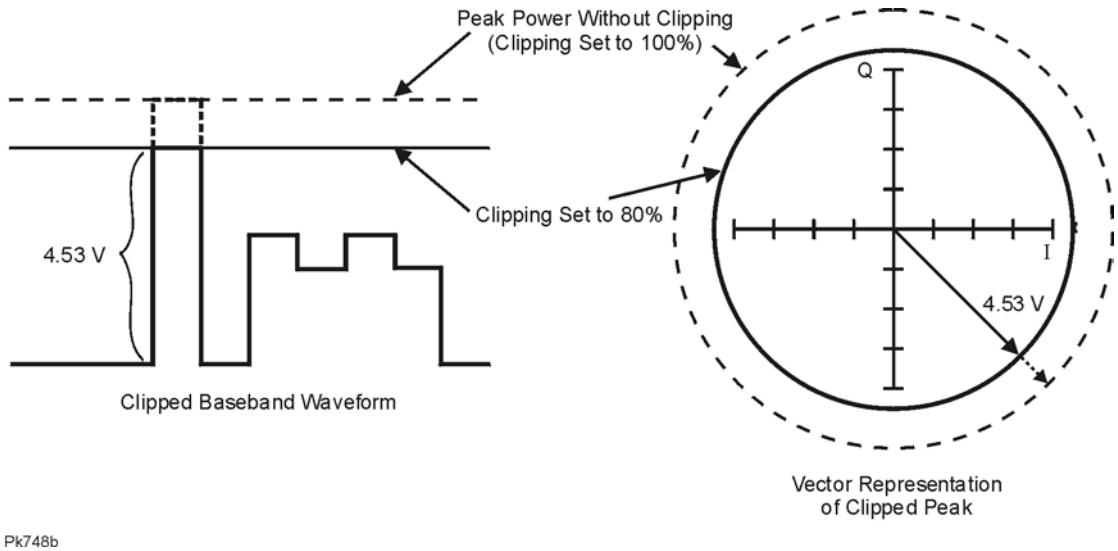


Figure 4-13 Rectangular Clipping

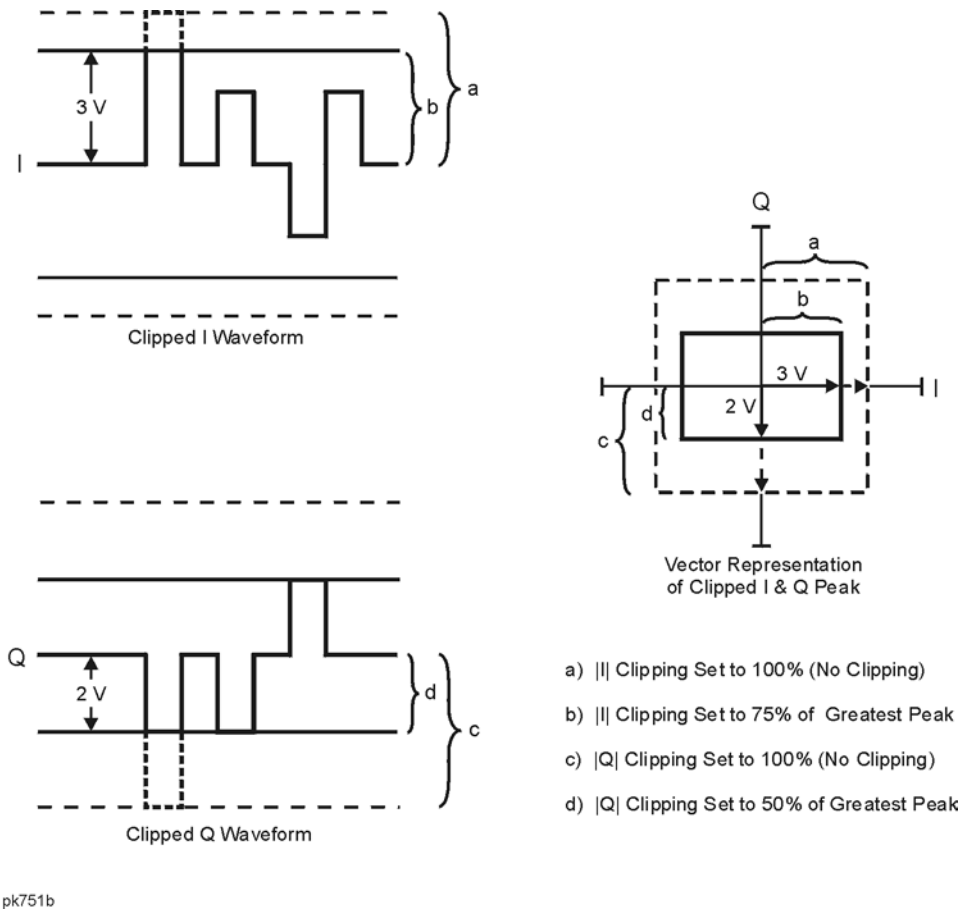
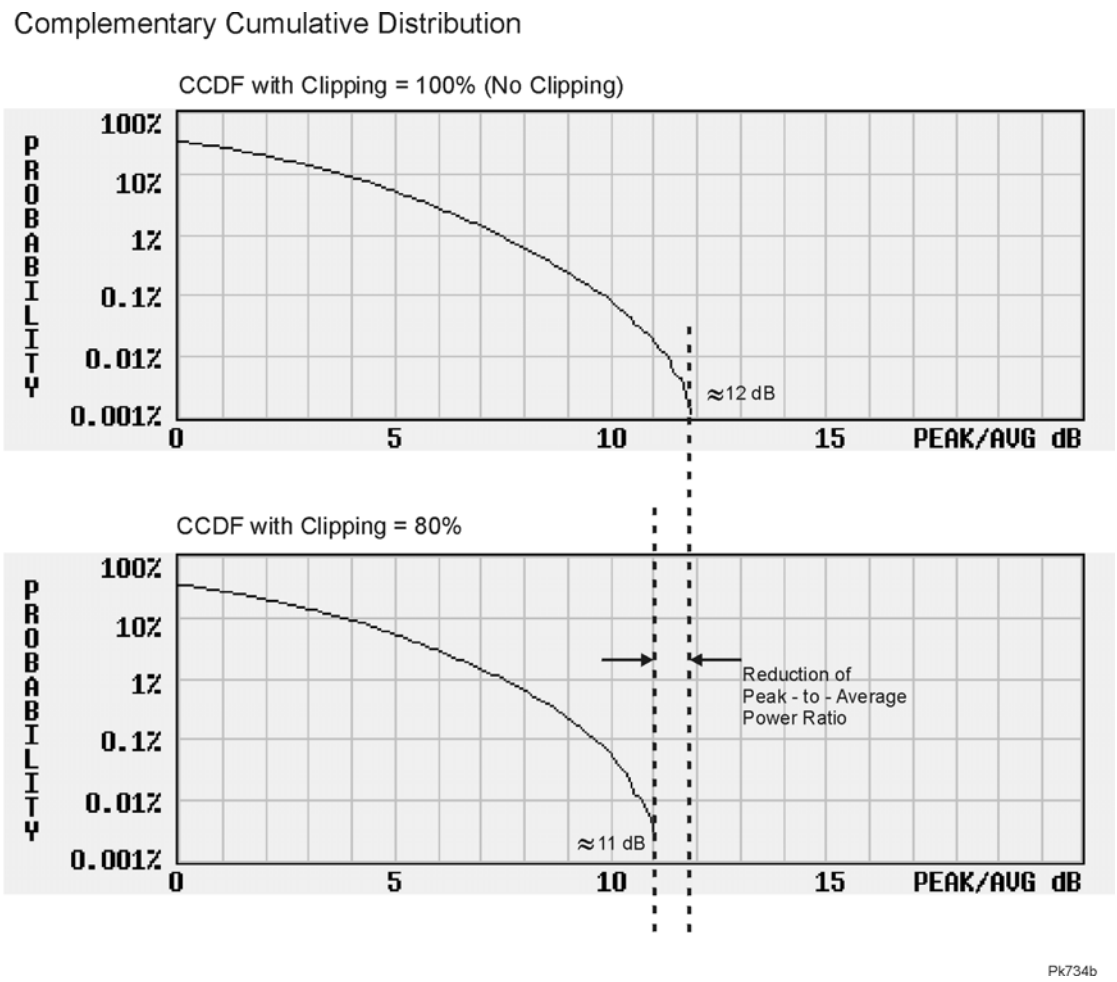


Figure 4-14 Reduction of Peak-to-Average Power



FIR Filtering Options

The ESG signal generator allows you to choose whether clipping occurs prior to, or after, FIR filtering. Because clipped waveforms have abrupt discontinuities which can generate noise, you can select *pre*-FIR filter clipping. The FIR filter smooths any discontinuities in the clipped waveform and prevents noise. If desired, however, you can also select *post*-FIR filter clipping.

How Clipping Differs from Symbol Offset

Another method used to control the power peak problem is to modify the symbol-offset values of the channels that comprise either the I or Q waveform. This is accomplished by using the signal generator's W-CDMA channel table editor. Unlike clipping, which reduces existing peaks, this method attempts to *prevent* peaks.

When multiple channels use a framing structure in which certain bits are designed to have the same state, these bits align and are summed to create power peaks. Offsetting the symbols in the channels prevents these bits from aligning, creating a cancelling effect. You can experiment with using the symbol-offset method in combination with clipping.

5 Remote Programming

This chapter describes W-CDMA subsystem SCPI commands. The descriptions include syntax requirements, ranges, restrictions, and status after a *RST.

W-CDMA Subsystem SCPI Command Reference

Use the following SCPI commands to remotely set the controls and parameters associated with the W-CDMA (Rev 1.0–1.2) communications standard. These commands apply only to signal generators with both Options UND and 100.

Apply Waveform

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:APPLy
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:APPLy
```

Execute this command to generate a W-CDMA signal based on the current values in the W-CDMA channel setup table editor.

ARB Reference Internal External

```
[:SOURce]:RADio:ARB:CLOCk:REFerence[:SOURce] INTernal|EXTernal
[:SOURce]:RADio:ARB:CLOCk:REFerence[:SOURce]?
```

Execute this command to select either an internal or external reference for the waveform clock. If external is selected, the external frequency *must* be entered (see the Reference Frequency command) and the signal must be applied to the BASEBAND GEN REF IN connector.

*RST Value: Internal.

Channel Setup

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:
CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,
<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,
<TFCI_power>,<TPC_power>,<pilot_power>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:
CHANnel? <chan_num>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:
CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,
<power>,<TFCI>,<TPC>,RANDom|<data_val>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:
CHANnel? <chan_num>
```

These commands define the channel parameters of the W-CDMA signal. Use `Init` to clear the table editor and define the parameters for the first channel; use `APPend` to add new channels.

Parameters include:

Parameter	Definition	*RST Value
<chan_num>	specifies the channel number to modify	N/A
<chan_type>	sets the channel type	DPCH
<symbol_rate>	sets the symbol rate	32 ksps
<spread_code>	sets the spread code	8
<power>	sets the power level for the channel	0.00 dB
<symbol_offset>	sets the symbol offset for the channel	0
<TFCI>	transport format combination indicator	0
<TPC>	transmit power control	AAAA
<scramble_code>	sets the scramble code value for the inserted channels	1
Random	random transmitted data	N/A
<data_val>	user-defined transmitted data	N/A
<TFCI_power>	power offset	0.00 dB
<TPC_power>	power offset	0.00 dB
<pilot power>	power offset	0.00 dB

Chip Rate

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CRATe <value>
[:SOURce]:RADio:WCDMa:STANdard:ARB:CRATe?
```

Execute this command to set the chip rate. Choices for the variable `<value>` are 4.096 Mcps, 8.192 Mcps, and 16.384 Mcps.

*RST Value: 4.096000 Mcps

Clipping Level, |I+jQ|

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping[:IJQ] <10-100%>
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping[:IJQ]?
```

Execute this command to clip (limit) the modulation level of the combined I and Q waveform to a percentage of full scale. A level of 100.0% equates to no clipping.

*RST Value: 100.0%

Clipping Level, |I|

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:I <10-100%>
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:I?
```

Execute this command to clip (limit) the modulation level of the waveform's I component to a percentage of full scale. A level of 100.0% equates to no clipping.

*RST Value: 100.0%

Clipping Level, |Q|

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:Q <10-100%>
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:Q?
```

Execute this command to clip (limit) the modulation level of the waveform's Q component to a percentage of full scale. A level of 100.0% equates to no clipping.

*RST Value: 100.0%

Clipping, Pre/Post FIR Filter

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:POSition PRE|POST
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:POSition?
```

Execute this command to select whether you want the waveform to be clipped before (PRE) or after (POST) FIR filtering.

*RST Value: PRE

Clipping, Type

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:TYPE IJQ|IORQ
[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:TYPE?
```

Execute this command to select either `IJQ` or `IORQ` as the clipping type. If you select `IJQ`, the combined I and Q waveform will be clipped (*circular* clipping). If you select `IORQ`, the I and Q components of the waveform are clipped independently (*rectangular* clipping). In this case, you can clip I and Q to different levels.

*RST Value: `IJQ`

Code Domain Power

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:
PADJust EQUal|SCALe
```

Execute this command to set the code domain power. Available in Forward Link only.

`EQUal|SCALe` - code domain power settings

`EQUal` - sets the channel power levels so that all channels are of equal energy per bit and the total power equals 0 dBm.

SCALe - scales all of the current channel powers so that the total power equals 0 dB while keeping the previous power ratios between the individual channels.

External Trigger Delay State

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:DELay:
STATe ON|OFF|1|0
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATe?
```

Execute this command to set the operating state for the external trigger delay. The choices are On or Off.

*RST Value: Off

External Trigger Delay Time

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:DELay <value>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:DELay?
```

Execute this command to set the external trigger delay time. The range of values allowed for the variable <value> is 2.000 microseconds through 3600 seconds.

*RST Value: 2.000 msec

External Trigger Polarity

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:
SLOPe POSitive|NEGative
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]:EXTernal:SLOPe?
```

Execute this command to set the polarity of the external trigger. The choices are positive or negative.

*RST Value: negative

Filter Alpha

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:ALPHa <value>
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:ALPHa?
```

Execute this command to change the Nyquist or root Nyquist filter's alpha value. The acceptable range for the variable <value> is 0.000 through 1.000.

This command is effective only *after* choosing a root Nyquist or Nyquist filter. It does not have an effect on other types of filters.

*RST Value: 0.500

Filter BbT

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:BBT <value>
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:BBT?
```

Execute this command to change the bandwidth-multiplied-by-bit-time (BbT) filter parameter. The acceptable range for the variable `<value>` is 0.000 through 1.000.

This command is effective only *after* choosing a Gaussian filter. It does not have an effect on other types of filters.

*RST Value: 0.500

Filter Optimization

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:CHANnel EVM|ACP
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:CHANnel?
```

Execute this command to optimize the filter for minimized error vector magnitude (select EVM) or to minimized adjacent channel power (select ACP). The EVM selection provides the most ideal passband. The ACP selection improves stopband rejection.

This feature only applies to root Nyquist, Nyquist, and Gaussian filters.

*RST Value: EVM

Filter Selection

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer RNYQuist|NYQuist|GAUSsian|
RECTangle|WCDMA|IS95|IS95_EQ|IS95_MOD|IS95_MOD_EQ|IS2000SR3DS|AC4Fm|
UGGaussian|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
```

Execute this command to select the pre-modulation filter type. The choices are:

- `RNYQuist` - root Nyquist filter
- `NYQuist` - Nyquist filter
- `GAUSsian` - Gaussian filter
- `RECTangle` - Rectangle filter
- `WCDMA` - 0.22 Nyquist filter optimized for ACP
- `IS95` - Standard IS-95 filter
- `IS95_MOD` - a modified version of an IS-95 filter which meets the IS-95 error function for improved adjacent channel performance.
- `IS95_EQ` - a modified version of an IS-95 filter with an equalizer which provides base station phase equalization for the transmit signal path.

- `IS95_MOD_EQ` - a modified version of an IS-95 filter which meets the IS-95 error function for improved adjacent channel performance with an equalizer which provides base station phase equalization for the transmit signal path.
- `IS2000SR3DS` - a modified IS-2000 spreading rate 3 direct spread filter
- `AC4Fm` - APCO 25 specified C4FM filter
- `UGGaussian` - UN3/4 delay compatible, fixed 0.300 BbT, GSM Gaussian
- `"<file name>"` - any filter file that you have either created externally and downloaded into memory, or that you have created internally in the Define User FIR menu and then subsequently stored.

*RST Value: WCDMA

Gate Active

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE:GATE:ACTive?
```

Execute this command to toggle the polarity of the “through” or active state of a gated trigger signal. The choices are low or high. Gate active low will output the signal while the gate is low at the PATTERN TRIG IN connector. Gate active high has the opposite effect, outputting the signal while the signal level at the PATTERN TRIG IN connector is in a high state.

I/Q Mapping

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:IQMap NORMal|INVert|INVerted
[:SOURce]:RADio:WCDMa:STANdard:ARB:IQMap?
```

Execute this command to select whether the I/Q outputs will be normal or inverted.

*RST Value: Normal

Link Direction

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK FORWard|REVerse
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK?
```

Use this command to select a W-CDMA forward or reverse link channel configuration.

Multicarrier, Define

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:
TABLe INIT|APPend|<car_num>,DPCH1|DPCH3|PERCH|PDPCH1|PDPCH3|PDPCH50|
"<file name>",<freq_offset>,<power>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:
TABLe? <car_num>
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe:
NCARriers?
```

This command defines the multicarrier W-CDMA waveform. Use `Init` to clear the table editor and define the parameters for the first carrier. Use `APPend` to add new up to four new carriers.

- `<car_num>` - specifies the carrier number to modify
- `DPCH1` - a single DPCH forward channel
- `DPCH3` - 3 DPCH forward channels
- `PERCH` - a single Perch forward channel
- `PDPCH1` - a Perch plus one single DPCH forward channel
- `PDPCH3` - a Perch plus three single DPCH forward channels
- `PDPCH50` - a Perch plus 50 single DPCH forward channels
- `"<file name>"` - a custom multicarrier W-CDMA waveform stored in the signal generator's memory. This value is entered only for a custom carrier.
- `<freq_offset>` - the frequency offset in hertz.
- `<power>` - the power level in dB

Multicarrier, Select Setup

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:
MCARrier CAR2|CAR3|CAR4|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier?
```

This command defines the type of multicarrier W-CDMA setup. The choices include:

`CAR2` - a standard 2-carrier setup with the following settings:

Carrier 1: Perch channel, –7.5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, 7.5 MHz frequency offset, 0 dB power

`CAR3` - a standard 3-carrier setup with the following settings:

Carrier 1: Perch channel, –5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, 0 kHz frequency offset, 0 dB power

Carrier 3: Perch channel, 5 MHz frequency offset, 0 dB power

`CAR4` - a standard 4-carrier setup with the following settings:

Carrier 1: Perch channel, –7.5 MHz frequency offset, 0 dB power

Carrier 2: Perch channel, –2.5 MHz frequency offset, 0 dB power

Carrier 3: Perch channel, 2.5 MHz frequency offset, 0 dB power

Carrier 4: Perch channel, 7.5 MHz frequency offset, 0 dB power

`"<file name>"` - a user-defined multicarrier W-CDMA state file stored in non-volatile memory.

*RST Value: 2 Carriers

Multicarrier, Store Custom

```
[:SOURce]:RADio:WCDMA:STANdard:ARB:LINK:FORWard:SETup:MCARrier:
STORe "<file  name>"
```

This command stores the current multicarrier setup information into the memory catalog under the file name you entered:

The following instrument state information is stored into the memory catalog:

- type of carriers
- frequency offset for each carrier
- power level for each carrier

NOTE To recall these custom multicarrier settings from memory, execute this command: `[:SOURce]:RADio:WCDMA:STANdard:ARB:LINK:FORWard:SETup:MCARrier "<file name>"`

Reconstruction Filter

```
[:SOURce]:RADio:ARB:RFILter <value>|THRough
[:SOURce]:RADio:ARB:RFILter?
```

Execute this command to modify the reconstruction filter. You may choose a filter with a cutoff frequency of 250.0 kHz, 2.500 MHz, 8.000 MHz or no filter (Through). Acceptable values for the variable `<value>` are `250.0 kHz`, `2.500 MHz`, or `8.000 MHz`.

*RST Value: 2.500 MHz

Reference Frequency

```
[:SOURce]:RADio:ARB:CLOCk:REFerence:EXTernal:FREQuency <value>
[:SOURce]:RADio:ARB:CLOCk:REFerence:EXTernal:FREQuency?
```

This command sets the reference frequency of the external clock. It is effective only when an external ARB reference is applied to the BASEBAND GEN REF IN connector. The acceptable range for the variable `<value>` is 250.0000 kHz to 20.0000000 MHz.

*RST Value: 10.0000000 MHz

Retrigger Mode State

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:RETRigger ON|OFF|1|0
[:SOURce]:RADio:WCDMa:STANdard:ARB:RETRigger?
```

This command sets the operating state of the retrigger mode. The choices are On or Off.

*RST Value: On

Scramble Code

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SCRamble <value>
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SCRamble?
```

Execute this command to enter the value that you want for the scramble code for all reverse link channels.

*RST Value: 1

Second DPDCH Setup

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SDPDch I|Q
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SDPDch?
```

Execute this command to set the second DPDCH channel to I or Q. Subsequent channels will alternate accordingly between I and Q.

*RST Value: Q

TFCI Field State

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:TFCI ON|OFF|1|0
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:TFCI?
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:TFCI ON|OFF|1|0
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:TFCI?
```

Execute this command to turn the TFCI (Transport Format Combination Indicator) field On or Off for all the channels in the current table editor.

*RST Value: On

Trigger Source

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce] KEY|EXT|BUS
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]?
```

Execute this command to set the trigger source. The choices include the front panel **Trigger** key, a trigger command sent over the GPIB bus, or an external trigger applied to the PATTERN TRIG IN connector.

*RST Value: Ext

Trigger Type

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE CONTinuous|SINGle|GATE
[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE?
```

Execute this command to set the trigger type. The choices are continuous, single, gated, and when a waveform sequence is active, segment advance.

*RST Value: Continuous

User FIR Definition

```
MEMory:DATA:FIR "<file name>",osr,coefficient{,coefficient}
MEMory:DATA:FIR? "<file name>"
```

This command defines User FIR filters. Although the maximum filter length is 1024 taps, with a maximum oversampling ratio of 32, an FIR filter for use in W-CDMA may not have more than 256 taps; select the number of symbols and the oversample ratio accordingly. Examples of using the FIR table editor are provided in Chapter 2, “Using Functions.”

Setting the Oversample Ratio

The oversample ratio (OSR) is the number of filter taps per symbol. Acceptable values range from 1 through 32/ Although the maximum combination of symbols and oversampling ratio allowed by the table editor is 1024, the instrument hardware is limited to 32 symbols, an oversample ratio between 4 and 16, and 256 coefficients. If you enter more than 32 symbols or 256 coefficients, the instrument will be unable to use the filter. If the oversample ratio is different from the internal, optimally selected one, the filter is automatically resampled to an optimal oversample ratio.

W-CDMA Link Setup

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup DPCH1|DPCH3|
PERCH|PDPCH1|PDPCH3|PDPCH50|MCARrier|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup?
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DPCCH|DDPDCH1|
DDPDCH2|DDPDCH3|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
```

Execute this command to select a pre-defined channel configuration for the W-CDMA forward or reverse links. You can select a pre-defined channel setup, or select a stored custom W-CDMA state. The command is also used to activate multicarrier mode (see also “Multicarrier, Select Setup” on page 5-8).

Forward link setup selections:

`DPCH1` - selects a single DPCH channel

`DPCH3` - selects a three DPCH channel

`PERCH` - selects a single perch channel

`PDPCH1` - selects a perch plus one DPCH channel

`PDPCH3` - selects a perch plus three DPCH channels

`PDPCH50` - selects a perch plus fifty DPCH channels

`MCARrier` - activates multicarrier mode

`"<file name>"` - selects a stored custom W-CDMA state

Reverse link setup selections:

`DPCCH` - selects a single DPCCH channel

`DDPDCH1` - selects a DPCCH plus one DPDCH channel

`DDPDCH2` - selects a DPCCH plus two DPDCH channels

`DDPDCH3` - selects a DPCCH plus three DPDCH channels

`"<file name>"` - selects a stored custom W-CDMA state

*RST Value: a single DPCH forward link channel (`DPCH1`)

W-CDMA State, On/Off

```
[:SOURce]:RADio:WCDMa:STANdard:ARB[:STATe] ON|OFF|1|0
[:SOURce]:RADio:WCDMa:STANdard:ARB[:STATe]?
```

Execute this command to enable or disable the W-CDMA capability. The choices are On (1) or Off (0). Executing the command `[:SOURce]:RADio:WCDMa:STANdard:ARB[:STATe] ON` sets up the internal hardware to generate the currently selected W-CDMA signal selection. The `W-CDMA` and `I/Q` annunciators are turned on in the display.

Although the digital modulation is enabled with this command, the modulation is not present on the RF carrier until you have executed the command: `OUTPut:MODulation[:STATe] ON`.

*RST Value: Off

W-CDMA State, Store Custom

```
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:
STORe "<file name>"
[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:
STORe "<file name>"
```

Execute this command to store the current custom W-CDMA state into a designated file name. Afterward, you can recall this custom state from the signal generator's memory by executing the command `[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard: SETup "<file name>"`, or `[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse: SETup "<file name>"` (with the appropriate file name in place of the variable).

Along with the contents of the W-CDMA channel table editor (channel types, spread code, scramble code, power levels, symbol rate, symbol offset, and data pattern), this command stores the following instrument state information to the memory catalog:

- FIR filter
- FIR filter file name
- FIR filter alpha and BbT
- FIR filter channel (EVM or ACP)
- IQ Mapping
- Link
- Chip rate
- ARB reconstruction filter
- ARB reference clock source (internal or external)
- Clipping
- Forward link TFCI on/off
- Reverse link TFCI on/off
- Reverse link SDDPCH
- Reverse link scramble code

6 Programming Command Cross-Reference

This chapter lists the W-CDMA softkeys and their corresponding SCPI commands. For a complete list of the signal generator hardkeys and softkeys and their corresponding SCPI commands, please refer to the programming guide.

Mode – W-CDMA Softkeys

Key	SCPI Command
1 DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup DPCH1 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,DPCH1,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe? <carrier_num>
2 Carriers	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier CAR2 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier?
2.500 MHz	[:SOURce]:RADio:ARB:RFILter 2.500 MHz [:SOURce]:RADio:ARB:RFILter?
3 Carriers	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier CAR3 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier?
3 DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup DPCH3 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,DPCH3,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe? <carrier_num>
4 Carriers	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier CAR4 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier?

Key	SCPI Command
8 ksps **16 ksps** **32 ksps** **64 ksps** **128 ksps** **256 ksps** **512 ksps** **1024 ksps**	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
8.000 MHz	[:SOURce]:RADio:ARB:RFILter 8.0 MHz [:SOURce]:RADio:ARB:RFILter?
250.0 kHz	[:SOURce]:RADio:ARB:RFILter 250 kHz [:SOURce]:RADio:ARB:RFILter?
Adjust Code Domain Power	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:PADJust EQUal|SCALe
APCO 25 C4FM	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer AC4Fm [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
Apply Channel Setup	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:APPLy [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:APPLy
Apply Multicarrier	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:APPLy
ARB Reference Ext Int	[:SOURce]:RADio:ARB:CLOCk:REFerence[:SOURce] INTernal|EXTernal [:SOURce]:RADio:ARB:CLOCk:REFerence[:SOURce]?
Bus	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce] BUS [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]?
Channels	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num>

Key	SCPI Command
Chip Rate	`[:SOURce]:RADio:WCDMa:STANdard:ARB:CRATe <value>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CRATe?`
Clip |I+jQ| To	`[:SOURce]:RADio:WCDMa:STANdard:ARB: CLIPping[:IJQ] <10-100%>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping[:IJQ]?`
Clip |I| To	`[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:I <10-100%>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:I?`
Clip |Q| To	`[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:Q <10-100%>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:Q?`
Clip At PRE POST FIR Filter	`[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping: POSition PRE|POST` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:POSition?`
Clipping Type |I+jQ| |I|,|Q|	`[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:TYPE IJQ|IORQ` `[:SOURce]:RADio:WCDMa:STANdard:ARB:CLIPping:TYPE?`
Continuous	`[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE CONT` `[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE?`
Custom W-CDMA Carrier	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: MCARrier:TABLe INIT|APPend|<carrier_num>,"<file name>", <freq_offset>,<power>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: MCARrier:TABLe:NCARriers?`
Custom W-CDMA Multicarrier	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: MCARrier:TABLe INIT|APPend|<carrier_num>,"<file name>", <freq_offset>,<power>` `[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: MCARrier:TABLe:NCARriers?`

Custom W-CDMA State	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard: SETup "<file name>"`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup?`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse: SETup "<file name>"`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?`

Define User FIR	`:MEMory:DATA:FIR "<file name>",osr, coefficient{,coefficient}` `:MEMory:DATA:FIR? "<file name>"`

Key	SCPI Command
DPCCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DPCCH [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
DPCCH + 1 DPDCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DDPDCH1 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
DPCCH + 2 DPDCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DDPDCH2 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
DPCCH + 3 DPDCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DDPDCH3 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num>
DPDCH Channels	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
Edit Channel Setup	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
Equal Energy per Symbol	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:PADJust EQUal

Key	SCPI Command
Ext	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce] EXT [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]?
Ext Delay Off On	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:DELay:STATe ON|OFF|1|0 [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:DELay:STATe?
Ext Delay Time	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:DELay <value> [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:DELay?
Ext Polarity Neg Pos	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:SLOPe POSitive|NEGative [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]: EXTernal:SLOPe?
Filter Alpha	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:ALPHa <value> [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:ALPHa?
Filter BbT	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:BBT <value> [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:BBT?
First Spread Code	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>, <symbol_rate>,<spread_code>,<power>,<symbol_offset>, <TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>, <TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: TABLe:CHANnel? <chan_num>
Gate Active	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE:GATE: ACTive LOW|HIGH [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE:GATE: ACTive?
Gated	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE GATE [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE?
Gaussian	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer GAUSsian [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?

Key	SCPI Command
Insert DPDCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
I/Q Mapping Normal Invert	[:SOURce]:RADio:WCDMa:STANdard:ARB:IQMap NORMal|INVert|INVerted [:SOURce]:RADio:WCDMa:STANdard:ARB:IQMap?
IS-2000 SR3 DS	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer IS2000SR3DS [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
IS-95	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer IS95 [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
IS-95 Mod	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer IS95_MOD [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
IS-95 Mod w/EQ	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer IS95_MOD_EQ [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
IS-95 w/EQ	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer IS95_EQ [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
Link Forward Reverse	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK FORWard|REVerse [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK?
Modify All Scramble Codes	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num>
Multicarrier Define	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<chan_num>, DPCH1|DPCH3|PERCH|PDPCH1|PDPCH3|PDPCH50|"<file name>", <freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe:NCARriers?
Multicarrier Off On	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup MCARrier [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup?

Key	SCPI Command
Multiple Channels	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num>
Nyquist	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer NYQuist [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
Optimize FIR For EVM ACP	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:CHANnel EVM|ACP [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer:CHANnel?
Oversample Ratio	:MEMory:DATA:FIR "<file name>",osr,coefficient{,coefficient} :MEMory:DATA:FIR? "<file name>"
Perch	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup PERCH [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,PERCH,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:<carrier_num
Perch + 1 DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup PDPCH1 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,PDPCH1,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:<carrier_num

Key	SCPI Command
Perch + 3 DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup PDPCH3 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,PDPCH3,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:<carrier_num
Perch + 50 DPCH	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup PDPCH50 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier:TABLe INIT|APPend|<carrier_num>,PDPCH50,<freq_offset>,<power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:<carrier_num
Power	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_VAL>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
Random	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_VAL>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>

Key	SCPI Command
Reconstruction Filter	[:SOURce]:RADio:ARB:RFILter 250 kHz|2.5 MHz| 8.0 MHz|THRough [:SOURce]:RADio:ARB:RFILter?
Rectangle	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer RECTangle [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
Reference Frequency	[:SOURce]:RADio:ARB:CLOCk:REFerence:EXTernal: FREQuency <value> [:SOURce]:RADio:ARB:CLOCk:REFerence:EXTernal:FREQuency?
Restore Default Filter	[:SOURce]:RADio:WCDMa:ARB:FILTer WCDMA [:SOURce]:RADio:WCDMa:ARB:FILTer?
Retrigger Mode Off On	[:SOURce]:RADio:WCDMa:STANdard:ARB:RETRigger ON|OFF|1|0 [:SOURce]:RADio:WCDMa:STANdard:ARB:RETRigger?
Root Nyquist	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer RNYQuist [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?
Scale To 0dB	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: TABLe:PADJust SCALe
Scramble Code	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>, <symbol_rate>,<spread_code>,<power>,<symbol_offset>, <TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>, <TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup: TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse: SCRamble <value> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SCRamble?
Second DPDCH I Q	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SDPDch I|Q [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SDPDch?
Select	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer RNYQuist| NYQuist|GAUSsian|RECTangle|WCDMA|IS95|IS95_EQ|IS95_MOD| IS95_MOD_EQ|IS2000SR3DS|AC4Fm|"<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?

Key	SCPI Command
Select File	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILter "<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:FILter? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup "<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup "<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?
Single	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE SINGle [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE?
Spread Only	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num>
Store Custom Multicarrier	[:SOURce]:RADio:WCDMA:STANdard:ARB:LINK:FORWard:SETup:MCARrier:STORe "<file name>"
Store Custom W-CDMA State	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:STORe "<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:STORe "<file name>"
Store to File	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:STORe "<file name>" [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:STORe "<file name>"
Symbol Rate	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>

Key	SCPI Command
TCFI Field Off On	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:TFCI ON|OFF|1|0 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:TFCI? [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:TFCI ON|OFF|1|0 [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:TFCI?
Through	[:SOURce]:RADio:ARB:RFILter THRough [:SOURce]:RADio:ARB:RFILter?
Trigger	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE CONTinuous|SINGle|GATE [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger:TYPE?
Trigger Key	[:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce] KEY [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]?
Trigger Source	[:SOURce]:RADio:WCDMa:STANdard:ARB: TRIGger[:SOURce] KEY|EXT|BUS [:SOURce]:RADio:WCDMa:STANdard:ARB:TRIGger[:SOURce]?
Type	[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<symbol_offset>,<TFCI>,<TPC>,<scramble_code>,RANDom|<data_val>,<TFCI_power>,<TPC_power>,<pilot_power> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:TABLe:CHANnel? <chan_num> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TFCI>,<TPC>,RANDom|<data_val> [:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup:TABLe:CHANnel? <chan_num>
UN3/4 GSM Gaussian	[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer UGGaussian [:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?

Key	SCPI Command
WCDMA	`[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer WCDMA` `[:SOURce]:RADio:WCDMa:STANdard:ARB:FILTer?`
W-CDMA Off On	`[:SOURce]:RADio:WCDMa:STANdard:ARB[:STATe] ON|OFF|1|0` `[:SOURce]:RADio:WCDMa:STANdard:ARB[:STATe]?`

W-CDMA Select	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup DPCH1|DPCH3|PERCH|PDPCH1|PDPCH3|PDPCH50|MCARrier|"<file name>"`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup?`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup DPCCH|DDPDCH1|DDPDCH2|DDPDCH3|"<file name>"`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:REVerse:SETup?`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier CAR2|CAR3|CAR4|"<file name>"`
	`[:SOURce]:RADio:WCDMa:STANdard:ARB:LINK:FORWard:SETup:MCARrier?`

Index

Numerics

1 DPCH softkey, 3-3
1024 ksps softkey, 3-2
128 ksps softkey, 3-2
16 ksps softkey, 3-2
2 Carriers softkey, 3-3
2.500 MHz softkey, 3-3
250 kHz softkey, 3-5
256 ksps softkey, 3-2
3 Carriers softkey, 3-4
3 DPCH softkey, 3-4
32 ksps softkey, 3-2
3GPP specification, 1-2
4 Carriers softkey, 3-4
512 ksps softkey, 3-2
64 ksps softkey, 3-2
8 ksps softkey, 3-2
8.000 MHz softkey, 3-4

A

Adjust Code Domain Power softkey, 3-5
APCO 25 C4FM softkey, 3-5
Apply Channel Setup softkey, 3-5
Apply Multicarrier softkey, 3-5
Apply To Waveform softkey, 3-6
ARB Reference Ext Int softkey, 3-6
ARB reference source SCPI command, 5-2
ARIB 1.0-1.2 specification, 1-2

B

baseband clipping. *See* clipping
bit rate, 4-4
  forward link, 4-3
  reverse link, 4-4
bits per frame, 4-4
  forward link, 4-3
  reverse link, 4-4
bits per slot, 4-4
  forward link, 4-3
  reverse link, 4-4
block diagrams
  DPCCH frame structure, 1-5
  DPCH frame structure, 1-4
  DPDCH frame structure, 1-5
  forward link channel structure, 1-4
  forward link frame structure, 4-3
  perch channel frame structure, 4-2
  reverse link channel structure, 1-5
  reverse link frame structure, 4-4
Bus softkey, 3-6

C

carrier frequency, setting, 2-27
carrier power, setting, 2-27
catalogs
  FIR files, 2-38
  forward W-CDMA files, 2-19
  FWCDMA files, 2-19
  MFWCDMA files, 2-24
  multicarrier W-CDMA files, 2-24
  reverse W-CDMA files, 2-19
  RWCDMA files, 2-19
channel configurations, editing forward link, 2-8
channel configurations, editing reverse link, 2-14
channel fields
  forward link, 4-3
  perch channel, 4-2
  reverse link, 4-4
channels
  editing values, 2-11, 2-17
  inserting DPCH, 2-8
  inserting DPDCH, 2-14
  inserting perch, 2-10
  reverse link block diagram, 1-5
  setup SCPI command, 5-2
  softkey, 3-6
Channels softkey, 3-6
chip rate SCPI command, 5-3
Chip Rate softkey, 3-7
circular clipping, 4-11
clipping
  block diagram, forward link, 1-4
  block diagram, reverse link, 1-5
  circular, 4-11
  concepts, 4-8
  FIR filtering options, 4-13
  intermodulation distortion, 4-10
  peak-to-average power, 4-11
  power peaks, 4-8
  rectangular, 4-11
  SCPI commands
    clipping level, |I+jQ|, 5-3
    clipping level, |I|, 5-4
    clipping level, |Q|, 5-4
    pre/post FIR filter, 5-4
    type, 5-4
  softkeys
    Apply To Waveform, 3-6
    Clip |I+jQ| To, 3-7
    Clip |I| To, 3-7
    Clip |Q| To, 3-7

softkeys (Continued)
Clip At PRE POST FIR Filter, 3-8
Clipping, 3-8
Clipping Type |I+jQ| |I|,|Q|, 3-8
spectral regrowth, 4-10
using, 2-28
versus symbol offset, 4-14
code domain
conflicts, identifying, 2-25
conflicts, resolving, 2-25, 2-26
power, SCPI command, 5-4
coefficient values (FIR), entering, 2-31
concepts of operation, W-CDMA, 4-1
Continuous softkey, 3-8
custom multicarrier W-CDMA waveforms
activating, 2-23
creating, 2-21
recalling, 2-24
storing, 2-24
storing, SCPI command, 5-9
Custom softkeys
Custom W-CDMA Carrier, 3-8
Custom W-CDMA Multicarrier, 3-9
Custom W-CDMA State, 3-9
custom W-CDMA waveforms
storing, SCPI command, 5-12

D

data bits
forward link, 4-3
reverse link, 4-4
Define User FIR softkey, 3-9
Delete softkeys
Delete All Rows, 3-9
Delete File, 3-9
Delete Row, 3-9
Display FFT softkey, 3-10
Display Impulse Response softkey, 3-10
DPCCH
bits per frame, 4-3, 4-4
bits per slot, 4-3, 4-4
fields, 4-3, 4-4
softkeys
DPCCH, 3-10
DPCCH + 1 DPDCH, 3-11
DPCCH + 2 DPDCH, 3-11
DPCCH + 3 DPDCH, 3-11
DPCH
channels, inserting, 2-8
softkey, 3-11
DPDCH
DPDCH (Continued)
bits per frame, 4-3, 4-4
bits per slot, 4-3, 4-4
channels
inserting, 2-14
inserting additional, 2-14
softkey, 3-11
fields, 4-3, 4-4

E

Edit Channel Setup softkey, 3-12
Edit Item softkey, 3-12
Equal Energy per Symbol softkey, 3-12
examples
channel configurations, editing
forward link, 2-8, 2-11
reverse link, 2-14, 2-17
channel configurations, selecting
overview, 2-4
predefined forward link, 2-5
predefined reverse link, 2-6
coefficients, duplicating with mirror table, 2-32
FIR filter
creating, 2-30
modifying, 2-35
using, 2-38
W-CDMA softkey menu, accessing, 2-3
W-CDMA waveform, outputting, 2-27
Ext softkeys
Ext, 3-12
Ext Delay, 3-13
Ext Delay Time, 3-13
Ext Polarity Neg Pos, 3-13
external trigger SCPI commands
delay state, 5-5
delay time, 5-5
polarity, 5-5

F

features, 1-3
files
custom multicarrier W-CDMA waveform
recalling, 2-24
storing, 2-24
FIR files catalog, 2-38
forward W-CDMA catalog, 2-19
loading FIR, 2-35
multicarrier W-CDMA catalog, 2-24
reverse W-CDMA catalog, 2-19
storing FIR filter, 2-34, 2-37

filter
FIR filter
block diagram, forward link, 1-4
block diagram, reverse link, 1-5
clipping options, 4-13
creating windowed sinc function, 2-30
modifying, 2-35
user-defined, 2-30
using a custom filter, 2-38
windowed sinc function, creating, 2-30
FIR table editor
accessing, 2-30
coefficients, duplicating with mirror table, 2-32
creating user-defined filter, 2-30
creating windowed sinc function, 2-30
entering coefficient values, 2-31
loading files, 2-35
modifying coefficients, 2-36
modifying FIR filter, 2-35
setting oversample ratio, 2-32, 5-11
storing filter, 2-34, 2-37
SCPI commands
alpha, 5-5
BbT, 5-6
optimization, 5-6
reconstruction filter, 5-9
selection, 5-6
user FIR definition, 5-11
softkeys
Filter, 3-13
Filter Alpha, 3-14
Filter BbT, 3-14
Filter Factor, 3-15
Filter Symbols, 3-15
First Spread Code softkey, 3-16
forward link
bit rate, 4-3
bits per frame, 4-3
bits per slot, 4-3
block diagram, 1-4
channel configuration, editing, 2-8, 2-11
channel configurations, selecting predefined, 2-5
channel fields, 4-3
data bits, 4-3
DPCCH fields, 4-3
DPDCH fields, 4-3
frame structure, 4-3
pilot bits, 4-3
spread factor, 4-3
symbol rate, 4-3
TFCI bits, 4-3
TPC bits, 4-3
frame structure
DPCCH block diagram, 1-5
DPCH block diagram, 1-4
frame structure (Continued)
DPDCH block diagram, 1-5
forward link, 4-3
perch, 4-2
reverse link, 4-4
frequency
setting, 2-27
FWCDMA files
catalog, 2-19
storing, 2-19

G

gate active SCPI command, 5-7
Gate Active softkey, 3-16
Gated softkey, 3-16
Gaussian softkey, 3-17
Goto softkeys
Goto Bottom Row, 3-17
Goto Middle Row, 3-17
Goto Row, 3-17
Goto Top Row, 3-18
guides
two-volume set, 1-2
W-CDMA (3GPP 3.1 12-99), 1-2
W-CDMA (ARIB 1.0-1.2), 1-2

H

Hamming softkey, 3-18
Hann softkey, 3-18
hardkey, Mode, 3-2

I

I/Q Mapping Normal Invert softkey, 3-18
I/Q mapping SCPI command, 5-7
Insert DPDCH softkey, 3-18
Insert Row softkey, 3-19
intermodulation distortion, 4-8, 4-10
IS-2000 SR3 DS softkey, 3-19
IS-95 and IS-2000 softkey, 3-19
IS-95 Mod softkey, 3-19
IS-95 Mod w/EQ softkey, 3-20
IS-95 softkey, 3-19
IS-95 w/EQ softkey, 3-20

K

Kaiser softkey, 3-20
key descriptions, 3-1

L

link direction SCPI command, 5-7
Link Forward Reverse softkey, 3-20
Load softkeys
  Load Default FIR, 3-21
  Load From Selected File, 3-21
  Load/Store, 3-21

M

manuals
  two-volume set, 1-2
  W-CDMA (3GPP 3.1 12-99), 1-2
  W-CDMA (ARIB 1.0-1.2), 1-2
memory
  FWCDMA files, 2-19
  MFWCDMA files, 2-24
  RWCDMA files, 2-19
  storing a W-CDMA state, 2-19
MFWCDMA files
  catalog, 2-24
  storing, 2-24
Mirror Table softkey, 3-21
mirror table, duplicating coefficients, 2-32
mode - W-CDMA softkeys, 6-2
Mode hardkey, 3-2
Modify All Scramble Codes softkey, 3-21
Multicarrier Define softkey, 3-22
Multicarrier Off On softkey, 3-22
multicarrier W-CDMA
  activating waveforms, 2-23
  creating custom waveforms, 2-21
  editing template, 2-22
  files catalog, 2-24
  recalling waveforms, 2-24
  SCPI commands
    define, 5-8
    setup select, 5-8
    storing waveforms, 5-9
  storing waveforms, 2-24
Multiple Channels softkey, 3-22

N

None softkey, 3-23
Nyquist softkey, 3-23

O

operation concepts, W-CDMA, 4-1
Optimize FIR For EVM ACP softkey, 3-23
Oversample Ratio softkey, 3-24
overview
  block diagrams, 1-3
  Option 100 features, 1-3
  revision numbers, 1-3
  specifications, 1-3
  W-CDMA personality, 1-3

P

Page Down softkey, 3-24
Page Up softkey, 3-24
peak-to-average power, 4-11
perch channel
  fields, 4-2
  frame structure, 4-2
  inserting, 2-10
Perch softkeys
  Perch, 3-24
  Perch + 1 DPCH, 3-25
  Perch + 3 DPCH, 3-25
  Perch + 50 DPCH, 3-25
personality overview, 1-3
pilot bits
  forward link, 4-3
  reverse link, 4-4
pilot power, 4-6
Plot CCDF softkey, 3-26
power
  clipping peaks, 4-8
  offsets
    pilot, 4-6
    TFCI, 4-6
    TPC, 4-6
  setting, 2-27
  softkey, 3-26
predefined channel configurations, 2-4
  forward link, 2-5
  reverse link, 2-6
programming command cross-reference, 6-1

R

Random softkey, 3-26
reconstruction filter SCPI command, 5-9
Reconstruction Filter softkey, 3-27
Rectangle softkey, 3-27
rectangular clipping, 4-11
reference frequency SCPI command, 5-9
Reference Frequency softkey, 3-27
Restore Default Filter softkey, 3-28
Retrigger Mode Off On softkey, 3-28

retrigger mode state SCPI command, 5-10
reverse link
  bit rate, 4-4
  bits per frame, 4-4
  bits per slot, 4-4
  channel fields, 4-4
  channel setup, editing, 2-14, 2-17
  channel structure block diagram, 1-5
  data bits, 4-4
  DPCCH fields, 4-4
  DPDCH fields, 4-4
  editing channel configurations, 2-14
  frame structure, 4-4
  frame structure block diagram, 1-5
  pilot bits, 4-4
  predefined channel configurations, 2-6
  spread factor, 4-4
  symbol rate, 4-4
  TFC bits, 4-4
  TFCI bits, 4-4
revision numbers, 1-3
Root Nyquist softkey, 3-28
RWCDMA files
  catalog, 2-19
  storing, 2-19

S

Scale To 0dB softkey, 3-29
SCPI commands, cross-reference, 6-1
SCPI commands, descriptions, 5-1
scramble code SCPI command, 5-10
Scramble Code softkey, 3-29
Second DPDCH I Q softkey, 3-29
second DPDCH setup SCPI command, 5-10
Select File softkey, 3-30
sinc function, windowed, creating a filter, 2-30
Single softkey, 3-30
softkeys
  descriptions, 3-1
  See also individual softkeys
specification
  3GPP, 1-2
  ARIB 1.0-1.2, 1-2
specifications, 1-3
spectral regrowth, 4-8, 4-10
spread factor
  forward link, 4-3
  reverse link, 4-4
Spread Only softkey, 3-30
Store softkeys
  Store Custom Multicarrier, 3-30
  Store Custom W-CDMA State, 3-31
  Store To File, 3-32
symbol
  offset versus clipping, 4-14
symbol rate
  forward link, 4-3
  reverse link, 4-4
Symbol Rate softkey, 3-32

T

table editors
  channel setup
    forward link, 2-8, 2-11
    reverse link, 2-14, 2-17
  editing basics, 2-2
TFCI
  power, 4-6
  SCPI command, field state, 5-10
  TFCI Field Off On softkey, 3-32
TFCI bits
  forward link, 4-3
  reverse link, 4-4
theory of operation, W-CDMA, 4-1
Through softkey, 3-32
TPC bits
  forward link, 4-3
  reverse link, 4-4
TPC power, 4-6
TPC values, 4-5
transmit power control, 4-5
trigger SCPI commands
  source, 5-10
  type, 5-11
Trigger softkeys
  Bus, 3-6
  Continuous, 3-8
  Ext, 3-12
  Ext Delay, 3-13
  Ext Delay Time, 3-13
  Ext Polarity Neg Pos, 3-13
  Gate Active, 3-16
  Gated, 3-16
  Trigger, 3-32
  Trigger Key, 3-33
  Trigger Setup, 3-33
  Trigger Source, 3-33
Type softkey, 3-33

U

UN 3/4 GSM Gaussian softkey, 3-33
user files
  FIR files catalog, 2-38
User FIR softkey, 3-34
user's and programming guide
  two-volume set, 1-2
user's and programming guides
  W-CDMA (3GPP 3.1 12-99), 1-2
  W-CDMA (ARIB 1.0-1.2), 1-2

W

Waveform Statistics softkey, 3-34
waveform, applying, SCPI command, 5-2
W-CDMA
  3GPP specification, 1-2
  ARIB specification, 1-2
  channel configurations, editing
    forward link, 2-8
    reverse link, 2-14
  channel configurations, predefined
    forward link, 2-5
    overview, 2-4
    reverse link, 2-6
  multicarrier template, editing, 2-22
  personality, 1-3
  RF output, enabling, 2-28
  setup SCPI command, 5-11
  softkey menu, accessing, 2-3
  state SCPI command, 5-12
  theory of operation, 4-1
  using, 2-3
  waveforms
    clipping, 2-28
    generating, 2-28
    outputting, 2-27
    storing, 2-19
    storing, SCPI command, 5-12
W-CDMA softkeys
  WCDMA, 3-34
  W-CDMA (Rev 1.0-1.2), 3-34
  W-CDMA Define, 3-34
  W-CDMA Off On, 3-35
  W-CDMA Select, 3-35
Window softkey, 3-36
Windowing softkeys
  Hamming, 3-18
  Hann, 3-18
  Kaiser, 3-20
  None, 3-23