Manual Supplement

Agilent Technologies ESG-D Series Option H97 Signal Generators

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1 Introducing Multi-Channel Wideband CDMA

This manual supplement provides operating and service information applicable to the Agilent Technologies ESG-D Family Option H97 Signal Generator. Use this information to supplement the ESG Family manual set. In all cases, the information in this supplement supersedes the information in the standard manual set.

Option H97 Product Overview

The ESG-D Series Option H97 Signal Generator is a multi-channel, wideband CDMA stimulus intended for base station and mobile testing. The Option H97 provides capability for generating a single repeating frame of downlink or uplink signals consistent with the wideband CDMA experimental system specifications.

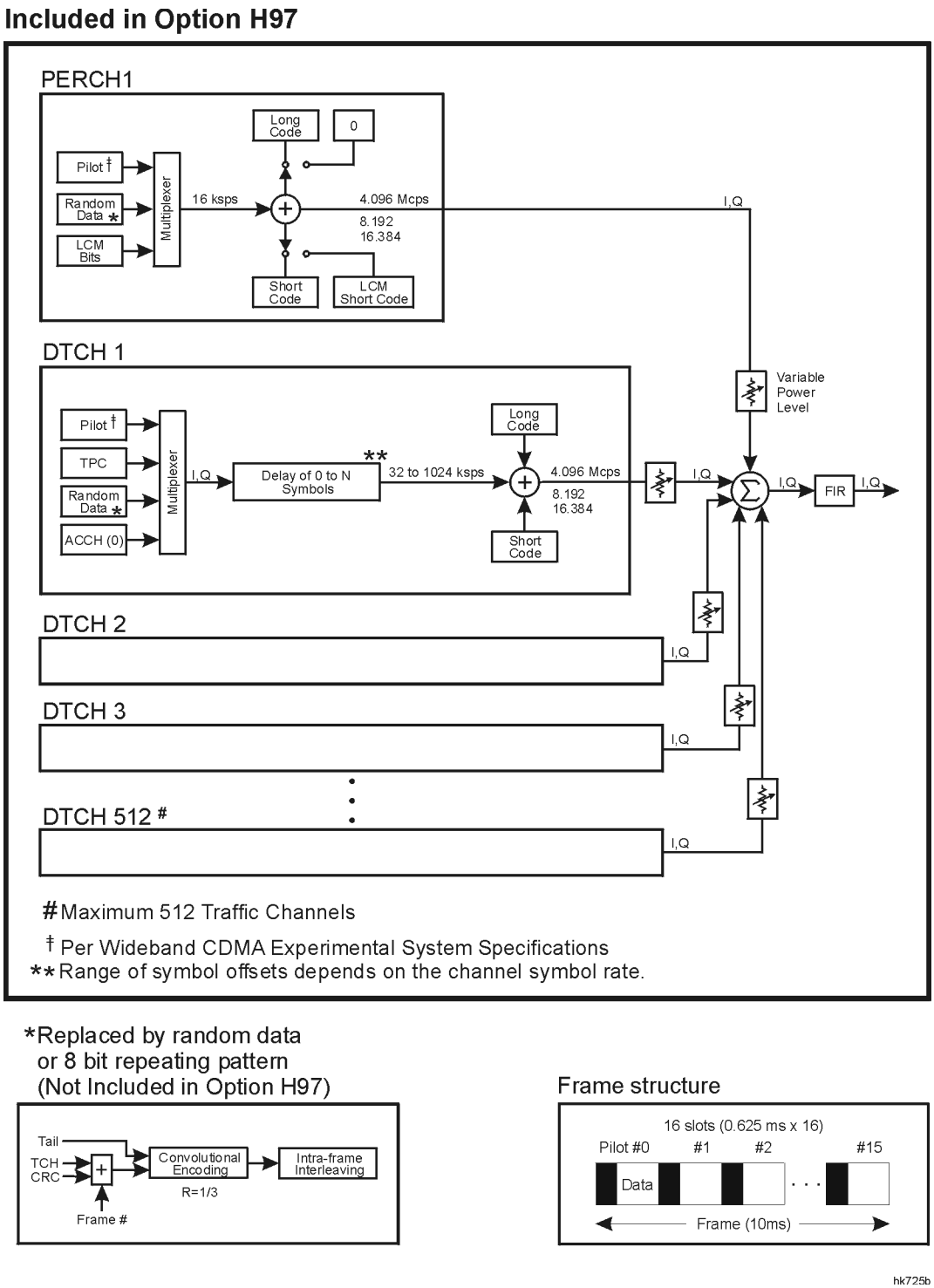
The pre-defined channel configurations include 1 DTCH, 3 DTCH, Perch1 only, Perch1 plus 1 DTCH, Perch1 plus 3 DTCH, and Perch1 plus 50 DTCH. The short codes are automatically assigned, the range of available short codes are described in Table 1-1. Filtering consists of Gaussian, IS-95, Nyquist, root Nyquist, and user-defined filters. The power ratio for the Perch channel and traffic channels are set according to the wideband CDMA experimental system specifications. The transmitted chip rate is 4.096 MHz, 8.192 MHz, or 16.384 MHz.

Table 1-1 Range of Available Short Code

Symbol Rate (ksps)	Chip Rate		
	4.096 MHz	8.132 MHz	16.384 MHz
32	0-127	0-255	0-511
64	0-63	0-127	0-255
128	0-31	0-63	0-127
256	0-15	0-31	0-63
512	0-7	0-15	0-31
1024	0-3	0-7	0-15

The following diagram shows the portions of the PERCH1 and DTCH physical layers supported by the Option H97.

Figure 1-1 PERCH1 and DTCH Physical Layer



Display Annotation

The Option H97 display is identical to the standard signal generator display in all respects except for the annunciator shown in the following figure. In the standard signal generator, or with other options enabled, this annunciator position is used for other purposes. In the Option H97, when wideband CDMA is enabled, the WCDMA annunciator is displayed in the position shown.

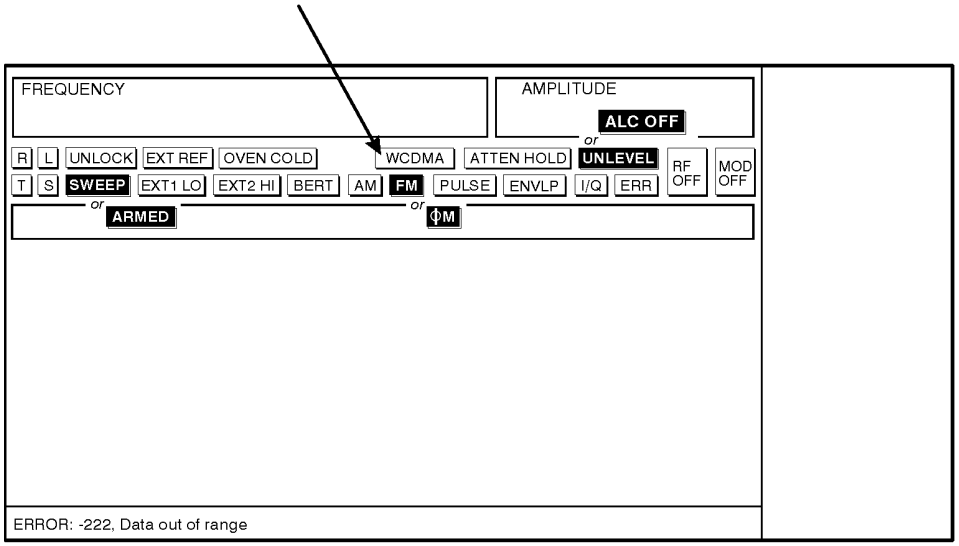


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Table Editor Basics

Option H97 provides several table editors that enable you to:

- select predefined WCDMA waveforms (for details, see page 2-4)
- modify WCDMA waveforms (for details, see page 2-10)
- create FIR data filters (for details, see page 2-14)
- modify FIR data filters (for details, see page 2-20)

While each of these table editors performs a different function, they are all used in basically the same way, 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, select this softkey.

Insert Row Inserts a row for data below 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 Enables you to load default values into a table editor.

Restore Default Enables you to reset factory default values for the filter and the channel setup.

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 can not retrieve it.

2 Using Functions

This chapter contains instructions for using the Option H97 Wideband CDMA features. Use this information to supplement the Agilent Technologies ESG Family manual set. In all cases, the information in this supplement supersedes the information in the standard manual set.

Using Wideband CDMA

This chapter describes how to set up a waveform using predefined and user defined channels.

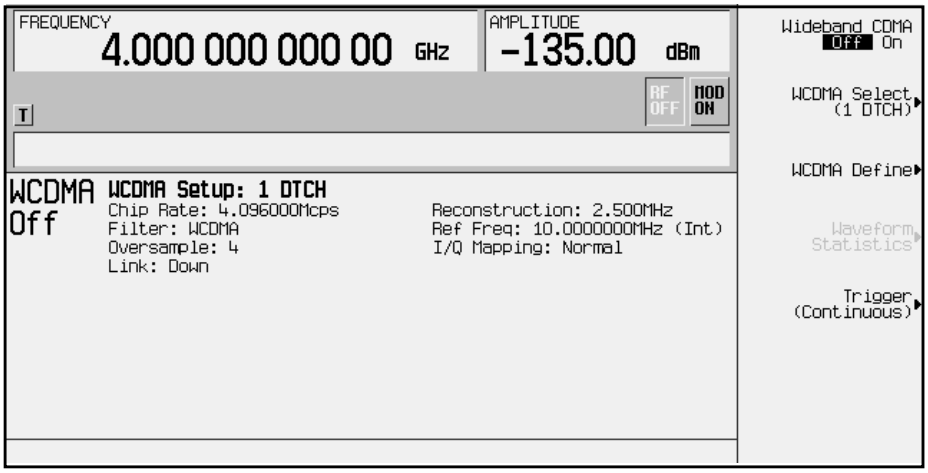
You will learn how to perform the following.

- Select channels.
- Modify channels.
- Turn on and output a waveform.
- Create filters.
- Modify filters.

Accessing the Wideband CDMA Menu

Perform the following procedure to use the Wideband CDMA features.

1. Press **Preset** to set the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA**. The Wideband CDMA menu should now be displayed. The following illustration shows the display on an E4433B.



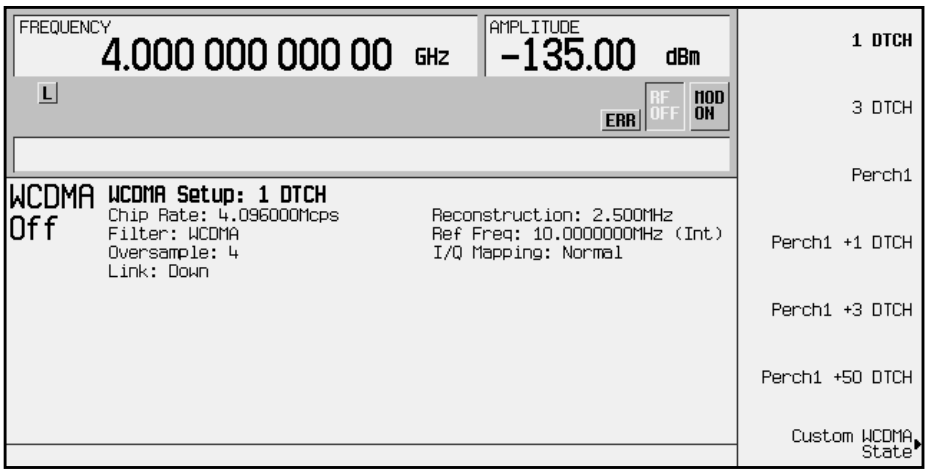
Notice the following attributes of the display:

- The default frequency (4 GHz) and output power (–135 dBm) are shown at the top of the display.
- The annunciator field shows the following:
  - The T annunciator is turned on. (The signal generator was in talk mode when this screen dump was created. This annunciator on your signal generator will probably not be visible at this time.)
  - The RF ON/OFF annunciator shows that RF is turned off.
  - The MOD ON/OFF annunciator shows that modulation is turned on.
- The first page of wideband CDMA softkeys is displayed on the right-hand side of the display.
- The center text area of the display shows the status of wideband CDMA configuration. These characteristics are immediately updated when you modify them in the softkey menus.
  - WCDMA Off shows that the wideband CDMA function is not enabled at this time.
  - WCDMA Setup indicates that the default channel setup (one dedicated traffic channel) is the present configuration.
  - The status of the wideband CDMA signal is displayed next, including the chip rate, filters, and oversample ratio (which cannot be changed), as well as the link status, reference frequency, and I/Q mapping status.

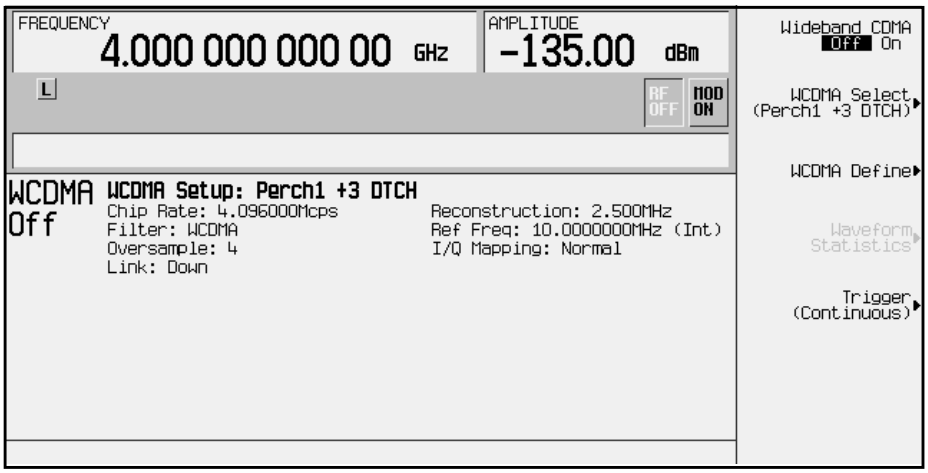
Selecting Predefined Channels for the Waveform

There are six predefined channel setups, for waveform generation, available in wideband CDMA, Option H97. The default predefined channel, after an instrument preset, is one dedicated traffic channel (1 DTCH). Any predefined channel can be used as defined, or modified using the channel table editor. See "Modifying Channel-Setup Configurations" on page 2-6 for more information. For the following example, a Perch1 plus three dedicated traffic channels will be selected for the waveform configuration.

1. Press **Preset** to set the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA**. The Wideband CDMA menu should now be displayed.
5. Press **WCDMA Select**. The wideband CDMA selection menu is now displayed on your instrument.



6. Press **Perch1 +3 DTCH** to select a Perch1 plus three dedicated traffic channels. (`Perch1 +3 DTCH`) now appears under **WCDMA Select**. Note that the instrument, also indicates `Perch1 +3 DTCH` as the `WCDMA Setup:` configuration.



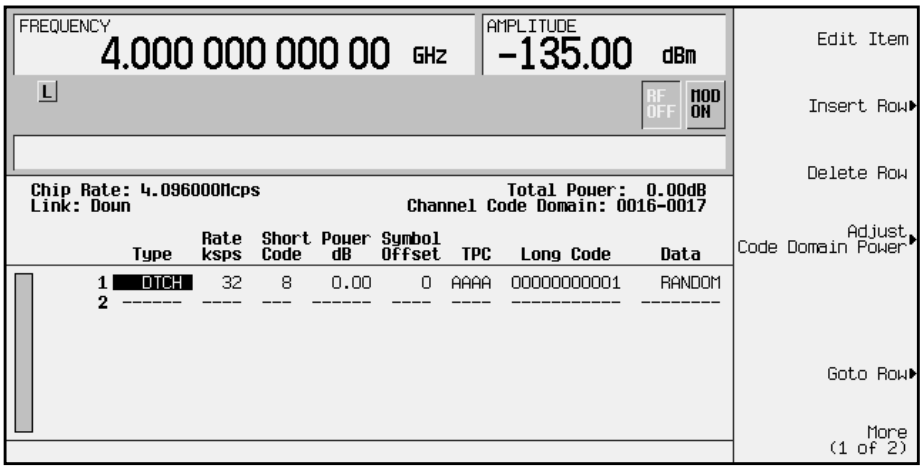
Modifying Channel-Setup Configurations

Channel-setup configurations can be modified using the channel setup table editor. Otherwise the last selection is displayed, in this case **Perch1+30TCH**. The table editor is located by pressing **WCDMA Define**, then **Edit Channel Setup**. Refer to "Table Editor Basics" on page 1-5 for more information about table editors.

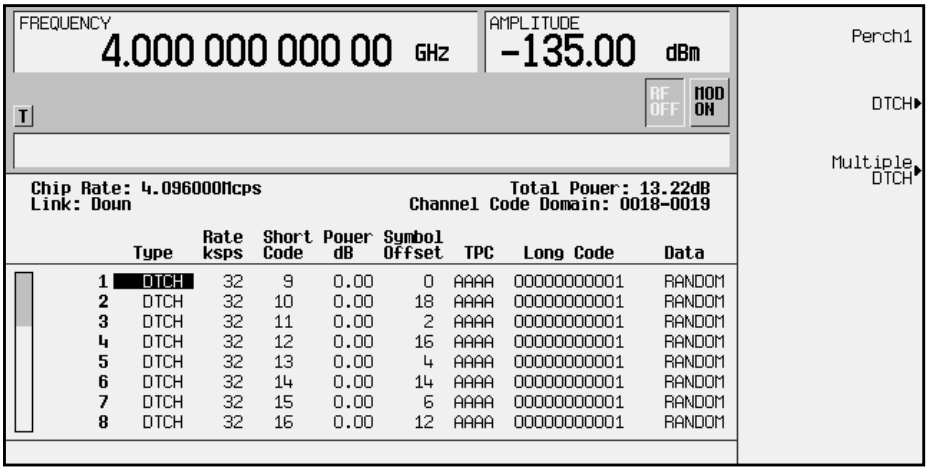
Inserting Additional Dedicated Traffic Channels

The default number of dedicated traffic channels after a normal instrument preset is 1. Up to 512 DTCH channels can be inserted. For the following example, an additional 20 dedicated traffic channels will be inserted.

1. Press **Preset** to set the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA**. The Wideband CDMA menu should now be displayed.
5. Press **WCDMA Define**, then **Edit Channel Setup**, the channel table editor is now displayed on your instrument.



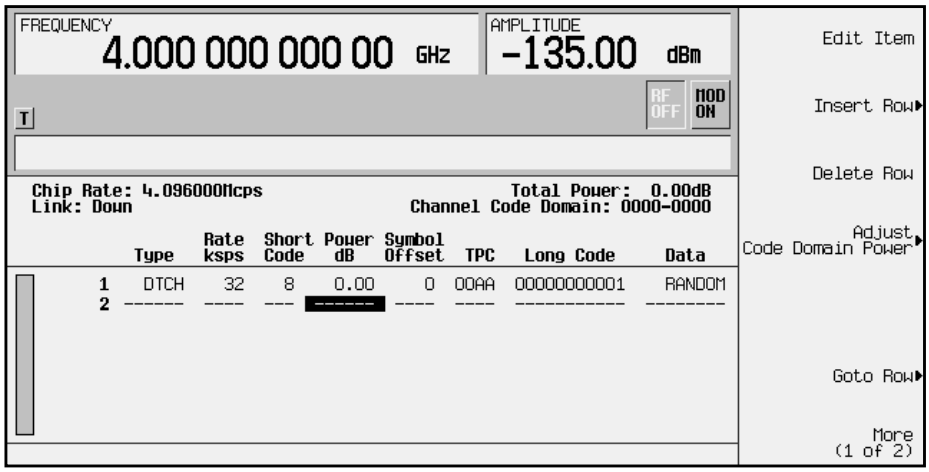
6. Press **Insert Row**, **Multiple DTCH**, then **DTCH Channels**. To enter the value, rotate the front-panel knob, use the up and down arrow keys, until the number 20 is displayed or enter 20 using the numeric keypad Then, terminate the entry with the **Enter** softkey.
7. Press **Done** to insert 20 additional dedicated channels. The channel table editor now contains the 20 additional channels. Note, that the first page only displays channels one through eight to see the additional channels, press **Return**, **Goto Row**, then **Page Down**, in this example there are three pages, press **Page Down** two times to view the last page.



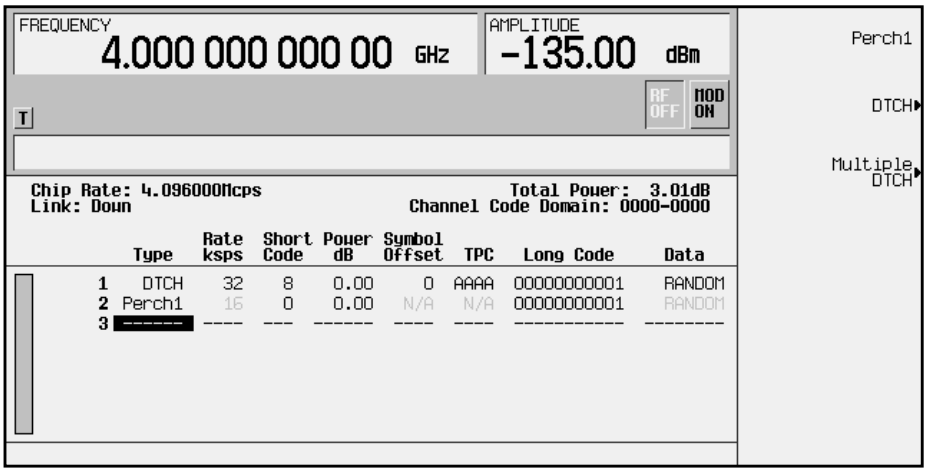
Inserting a Perch1 Channel

After a normal instrument preset, one dedicated traffic channel is the default waveform. A Perch1 channel can also be added to the waveform. For this example, a Perch1 channel will be inserted in row two, after the dedicated channel. Note that channels are always inserted before the row that is currently selected.

1. Press **Preset** to set the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA**. The Wideband CDMA menu should now be displayed.
5. Press **WCDMA Define**, then **Edit Channel Setup**, the channel table editor is now displayed on your instrument. Move to the last row of the channel table editor, by using the front-panel knob, or arrow keys.



6. Press **Insert Row**, then **Perch1**. A Perch1 channel is now inserted in the channel table editor.



Editing Channel Values in the Table Editor

Some values can be modified in the channel table editor. You can edit the `Rate ksps` (symbol rate), `Short Code`, `Power dB`, `Symbol Offset`, transmit power control (TPC) and `Long Code` values by first highlighting the value you wish to change, using the front-panel arrows or knob. Then, enter the new values using the numeric keypad. Or, you may use the table editor softkeys, refer to "Table Editor Basics" on page 1-5 for more information.

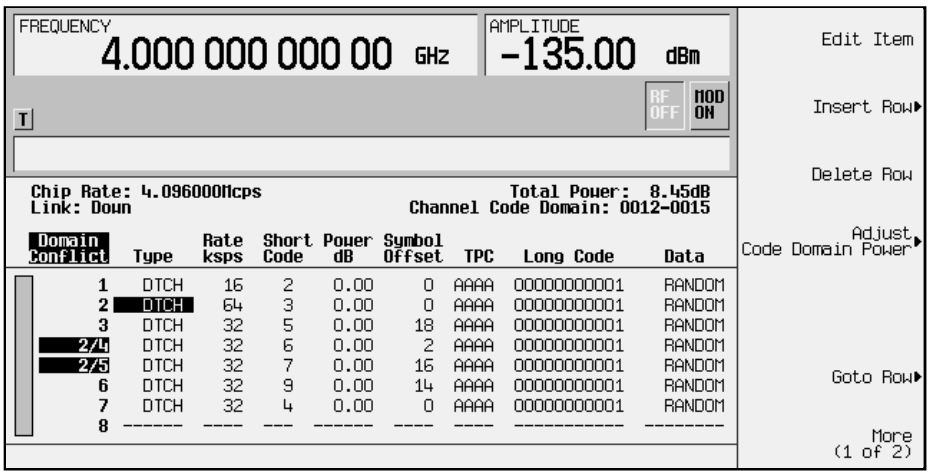
Note that TPC and Long Code values are entered as hex digits (0-9, A-F).

Identifying and Resolving Code Domain Conflicts

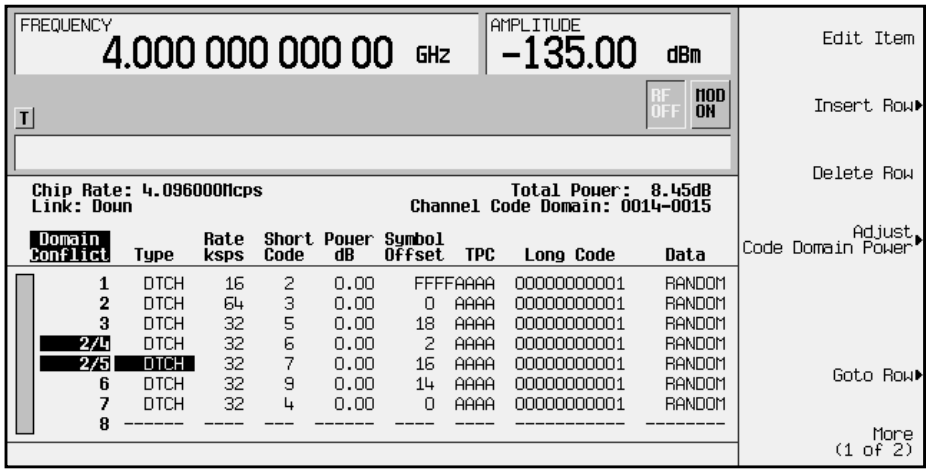
The code domain space of each channel is defined by the symbol rate and short code. Code domain conflicts can arise when two channels of different rates map to the same code domain space.

Identifying conflicts

The following illustration shows a code domain conflict between the dedicated traffic channels in rows 4 and 5 with the dedicated traffic channel in row 2.

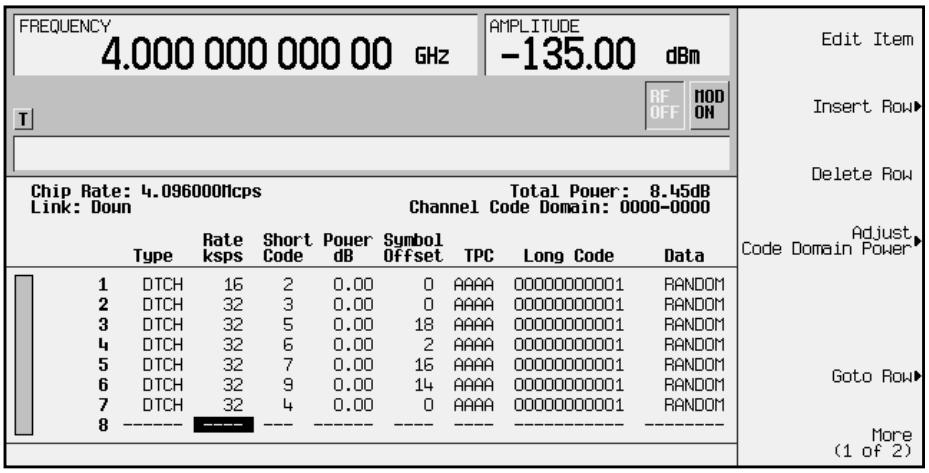


These conflicts are flagged in the channel setup table editor. When there is a domain conflict the row number of the conflicting channel will be highlighted (flagged), with the row number of the channel it conflicts with. In this example rows four and five have a conflict with row two. Row two occupies the channel code domain of 0012-0015, see the previous illustration. Row 4 conflicts by occupying `Channel Code Domain: 0012-0013`. Then, row 5 conflicts by occupying `Channel Code Domain: 0014-0015`, as shown in the illustration below.



Resolving Conflicts

To resolve conflicts you can either change the value of the short code or the value of the symbol rate. 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 illustration below, the symbol rate, in row two, has been changed to 32 ksps to resolve the conflicts in rows four and five.

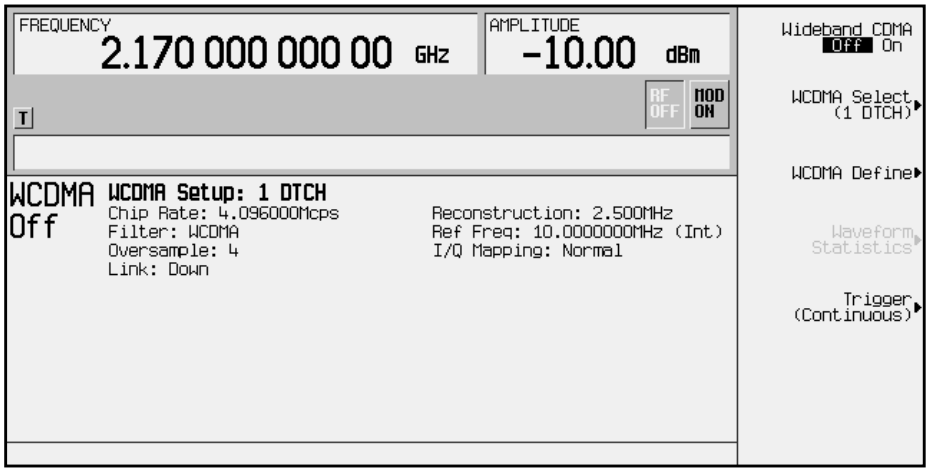


Setting the Carrier Frequency and Power

The frequency and power of the carrier can be set by performing the following procedure.

1. Press **Preset** to set the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA**. The Wideband CDMA menu should now be displayed.
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 and terminating the entry with the **GHz** softkey.
6. For this example, set the output power to –10 dBm by pressing the front-panel **Amplitude** key. Enter –10 dBm by rotating the front-panel knob, using the up and down arrow keys, or entering the value using the numeric keypad and terminating the entry with the **dBm** softkey.

   The wideband CDMA signal frequency and power have now been set. The following illustration shows the display with the current configuration.

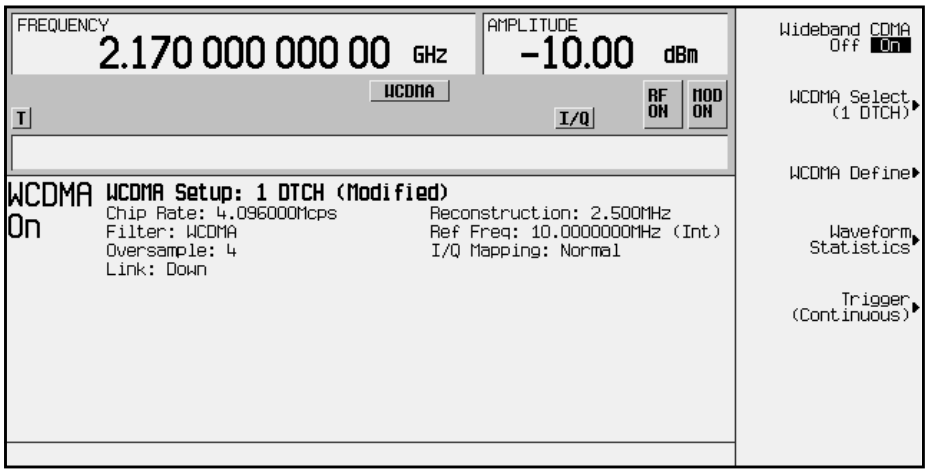


Enabling and Outputting the Signal

Perform the following procedure to turn on and output a wideband CDMA waveform.

1. Press **Wideband CDMA Off On** so that **On** is highlighted to enable the wideband CDMA function. (The signal generator will display a message while the waveform is being generated.) The `WCDMA` and `I/Q` annunciators will turn on.
2. Toggle the front-panel **RF On/Off** key so that the display annunciator shows `RF ON`.
3. Modulation should be turned on as a default condition. (The display annunciator will show `MOD ON`.) If modulation is off, toggle the front-panel **Mod On/Off** key.

   The wideband CDMA signal is now present at the RF OUTPUT connector. The following illustration shows the display with the current configuration.

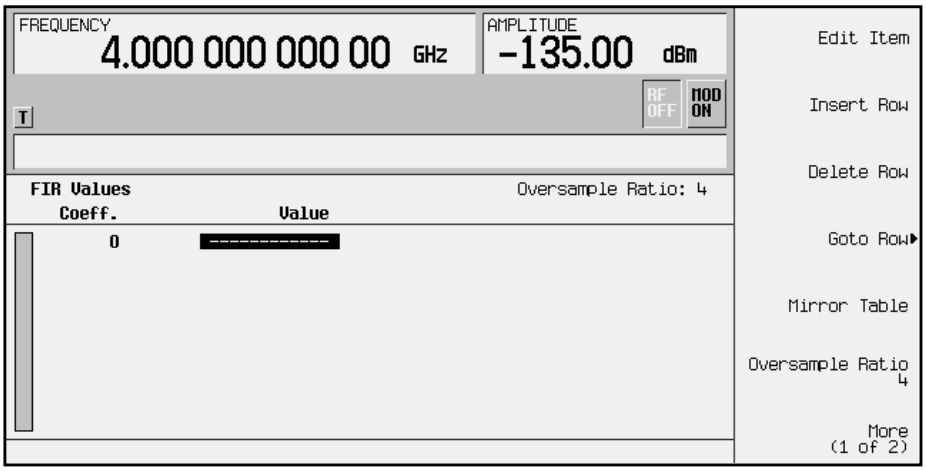


Creating a User-Defined FIR Filter Using the FIR Table Editor

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

1. Preset the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR.** The FIR table editor should now be displayed. The following illustration shows the FIR table editor.

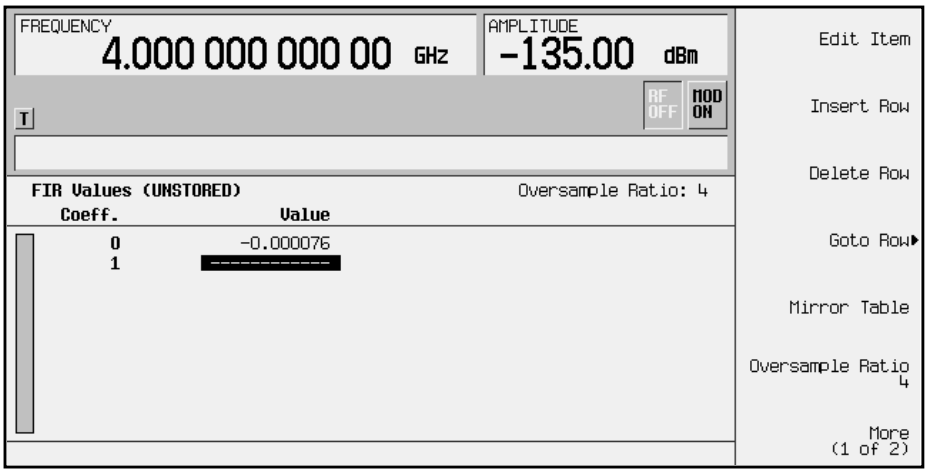


Entering the Coefficient Values

The FIR table editor creates a filter from values that you provide. In this example, the values you will enter are listed after step 2.

1. Notice that the Value field for coefficient 0 is already highlighted. Use the numeric keypad to type the first value from the list. 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.)

   Terminate your entry by pressing the **Enter** softkey. Notice that the value for coefficient 0 is now displayed in the Value field and a second row is automatically displayed with the Value field highlighted. (The following illustration shows the FIR table editor at this point in the process.)



2. Continue entering the coefficient values until all 16 are complete.

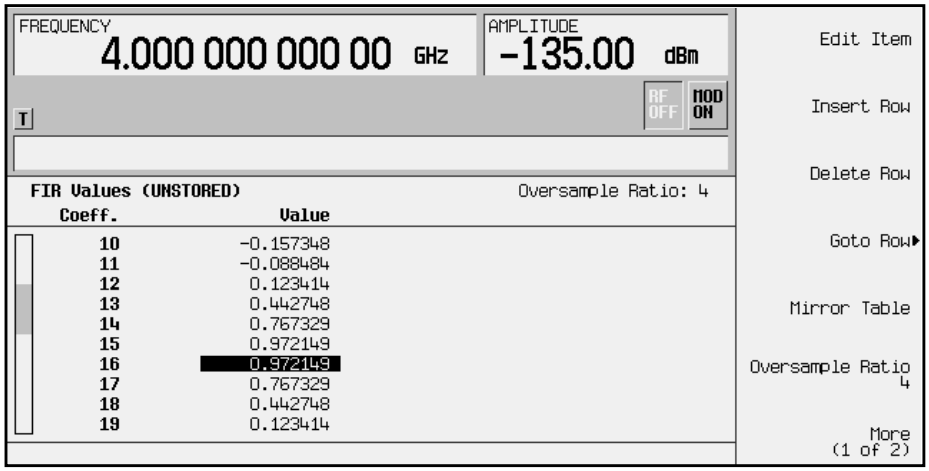
Coefficient	Value
0	–0.000076
1	–0.001747
2	–0.005144
3	–0.004424
4	0.007745
5	0.029610
6	0.043940
7	0.025852

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

Duplicating the First 16 Coefficients Using Mirror Table

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.

1. Press the **Mirror Table** softkey. The last 16 coefficients are automatically generated and the first of these coefficients (number 16) is highlighted. The following illustration shows the display at this point in the process.



Setting the Oversample Ratio

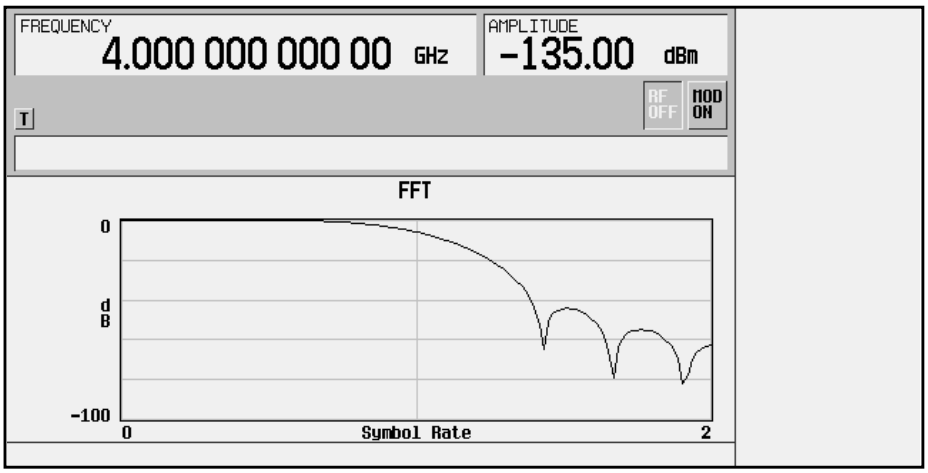
The oversample ratio (OSR) is the number of filter taps per symbol. Acceptable values range from 1 through 32; the maximum combination of symbols and oversampling ratio allowed by the table editor is 1024. The instrument hardware, however, is actually limited to 32 symbols, an oversample ratio between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

For this example, the desired OSR is 4, which is the default, so no action is necessary.

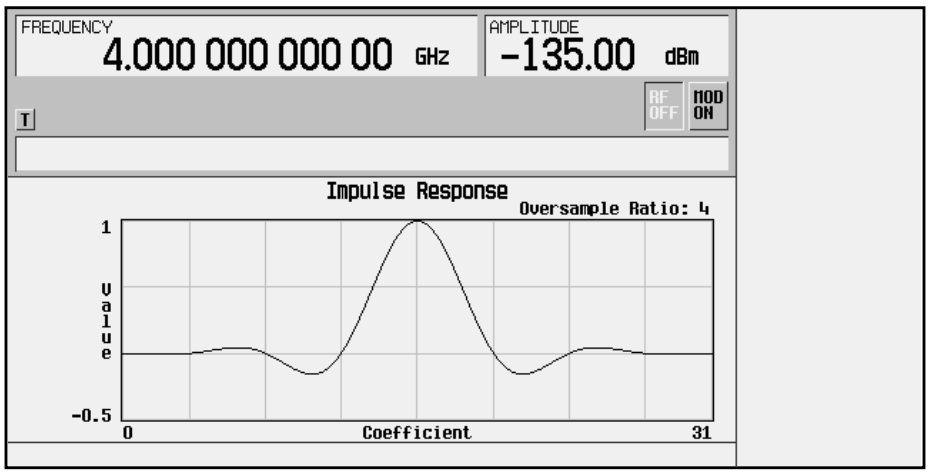
Displaying a Graphical Representation of the Filter

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

1. To view the filter frequency response (calculated using a fast Fourier transform), press **More (1 of 2)** > **Display FFT**. The following graph will be displayed.



2. To return to the menu keys, press **Return**.
3. Display the filter impulse response in time by pressing **Display Impulse Response**. The following graph will be displayed.

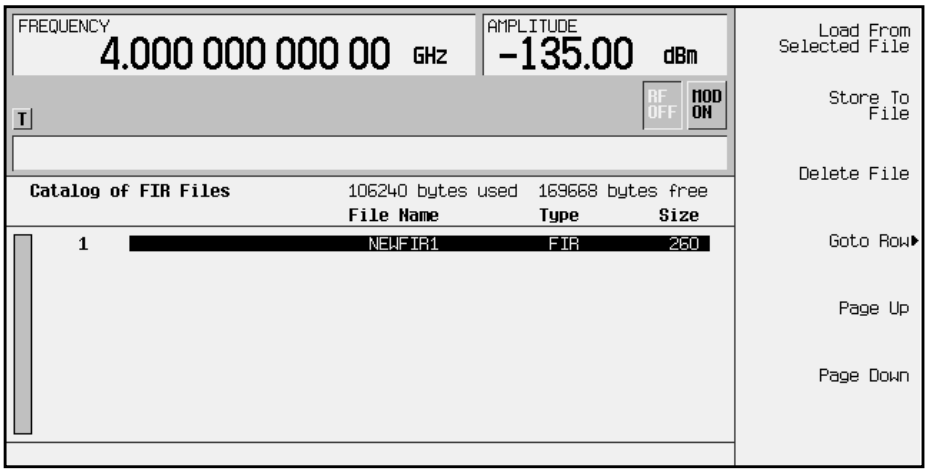


4. To return to the menu keys, press **Return**.

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 will first prompt 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 is displayed 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 illustration shows the display.



The NEWFIR1 file is the first file name listed. (If you have previously stored other FIR files, additional file names will be 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

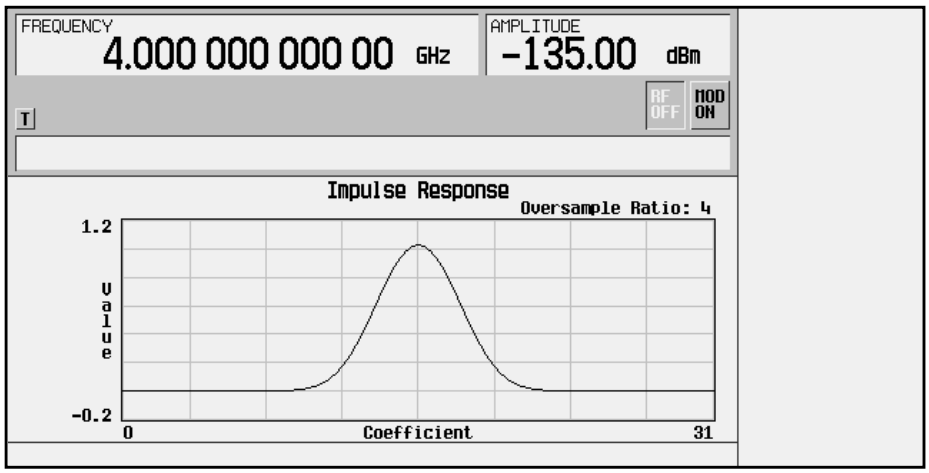
FIR filters stored in signal generator memory can easily be modified using the FIR table editor. You can load the FIR table editor with coefficient values from user-defined FIR files stored in the signal generator's memory, or from one of the default FIR filters. Then you can modify the values, and store 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

1. Preset the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. To select the Gaussian filter, press **Custom** > **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.

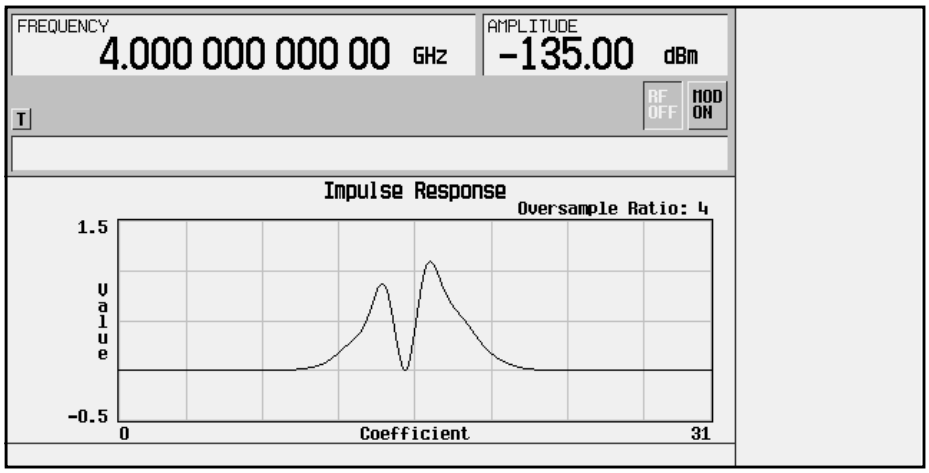
NOTE The actual oversample ratio during modulation is automatically selected by the instrument. A value between 4 and 16 is chosen dependent on the symbol rate, the number of bits per symbol of the modulation type, and the number of symbols.

8. Press **Display Impulse Response** for a graphic representation of the filter impulse response as shown on the following page.
9. To return to the menu keys, press **Return**.



Modifying the Coefficients

1. The value for coefficient 0 should be highlighted. Use the front-panel knob to scroll down until coefficient 15 is highlighted.
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.



Notice that the graphic display can provide a useful troubleshooting tool (in this case indicating a missing coefficient value for a proper Gaussian response).

4. To return to the menu keys, press **Return**.
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. Change coefficient 15 back to its original value.
   a. Use the front-panel knob to highlight row 15.
   b. Press **1** > **Enter**.

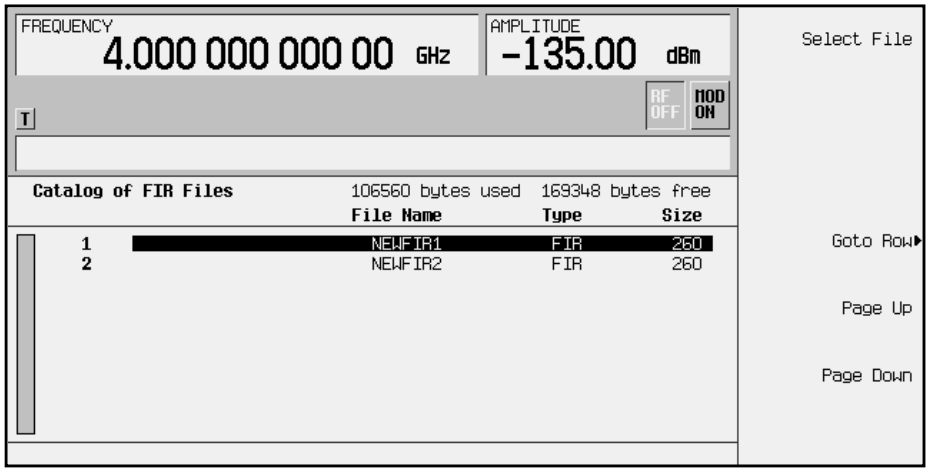
Storing the Filter to Memory

1. Press **More 1 of 2** > **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 Wideband CDMA Signal

Custom FIR filters can be created using the FIR table editor feature or they can be created externally and downloaded into 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 an FIR filter, see "Creating a User-Defined FIR Filter Using the FIR Table Editor" on page 2-14.

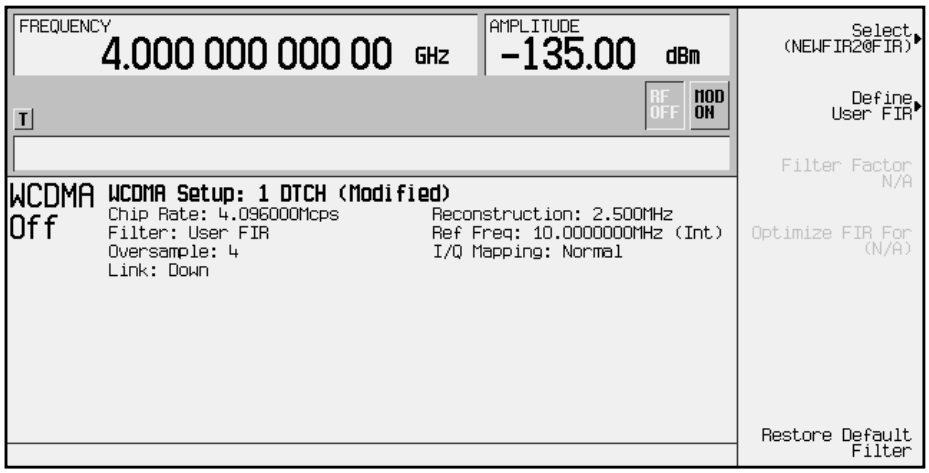
1. Preset the signal generator to normal preset conditions.
2. Press the front-panel **Mode** key.
3. If you have multiple options and the **Arb Waveform Generator** softkey is visible, press it next.
4. Press **Wideband CDMA** > **Wideband CDMA Define** > **Filter** > **Select** > **User FIR**. The catalog of FIR files should now be displayed. The following illustration 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 is highlighted. 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.

6. Press **Select File**. The highlighted filter is now selected for use in your custom modulation state. The following illustration shows our example displayed.



The filter you selected is NEWFIR2. You can see the name displayed below the **Select** softkey (at the top and right). 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

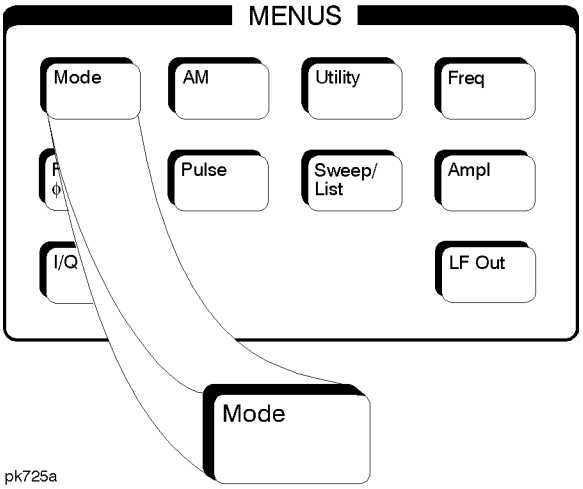
This chapter contains instructions for using the Option H97 features via the front panel or by remote operation. Use this information to supplement the Agilent Technologies ESG Family manual set. In all cases, the information in this supplement supersedes the information in the standard manual set.

Mode Key

The information in this section supersedes the **Mode** key documentation in the standard manual set.

Pressing the front panel **Mode** key accesses a menu of softkeys. To display the Wideband CDMA menu, press the **Wideband CDMA** softkey. (If you have multiple options installed, you must first press the **Arb Waveform Generator** softkey before the **Wideband CDMA** softkey is visible.) This document assumes that the **Wideband CDMA** softkey is in the first menu.

The softkeys in the Wideband CDMA menu are described in this section in alphabetical order. The SCPI commands that duplicate these softkeys remotely are provided in this section also.



16 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 16 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH**, **Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **16 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** >**Symbol Rate** > **16 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,16,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,16,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

32 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 32 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH**, **Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **32 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **32 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,32,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,32,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

64 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 64 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH**, **Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **64 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **64 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,64,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,64,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}

[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

128 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 128 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH**, **Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **128 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **128 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,128,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,128,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}

[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

250.0 kHz

Press this softkey to select a reconstruction filter with a cutoff frequency of 250.0 kHz.

Softkey Location: **Mode** > **WCDMA** > **WCDMA Define** > **Reconstruction Filter** > **250.0 kHz**

SCPI Commands:

```
[:SOURce]:RADio:ARB:RFILter <value>

[:SOURce]:RADio:ARB:RFILter?
```

256 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 256 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH, Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **256 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **256 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,256,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,256,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

512 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 512 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH, Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **512 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **512 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,512,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,512,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

1024 ksps

When this softkey is accessed via the **DTCH** softkey, you will enter a symbol rate of 1024 ksps (kilosymbols per second) for a *specific* dedicated traffic channel into the **Edit Channel Setup** table editor shown on the display. When this softkey is accessed via the **Multiple DTCH**, **Symbol Rate** softkeys, you will insert *multiple* dedicated traffic channels with this symbol rate into the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH** > **1024 ksps**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Symbol Rate** > **1024 ksps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,1024,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,1024,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

2.500 MHz

Press this softkey to select a reconstruction filter with a cutoff frequency of 2.500 MHz.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Reconstruction Filter** > **2.500 MHz**

SCPI Commands:

```
[:SOURce]:RADio:ARB:RFILter <value>
```

```
[:SOURce]:RADio:ARB:RFILter?
```

4.096 Mcps

Press this softkey to set the chip rate of the wideband CDMA waveform being defined in the table editor to 4.096 Mcps (megachips per second).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Chip Rate** > **4.096 Mcps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:CRATe 4.096 mcps
```

```
[:SOURce]:RADio:WCDMa:ARB:CRATe?
```

8.000 MHz

Press this softkey to select a reconstruction filter with a cutoff frequency of 8.000 MHz.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Reconstruction Filter** > **8.000 MHz**

SCPI Commands:

```
[:SOURce]:RADio:ARB:RFILter <value>

[:SOURce]:RADio:ARB:RFILter?
```

8.192 Mcps

Press this softkey to set the chip rate of the wideband CDMA waveform being defined in the table editor to 8.192 Mcps (megachips per second).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Chip Rate** > **8.192 Mcps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:CRATe 8.192 mcps

[:SOURce]:RADio:WCDMa:ARB:CRATe?
```

16.384 Mcps

Press this softkey to set the chip rate of the wideband CDMA waveform being defined in the table editor to 16.384 Mcps (megachips per second).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Chip Rate** > **16.384 Mcps**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:CRATe 16.384 mcps

[:SOURce]:RADio:WCDMa:ARB:CRATe?
```

Adjust Code Domain Power

Press this softkey to display a menu for configuring how the channel power is distributed among the individual channels in the table editor. You can select **Equal Energy per Symbol** or **Scale To 0dB**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power**

Apply Channel Setup

Press this softkey to apply the changes made to the WCDMA channel setup using the WCDMA channel setup table editor (accessed by pressing the **Edit Channel Setup** softkey). If WCDMA is ON then the new channel data is used to generate a new modulation waveform in volatile waveform memory.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Apply Channel Setup**

ARB Reference Ext Int

Press this softkey to toggle between either an internally generated 10 MHz reference or an external reference for the waveform clock. If external is selected, press the **Reference Freq** softkey and enter the frequency of the signal applied to the BASEBAND GEN REF IN connector.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **More (1 of 2)** > **ARB Reference Ext Int**

Status after Normal Preset or *RST: Int

SCPI Commands:

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

[:SOURce]:RADio:ARB:CLOCk:REFerence[:SOURce]?
```

Bus

Press this softkey to set the trigger source to **Bus**. When the Trigger Source is set to **Bus**, the signal generator will trigger an event when it receives the appropriate command via GPIB.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Bus**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce] BUS

[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce]?
```

Chip Rate

Press this softkey to access a menu of chip rate values (in Mcps, megachips per second) to apply to the wideband CDMA waveform being defined in the table editor. You can choose from 4.096 Mcps, 8.192 Mcps, or 16.384 Mcps. Changing the chip rate will cause the table editor to be set to a single perch channel.

Status after Normal Preset or *RST: 4.096 Mcps

Softkey Location:**Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Chip Rate**

SCPI Commands:

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

Continuous

Press this softkey to set the wideband CDMA trigger type to continuous. In continuous trigger mode, the wideband CDMA waveform will repeat itself indefinitely.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Continuous**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE CONT
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE?
```

Custom WCDMA State

Press this softkey to display the WCDMA Setup Select File menu. From this menu, you can choose a custom WCDMA setup that has previously been defined and stored in the memory of the signal generator. Use the front-panel knob, arrow keys, or the data-entry keypad to highlight the desired WCDMA state file, then press **Select File** to activate the custom WCDMA state.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Select** > **Custom WCDMA State**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:Setup "<file name>"
[:SOURce]:RADio:WCDMa:ARB:Setup?
```

Define User FIR

Press this softkey to access 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 wideband CDMA, however, cannot have more than 256 taps so the number of symbols and the oversample ratio should be selected accordingly. Example of using the FIR table editor are provided in the "Using Functions" chapter.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR**

SCPI Commands:

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

MEMory:DATA:FIR? "<file name>"
```

Delete All Rows

Press this softkey to delete all rows in any of the table editors. Deletions cannot be recovered.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Delete All Rows**

Delete File

Press this softkey to delete a file in the catalog listing. Scroll through the catalog of files and when the desired file is highlighted, press the **Delete File.** Be certain that you want to delete the file; you cannot recover the file once you subsequently press **Confirm Delete.** If you do not wish to delete the file, press the **Return** key.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom CDMA State** > **Delete File**

Delete Row

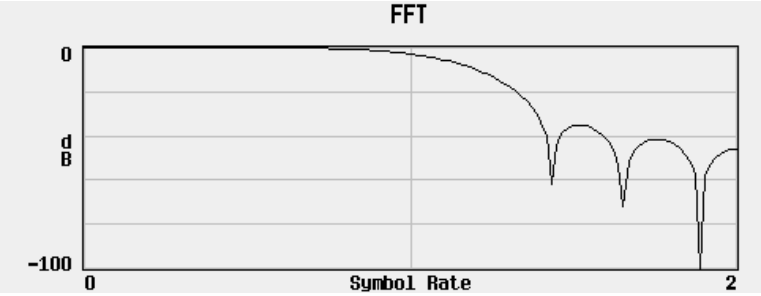
Press this softkey to delete the highlighted row in the table. Deletions cannot be recovered.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Delete Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Delete Row**

Display FFT

Press this softkey to display 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.

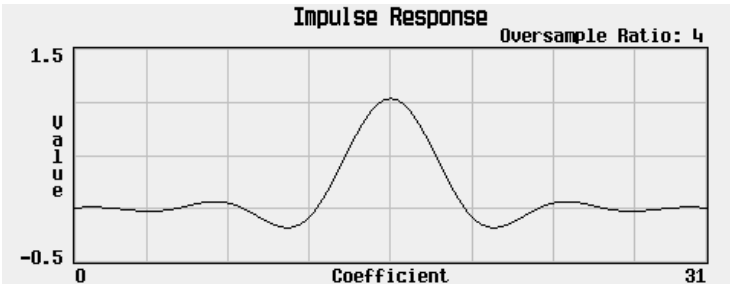


To return to the FIR table editor and the menu keys, press **Return**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Display FFT**

Display Impulse Response

Press this softkey to display a graphical representation 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** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Display Impulse Response**

Done

Press this softkey when you are done entering multiple DTCH channel data and it will be applied to the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Done**

DTCH

Press this softkey to insert a dedicated traffic channel above the highlighted row in the table editor. After selecting DTCH, select the desired symbol rate (**16 ksps**, **32 ksps**, **64 ksps**, **128 ksps**, **256 ksps**, **512 ksps**, or **1024 ksps**) to complete the channel entry.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **DTCH**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>{,DTCH,<symbol_rate>,<short_code>,<pow
er_value>,NA|<symbol_offset>,<tpc_value>,
<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

DTCH Channels

Press this softkey to select the number of dedicated traffic channels to be inserted into the table editor. To enter the 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. When you have finished setting the other channel parameters, press **Done** to insert the new channels into the table editor above the row where the cursor is positioned. The range of values allowed is 0 through 512.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **DTCH Channels**

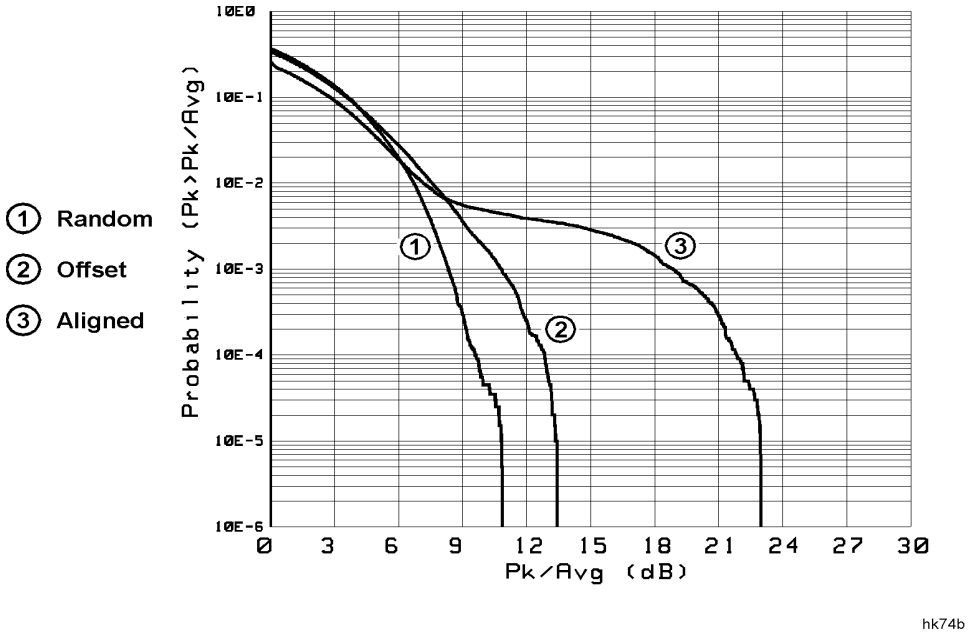
SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:DTCHannel <value>
```

```
[:SOURce]:RADio:WCDMa:ARB:DTCHannel?
```

DTCH Symbols

Press this softkey to access a menu for formatting the DTCH pilot symbols of the channels that will be inserted into the table editor. In this menu you can select random data to fill the pilot, TPC, and ACCH fields, align the pilot fields of the DTCH channels to start simultaneously, or offset the start of the pilot fields of the DTCH channels by 0 to 9 Perch1 symbols. Aligning the DTCH symbols will generate the highest peak-to-average ratio in the output signal. Selecting random data will generate the least stressful peak-to-average ratio. The following complementary cumulative distribution function (CCDF) graph compares the typical peak-to-average power generated using offset symbols, random symbols, and aligned symbols with 127 traffic channels and Perch1 turned on.



Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **DTCH Symbols**

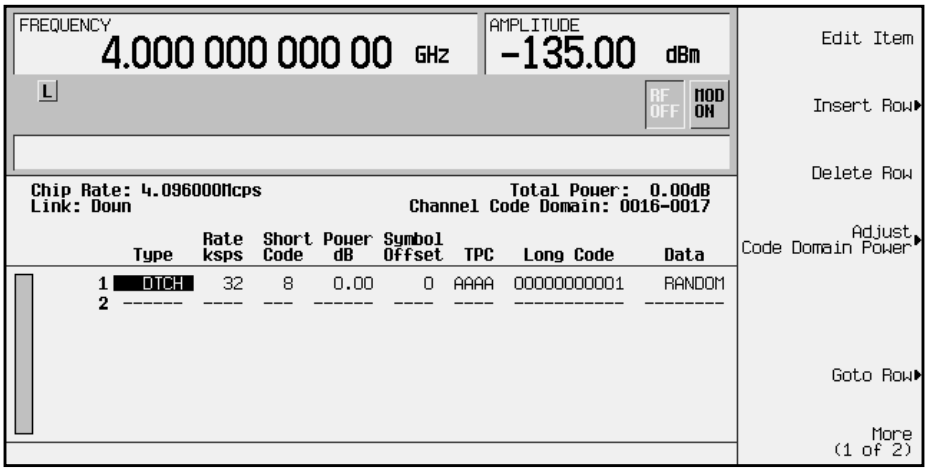
SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:DTCHannel:SYMBols
RANDom|ALIGned|OFFSet

[:SOURce]:RADio:WCDMa:ARB:DTCHannel:SYMBols?
```

Edit Channel Setup

Press this softkey to access a table editor used to define the channel parameters of the wideband CDMA signal. These parameters include code domain power, and the individual channel type, short code, power, symbol offset, symbol rate and data. (An example of the display is shown here.)



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

You can insert one or more Perch1 or traffic channels by pressing the **Insert Row** softkey. When you have finished setting up new channel types, press the **Return** hardkey to go back to the main WCDMA Channel Setup editor window.

You can move quickly through a large table using the keys found beneath the **Goto Row** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>{,PERCH1|DTCH,<symbol_rate>,
<short_code>,<power_value>,NA|<symbol_offset>,<tpc_value>,
<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

The variables used in this SCPI command, the associated column in the table editor, and acceptable value range are described below.

Table Editor Column	SCPI Variable	Acceptable Range:
Rate ksps	<symbol_rate>	32, 64, 128, 256, 512, or 1024 ksps
Short Code	<short_code>	DTCH: 0 to 511 (limited by the symbol rate and chip rate, see Table 3-1 on page 3-16). Perch1: 0 to 1023 (limited by chip rate, see Table 3-2 on page 3-16).
Power dB	<power_value>	0 to –40 dB
Symbol Offset	<symbol_offset>	Random or 0 to 639 (limited by the symbol rate, see Table 3-3 on page 3-16). If symbol offset is set to Random, TPC and Data are not modifiable and are set to Random.
TPC	<tpc_value>	0000 to FFFF (hex)
Long Code	<long_code>	Downlink: 1 to 80 (hex) Uplink: 0 to 1FFFFFFFFF
Data	<data_value>	Random or 0 to 255

Table 3-1 DTCH Short Code Values

Symbol Rate (ksps)	Chip Rate (MHz)		
	4.096	8.132	16.384
	Short Codes		
32	0-127	0-255	0-511
64	0-63	0-127	0-255
128	0-31	0-63	0-127
256	0-15	0-31	0-63
512	0-7	0-15	0-31
1024	0-3	0-7	0-15

Table 3-2 Perch1 Short Code Values

Chip Rate (MHz)	Short Code
4.096	0-255
8.192	0-511
16.384	0-1023

Table 3-3 Symbol Offset Values

Symbol Rate (ksps)	Offset Range
32	0-19
64	0-39
128	0-79
256	0-159
512	0-319
1024	0-639

Edit Item

Press this softkey to change the highlighted item in the displayed table. Using **Edit Item** you can change the values of the symbol rate, short code, power, symbol offset, transmit power control (TPC), long code and data to the values described in "Edit Channel Setup" on page 3-14.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Edit Item**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Edit Item**

Equal Energy per Symbol

Press this softkey to set the channel powers so that all channels have equal energy per symbol referenced to 16 ksps and increasing by 3 dB for each doubling of the symbol rate.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power** > **Equal Energy per Symbol**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,<symbol_offset>,
<TPC>,<long_code>,RANDom|<data_value> {,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Ext

Press this softkey to set the Trigger Source to external triggering. When the Trigger Source is set to **Ext**, the signal generator will trigger an event when it receives the appropriate signal via the PATTERN TRIG IN connector.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce] EXT

[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce]?
```

Ext Polarity Neg Pos

Press this softkey to set the Trigger Source to external triggering. When the Trigger Source is set to **Ext**, the signal generator will trigger an event when it receives the appropriate signal via the TRIGGER IN connector.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Polarity Neg Pos**

SCPI Commands:

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

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

Ext Delay Off On

Press this softkey to arm (ON) or disarm (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.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Delay Off On**

SCPI Commands:

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

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

Ext Delay Time

Press this softkey to set the time for the External Trigger Delay. External Trigger Delay may be adjusted to trigger a wideband CDMA waveform at a specified length of time after an external trigger signal has been received at the PATTERN TRIG IN connector. 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. The range of values allowed is 2.0 microseconds through 3600 seconds.

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.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Ext Delay Time**

Status after Normal Preset or *RST: 2.000 milliseconds

SCPI Commands:

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

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

Filter

Press this softkey to access 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** > **Wideband CDMA** > **WCDMA Define** > **Filter**

Filter Alpha

Press this softkey to change the alpha parameter of the FIR filter alpha parameter in either the Filter menu or the Load Default FIR menus.

In the Filter menu, the **Filter Alpha** softkey 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. The range of values allowed is 0.000 through 1.000.

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**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Root Nyquist** (or **Nyquist**) > **Filter Alpha**

SCPI Commands:

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

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

In the Load Default FIR menus, the **Filter Alpha** softkey 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.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Root Nyquist** (or **Nyquist**) > **Filter Alpha**

Filter BbT

Press this softkey to change the bandwidth-multiplied-by-bit-time (BbT) filter parameter in either the Filter menu or the Load Default FIR menu.

In the Filter menu, the **Filter BbT** softkey changes the BbT parameter of the selected Gaussian 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. The range of values allowed is 0.000 through 1.000.

This key only appears *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 grayed-out softkey: **Filter Factor N/A**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Gaussian** > **Filter BbT**

SCPI Commands:

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

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

In the Load Default FIR menu, the **Filter BbT** softkey 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.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Gaussian** > **Filter BbT**

Filter Factor N/A

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** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Filter Factor N/A**

Filter Symbols

Press this softkey to define 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 WCDMA, 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. The range of values allowed is 1 through 32.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR**> **Root Nyquist** (or **Nyquist** > **Gaussian** > or **Rectangle**) > **Filter Symbols**

First Short Code

Press this softkey to set the starting short code for the dedicated traffic channels being inserted into the table editor, using **Multiple DTCH**. The signal generator will always find the first short code that doesn't cause a conflict, starting with the short code you entered.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **First Short Code**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Formatted Aligned

Press this softkey to align the pilot fields of the DTCH channels being inserted into the table editor to start simultaneously. This results in waveforms with very high peak-to-average ratios when many DTCH channels are turned on.

CAUTION If you align the symbols of a large number of DTCH channels, you may be generating a signal with a very large peak-to-average ratio (potentially > 20 dB). In such cases, the output of the signal generator may be unleveled as well. To correct the unleveled condition, change to offset symbols, random symbols, or reduce the output power level until the UNLEVEL annunciator is turned off.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **DTCH Symbols** > **Formatted Aligned**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
0,<TPC>,<long_code>,RANDom|<data_value>{,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,0,
<tpc_value>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Formatted Offset

Press this softkey to offset the start of the pilot fields of the DTCH channels being inserted into the table editor by a time equal to 0 to N symbol periods, depending on the symbol rate. The offsets are generated according to the wideband CDMA experimental system specification and assigned arbitrarily.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **DTCH Symbols** > **Formatted Offset**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Gate Active N/A

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** > **Wideband CDMA** > **Trigger** > **Gated** > **Trigger Setup** > **Gate Active Low High**

SCPI Commands:

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

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE:GATE:ACTive?
```

Gated

Press this softkey to set the wideband CDMA 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.**

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Gated**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE GATE
```

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE?
```

Gaussian

Press this softkey to select the Gaussian pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (filter) menu, pressing the **Gaussian** softkey selects this FIR filter for use in your wideband CDMA setup. The default filter bandwidth-multiplied-by-bit time product (BbT) is automatically set to 0.500. You can change the filter BbT to any value between 0.000 and 1.000 by pressing the **Filter BbT** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Gaussian**

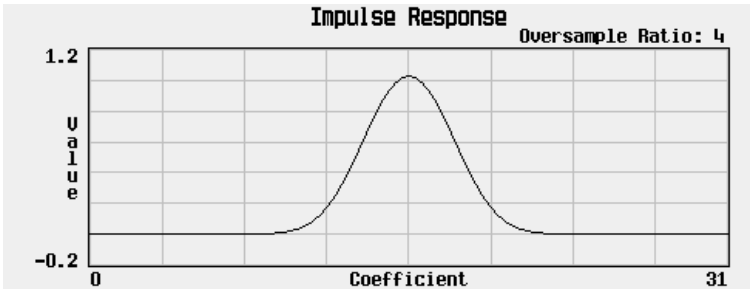
SCPI Commands:

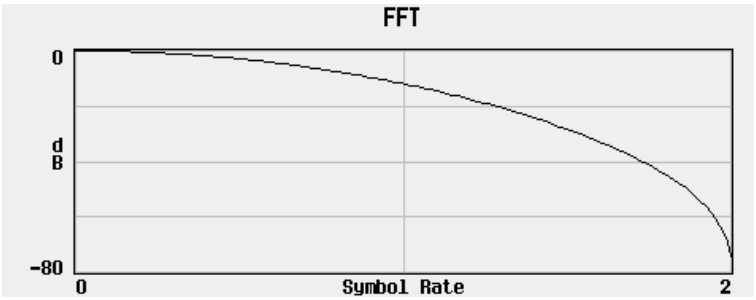
```
[:SOURce]:RADio:WCDMa:ARB:FILTer GAUSsian

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

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 impulse response and the frequency response of a Gaussian filter with an oversample ratio of 4 are shown in the following graphs.





Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Gaussian**

Generate

Press this softkey to create the filter using the values specified.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Root Nyquist** (or **Nyquist** > **Gaussian** > or **Rectangle**) > **Generate**

Goto Bottom Row

Press this softkey to go to the bottom row of the current column in the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row** > **Goto Bottom Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **User FIR** > **Goto Row** > **Goto Bottom Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row** > **Goto Bottom Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Goto Row** > **Goto Bottom Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Goto Row** > **Goto Bottom Row**

Goto Middle Row

Press this softkey to go to the middle row of the current column in the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row** > **Goto Middle Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **User FIR** > **Goto Row** > **Goto Middle Row**

Or: **Mode** > **Wideband CDMA** >, **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row** > **Goto Middle Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Goto Row** > **Goto Middle Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Goto Row** > **Goto Middle Row**

Goto Row

Press this softkey to select a row to move to in the current column of the table editor. The front-panel arrow keys and number keypad are used to select the desired row. Pressing **Enter** terminates the selection.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **User FIR** > **Goto Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Goto Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Goto Row**

Goto Top Row

Press this softkey to go to the top row of the current column in the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row** > **Goto Top Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **User FIR** > **Goto Row** > **Goto Top Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row** > **Goto Top Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Goto Row** > **Goto Top Row**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Goto Row** > **Goto Top Row**

Insert Row

There are two **Insert Row** softkeys.

In the Edit Channel Setup menu, this softkey accesses a menu that allows you to insert a channel type (**DTCH**, **Perch1**, or **Multiple DTCH**) directly above the highlighted row in the table.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row**

In the Define User FIR menu, this softkey inserts a row directly above the highlighted row in the table. The coefficient value in the inserted row is copied from the highlighted row.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Insert Row**

I/Q Mapping Normal Invert

Press this softkey to select whether the I/Q output will be inverted or not (Normal).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **More (1 of 2)** > **I/Q Mapping Normal Invert**

Status after Normal Preset or *RST: Normal

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:IQMap NORM|INVert
```

```
[:SOURce]:RADio:WCDMa:ARB:IQMap?
```

IS-95

There are two **IS-95** softkeys.

Press the first **IS-95** softkey to open a menu for selecting an IS-95 baseband filter. The choices include the standard IS-95 filter, as well as a modified version of this filter for improved adjacent channel performance. (This modified filter still meets the IS-95 error function.) These two filters are also provided with an equalizer which provides base station phase equalization for the transmit signal path.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **IS-95**

Press the second **IS-95** softkey (located in the IS-95 menu), to select the standard IS-95 baseband filter.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **IS-95** > **IS-95**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILTer IS95
```

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

IS-95 Mod

Press this softkey to select a modified version of the standard IS-95 baseband filter. This filter is modified for improved adjacent channel performance. The modification, however, is done so that it still meets the IS-95 error function criterion.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **IS-95** > **IS-95 Mod**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILTer IS95_MOD

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

IS-95 Mod w/EQ

Press this softkey to select 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 so that it still meets the IS-95 error function criterion.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **IS-95** > **IS-95 Mod w/EQ**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILTer IS95_MOD_EQ

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

IS-95 w/EQ

Press this softkey to select the standard IS-95 baseband filter with an equalizer provided for phase compensation required by the base station.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **IS-95** > **IS-95 w/EQ**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILTer IS95_EQ

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

Link Down Up

Press this softkey to set the wideband CDMA waveform being defined in the table editor to uplink or downlink.

Status after Normal Preset or *RST: Down

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **More (1 of 2)** > **Link Down Up**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:LINK UP|DOWN

[:SOURce]:RADio:WCDMa:ARB:LINK?
```

Load/Store

Press this softkey to access a menu for loading the FIR filter table editor with values from files previously stored in the signal generator memory, and for saving to memory a user-defined filter from the FIR table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store**

Load Default FIR

Press this softkey to access 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** > **Wideband CDMA** > **WCDMA Define** > **Filter**> **Define User FIR** > **More (1 of 2)** > **Load Default FIR**

Load From Selected File

Press this softkey to fill the FIR table editor with the filter coefficient values stored in the highlighted file. Press the **Confirm Load From File** softkey to confirm the action. The signal generator overwrites any current values in the table. If you have not previously saved the current values to a file, they are lost. If you do not wish to load the file, press the **Return** key.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Load From Selected File**

Long Code

Press this softkey to set the long code for the dedicated traffic channels being inserted into the table editor, using **Multiple DTCH**. The long code must be entered in hexadecimal format with 80 being the highest value allowed.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **Long Code**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Mirror Table

Press this softkey to mirror 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** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Mirror Table**

Multiple DTCH

Press this softkey to access the multiple DTCH menu, to insert multiple DTCH channels. After selecting **Multiple DTCH**, select the number of channels, symbol rate (**16 ksps**, **32 ksps**, **64 ksps**, **128 ksps**, **256 ksps**, **512 ksps**, or **1024 ksps**), first short code, power, symbol offset, and long code. Pressing **Done** completes the channel entries by inserting the desired number of channels above the highlighted row in the table editor.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>{,DTCH,<symbol_rate>,
<short_code>,<power_value>,NA|<symbol_offset>,<tpc_value>,
<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Nyquist

Press this softkey to select 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 your wideband CDMA setup. The default filter alpha is automatically set to 0.500. You can change the filter alpha to any value between 0 and 1 by pressing the **Filter Alpha** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Nyquist**

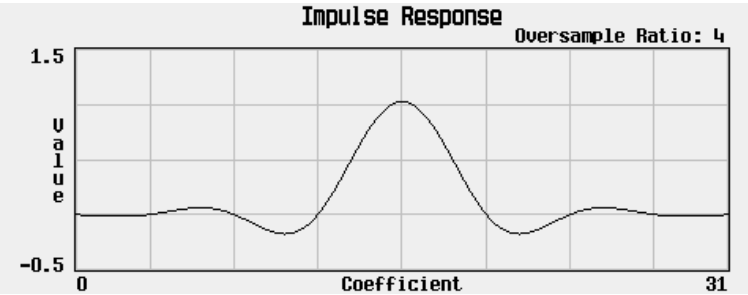
SCPI Commands:

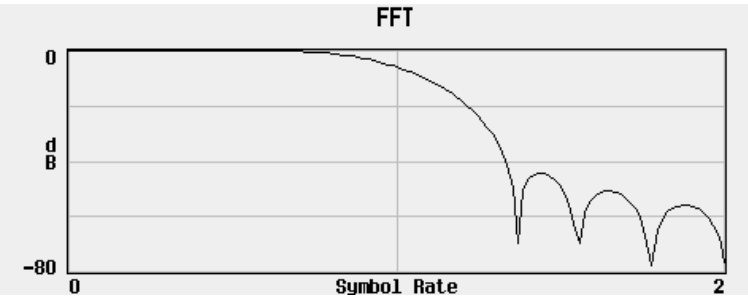
```
[:SOURce]:RADio:WCDMa:ARB:FILTer NYQuist

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

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 impulse response and the frequency response of a Nyquist filter with an oversample ratio of 4 are shown in the following graphs.





Softkey Location: **Mode** > **CDMA** > **CDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Nyquist**

Optimize FIR For EVM ACP

Press this softkey 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, and Gaussian filters. The softkey is grayed out when any other filter is selected.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Root Nyquist** (or **Nyquist** or **Gaussian**) > **Optimize For EVM ACP**

SCPI Command:

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

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

Oversample Ratio

Press this softkey to set the oversampling ratio to be applied to a custom FIR filter design. Acceptable values range from 1 through 32, where the maximum combination of symbols and oversampling ratio is 1024. An FIR filter selected for use in wideband CDMA, however, cannot have more than 256 coefficients so the number of symbols and the oversample ratio should be selected accordingly.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Oversample Ratio**

Page Down

Press this softkey to view the next page of entries.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row** > **Page Down**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row** > **Page Down**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Page Down**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Page Down**

Page Up

Press this softkey to view the previous page of entries.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Goto Row** > **Page Up**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Goto Row** > **Page Up**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Goto Row** > **Page Up**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Page Up**

Perch1

Press this softkey to insert a Perch1 channel above the highlighted row in the table. The Perch1 channel can be enabled alone, with up to 511 dedicated traffic channels, or it can be turned off. A short code of 0 is automatically assigned to the Perch1 channel.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Perch1**

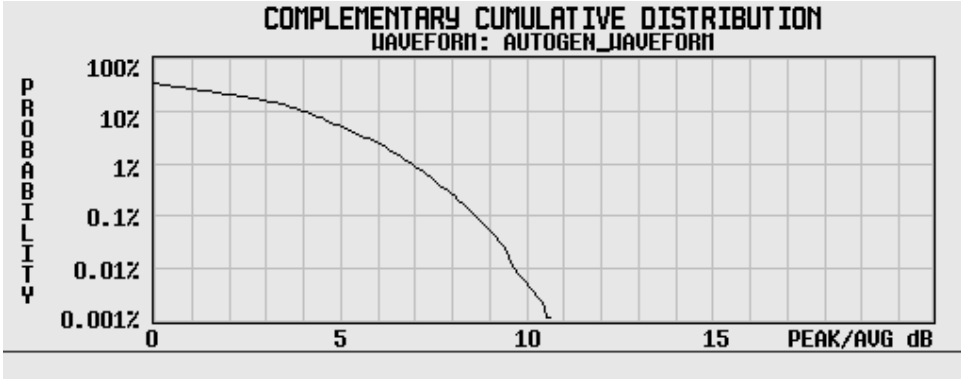
SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>{,PERCH1,<symbol_rate>,
<short_code>,<power_value>,NA|<symbol_offset>,<tpc_value>,
<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Plot CCDF

After generating a wideband CDMA waveform by pressing **Wideband CDMA Off On** until **On** is highlighted, press this softkey to display a plot of the Complementary Cumulative Distribution Function for the generated 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** > **Wideband CDMA** > **Wideband CDMA On** > **Waveform Statistics** > **Plot CCDF**

Power

Press this softkey to set the channel power for the dedicated traffic channels being inserted into the table editor, using **Multiple DTCH**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Insert Row** > **Multiple DTCH** > **Power**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Random

The **Random** softkey has two different applications.

Random Used in Channel Data

Press the **Random** softkey while an item is highlighted in the Data column of the table editor to enter random data as the wideband CDMA channel data type. RANDOM will appear in the Data field of the table editor

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > (*move cursor to an item in the* Data *column*) > **Edit Item** > **Random**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|NONE,
PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom{,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,RANDom}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Random Used in Pilot, TPC, and ACCH Fields

Press the **Random** softkey while an item is highlighted in the Symbol Offset column of the table editor to assign random data to the pilot, TPC, and ACCH fields of dedicated traffic channel selected. N/A will appear in the Symbol Offset and TPC fields of the table editor.

You can also select **Random** when you are inserting multiple dedicated traffic channels into the table editor via the **Multiple DTCH** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > (*move cursor to an item in the* Symbol Offset *column*) > **Edit Item** > **Random**

Or: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Insert Row** > **Multiple DTCH** > **DTCH Symbols** > **Random**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA,<tpc_value>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
NA,<tpc_value>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Reconstruction Filter

Press this softkey to display a menu for selecting a 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**).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Reconstruction Filter**

Status after Normal Preset or *RST: 2.500 MHz

SCPI Commands:

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

[:SOURce]:RADio:ARB:RFILter?
```

Rectangle

Press this softkey to select a rectangle pre-modulation filter in either the Select (filter) menu or the Load Default FIR menu.

In the Select (filter) menu, pressing the **Rectangle** softkey selects this FIR filter for use in your wideband CDMA setup.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **More (1 of 2)** > **Rectangle**

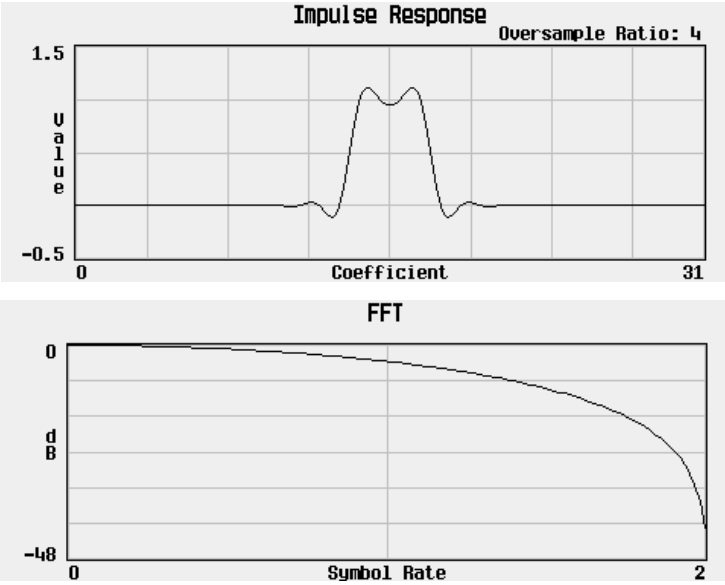
SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILTer RECTangle

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

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 impulse response and the frequency response of a rectangle filter with an oversample ratio of 4 are shown in the following graphs.



Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Rectangle**

Reference Frequency

Press this softkey to set the reference frequency of the external clock. It is only accessible when you are using an external ARB reference applied to the BASEBAND GEN REF IN connector. Acceptable values range from 250.0000 kHz to 20.0000000 MHz.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **More (1 of 2)** > **Reference Freq**

SCPI Commands:

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

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

Restore Default Filter

Press this softkey to replace the current FIR filter with the default filter (WCDMA).

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Restore Default Filter**

SCPI Commands:

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

Retrigger Mode Off On

Press this softkey to toggle the operating state of the wideband CDMA retrigger mode. When **Retrigger Mode Off On** is set to ON, if a trigger occurs while a waveform is playing, the waveform will retrigger at the end and play one more time. The retriggers do not accumulate. If several triggers are received during a waveform, it will only be replayed once.When **Retrigger Mode Off On** is set to **OFF**, if a trigger occurs while a waveform is playing, it is ignored.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Retrigger Mode Off On**

SCPI Commands:

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

Root Nyquist

Press this softkey to select 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 for use in your wideband CDMA setup. The default filter alpha is automatically set to 0.500. You can change the filter alpha to any value between 0 and 1 by pressing the **Filter Alpha** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **Root Nyquist**

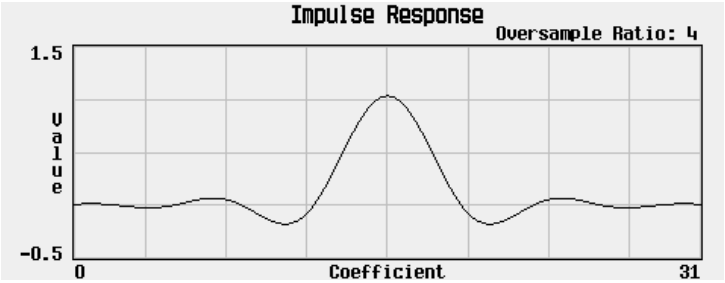
SCPI Commands:

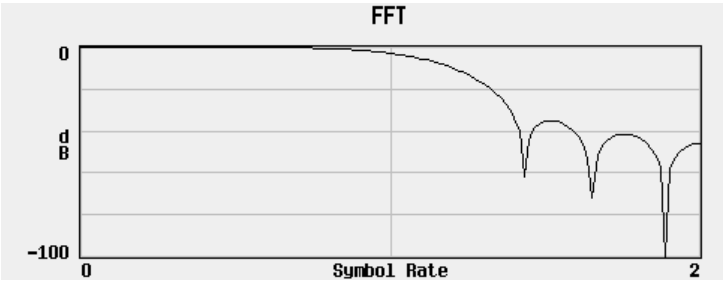
```
[:SOURce]:RADio:WCDMa:ARB:FILTer RNYQuist

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

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 impulse response and the frequency response of a Root Nyquist filter with an oversample ratio of 4 are shown in the following graphs.





Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load Default FIR** > **Root Nyquist**

Scale To 0dB

Press this softkey to scale all of the current channel powers so that the total power equals 0 dB while keeping the previous power ratios between the individual channels.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Edit Channel Setup** > **Adjust Code Domain Power > Scale To 0dB**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel SCALe,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,<symbol_offset>,
<TPC>,<long_code>,RANDom|<data_value> {,PERCH1|DTCH,
<symbol_rate>,<short_code>,<power_value>,
NA|<symbol_offset>,<tpc_value>,<long_code>,
RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Select

Press this softkey to access a menu for selecting the pre-modulation filter type. The pre-defined choices are Root Nyquist, Nyquist, Gaussian, and several IS-95 baseband filters. The standard IS-95 filter is available as well as a modified version of this filter which 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. In addition to the pre-defined filters, you can access the catalog of files stored in the signal generator memory. You can select any filter 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.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select**

Status after Normal Preset or *RST: WCDMA

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILter
RNYQuist|NYQuist|GAUSsian|IS95|IS95_EQ|IS95_MOD|
IS95_MOD_EQ|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:ARB:FILter?
```

Select File

There are two **Select File** softkeys.

In the User FIR menu, use the **Select File** softkey to choose a custom filter for your pre-modulation filter from the catalog of user-defined FIR filters. Scroll through the catalog of files and when the desired filter is highlighted, press the **Select File** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **User FIR** > **Select File**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:FILter "<file name>"
```

```
[:SOURce]:RADio:WCDMa:ARB:FILter?
```

In the Custom WCDMA State menu, use the **Select File** softkey to choose a customized WCDMA instrument state from the catalog of wideband CDMA files. (You can create these files using the **Store Custom WCDMA State** softkey in the Setup Select menu.) Scroll through the catalog of files and when the desired WCDMA state is highlighted, press the **Select File** softkey.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Select** > **Custom WCDMA State** > **Select File**

Single

Press this softkey to set the wideband CDMA trigger type to single. After receiving a trigger, the wideband CDMA signal will be output once.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger**, **Single**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE SINGLE
```

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE?
```

Store Custom WCDMA State

Press this softkey to access a menu that allows you to store the current custom wideband CDMA state into the file you enter. Afterward, you can recall this custom state from the instrument' memory by pressing **Mode**, **Wideband CDMA**, **Setup Select, Custom WCDMA State** and selecting the appropriate file.

Along with the contents of the wideband CDMA channel table editor (channel type, symbol rate, short code, power level, TPC, symbol offset, long code, and data), this softkey stores the following instrument state information to the memory catalog:

- FIR filter
- FIR filter filename
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q mapping
- link
- chip rate
- oversample ratio
- ARB reconstruction filter
- ARB reference clock source (internal or external)
- ARB reference clock frequency

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom CDMA State**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:STORe "<file name>"
```

Store To File

There are two **Store to File** softkeys.

In the Load/Store menu for defining custom FIR filters, use the **Store to File** softkey to save a custom filter, created in the FIR table editor, to a file in the signal generator non-volatile memory. When you press the **Store to File** softkey, a menu is displayed for creating a file name. The file name can consist of up to 23 alpha-numeric and special characters. After creating the file name, press the **Enter** terminator softkey and the file is stored. Once stored, this file becomes a part of the catalog of FIR files and can be re-loaded into the FIR table editor for further modifications, or can be applied to a custom wideband CDMA modulation state.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **More (1 of 2)** > **Load/Store** > **Store to File**

In the Store Custom WCDMA State menu, use the **Store to File** softkey to save the current wideband CDMA instrument state to a file in the signal generator non-volatile memory. Create a file name and store the file as described in the previous paragraph. Once stored, this file becomes a part of the catalog of wideband CDMA states and can be re-loaded using the **Select File** softkey in the Custom WCDMA State menu.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Store Custom WCDMA State** > **Store To File**

Symbol Rate

Press this softkey to set the symbol rate for the dedicated traffic channels being inserted into the table editor, using **Multiple DTCH**.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Define User FIR** > **Insert Row** > **Multiple DTCH** > **Symbol Rate**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel EQUal|SCALe|
NONE,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>
{,PERCH1|DTCH,<symbol_rate>,<short_code>,<power_value>,
<symbol_offset>,<TPC>,<long_code>,RANDom|<data_value>}
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup:CHANnel?
```

Through

Press this softkey to bypass all reconstruction filtering. This is useful for using external reconstruction filters at frequencies different than those supplied internally.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Reconstruction Filter** > **Through**

SCPI Commands:

```
[:SOURce]:RADio:ARB:RFILter THRough
[:SOURce]:RADio:ARB:RFILter?
```

Trigger

Press this softkey to display the wideband CDMA trigger menu. This menu offers three different types of wideband CDMA triggering: Continuous, Single and Gated. The menu also contains a **Trigger Setup** key that allows you to adjust the trigger source, the retrigger mode and the gate active polarity.

NOTE

Wideband CDMA Triggers, their associated softkeys and SCPI functionality became available in Option UND signal generators with serial number prefix US3844 or GB3845. Wideband CDMA Triggers are *not* available in Option UND signal generators with an earlier serial number prefix, unless upgraded.

To upgrade your Option UND signal generator to include Wideband CDMA Triggering, contact your nearest Agilent Technologies Sales and Service office. A list of Sales and Service offices is provided in the *Agilent Technologies ESG Family Signal Generator User's Guide* at the end of Chapter 2, "Using Functions."

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE CONT|SINGLE|GATE
[:SOURce]:RADio:WCDMa:ARB:TRIGger:TYPE?
```

Trigger Key

Press this softkey to set the trigger source to the signal generator 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.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source** > **Trigger Key**

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce] KEY
[:SOURce]:RADio:WCDMa:ARB:TRIGger[:SOURce]?
```

Trigger Setup

Press this softkey to display the wideband CDMA trigger setup menu. This menu allows you to adjust the trigger source, the retrigger mode and the gate active polarity.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup**

Trigger Source

Press this softkey to display the wideband CDMA trigger source menu. This menu allows 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.

NOTE For trigger availability information, see the **Trigger** softkey definition.

Softkey Location: **Mode** > **Wideband CDMA** > **Trigger** > **Trigger Setup** > **Trigger Source**

User FIR

Press this softkey to display the catalog of FIR filter files stored in the signal generator 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 File` is shown in the `Data` field of the display as well as in the second line of the **Select** softkey.

Softkey Location: **Mode** > **WCDMA Define** > **Filter** > **Select** > **User FIR**

Waveform Statistics

Press this softkey to display the Waveform Statistics Menu. When the softkey is active, statistics are available for the selected waveform.

Softkey Location: **Mode** > **Wideband CDMA** > **Waveform Statistics**

WCDMA

Press this softkey to select a filter that is optimized for WCDMA.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define** > **Filter** > **Select** > **WCDMA**

WCDMA Define

Press this softkey to access a menu for defining WCDMA signal parameters such as channel setup, filter adjustments, oversample ratio, chip rate, and reconstruction filter parameters.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Define**

WCDMA Select

Press this softkey to access a menu for selecting the channel type. The pre-defined choices are 1 DTCH, 3 DTCH, Perch1, Perch +1 DTCH, Perch1 +3 DTCH, Perch1 +50 DTCH and custom-defined WCDMA state.

Softkey Location: **Mode** > **Wideband CDMA** > **WCDMA Select**

Status after Normal Preset or *RST: 1 DTCH

SCPI Commands:

```
[:SOURce]:RADio:WCDMa:ARB:SETup DTCH1|DTCH3|PERCH1|
P1DTCH1|P1DTCH3|P1DTCH50|"<file name>"
```

```
[:SOURce]:RADio:WCDMa:ARB:SETup?
```

Wideband CDMA Off On

Press this softkey to enable Option H97 wideband CDMA functionality. Turning the feature on sets up the internal hardware to generate the structure defined by the wideband CDMA experimental system specification. A 10 ms radio frame is constructed for each dedicated traffic channel consisting of 16 timeslots which include pilot symbols, user-defined power control bits, ACCH fields filled with zeroes, and data fields filled with random data or an 8-bit repeating pattern. The `WCDMA` and `I/Q` annunciators are turned on in the display when this softkey is toggled on.

Softkey Location: **Mode** > **Wideband CDMA** > **Wideband CDMA Off On**

Status after Normal Preset or *RST: Off

SCPI Commands:

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

[:SOURce]:RADio:WCDMa:ARB[:STATe]?
```

4 Specifications

This chapter provides the specifications and supplemental characteristics for the Agilent Technologies ESG-D Series Option H97 Signal Generator. This chapter, as with the rest of this supplement, provides only the information unique to the Wideband CDMA, Option H97. Use this information to supplement the ESG Family manual set. In all cases the information in this supplement supersedes the information in the standard manual set.

Option H97 Specifications

Specifications describe the warranted performance of the instrument and apply only after a 45 minute warm-up. The Option H97 has no specified performance specific to the operation of the multi-channel wideband CDMA functionality. Specifications for the base performance of the instrument do exist and are documented in the standard manual set.

Supplemental characteristics are typical or nominal and provide additional, non-warranted information useful in applying the signal generator. The following conditions are all supplemental characteristics applicable to the Option H97 functionality.

Recommended configuration includes Agilent Technologies 4432B with Options UND (required), H97, H99, and 1E5.

Frequency Range: 20 MHz to 4 GHz

Chip Rate: 4.096 MHz, 8.192 MHz, 16.384 MHz

Modulation: QPSK with long and short code spreading

Pre-defined Channel Configurations:

1 DTCH: Single 32 ksps DTCH on short code 8

3 DTCH: Three 32 ksps DTCH on short codes 8, 9, 10

Perch 1: Single Perch 1 on short code 0

Perch 1 + 1 DTCH: Perch on short code 0, 32 ksps DTCH on short code 8

Perch 1 + 3 DTCH: Perch on short code 0, 32 ksps DTCH on short codes 8, 9, 10

Perch 1 + 50 DTCH: Perch on short code 0, 32 ksps DTCH on short codes 8-57

All predefined channels at 4.096 Mcps, root Nyquist .22 α (alpha) filter, Long Code 1, alternating up and down TPC bits, offset symbols. Channel powers computed to scale for equal energy per symbol.

User Defined WCDMA DTCH Variables (1 Repeating Frame)

Symbol Rate: 16, 32, 64, 128, 256, 512, 1024 ksps

Number of Channels: up to 512

Short Code Range: 0 to 511, limited by the symbol rate and chip rate (see table below)

Symbol Rate (ksps)	Chip Rate (MHz)		
	4.096	8.132	16.384
	Short Codes		
32	0-127	0-255	0-511
64	0-63	0-127	0-255
128	0-31	0-63	0-127
256	0-15	0-31	0-63
512	0-7	0-15	0-31
1024	0-3	0-7	0-15

Channel Power: 0 to -40 dB, .02 dB resolution

Symbol Offset: Random, 0 to 639, limited by the symbol rate (see table below)

Symbol Rate (ksps)	Offset Range
32	0-19
64	0-39
128	0-79
256	0-159
512	0-319
1024	0-639

Transmit Power Control (TPC): User specified TPC bits for each of 16 timeslots, 0000 to FFFF (HEX)

Data: Random or 8-bit repeating sequence, 00 to FF (HEX)

Perch1 Structure (1 Repeating Frame)

Symbol Rate: 16 ksymbols/second

Long Code Mask (LCM): Yes

Short Code Number for LCM Symbols: 1

Short Code: 0 to 1023, limited by chip rate (see table below)

Chip Rate (MHz)	Short Code
4.096	0-255
8.192	0-511
16.384	0-1023

Downlink Long Code: 1 to 80 (hex) set independently for each channel

Uplink Long Code: 0 to 1FFFFFFFFF (hex) set independently for each channel

I/Q Mapping: Normal, invert

Frame Duration: 10 ms

Filtering:

Default:	WCDMA root Nyquist with alpha (α) of 0.22
Other:	
Nyquist, root Nyquist	α = 0 to 1
Gaussian	BT=0.1 to 1
User Defined FIR	Up to 256 coefficients, 16-bit resolution
IS-95	IS-95, IS-95 with equalizer, IS-95 modified, IS-95 modified with equalizer
Rectangle	

EVM
(f_c 1800 to 2200 MHz, default WCDMA filters, 4.096 chip rate, typical output power ≤ 4dBm, ≤ 7dBm with Option UNB)

1 DTCH: *2.3%*

Adjacent Channel Power
(1800 MHz ≤ f_c ≤ 2200 MHz, default filters, 4.096 chip rate, ≤ –2 dBm)[1]

	Electronic Attenuator (Standard), typical	Mechanical Attenuator (Option UNB), typical	Low ACP (Option H99)
1 DTCH	*–58 dBc*	*–58 dBc*	–61 dBc (*–63 dBc, typical*)
127 DTCH and PERCH1	*–50 dBc*	*–56 dBc*	–60 dBc (*–62 dBc, typical*)

1. ≤ 0 dBm with Option H99.

A Reconciling New Firmware Revisions with Earlier Revisions

Remote and front panel operation of firmware revision B.02.21 and greater is quite different from earlier firmware revisions. This appendix contains information to help you if you are operating instruments with different firmware revisions.

Overview of the Changes

NOTE The following changes are linked to the signal generator's firmware revision. To determine the firmware revision of your instrument, press **Utility** > 0**Instrument Info/Help Mode** > **Diagnostic Info.**

In firmware revisions prior to B.02.21, Option H97 provided pre-defined channel configurations for Perch1, for up to 127 DTCH, and for combinations of Perch1 and up to 127 DTCH. Most channel variables were fixed except for the selection of long code spreading and symbol alignment.

Firmware revisions B.02.21 and greater provide a new and expanded set of pre-defined channel configurations that are *not* identical to the previous channel configurations. If you have B.02.21 or greater, and you want to duplicate the earlier pre-defined channels, the following table describes the channel variables that were set up with firmware revisions prior to B.02.21:

Perch1	Symbol rate	16 ksps
	Short code	0
	Symbol alignment	Always aligned
DTCH	Symbol rate	32 ksps*
	Short code	Starts at 8, increments by 1 for each DTCH up to short code of 127. Then restarts at 1.
	TPC	AAAA
	Channel power	All equal
	Symbol alignment	Selectable**

***The following special cases apply[1]:**

Long code	Number of DTCH	Symbol Rate (ksps)
71	≤ 63	64
72	≤ 31	128
73	≤ 15	256
74	≤ 7	512
75	≤ 3	1024
76[2]	15 DTCH at 32 ksps 8 DTCH at 64 ksps 4 DTCH at 64 ksps 2 DTCH at 256 ksps	

1. All short codes start at 1 (rather than 8).
2. For long code 76, 29 DTCH must be selected to achieve this pattern.

****When alignment = offset, the following offsets apply:**

DTCH	Offset
1	0
2	18
3	2
4	16
5	4
6	14
7	6
8	12
9	8
10	10
11	0
12	18
13	2
⋮	⋮

You can duplicate these channel configurations by using the front panel table editor described in Chapter 2, or by remote operation. For help with remote operation, continue with the “Remote Operation Differences” section.

Remote Operation Differences

Most of the SCPI wideband CDMA commands in the earlier revisions of firmware (prior to B.02.21) can no longer be used with later revisions (B.02.21 and greater). This section describes the differences and also provides a program for the later firmware revisions that builds traffic channels and a Perch1 channel with the same variables used in the earlier firmware revisions.

Commands from Earlier Firmware Revisions That are Still Valid in Later Revisions

If your signal generator has a later revision of firmware (B.02.21 or greater), the following wideband CDMA commands from the earlier revisions of firmware can still be used. (All other wideband CDMA commands are invalid!)

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

Sets the reference for the waveform clock to either the internally generated 10 MHz reference or to an external reference signal applied to the BASEBAND GEN REF IN connector.

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

Specifies the frequency of the external clock reference applied to the BASEBAND GEN REF IN connector.

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

Enables Option H97 wideband CDMA functionality. This command sets up the internal hardware to generate the structure defined by the wideband CDMA experimental system specification.

Programming the Later Revisions of Firmware to Duplicate the Earlier Revisions

If you have programming code developed for signal generators with earlier revisions of firmware (prior to B.02.21), and you wish to duplicate the same functionality in instruments with later revisions of firmware (B.02.21 and greater), the following program builds traffic channels and Perch1 with the same variables as were defined with the earlier SCPI commands.

`5 INTEGER Channel,N_of_channels`	Creates an integer for the number of traffic channels.
`10 DIM Offset$(0:9)[2]`	Dimensions a variable for symbol offset values.
`15 ! ****** Initialize Symbol Offset Pattern`	
`20 Offset$(0)="0"`	Sets offsets for variables 0 through 9.
`25 Offset$(1)="18"`	
`30 Offset$(2)="2"`	
`35 Offset$(3)="16"`	
`40 Offset$(4)="4"`	
`45 Offset$(5)="14"`	
`50 Offset$(6)="6"`	
`55 Offset$(7)="12"`	
`60 Offset$(8)="8"`	
`65 Offset$(9)="10"`	
`70 !`	
`71 N_of_channels=127`	Sets the number of traffic channels. (Replace 127 with your desired number.)
`72 Symbol_offset_s$="RANDOM"`	Sets the symbol offset variable to RANDOM. Replace with OFFSET, if desired.)
`75 OUTPUT 719 USING"K,#";"SOURCE:RADIO:WCDMA :ARB:SETUP:CHAN EQU ,"`	Sets equal energy per bit for all traffic channels. (The # symbol indicates that End-Of-Line (EOL) sequence has been suppressed.)
`76 !`	
`77 ! ********* INSERT PERCH CHANNEL`	
`80 OUTPUT 719 USING "K,#";"PERCH1,16,0,0,0, 43690,00000000001,RANDOM,"`	Sets up the Perch1 channel with symbol rate=16 ksps, shortcode=0, power=0 dBm, symbol offset=0, TPC=43690, long code=00000000001, symbol alignment=random. (The # symbol indicates that End-Of-Line (EOL) sequence has been suppressed.)
`87 !`	
`88 !***** BUILD N TRAFFIC CHANNELS`	
`89 !`	
`91 FOR Channel=1 TO N_of_channels`	
`95 SELECT Channel`	
`100 CASE <=120`	Sets the short code to the channel number plus 7 if the channel number is <=120. Sets the short code to the channel number minus 120 if the channel number is >120.
`105 Short_code=Channel+7`	
`110 CASE ELSE`	
`115 Short_code=Channel-120`	
`120 END SELECT`	
`125 SELECT Symbol_offset_s$`	

130 CASE “OFFSET”	If OFFSET is selected in line 72, the symbol offset value is selected by selecting the Offset$ variable that matches the value of the integer remainder of the channel number divided by 10.
135 Symbol_offset$=Offset$(Channel MOD 10)	
140 CASE “RANDOM”	If RANDOM is selected in line 72, the symbol offset is set to NA.
145 Symbol_offset$=”NA”	
150 END SELECT	
155 OUTPUT 719 USING“K,#”;”DTCH,32, ”&VAL$(Short_code)&”,0, ”&Symbol_offset$&”,43690,00000000001 RANDOM,”	Outputs to the signal generator the channel number, symbol rate=32 ksps, short code value, power=0 dBm, symbol offset, TPC=43690, long code=00000000001, symbol alignment=random. (If OFFSET is selected in line 72, replace “RANDOM” with the offset value.)
160 PRINT Channel,Short_code,Channel MOD 10,Offset$((Channel-1) MOD 10)	Prints the channel number, short code, offset variable, symbol offset value.
165 NEXT Channel	Repeats from line 95 for each channel.
170 OUTPUT 719;””	Sends End of Line command. The signal generator then builds the waveforms.
175 Clear_error	Queries for errors. Puts the errors into the Error$ variable. Prints the errors to the print device. Loops until “No error” is found.
180 !	
185 !	
190 !	
195 END	
200 SUB Clear_error	
205 Clear_error: !	
210 COM /Ierror/ E$[100]	
215 REPEAT	
220 R	
225 PRINT E$	
230 UNTIL E$=”+0,””No error”””	
235 SUBEND	
240 !	
245 ! **********	
250 !	
255 SUB R	
260 R: !	
265 COM /Ierror/ Error$[100]	
270 !	
275 OUTPUT 719;”SYSTem:ERRor?;”	
280 ENTER 719;Error$	
285 !	
290 PRINT Error$	
295 SUBEND	
300 !	
305 !**********	
310 !	

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