MS2690A/MS2691A/MS2692A
and MS2830A/MS2840A
Signal Analyzer
Vector Signal Generator
Operation Manual
IQproducer™

15th Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the "MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)", "MS2830A Signal Analyzer Operation Manual (Mainframe Operation)" or "MS2840A Signal Analyzer Operation Manual (Mainframe Operation)", and "MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator (Operation)" and "MS2830A/MS2840A Vector Signal Generator (Operation)" Please also refer to them before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W2914AE-15.0

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These indicate that the marked part should be recycled.

MS2690A/MS2691A/MS2692A and MS2830A/MS2840A Signal Analyzer
Vector Signal Generator
Operation Manual (IQproducer™)

25 April 2007 (First Edition)
12 June 2026 (15th Edition)

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Revision History:

February 29th, 2020
December 17th, 2021
March 11th, 2024

Cautions Against Computer Virus Infection

- Copying files and data
  Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
  All other required files should be transferred by means of USB flash drive or CompactFlash media after undergoing a thorough virus check.
- Adding software
  Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
  Ensure that the network has sufficient anti-virus security protection in place.
- Protection against malware (malicious software such as viruses).
  This equipment runs on Windows Operating System.
  To connect this equipment to network, the following is advised.
  - Activate Firewall.
  - Install important updates of Windows.
  - Use antivirus software.

Protection Against Computer Virus Infections

Prior to the software installation

Before installing this software or any other software recommended or approved by Anritsu, run a virus scan on your computer, including removable media (e.g. USB flash drive and CF memory card) you want to connect to your computer.

When using this software and connecting with the measuring instrument

- Copying files and data
  On your computer, do not save any copies other than the following:
  - Files and data provided by Anritsu
  - Files created by this software
  - Files specified in this document

  Before copying these files and/or data, run a virus scan, including removable media (e.g. USB flash drive and CF memory card).
- Connecting to network
  Connect your computer to the network that provides adequate protection against computer viruses.
- Protection against malware (malicious software such as viruses).
  To connect your computer to network, the following is advised.
  - Activate Firewall.
  - Install important updates of Windows.
  - Use antivirus software.

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This software may not operate normally if any of the following operations are performed on your computer:

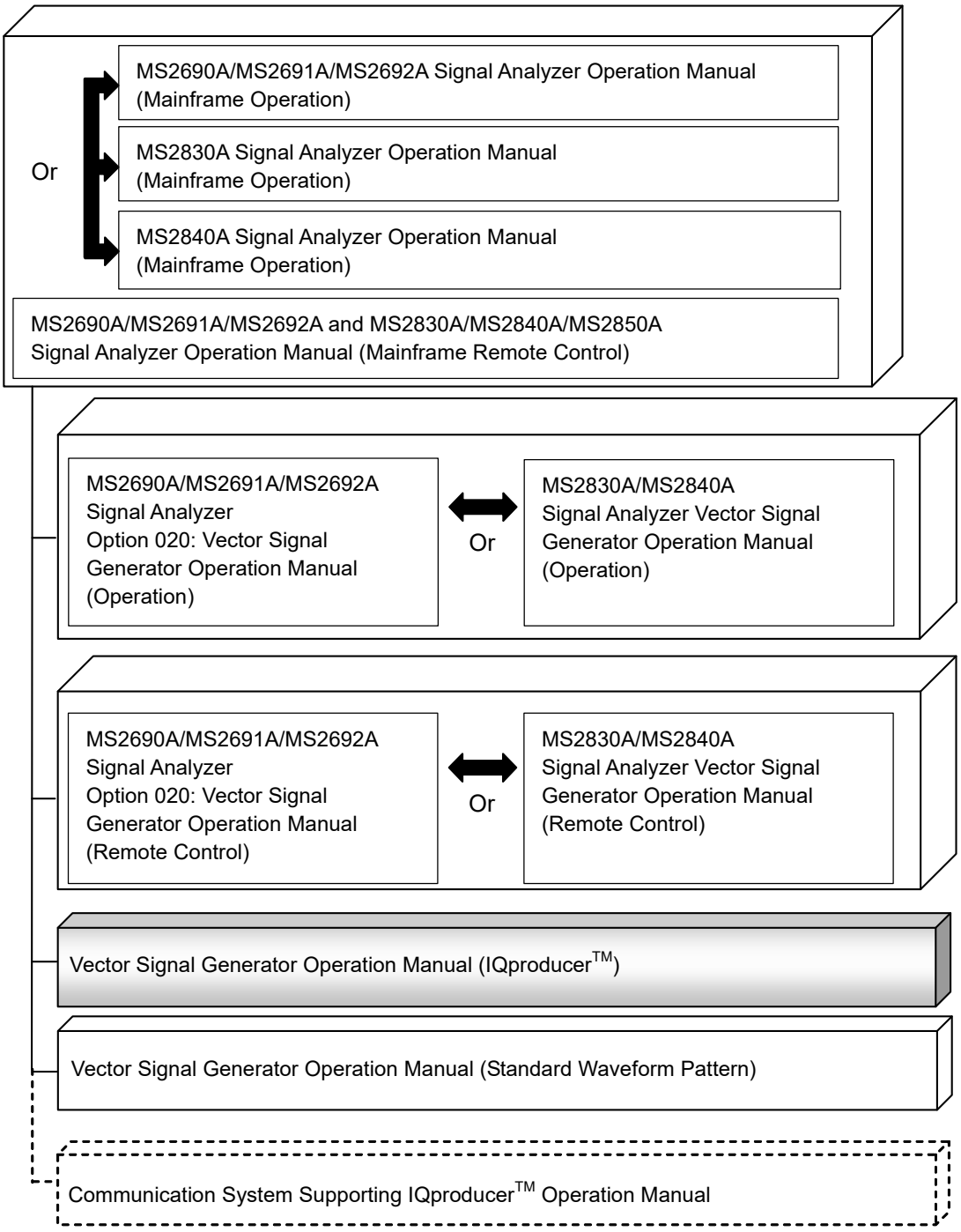
- Simultaneously running any software other than that recommended or approved by Anritsu
- Closing the lid (Laptop computer)
- Turning on the screen saver function
- Turning on the battery-power saving function (Laptop computer)

For how to turn off the functions, refer to the operation manual that came with your computer.

About This Manual

■ **Composition of Operation Manuals**

The operation manuals for the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A Signal Analyzer are comprised as shown in the figure below.



- **Signal Analyzer Operation Manual (Mainframe Operation)**
- **Signal Analyzer Operation Manual (Mainframe Remote Control)**

These manuals describe basic operating methods, maintenance procedures, common functions, and common remote control of the signal analyzer mainframe.

- **Vector Signal Generator Operation Manual (Operation)**

This manual describes functions, operating methods, and so on of the vector signal generator (option).

- **Vector Signal Generator Operation Manual (Remote Control)**

This manual describes remote control of the vector signal generator (option).

- **Vector Signal Generator Operation Manual (IQproducer™) (This manual)**

This manual describes functions, operating methods, and so on of the IQproducer, which is application software used with the vector signal generator (option).

- **Vector Signal Generator Operation Manual (Standard Waveform Pattern)**

This manual describes details on the standard waveform pattern data used with the vector signal generator (option).

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Chapter 1 Overview

This chapter provides an overview of the IQproducer™ for the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A Signal Analyzer Vector Signal Generator option.

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1.1 Overview

The IQproducer™ is Windows application software used to generate a modulated waveform pattern to be used by the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A Signal Analyzer Vector Signal Generator option.

Note that purchase of a license key corresponding to the serial number of your Vector Signal Generator option is required when actually using a waveform file with the Vector Signal Generator option, a file generated by the modulated waveform pattern generator IQproducer™ (hereinafter, referred to as “signal generation application”) corresponding to each communication system.

The IQproducer™ also enables the Complimentary Cumulative Distribution Function (CCDF) results and Fast Fourier Transform (FFT) results of a generated modulated waveform pattern to be displayed in a graph. In addition, it can convert an ASCII-format waveform pattern generated by your signal generation application tool to a binary-format waveform pattern that can be used in the Vector Signal Generator option.

This operation manual describes the functions of the IQproducer™, except for the signal generation application.

1.2 Functions

1.2.1 Signal generation application corresponding to communications system

Signal generation applications that generate modulation waveform patterns are provided for each communications system. For detailed information on the operations and functions of these applications, refer to the operation manual of each signal generation application.

1.2.2 CCDF graph display function

The IQproducer™ can read a modulation waveform pattern generated by each signal generation application and display it in the CCDF graph with up to eight traces.

The CCDF graph displayed on the screen can be printed out and saved into a CSV-format file.

1.2.3 FFT graph display function

The IQproducer™ can read a modulation waveform pattern generated by each signal generation application and display it in the FFT graph with up to four traces.

The FFT graph displayed on the screen can be printed out and saved into a CSV-format file.

1.2.4 File conversion function

The IQproducer™ can convert an ASCII-format waveform pattern generated by simulation software or other external software to a binary-format modulation waveform pattern file that can be used in the Vector Signal Generator option.
In addition, it can convert a digitized file that is created by the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A Signal Analyzer using the digitize function, and convert a waveform pattern for the MG3700A/MG3710A Vector Signal Generator (hereinafter, referred to as "MG3700A/MG3710A") into a binary-format modulation waveform pattern that can be used in the Vector Signal Generator. Conversely, a waveform pattern for the MS269x/MS2830/MS2840 can also be converted into a file that can be used in the MG3700A/MG3710A.

1.2.5 Time domain graph display function

The IQproducer™ can read a modulation waveform pattern generated by each signal generation application and display it in the time domain graph with up to four traces.

1.2.6 Clipping function

This function performs clipping processing for a waveform pattern generated by each signal generation application.

Chapter 2 Installation/Uninstallation

This chapter describes how to install/uninstall the IQproducer™ to a PC.

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2.1 Operating Environment

The IQproducer™ requires the following environment.

Table 2.1-1 Operating Environment

PC	
OS	IQproducer™ Version 16.01 or earlier Windows XP/Windows Vista/Windows 7 IQproducer™ Version 17.00 to 21.00 Windows 7/Windows 10 IQproducer™ Version 22.00 or later Windows7/Windows10/Windows11
CPU	At least 1 GHz or faster Pentium III or equivalent
Memory	512 MB or more
Hard disk	5 GB or more free space in the drive where the IQproducer™ is to be installed.
Peripheral device	
Display	Displays with a resolution of 1024 × 768 pixels are best viewed using a small font setting.

Although the IQproducer™ can be installed and operated in the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A, operations of the measurement functions are not guaranteed when the IQproducer™ is running on the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A.

2.2 Installation/Uninstallation Procedure

The IQproducer™ can be installed interactively by activating the setup program.

If resident virus check programs are running on your PC, exit them before activating the IQproducer™ setup program, as well as other Windows applications in progress.

Note:

If you upgrade the IQproducer™ after the version 3.00 (hereafter referred to as "new software") in PC in which the IQproducer™ before version 2.01 (hereafter referred to as "old software") is installed, please execute the setup file of the old software and uninstall it before executing the setup file of new software. However, if the short file name support was disabled on your Windows, old software cannot be uninstalled. In this case, instead of uninstalling the old software, execute the setup file of the new software and specify the installation folder of the old software for the **Destination Folder**, thereby installing the new software, while overwriting the old one.

Note:

This software of version 13.00 or later requires you to have installed Microsoft Visual C++ 2010 Redistributable Package (x86). In addition, this software of version 13.00 or later does not work on Windows2000.

Note:

When you run the setup program for IQproducer™ version 14.02 or later (hereafter referred to as "new software") on the PC to which IQproducer™ version 14.01 or earlier (hereafter referred to as "old software") has been installed, the automatic uninstallation of the old software starts.
When the old software has been successfully uninstalled, the installation of the new software starts.

Note:

To downgrade from IQproducer™ version 14.02 or later (hereafter referred to as "new software") to IQproducer™ version 14.01 or earlier (hereafter referred to as "old software"), uninstall the new software before installing the old software.

2.2.1 Installation procedure

Follow the procedure below to install the IQproducer™ on the hard disk of your PC.

<Procedure>

1. Double-click the SETUP.EXE file in the folder where the files of the IQproducer™ are stored.
   When installing the IQproducer™ using the **setup disk**, double-click the SETUP.EXE file in the \IQproducer directory of the **setup disk**.
2. If Microsoft Visual C++ 2010 Redistributable Package (x86) is not installed to your PC, start the installation of the package.

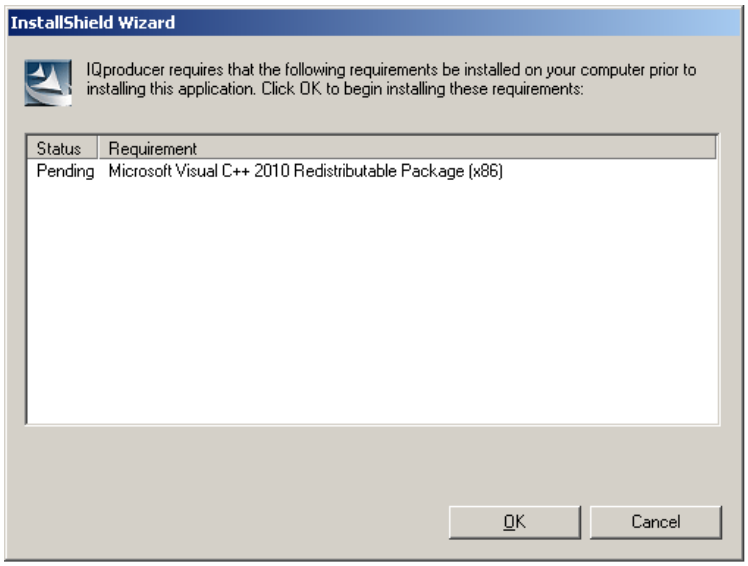

Figure 2.2.1-1 Installation of the Microsoft Visual C++2010 Redistributable Package

3. When Microsoft Visual C++ 2010 Redistributable Package (x86) version 10.0.30319 or later has been already installed, the following confirmation message may appear. If you see the confirmation message, continue the installation.

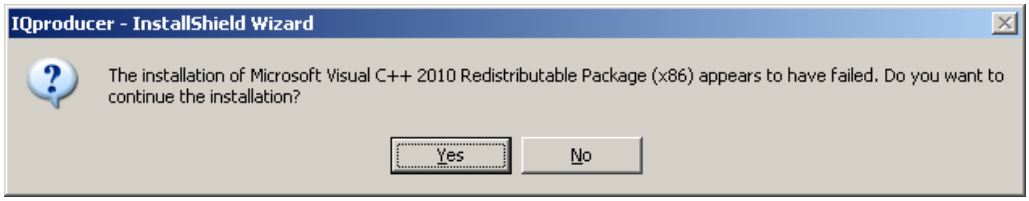

Figure 2.2.1-2 Confirmation Message That Appears When the New Version of Microsoft Visual C++2010 Redistributable Package Is Installed

To check the version information of Microsoft Visual C++ 2010 Redistributable Package (x86), click **Control Panel**, and then click **Uninstall a program**.

4. The IQproducer™ setup program starts. When **"Welcome to the InstallShield Wizard for IQproducer"** is displayed on the screen, click the **Next** button.
5. The License Agreement screen is displayed. Read the license agreement terms, and click the **Yes** button if you agree with the contents.
   Note that the installation procedure will not continue unless you agree with the license agreement terms.
6. The directory path in which the software will be installed is displayed in the **Destination Folder** field.
   When changing the installation folder, click the **Browse** button to open the directory change dialog box, and specify the desired folder. In this event, be sure to confirm that there is enough free space in the drive where the target folder belongs to. For free space, refer to Section 2.1 "Operating Environment."
   The IQproducer™ generates temporary data under the installation folder.
7. After specifying the installation folder, click the **Next** button to display the folder for storing the program icon in the program folder selection window. It is also possible to change from this window the folder for storing the program icon. Click the **Next** button to start installation.
8. When **"InstallShield Wizard Complete"** is displayed, click the **Finish** button.

2.2.2 Upgrade procedure

Follow the procedure below to upgrade the IQproducer™.

The upgrade process is run by double-clicking the SETUP.EXE file for the later version than the version currently installed on your PC.

<Procedure>

1, Double-click the SETUP.EXE file in the folder where the IQproducer™ is stored. To install using the **setup disk** for the IQproducer™, double-click the SETUP.EXE file stored in the \IQproducer folder on the **setup disk**.

2. The installation of Microsoft Visual C++ 2010 Redistributable Package (x86) begins in the same way as described in step 2 of 2.2.1 "Installation procedure". Follow step 2 of 2.2.1 "Installation procedure".

3. Follow step 3 of 2.2.1 "Installation procedure".

4. When you see the following message after the IQproducer™ setup program starts, click the **Yes** button:
"The setup will perform an upgrade of 'IQproducer'. Do you want to continue?"

5. When you see the following message, click the **Next** button to start upgrade:
"Resuming the InstallShield Wizard for IQproducer"

6. When you see the following message, click the **Finish** button:
"Update Complete"

Note:

If you double-click the SETUP.EXE file for the older version than the version currently installed on your PC, the setup process is cancelled and you will see the following message:
"A later version of 'IQproducer' is already installed on this machine. The setup cannot continue."

2.2.3 Uninstallation procedure

Follow the procedure below to uninstall the IQproducer™ from the hard disk of your PC.

<Procedure>

1. Click the **Start** button on the Windows task bar, point **Setting**, and click **Control Panel**.
2. Double-click the **Add or Remove Programs** icon.
3. On the **Change or Remove Programs** tab, click the **IQproducer** item in the **Currently Installed Programs** list to display it highlighted.
4. Click the **Change/Remove** button.
5. When the uninstall program starts, read the message, and click the **OK** button.
6. A confirmation message may be displayed during uninstallation, asking whether to remove a shared file. Select **NO** unless it is not certain whether the indicated file is shared by any other programs. Some programs may not function correctly if a necessary shared file is removed inadvertently.
7. When **"Uninstallation Complete"** is displayed, click the **Finish** button.

Note:

If a shared file is removed, there is a possibility that other application programs may not function. Do not remove the shared file unless it is not certain whether the indicated file is shared or not.

Even if a shared file is removed inadvertently, it may be restored by installing the IQproducer™ again.

If the short file name support was disabled on your Windows, IQproducer™ before version 1.02 cannot be uninstalled.

Chapter 3 Basic Operations

This chapter describes the operations specifically important for operating the IQproducer™ on Windows.

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3.1 Operations for Menu

3.1.1 Operations using mouse

■ Description for mouse operation

- Point: To move a mouse and place the mouse pointer onto the operation target object.
- Click: To press a mouse button and release it immediately. The button indicates a left button unless otherwise specified.
- Double click: To click a mouse button twice quickly. The button indicates a left button unless otherwise specified.
- Drag: To press a mouse button and then move the mouse while holding down the button. The button indicates a left button unless otherwise specified.

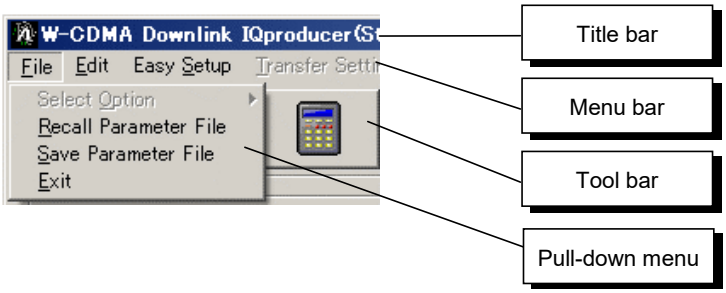

Figure 3.1.1-1 Screen explanation

<Procedure>

1. Click a menu on the menu bar (**File**, **Edit**, etc.) to display the pull-down menu.
2. Select an item to be executed from the displayed pull-down menu, and click it.

3.1.2 Operations using keyboard

<Procedure>

1. Press Alt.
2. Select a menu on the menu bar using the right and left cursor keys (←/→), and press Enter or the down cursor key (↓) to display the pull-down menu.
3. Select an item to be executed from the displayed pull-down menu, and then press Enter.

3.1.3 Operations using up and down cursor keys

<Procedure>

1. Select an item to be executed using the up and down cursor keys (↑/↓) and press [Enter].
   An item can also be selected by pressing the underscored character in that item on the menu bar and pull-down menus. Such a key is referred to as "accelerator key." For example, the accelerator key for the **Recall Parameter file** item is [R], and for **Exit**, [E]. When selecting an item on the menu bar, however, it is necessary to activate the menu bar (an item is highlighted when the menu bar is activated) by pressing [Alt].

3.2 Operations for Dialog Box

3.2.1 File Open and Save as…

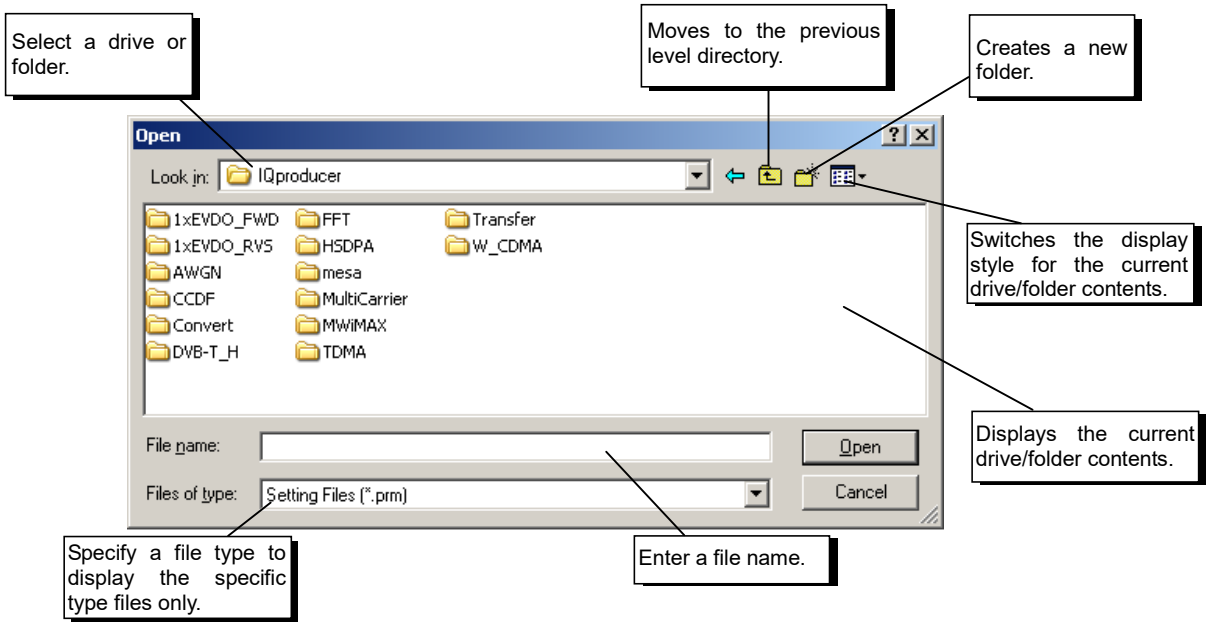

Figure 3.2.1-1 Dialog box

<Procedure>

1. Select a drive or folder from the **Look in** box (for opening a file) or the **Save in** box (for saving a file).
   For the mouse operation, click the **Look in** or **Save in** box to open the list of drives and folders. Select the target drive or folder from the list and click it to switch the display (the contents of the selected drive/folder are displayed).
   For the keyboard operation, press Tab several times to highlight the **Look in** or **Save in** box, then press the up or down cursor key (↑/↓) to open the pull-down list of drives and folders. Use the cursor keys (↑/↓/←/→) to select the target drive or folder from the list and then press Enter.
2. Select a file type from the **Files of type** text box.
   For the mouse operation, click the **Files of type** text box to open the list of file types. Select the target file type from the list and click it.
   For the keyboard operation, press Tab several times to highlight the **Files of type** text box, then press the up or down cursor key (↑/↓) to open the pull-down list of file types. Use the cursor keys (↑/↓/←/→) to select the target file type from the list and then press Enter.

3. Enter into the **File name** box the name of a file to be opened or saved.
4. When opening a file by the mouse operation, click the file to be opened from the displayed files. The name of the selected file is displayed in the **File name** text box. Click the **Open** button to open the selected file.
   The contents of a folder can also be displayed in a similar manner. Click a folder and then click the **Open** button to open the contents of the selected folder.
   When opening a file or folder by the keyboard operation, press Tab several times to move the cursor to the folder/file display field (highlighted when selected), and use the cursor keys (↑/↓/←/→) to select the file or folder to be opened. Then press Enter to open the selected file/folder.
5. When saving a file with a specified name, highlight the **File name** text box by clicking it (mouse operation) or pressing Tab several times (keyboard operation).
   Next, type the desired file name in the text box.
   Then click the **Save** button (mouse operation) or press Enter (keyboard operation) to save the file with the specified name.
6. The "Open" and "Save As" operations can be cancelled halfway. For the mouse operation, click the **Cancel** button. For the keyboard operation, press Tab several times to move the cursor to the **Cancel** button and press Enter.

3.2.2 Entering numeric value and character string

<Procedure>

1. When entering a numeric value, click the desired numeric value entry text box or move the cursor to the desired numeric value entry text box by pressing [Tab] several times.
   Enter a numeric value from the keyboard or numeric keypad. Then click the **OK** button or press [Enter] to input (finalize) the entered value.
2. When entering a character string, click the desired character string entry text box or move the cursor to the desired character string entry text box by pressing [Tab] several times.
   Enter a character string from the keyboard. Then click the **OK** button or press [Enter] to input (finalize) the entered character string.
3. The numeric value or character string entry operation can be cancelled halfway. For the mouse operation, click the **Cancel** button. For the keyboard operation, move the cursor to the **Cancel** button by pressing [Tab] several times and press [Enter].

Chapter 4 Operations for Each Function

This chapter describes the items that the users should understand when actually operating the IQproducer™, including the names of parts in each screen, operations in the CCDF/FFT graph screens, file conversion settings in the Convert screen, and functions in the data transfer screen.

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4.1 Starting/Exiting IQproducer™

4.1.1 Starting Software

Start the IQproducer™ by following the procedures below.

<Procedure>

1. Click the **Start** button on the Windows task bar, and select **All Programs**. Then select **Anritsu Corporation** from the displayed program group and click **IQproducer**.
2. When IQproducer™ is started, the Select instrument dialog box is displayed.

   From the Select instrument options, select the main unit model that will use the waveform patterns created by IQproducer™.

Notes:

- MG3740A requires the digital modulation option (020/120) to start IQproducer™.
- If you don't want to see the Select instrument window again, select the **Don't show this window next time** check box, and IQproducer™ will start for the selected model from the next startup without displaying the Select instrument window.

3. The common platform screen is displayed after starting up the IQproducer™.

   The common platform screen is a screen used to select each function of the IQproducer™.

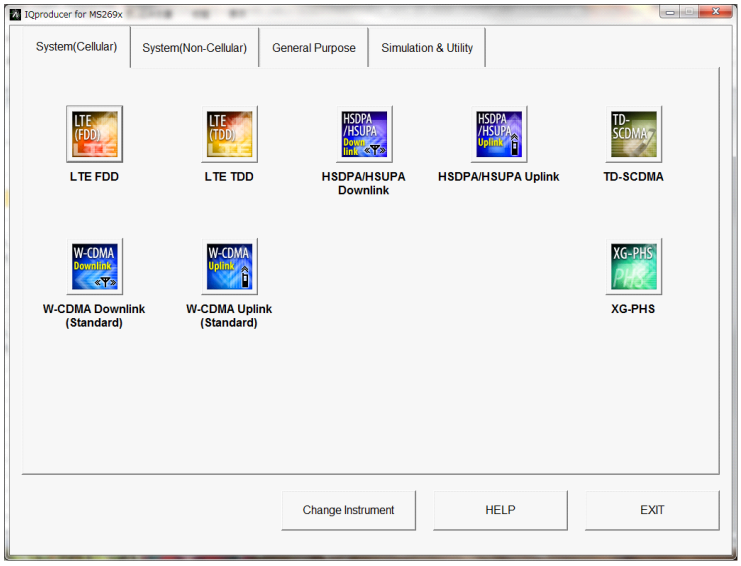


Figure 4.1.1-1 Common Platform Screen

4.1.2 Exiting Software

To exit IQproducer™ that are running, select **Exit** on the Common Platform Screen. In this case, a dialog is displayed to confirm stopping of each running tool.

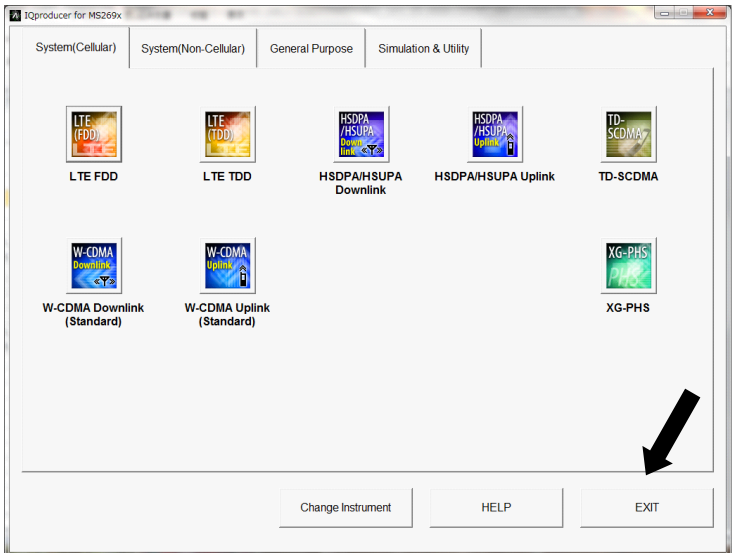


Figure 4.1.2-1 Exiting IQproducer™

4.2 Common Platform Screen

The common platform screen shown in Figure 4.2-1 below is displayed first after starting up the IQproducer™.

The common platform screen is a screen used to select each function of the IQproducer™. Only the menu bar for selecting a function is displayed in this screen.

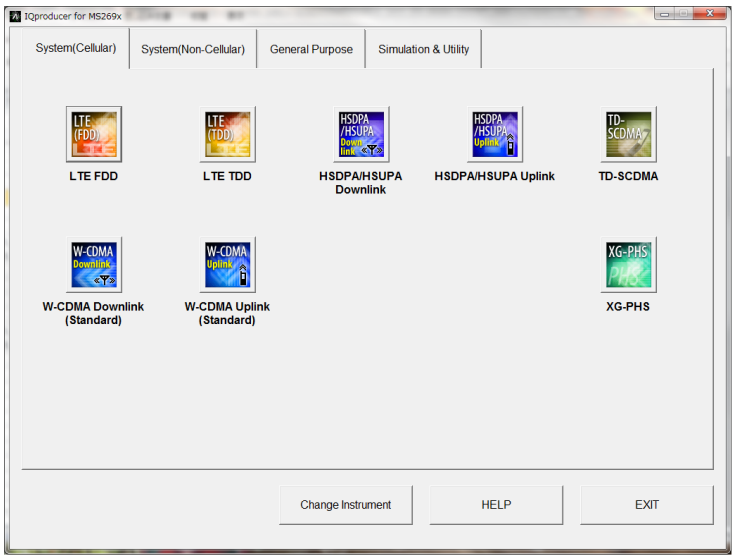


Figure 4.2-1 Common Platform Screen

■ Description of menus

(1) System (Cellular) tab

Cellular system applications are displayed on the tabbed page. For detailed information about the signal generation applications, refer to the operation manual for each application.

(2) System (Non-Cellular) tab

Non-cellular system applications are displayed on the tabbed page. For detailed information about the signal generation applications, refer to the operation manual for each application.

(3) General Purpose tab

General purpose applications are displayed on the tabbed page. For detailed information about the signal generation applications, refer to the operation manual for each application.

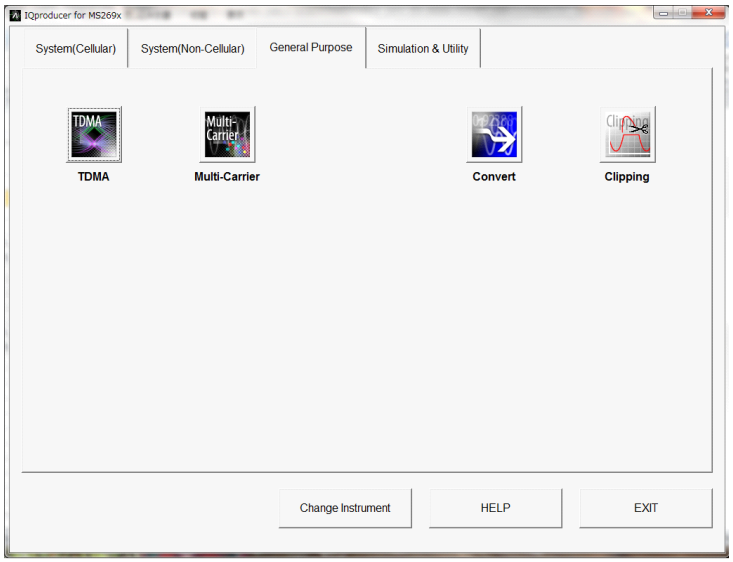


Figure 4.2-2 General Purpose Tab

1 TDMA

TDMA applications are displayed.
Waveform patterns corresponding to TDMA system specifications are created in this application.

2 Multi-Carrier

Multi-Carrier applications are displayed.
Modulated waveform patterns corresponding to Multi-Carrier system specifications are created in this application.

3 Convert

The Convert screen is displayed.
In the Convert screen, ASCII-format waveform patterns generated by simulation software, digitized files created by the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A using the digitize function, and waveform patterns formatted for the MS269x, MS2830A or MS2840A can be converted into a file so as to be used in the mainframe. Conversely, a waveform pattern for the mainframe can also be converted into a file that can be used in the MS2690A/MS2691A/MS2692A, MS2830A or MS2840A.

4 Clipping

The Clipping setting screen is displayed.
Clipping processing can be performed in the Clipping setting screen, for a waveform pattern generated by each signal generation application.

(4) Simulation & Utility tab

Application menus of simulations and utilities are displayed on this tabbed page.

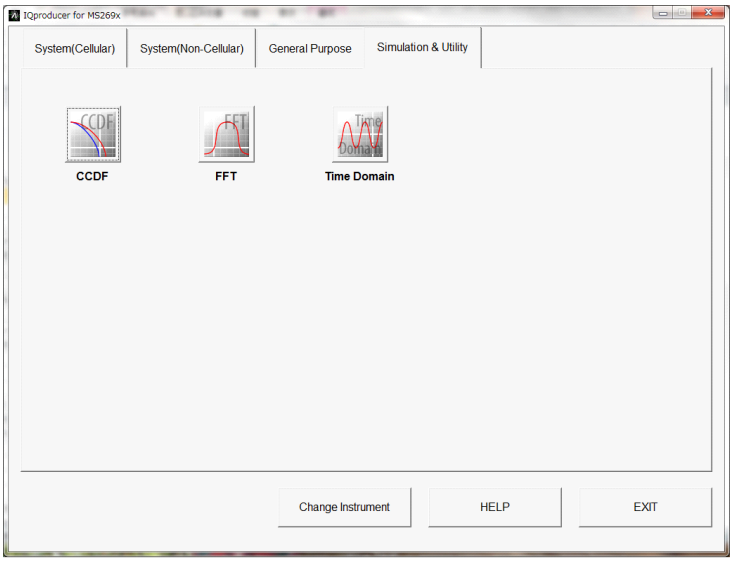


Figure 4.2-3 Simulation & Utility Tab

1 CCDF

Displays the CCDF Graph Monitor screen.
The CCDF of a generated waveform pattern is displayed in a graph.

2 FFT

Displays the FFT Graph Monitor screen.
The spectrum where FFT processing is performed for a generated waveform pattern is displayed in a graph.

3 Time Domain

Displays the time domain graph display screen.
The time domain waveform of a created waveform pattern can be displayed in a graph.

(5) Change Instrument button

Provided to display the Select instrument dialog box at the next startup. A message is displayed indicating that the IQproducer™ must be restarted to change the target model.

(6) Help button

The version information of the IQproducer™ is displayed.

(7) Exit button

Exits from this software. This menu also closes all the other screens for IQproducer™ functions if displayed.

4.3 CCDF Graph Display

The Complementary Cumulative Distribution Function (CCDF) of a waveform pattern generated by a signal generation application can be displayed.

In a CCDF graph, the signal peak power/average power is displayed on the X axis, and on the Y axis, the cumulative probability that the peak power / average power of the signal is equal to or less than the value on the X axis is displayed. Distribution of peak powers of various modulation signals can be displayed in a screen. This screen is useful, for example, for estimating the output waveform distortion characteristics when a generated signal is input from the Vector Signal Generator option to a power amplifier or other devices.

4.3.1 Activation

Select **CCDF** from the **Simulation & Utility** tab on the common platform screen. The CCDF graph display screen is displayed separately.

4.3.2 CCDF graph display screen

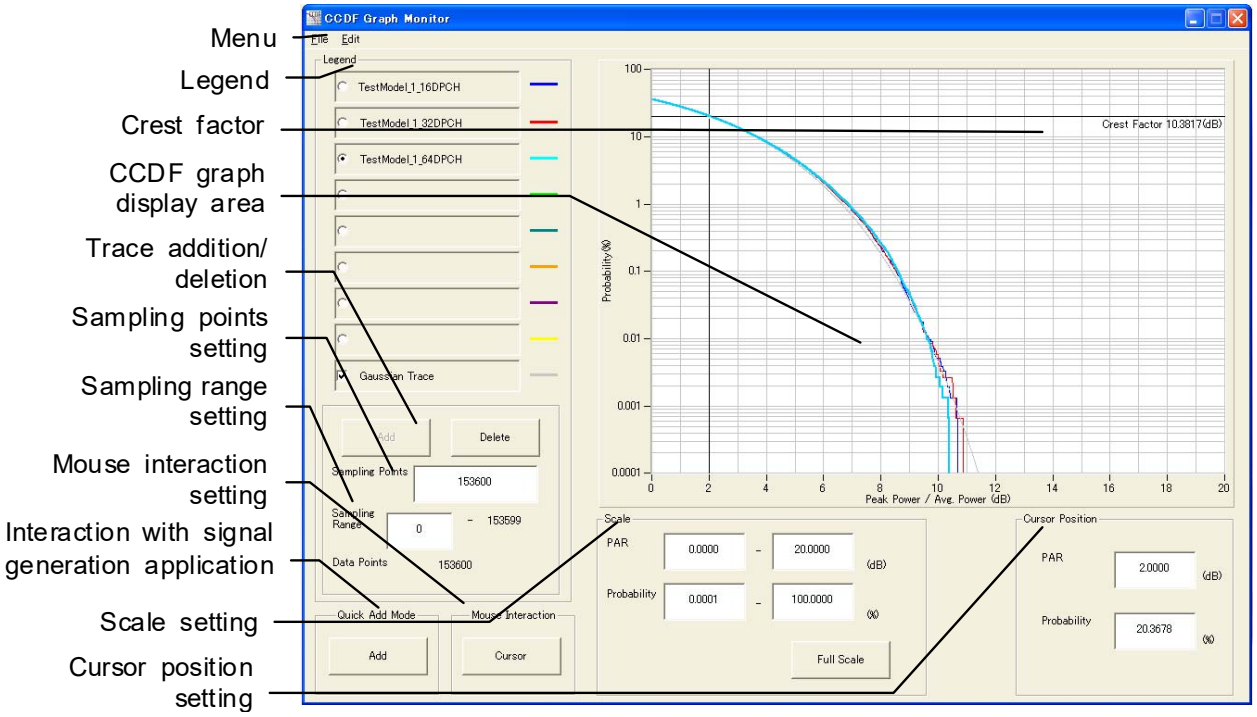


Figure 4.3.2-1 CCDF graph display screen

■ Description of items in CCDF graph display screen

(1) Menu

Trace addition, graph print out, screen copy, graph data saving into a CSV format file, and CCDF graph display close can be executed.

(2) Legend

File name display for an added trace, selection of a displayed trace, and selection of a trace to be added/deleted can be executed.

(3) CCDF graph display area

A CCDF graph is displayed in this area. Cursor move and graph zoom-in display can be executed.

(4) Crest Factor

The ratio between the peak value and RMS value of the selected trace is displayed.

(5) **Add/Delete** (trace addition/deletion)

A trace can be added/deleted.

(6) Sampling Points

The number of samples calculated by reading the selected trace is displayed. Different sampling points can be set by changing the value in this text box.

(7) Sampling Range
The sampling range for the selected trace is displayed. A different sampling range can be set by changing the value in this text box.

(8) Cursor Position
The current cursor position is displayed. The cursor position in the CCDF graph display area can be specified by entering a value in either **PAR** or **Probability** text box.

(9) Quick Add Mode (interaction with signal generation application)
Settings for addition of a waveform pattern generated by a signal generation application to the CCDF graph display in conjunction with the signal generation application can be executed.

(10) Scale setting
The scale of the X and Y axes in the CCDF graph display area can be changed.

(11) Mouse Interaction
The mouse operation in the CCDF graph display area can be set to either the cursor move function or the zoom-in function.

4.3.3 Displaying CCDF graph

A waveform pattern generated by a signal generation application of the IQproducer™ can be read and displayed in a CCDF graph.

■ CCDF graph display procedure

<Procedure>

1. Click one of the option buttons in the **Legend** dialog box to select the trace color of the waveform pattern in the CCDF graphical area.

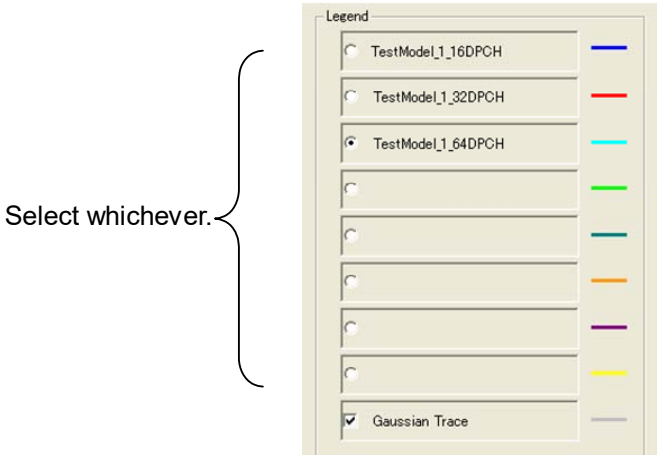


Figure 4.3.3-1 Selecting radio button in Legend

2. Click the **Add** button.

   The **Add** button is disabled and cannot be selected when another waveform pattern is already selected. In this event, delete the selected waveform pattern or click another radio button in the **Legend** field.

   Otherwise, click **Add Trace** from the **File** menu.

Figure 4.3.3-2 Add button

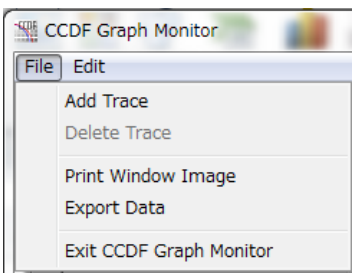


Figure 4.3.3-3 Add Trace in File menu

3. Click the [...] button in the Add Trace screen, and select a waveform pattern for which a CCDF graph is displayed. Next, set the number of target data samples and the target data area for displaying the CCDF graph, in the **Sampling Points** and **Sampling Range** text boxes, respectively. If the target area includes the RF Gate OFF area (RF output is set to off) at this time, the RF Gate OFF interval can be excluded from the CCDF graph display target by selecting the **Exclude RF Output Off Sample** check box.

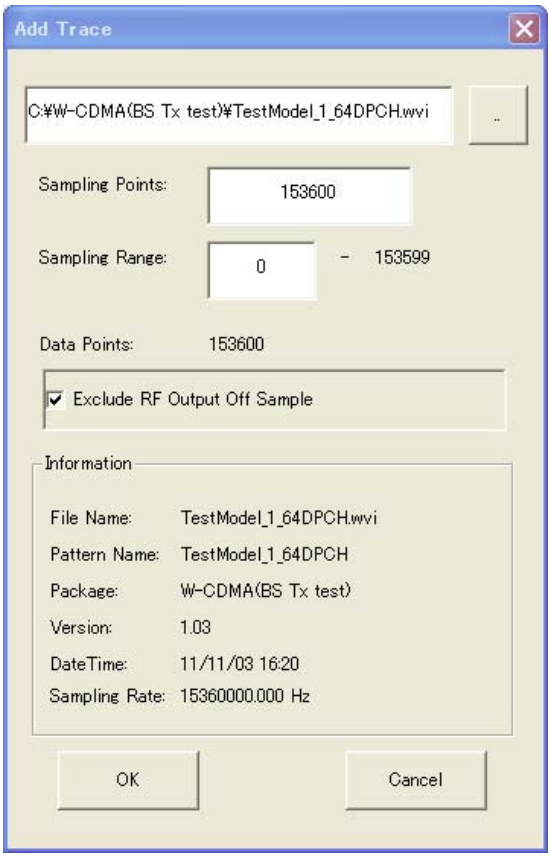


Figure 4.3.3-4 Add Trace screen

4. Click the **OK** button on the Add Trace screen to read the waveform pattern. A graph calculation progress screen as shown below is displayed while reading the waveform pattern.

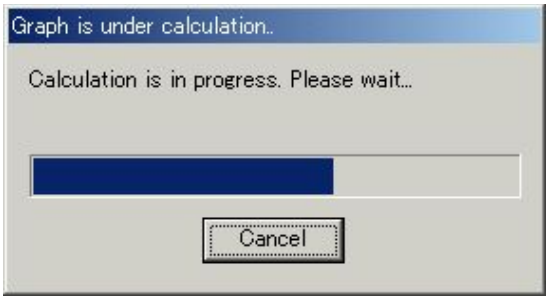


Figure 4.3.3-5 Graph calculation progress screen

If the **Cancel** button is clicked during the graph calculation, the calculation is interrupted and waveform pattern reading is stopped.

When the graph calculation and waveform reading have been completed, the graph calculation progress screen is closed automatically, and the CCDF graph display screen is displayed again with a trace in the color selected in **Legend**.

4.3.4 Deleting CCDF graph

The CCDF graph displayed in the screen can be deleted.

■ CCDF graph display deleting procedure

<Procedure>

1. In the **Legend** field, click the radio button of the trace to be deleted.

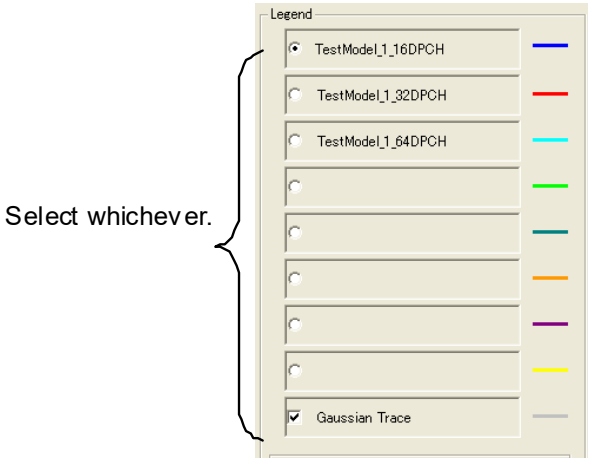


Figure 4.3.4-1 Selecting radio button in Legend

2. Click the **Delete** button.

Figure 4.3.4-2 Delete button

Otherwise, click **Delete Trace** from the **File** menu.

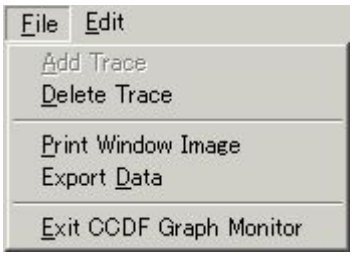


Figure 4.3.4-3 Delete Trace in File menu

The trace selected in **Legend** is deleted. After deleting a trace, another waveform pattern can be selected for that item.

4.3.5 Displaying Gaussian trace

A Gaussian distribution trace can be displayed in the graph when the **Gaussian Trace** check box is selected. This is useful when comparing the Peak Power/Average Power distribution of the waveform pattern used with the Gaussian distribution.

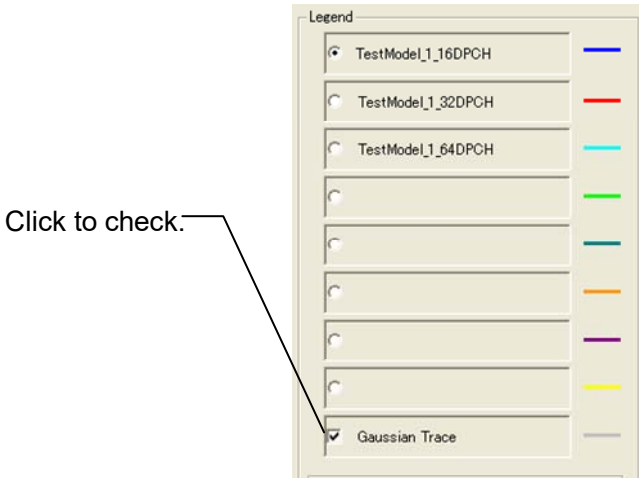


Figure 4.3.5-1 Selecting Gaussian trace

4.3.6 Interaction with signal generation application (Quick Add Mode)

The method for adding a trace to the CCDF graph in conjunction with a signal generation application can be set and changed. This function is enabled only when the CCDF graph display function is activated.

Click the **Quick Add Mode** button to display the **Quick Add Mode** dialog box.

Figure 4.3.6-1 Quick Add Mode Dialog Box

■ When Add is selected:

A trace is added to the **CCDF** graph when **CCDF** is selected from the **Simulation** menu or the **CCDF** tool button is clicked after data generation by the signal generation application. Note that the CCDF graph display will not be updated when the eight traces are all used.

■ When Clear is selected:
A trace is deleted from the CCDF graph and the distribution of the generated waveform pattern is displayed when **CCDF** is selected from the **Simulation** menu or the **CCDF** tool button is clicked after data generation by the signal generation application.

■ When Off is selected:
The CCDF graph display will not be updated even when **CCDF** is selected from the **Simulation** menu or the **CCDF** tool button is clicked after data generation by the signal generation application.

4.3.7 Selecting mouse interaction in CCDF graph display area

Cursor move or graph zoom-in is selected for a dragging operation in the CCDF graph display area.

Click the **Mouse Interaction** button to display the **Mouse Interaction** dialog box.

Cursor The mouse is used to move the cursor.

Zoom The mouse is used to set the zooming area.

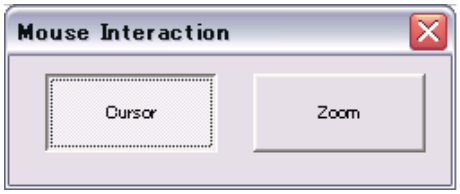


Figure 4.3.7-1 Mouse Interaction Dialog Box

4.3.8 Moving graph cursor

The cursor displayed in the CCDF graph display area can be moved.

■ Moving cursor using mouse

When the **Cursor** radio button is selected in **Mouse Interaction**, the black-line cursor is moved by dragging the cursor in the CCDF graph display area.

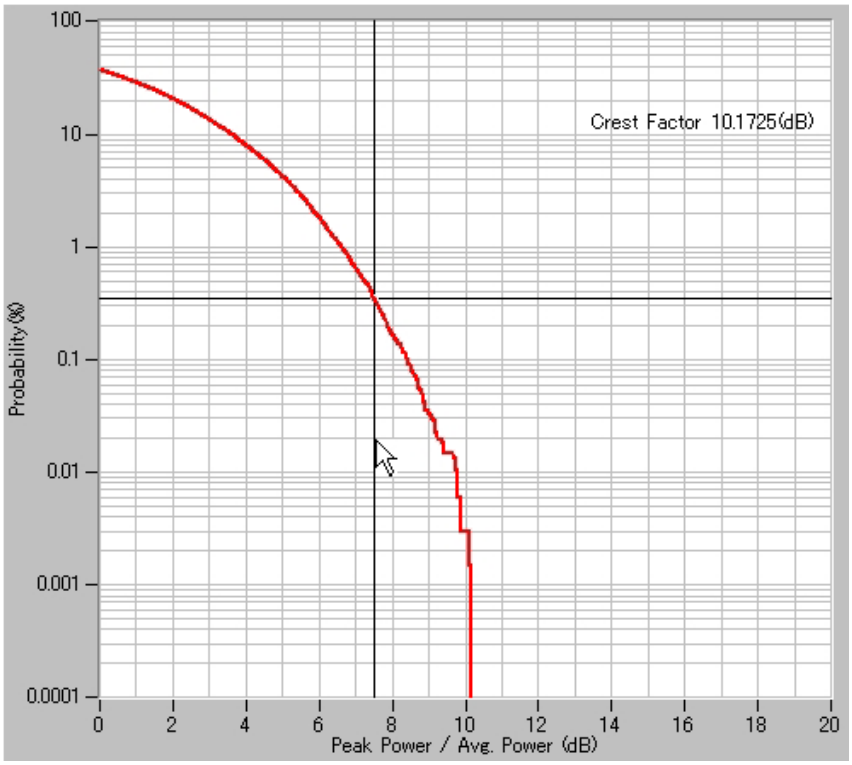


Figure 4.3.8-1 Cursor in CCDF graph display area

The contents displayed in **Cursor Position** in the CCDF graph display screen are updated as the cursor is moved.

■ Moving cursor changing Cursor value

The black-line cursor is moved by changing the value of **Cursor Position** in the CCDF graph display screen.

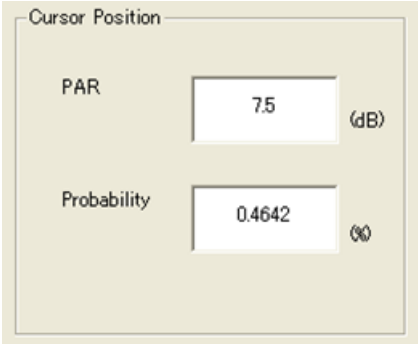


Figure 4.3.8-2 Cursor Position input

<Procedure>

1. When setting the cursor position by a Peak Power/Average Power value, click the **PAR** text box and enter a value from the keyboard.
2. When setting the cursor position by a cumulative possibility, click the **Probability** text box and enter a value from the keyboard.

When the focus is moved after changing the value in the **PAR** or **Probability** text box as shown in step 1 or 2, the black-line cursor in the CCDF graph display area is moved.

4.3.9 Changing graph scale

The scale of the graph currently displayed can be changed.

■ Changing graph display area scale

The display ranges for the X and Y axes in the CCDF graph display area are updated by changing the value in **Scale** in the CCDF graph display screen.

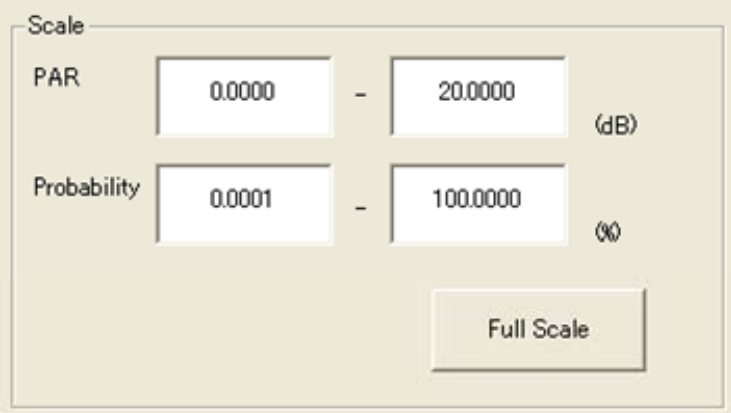


Figure 4.3.9-1 Scale input

<Procedure>

1. When changing the display range for the X axis, click the **PAR** text field and enter a value from the keyboard.
2. When changing the display range for the Y axis, click the **Probability** text field and enter a value from the keyboard.
3. When the **Full Scale** button is clicked, the scales for both axes are adjusted so that the entire of CCDF curve is displayed.

When the focus is moved after changing the value in the **PAR** text box as shown in 1. above, the scale for the X axis in the CCDF graph display area is updated.

Similarly, when the focus is moved after changing the value in the **Probability** text box as shown in 2. above, the scale for the Y axis in the CCDF graph display area is updated.

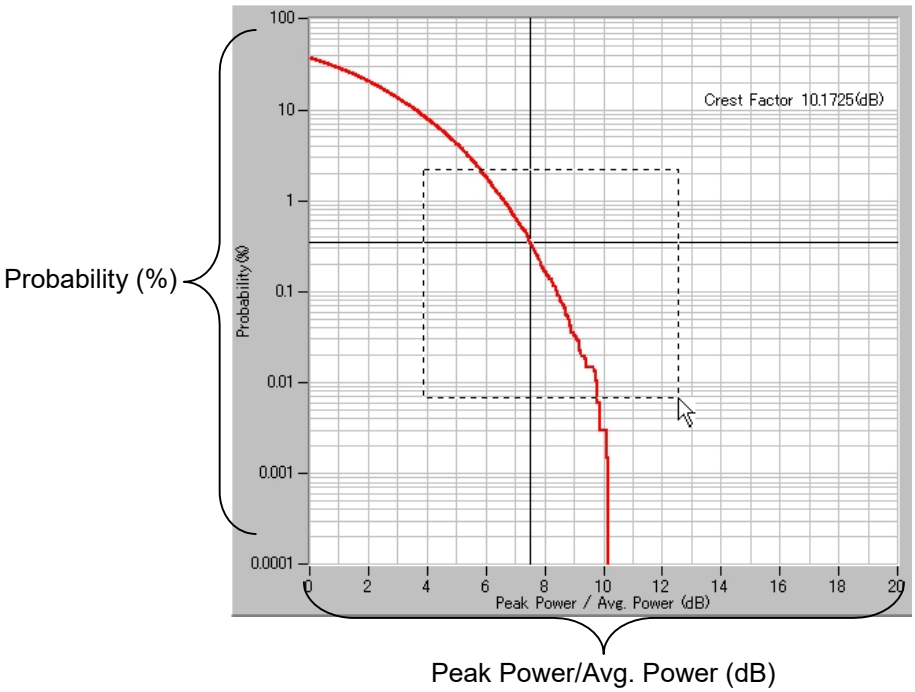


Figure 4.3.9-2 Graph scale change in CCDF graph display area

■ Specifying display area by mouse operation

When **Zoom** is selected for **Mouse Interaction**, pointing and dragging an area in the CCDF graph enlarges the selected area (enclosed by dotted lines).

4.3.10 Printing/saving graph data

■ Printing out graph display screen

Click **Print Window Image** from the **File** menu to display the print screen. Set the printer, printing range, number of copies, etc., in this screen, and print out the CCDF graph display screen (entire of the window) from the printer.

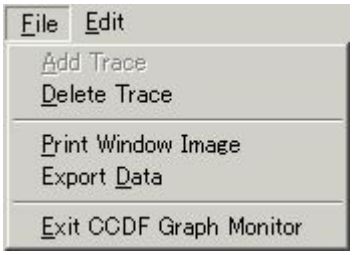


Figure 4.3.10-1 Print Window Image in File menu

■ Outputting graph data to file

Click **Export Data** from the **File** menu to display the file save screen. Set the saving destination, etc., in this screen, and click the **Save** button. Lists of Peak per Average (dB) and Probability (%) are saved to a file in the CSV format (a text file format in which values are delimited by a comma).

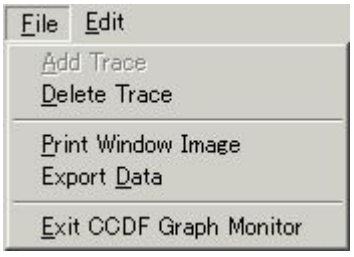


Figure 4.3.10-2 Export Data in File menu

■ Copying graph image on screen

Click **Copy Graph Image** from the **Edit** menu to copy the current graph image on the screen to the clipboard.

Figure 4.3.10-3 Copy Graph Image in Edit menu

4.4 FFT Graph Display

The Fast Fourier Transform (FFT) calculation results for a waveform pattern can be displayed in a graph.
The Blackman-Harris window function is used.

4.4.1 Activation

Select **FFT** from the **Simulation & Utility** tab on the common platform screen. The FFT graph display screen is displayed separately.

4.4.2 FFT graph display screen

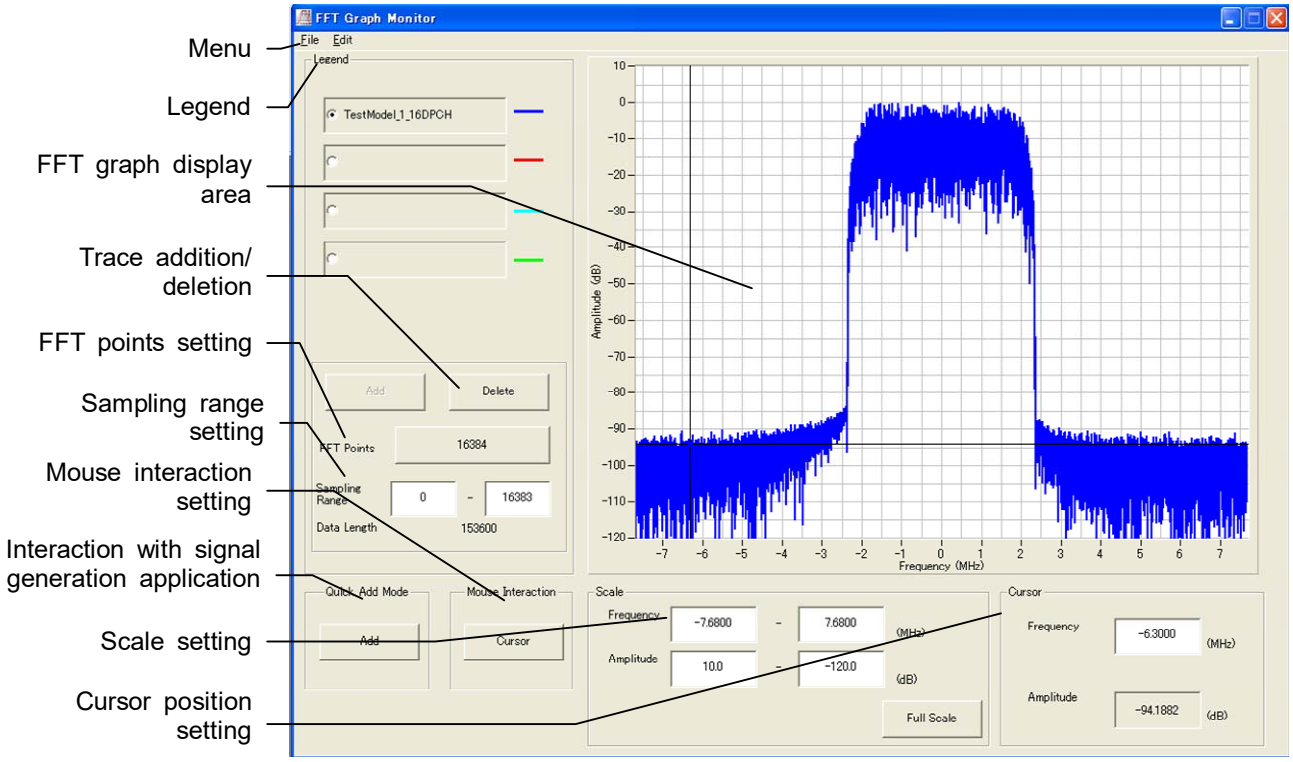


Figure 4.4.2-1 FFT graph display screen

■ Description of items in FFT graph display screen

(1) Menu
Trace addition, graph print out, screen copy, graph data saving into a CSV format file, and FFT graph display close can be executed.

(2) Legend
File name display for an added trace, selection of a displayed trace, and selection of a trace to be added/deleted can be executed.

(3) FFT graph display area
An FFT graph is displayed in this area. Cursor move and graph zoom-in display can be executed.

(4) **Add/Delete** (trace addition/deletion)
A trace can be added/deleted.

(5) FFT Points
The number of points of the X axis in the FFT graph display area can be specified.

(6) Cursor Position
The cursor position in the FFT graph display area can be specified by entering a value in the **Frequency** text box.

(7) Quick Add Mode (interaction with signal generation application)
Settings for addition of a waveform pattern generated by a signal generation application to the FFT graph display in conjunction with the signal generation application can be executed.

(8) Scale setting
The scale of the X and Y axes in the FFT graph display area can be changed.

(9) Mouse Interaction
The mouse operation in the FFT graph display area can be set to either the cursor move function or the zoom-in function.

4.4.3 Displaying FFT graph

A waveform pattern generated by a signal generation application of the IQproducer™ can be read and displayed in an FFT graph.

■ FFT graph display

<Procedure>

1. Click one of the option buttons in the **Legend** dialog box to select the trace color of the wave form pattern in the FFT graphical area.

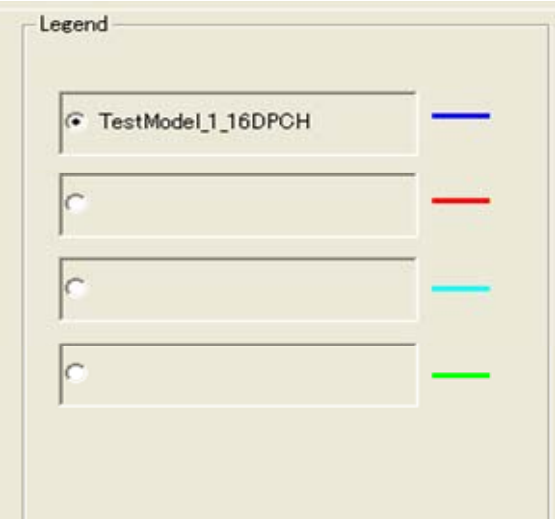


Figure 4.4.3-1 Selecting radio button in Legend

2. Click the **FFT Points** button to display the **FFT Points** dialog box. Then, select the number of points for the FFT operation. Be sure to select a value smaller than the number of sample points of the selected waveform pattern.

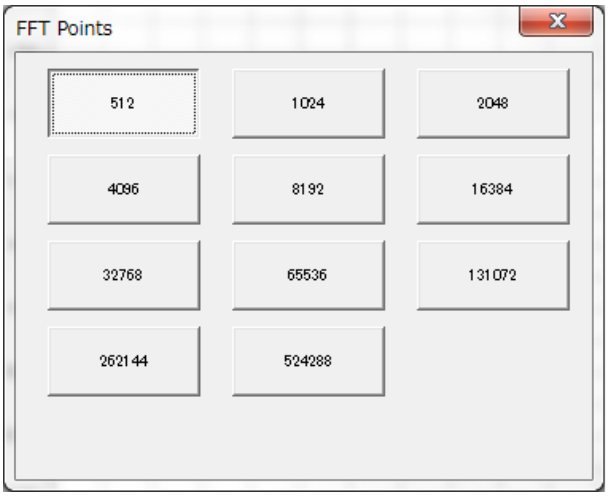


Figure 4.4.3-2 FFT Point selection

3. Click the **Add** button.

   The **Add** button is disabled when any other waveform pattern is already specified on the selected option button. In such a case, delete the waveform pattern by clicking the Delete button, or click one of other option button.

Figure 4.4.3-3 Add button

Otherwise, click **Add Trace** from the **File** menu.

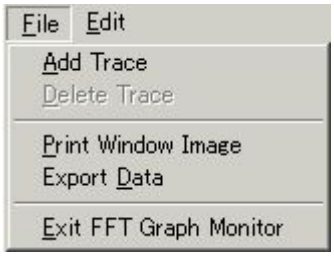


Figure 4.4.3-4 Add Trace in File menu

4. Click the [..] button in the Add Trace screen, and select a waveform pattern for which an FFT graph is displayed.

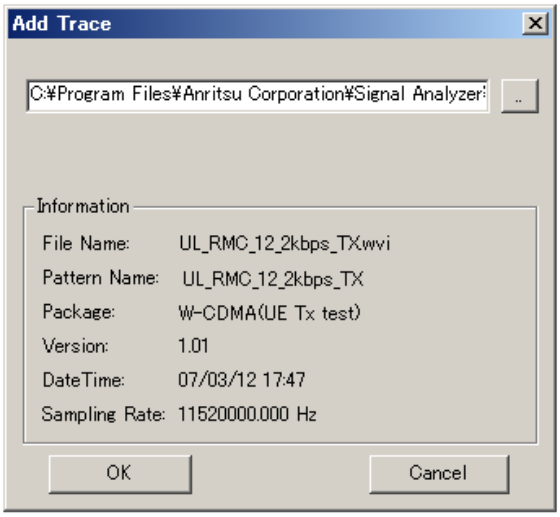


Figure 4.4.3-5 Add Trace screen

5. Click the **OK** button on the Add Trace screen to read the waveform pattern. A graph calculation progress screen as shown below is displayed while reading the waveform pattern.
   When the graph calculation has completed, the FFT graph display screen is displayed again with a trace in the color selected in the **Legend** field.
   If a waveform pattern having a different sampling rate with that of the currently displayed waveform pattern is added, the current waveform pattern display disappears.

4.4.4 Deleting FFT graph

The FFT graph displayed in the screen can be deleted.

■ Deleting FFT graph display

<Procedure>

1. In the **Legend** field, click the radio button of the trace to be deleted.

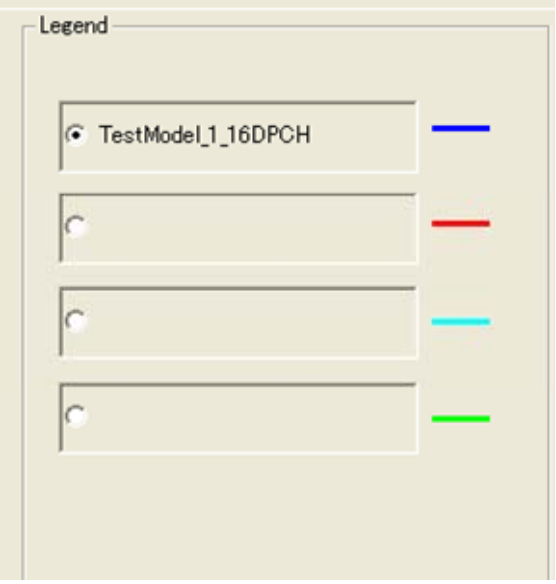


Figure 4.4.4-1 Selecting radio button in Legend

2. Click the **Delete** button to delete the graph corresponding to the selection in the Legend field.

Figure 4.4.4-2 Delete button

Otherwise, click **Delete Trace** from the **File** menu.

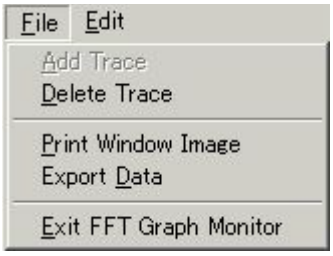


Figure 4.4.4-3 Delete Trace in File menu

The trace selected in **Legend** is deleted. After deleting a trace, another waveform pattern can be selected for that item.

4.4.5 Changing graph display area and axis plot interval

The plot interval of the X axis (frequency) on the FFT graph and the data range for FFT analysis can be changed.

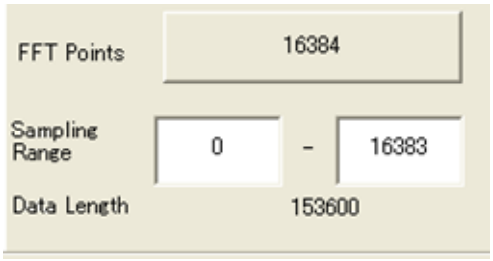


Figure 4.4.5-1 Parameter input

<Procedure>

1. Click the **FFT Points** button to display the **FFT Points** dialog box. Then, select the number of points for the FFT operation.

   When the focus is moved to another control after selecting the FFT Points value, the plot interval of the X axis in the graph display area is changed.

2. Click the **Sampling Range** text box and enter the Sampling Range value.
   When the focus is moved to another control after changing the Sampling Range value, the data range of the waveform pattern for FFT analysis is changed.

When the FFT Points value is changed, the new FFT Points value is applied to all the waveform patterns currently read. If the Sampling Range value has been set before changing the FFT Points value, it is cleared to "0" – "FFT Points – 1" after FFT Point value changes.

4.4.6 Interaction with signal generation application (Quick Add Mode)

The method for updating the FFT graph display in conjunction with waveform pattern generation by a signal generation application can be set and changed. This function is enabled only when the FFT graph display function is activated. Click the **Quick Add Mode** button to display the **Quick Add Mode** dialog box.

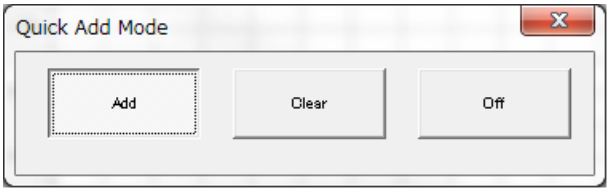


Figure 4.4.6-1 Quick Add Mode

■ When Add is selected:

A trace is added to the FFT graph when **FFT** is selected from the **Simulation** menu or the **FFT** tool button is clicked after data generation by the signal generation application. Note that the FFT graph display will not be updated when the four traces are all used.

■ When Clear is selected:

A trace is deleted from the FFT graph and the FFT analysis result of the generated data is displayed when **FFT** is selected from the **Simulation** menu or the **FFT** tool button is clicked after data generation by the signal generation application.

■ When Off is selected:

The FFT graph display will not be updated even when **FFT** is selected from the **Simulation** menu or the **FFT** tool button is clicked after data generation by the signal generation application.

4.4.7 Selecting mouse interaction in CCDF graph display area

Cursor move or graph zoom-in is selected for a mouse dragging operation in the FFT graph display area. Click the **Mouse Interaction** button to display the Mouse Interaction dialog box.

Cursor The mouse is used to move the cursor.

Zoom The mouse is used to set the zooming area.

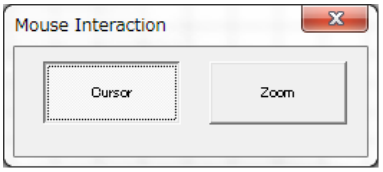


Figure 4.4.7-1 Mouse Interaction Dialog Box

4.4.8 Moving graph cursor

The cursor displayed in the FFT graph display area can be moved.

■ Moving cursor using mouse

The black-line cursor moves by dragging the cursor in the FFT graph display area.

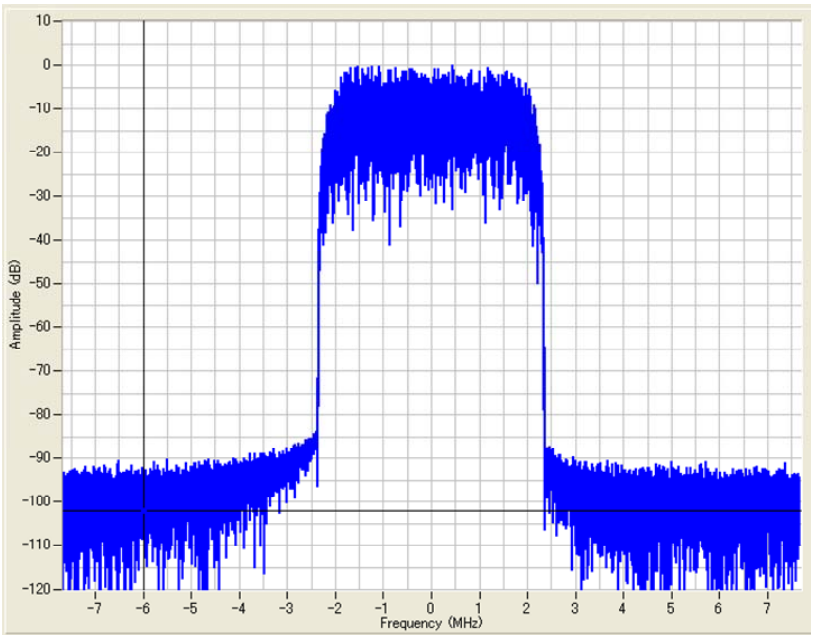


Figure 4.4.8-1 Cursor in FFT graph display area

The contents displayed in **Cursor** in the FFT graph display screen are updated as the cursor is moved.

■ Moving cursor changing Cursor value

The black-line cursor is moved by changing the value of **Cursor** in the FFT graph display screen.

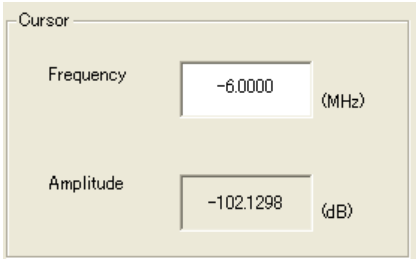


Figure 4.4.8-2 Cursor input

Click the **Frequency** text field and enter the Frequency value from the keyboard.

When the focus is moved after changing the Frequency value, the black-line cursor in the FFT graph display area is moved.

4.4.9 Changing graph scale

The scale of the graph currently displayed can be changed.

■ Changing graph display area scale

The scales for the X and Y axes in the FFT graph display area are updated by changing the value in **Scale** in the FFT graph display screen.

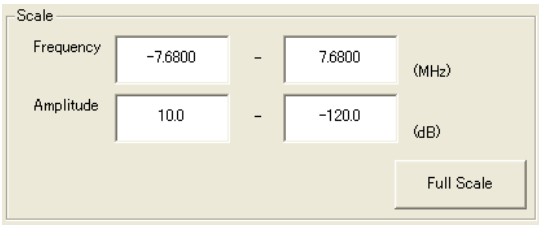


Figure 4.4.9-1 Scale input

<Procedure>

1. Click the **Frequency** text field and enter the Frequency value.
2. Click the **Amplitude** text field and enter the Amplitude value.
3. When the **Full Scale** button is clicked, the scales for both axes are adjusted so that the entire of FFT graph is displayed.

When the focus is moved after changing the value in the **Frequency** text box as shown in 1. above, the scale for the X axis in the FFT graph display area is updated.

Similarly, when the focus is moved after changing the value in the **Amplitude** text box as shown in 2. above, the scale for the Y axis in the FFT graph display area is updated.

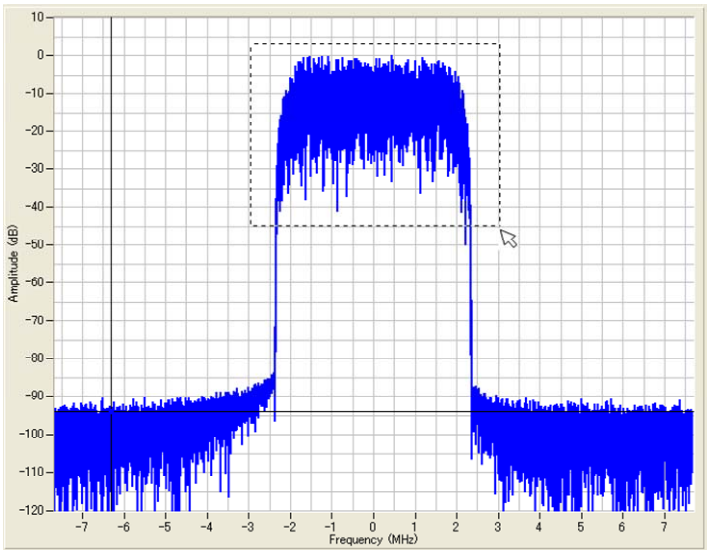


Figure 4.4.9-2 Graph scale change in FFT graph display area

■ Specifying display area by mouse operation

When **Zoom** is selected for **Mouse Interaction**, pointing and dragging an area in the CCDF graph enlarges the selected area (enclosed by dotted lines).

4.4.10 Printing/saving graph data

■ Printing out graph display screen

Click **Print Window Image** from the **File** menu to display the print screen. Set the printer, printing range, number of copies, etc., in this screen, and print out the FFT graph display screen (entire of the window) from the printer.

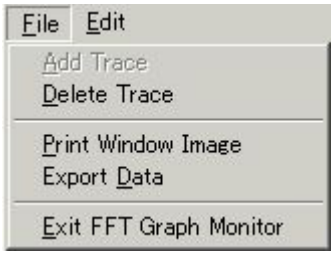


Figure 4.4.10-1 Print Window Image in File menu

■ Outputting graph data to file

Click **Export Data** from the **File** menu to display the file save screen. Set the saving destination, etc., in this screen, and click the **Save** button. Lists of Peak per Average (dB) and Probability (%) are saved to a file in the CSV format (a text file format in which values are delimited by a comma).

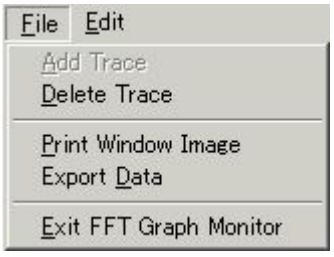


Figure 4.4.10-2 Export Data in File menu

■ Copying graph image on screen

Click **Copy Graph Image** from the **Edit** menu to copy the current graph image on the screen to the clipboard.

Figure 4.4.10-3 Copy Graph Image in Edit menu

4.5 File Conversion on Convert Screen

ASCII-format waveform patterns generated by simulator software, digitized files created by the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A using the digitize function, and waveform patterns formatted for the MG3700A/MG3710A/MG3740A can be converted into a file in the format that can be used in the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A. Conversely, a waveform pattern for the MS269x/MS2830/MS2840 can also be converted into a file that can be used in the MG3700A/MG3710A/MG3740A. The output file consists of a waveform information file (text format file with the extension ".wvi") that stores the information related to the waveform pattern and a waveform data file (binary format file with the extension ".wvd").

If the **Convert** screen is displayed in the MS2830/MS2840 mode, the functions below can be used.

Whether the memory option is used can be selected.

When **With option 27(Memory 256Msamples)** is selected for **Memory Option**, the maximum size of waveform patterns that can be generated increases from 64Msamples to 256Msamples. Enabling the memory option increases the maximum size of waveform patterns, but waveform patterns exceeding 64 Msamples can only be used if the ARB memory expansion option 256Msamples is installed for the used option (MS2690A/MS2691A/MS2692A, MS2830A, or MS2840A). Change the setting according to whether the ARB memory expansion option 256Msamples is installed for the used option (MS2690A/MS2691A/MS2692A, MS2830A, or MS2840A).
The waveform pattern bit width can be selected as 14, 15, or 16 bits. Changing the bit width can improve the dynamic range. In addition, the specifiable RMS value range and usable marker signals differ for each bit width as follows.

Table 4.5-1 Restrictions on each bit width

Bit Width	Specifiable RMS Value Range	Usable Marker Signals
14 bit	1 to 8191	Marker 1 to 3, RF Gate
15 bit	1 to 16383	Marker 1, RF Gate
16 bit	1 to 32767	None

The specifiable bit widths differ for each conversion file format as follows.

Table 4.5-2 Input file format and specifiable bit widths

Input File Format	Selectable Bit Width
ASCII1	14/15/16 bit
ASCII2	16 bit
ASCII3	14/15
MS269x/MS2830/MS2840 Digitizer	14/15/16 bit
MG3710/MG3740/MS269x/MS2830/MS2840 (to MG3700)	14 bit
MG3700/MS269x/MS2830/MS2840 (to MG3710)	14 bit
MG3700/MS269x/MS2830/MS2840 (to MG3740)	14 bit
MG3700/MG3710/MG3740/MS2830/MS2840 (to MS269x)	14 bit
MG3700/MG3710/MG3740/MS269x (to MS2830/MS2840)	14 bit

4.5.1 Activation

Click the **Convert** button on the **General Purpose** tabbed box in the Common Platform Screen. The Convert screen is displayed separately.

4.5.2 Convert screen

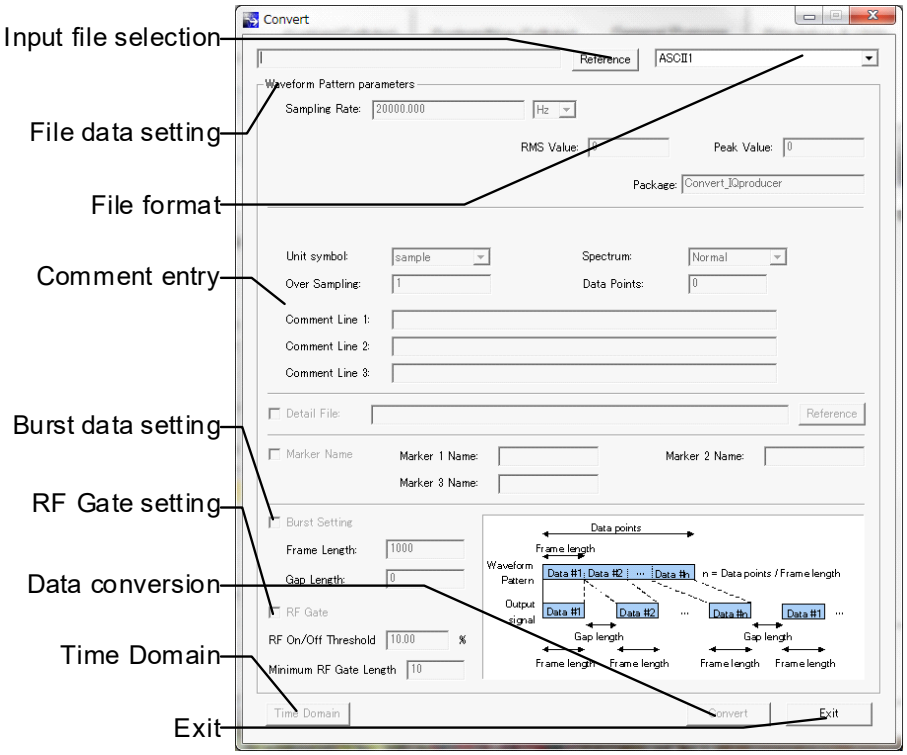


Figure 4.5.2-1 Convert screen

■ Description of items

(1) Input file selection

Click the **Reference** button and select a file to be input.

Two or more files can be selected. The selected files are displayed in the left field. The number of files to be selected varies depending on the file format setting.

(2) File data setting

Set the data to be written in the waveform information file (.wvi format) of the waveform pattern to be generated.

(3) File format

Select a file format of the conversion source file from:

ASCII1,ASCII2,ASCII3,
MS269x/MS2830/MS2840 Digitizer,
MG3710/MG3740/MS269x/MS2830/MS2840 (to MG3700),
MG3700/MS269x/MS2830/MS2840 (to MG3710),
MG3700/MS269x/MS2830/MS2840 (to MG3740),
MG3700/MG3710/MG3740/MS2830/MS2840 (to MS269x),
MG3700/MG3710/MG3740/MS269x (to MS2830/MS2840)

(4) Comment entry

Enter the comment.

(5) Burst data setting
Set the Burst data. The Burst data includes Gap Length and Frame Length, and they should be set respectively.
For a non-Burst continuous wave, set the number of samples per frame of the used communication system or "1" for Frame Length, and set "0" for Gap Length.
When an external trigger is used, the waveform pattern output timing is determined based on this setting. Refer to 2.6.2 "Setting Start/Frame trigger" in the *Vector Signal Generator Operation Manual (Operation)* for details of the external trigger.

(6) RF Gate setting (ASCII file and digitized file conversion)
Configures the RF gate settings. These parameters are enabled only when the file format is set to ASCII1, ASCII2, ASCII3, or MS269x/MS2830A/MS2840 Digitizer. When the **RF Gate** check box is selected, RF Gate processing is performed during waveform pattern conversion for samples in which the I and Q values ($|I + jQ|$) of the input ASCII file or digitized file data are continuously at or below the threshold level. The threshold level can be set by entering a ratio to the waveform pattern peak value in the RF On/Off Threshold text box. The RF Gate is executed only for the samples in which the I and Q values less than the threshold level continue for longer than the value set in the Minimum RF Gate Length text box. Since the samples for which the RF Gate is executed are excluded for rms calculation during waveform pattern conversion, it is therefore possible to prevent underestimation of the rms value of the burst signal waveform pattern (accordingly, the output level in a burst-on interval can be kept under the specified RF output level).

(7) Data conversion
Starts file conversion.

(8) Exit
Ends the conversion process.

4.5.3 Selecting input file

Select a file to be converted.

<Procedure>

1. Click the button in the **File format** box to open a pull-down menu, and select the format of the file to be input.
2. Click the **Reference** button to open the file dialog box, and select a file to be converted (conversion source file).
   The file selection dialog box is displayed when selecting several files having the same file format. Select a data file displayed in the file type.

Figure 4.5.3-1 Conversion source file selection

The number of files to be selected and the file type differ depending on the file format as follow:

ASCII1: One file that contains I-phase data, Q-phase data, and marker data.

ASCII2: Two files of I-phase data file and Q-phase data file.

ASCII3: Three files of I-phase data file, Q-phase data file, and marker data file.

MS269x/MS2830/MS2840 Digitizer:
xml file, which is a digitized file created by the Signal Analyzer using the digitize function.

MG3710/MG3740/MS269x/MS2830/MS2840 (to MG3700):
Of the wvi and wvd files, which are waveform patterns for the MG3710A, MG3740A, MS269x, MS2830A or MS2840A, respectively, select the wvi file.

MG3700/MS269x/MS2830/MS2840 (to MG3710):
Of the wvi and wvd files, which are waveform patterns for the MG3700A, MS269x, MS2830A or MS2840A, respectively, select the wvi file.

MG3700/MS269x/MS2830/MS2840 (to MG3740):
Of the wvi and wvd files, which are waveform patterns for the MG3700A, MS269x, MS2830A or MS2840A, respectively, select the wvi file.

MG3700/MG3710/MG3740/MS2830/MS2840 (to MS269x):
Of the wvi and wvd files, which are waveform patterns for the MG3700A, MG3710A, MG3740A, MS2830A or MS2840A, respectively, select the wvi file.

MG3700/MG3710/MG3740/MS269A (to MS2830/MS2840):
Of the wvi and wvd files, which are waveform patterns for the MG3700A, MG3710A, MG3740A and MS269A, respectively, select the wvi file.

Click the **OK** button to finalize the input file selection.
Click the **Cancel** button to cancel the input file selection.

If the file format is changed in the **File format** box after selecting the input files, the current settings are cleared.

3. In the MS2830A/MS2840A mode, the dialog box below for selecting the bit width appears after selecting the input file. Specify 14, 15, or 16 bits. However, the bit widths that can be specified depend on the selected file format as shown in Table 4.5-2.

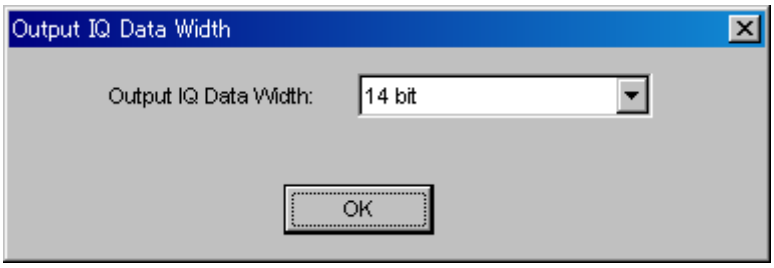


Figure 4.5.3-2 Bit-width specification dialog box

4. When the input files are selected, they are read and a dialog box appears displaying the maximum value, minimum value, RMS value and the number of data.
In this dialog box, the edit boxes for setting the first and last samples are displayed only when MS269x/MS2830A/MS2840A Digitizer is selected for the file format. Use the edit boxes for setting the reading range.

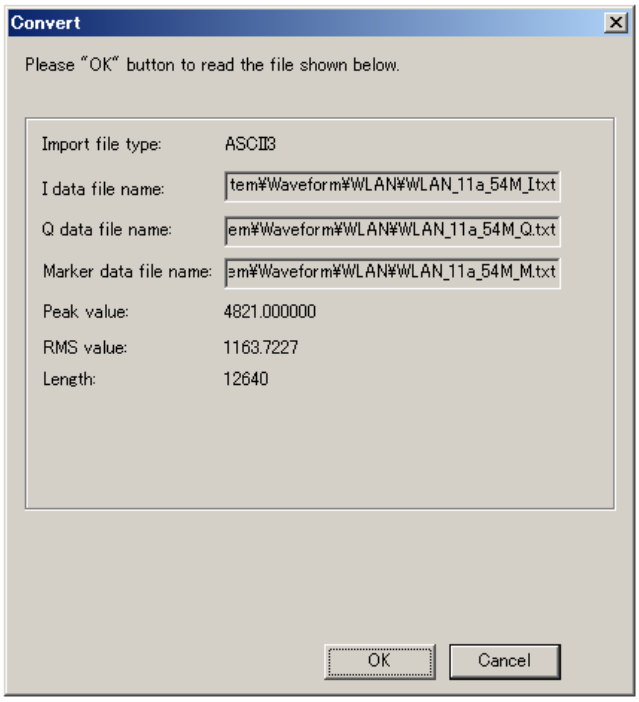


Figure 4.5.3-3 Input file information display dialog box

Click the **OK** button to finalize the input file selection.
Click the **Cancel** button to cancel the input file selection.

If the file format is changed in the **File format** box after selecting the input files, the current settings are cleared.

4.5.4 Editing data in Convert screen

The data to be written in the waveform information file of the waveform pattern to be generated can be edited by setting the parameters in the **Waveform Pattern parameters** field.

■ Setting sampling rate

<Procedure>

1. Click the **Sampling Rate** box and enter a sampling rate value to be set to the Vector Signal Generator from the keyboard.
   After the waveform pattern is selected by the Vector Signal Generator, the sampling rate can be changed to any value within the setting range when the selected waveform pattern is actually used.
   The sampling rate can be set from 20 kHz to 160 MHz.
2. Click the ▼ button on the right of the **Sampling Rate** box to open a pull-down menu, and select the unit of the sampling rate.
   The unit can be set from Hz, kHz, and MHz.

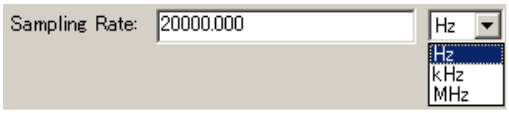


Figure 4.5.4-1 Sampling Rate input

■ **Normalizing** setting (only available when the **Convert** screen is displayed in the MS2830A/MS2840A mode)

To apply the RMS (Route Mean Square) value of the standard waveform pattern used by the MS2830A or MS2840A to the amplitude of the waveform pattern to be converted, select the **Normalizing** check box.

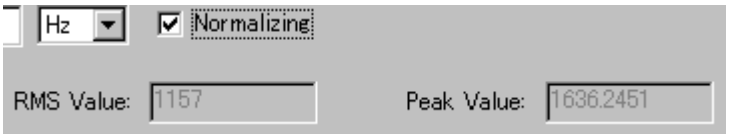


Figure 4.5.4-2 Normalizing selection

Here, *the RMS (Root Mean Square) value of the standard waveform pattern used for the MS2830A or MS2840A* refers to the RMS_I and RMS_Q values below. However, these values depend on the specified bit width.

$$RMS_I = \sqrt{\frac{1}{N}\sum_n I_n^{\,2}}$$

$$RMS_Q = \sqrt{\frac{1}{N}\sum_n Q_n^{\,2}}$$

$$RMS_{IQ} = \sqrt{\frac{1}{N}\sum_n (I_n^{\,2} + Q_n^{\,2})}$$

Here, Σ indicates the sum of target waveform patterns. (except samples for which RF Gate is used to set RF output to Off).

Table 4.5.4-1 Bit widths and RMS values for standard waveform patterns

Bit Width	RMS_I	RMS_Q	RMS_{IQ}
14bit	1157	1157	1636
15bit	2314	2314	3272
16bit	4628	4628	6545

RMS_I indicates the RMS value for the I phase, and RMS_Q indicates that for the Q phase.

RMS_{IQ} indicates the RMS value of the I/Q vector when RMS_I and RMS_Q are as described above.

When **Normalization** is selected, a crest factor (Peak Power/RMS Power) of 17 dB can be obtained if the signal output of the MS2830A or MS2840A is set within the level assurance range.

■ RMS Value and Peak Value setting

When the **Convert** screen is displayed in the MS269xA mode

The RMS value and the Peak value are displayed in each text box. The RMS value is fixed to 1157. The Peak value calculation method varies depending on the read file type. When an ASCII1, ASCII2, ASCII3, or a digitized file of the MS2690A/MS2691A/MS2692A, MS2830A, or MS2840A is read, the value is calculated from the RMS value (1157) and the ratio of the peak value calculated at file reading to the average (peak/average), and is displayed. When a waveform pattern for the MG3700A or a waveform pattern for the MS2690A/MS2691A/MS2692A, MS2830A, or MS2840A is read, the ratio of the Peak to the average (peak/average) is obtained from the value recorded in the wvi file, and the value is calculated from the obtained value.

When the **Convert** screen is displayed in the MS2830A/MS2840A mode

When reading waveform patterns, the data in the file to be converted is read, and then the RMS and Peak values are calculated and displayed. Click the **RMS Value** text box, and then enter the RMS value of the post-conversion waveform that is actually used for the MS2830A or MS2840A. The Peak value changes according the specified RMS value. Similarly, if the **Peak Value** text box is clicked and the Peak value is specified, the RMS value changes.

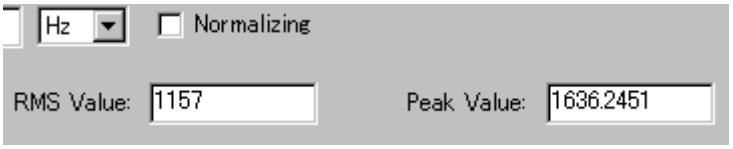


Figure 4.5.4-3 RMS Value input

Normally, the **Normalizing** check box is selected and the RMS and Peak values are automatically specified, but the values can be manually specified to adjust the characteristics for such signals that have a crest factor larger than 17 dB.

Note that the RF output level reliability for the MS2830A or MS2840A is specified assuming the following RMS values.

Table 4.5.4-2 RMS-value setting ranges that guarantee output level reliability

Bit Width	RMS-value setting range
14 bit	819 to 1634
15 bit	1638 to 3269
16 bit	3276 to 6537

■ Memory size setting (only available when the **Convert** screen is displayed in the MS2830A/MS2840A mode)

Select whether the ARB memory expansion option 256Msamples is installed for the used option (MS2830A or MS2840A). Specifying **With Option 27(Memory 256Msamples)** increases the maximum size of waveform patterns that can be generated, but waveform patterns exceeding 64Msamples can only be used if the ARB memory expansion option 256Msamples is installed for the used option (MS2830A or MS2840A). Change the setting according to whether the ARB memory expansion option 256Msamples is installed for the used option (MS2830A or MS2840A).

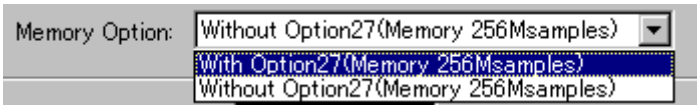


Figure 4.5.4-4 Memory Option selection

■ Setting package name

Enter the name of the package that is used to store the generated waveform patterns when transferring them to the Vector Signal Generator option.

Up to 31 characters can be used for a package name.

Alphanumeric characters and the following symbols may be used:

! % & ( ) + = ` { } _ - ^ @ [ ]

Figure 4.5.4-5 Package input

■ Unit setting (only available when ASCII1, ASCII2, ASCII3, or MS269x/MS2830A/MS2840A Digitizer is specified)

Click ▼ in the **Unit symbol** list box, and then select the unit.

sample, **symbol**, **chip**, or **none** can be selected as the unit.

This setting is used as the unit for displaying values on screens when using waveform patterns with the MS2690A/MS2691A/MS2692A, MS2830A, or MS2840A.

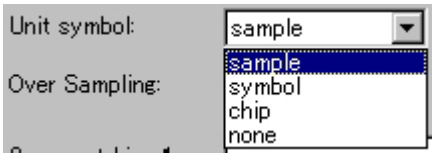


Figure 4.5.4-6 Unit symbol selection

■ Selecting spectrum (available for ASCII1, ASCII2, ASCII3, and Digitizer)
Click the button on the right of the **Spectrum** box to open a pull-down menu, and select the spectrum from Normal and Reverse. When Reverse is selected, the phase of the RF modulated signal output is reversed.

Figure 4.5.4-7 Spectrum selection

■ Setting over sampling rate (available for ASCII1, ASCII2, ASCII3, and Digitizer)
Set the over sampling rate for the waveform pattern to be input to Convert. Click the **Over Sampling** box and enter a numeric value from the keyboard.

When setting the sampling rate of 4 MHz for signals with 1-MHz symbol rate, for example, enter "4".

Figure 4.5.4-8 Over Sampling input

■ Setting Data Points (available for ASCII1, ASCII2, and ASCII3)
The number of sample points of the read waveform pattern is displayed in the **Data Points** box. Enter a Data Points value from the keyboard to change the value, though it is not necessary to change this setting normally.

Figure 4.5.4-9 Data Points input

The maximum number of Data Points is 256M points. The number of sample points of the read data is greater than 256M points, an error message is displayed and reading fails.
When the number of sample points of the read waveform is less than 1000 points, the output pattern is repeated so that the number of output patterns becomes 1000 points or more. When the number of sample points of the read waveform is 99 points, for example, the output pattern is repeated 11 times and a waveform pattern with 1089 points is output.

■ Entering comments

Click the **Comment Line 1** box and enter a comment from the keyboard. The text entered here is displayed on the screen when the Vector Signal Generator option selects the corresponding waveform.
Leave this text box blank if unnecessary.
The **Comment Line 2** box is disabled until any comment is entered in the **Comment Line 1** box. Similarly, the **Comment Line 3** box is disabled until any comment is entered in the **Comment Line 2** box.

Figure 4.5.4-10 Comment Line input

■ Setting marker names

To set a marker name, select the **Marker Name** check box. Then the **Marker 1 Name**, **Marker 2 Name**, and **Marker 3 Name** boxes become available. Click an input area and enter a marker name.
Note that these settings do not enable/disable the marker output of the Vector Signal Generator option.
The contents of these settings are displayed on the Vector Signal Generator option screen.

Figure 4.5.4-11 Marker Name input

■ Setting Burst information

To set the Burst information, select the **Burst Setting** check box. Then the **Frame Length** and **Gap Length** boxes become available. Click an input area and enter a numeric value to set Frame Length and/or Gap Length.
Refer to Section 5.1 “Generating Waveform Pattern” for details.

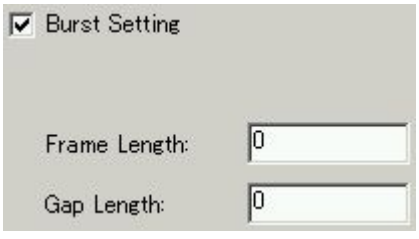


Figure 4.5.4-12 Burst Setting input

■ Configuring RF Gate settings (ASCII file and for digitized file conversion)

To configure the RF Gate settings, select the **RF Gate** check box. The **RF On/Off Threshold** and **Minimum RF Gate Length** boxes will then become available. Click an input area and enter a numeric value to set the RF On/Off threshold and minimum RF gate length.

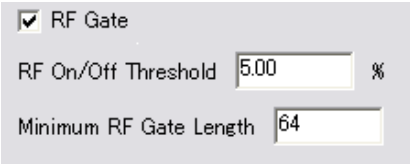


Figure 4.5.4-13 RF Gate setting input

4.5.5 Executing conversion

Set a file before conversion (conversion source file) and a file after conversion (conversion destination file) before executing conversion.

<Procedure>

1. Click the **Convert** button to display the Export File screen shown in Figure 4.5.5-2 below.

Figure 4.5.5-1 Convert button

2. Click the **Export File Name** box on the Export File screen and enter the name of the file to be output.

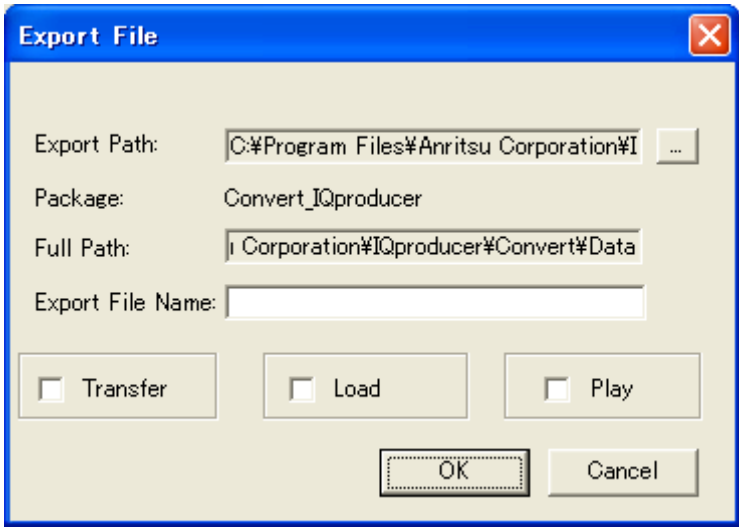


Figure 4.5.5-2 Export File screen

3. Click the **OK** button to start conversion.
   After this, if a clipping occurs during the conversion, the warning message "The waveform pattern to be generated will be above 8191 and be clipped." is displayed. If the **OK** button on the warning message dialog box is clicked at this time to continue the conversion as is, a waveform pattern for which clipping has been processed is generated.

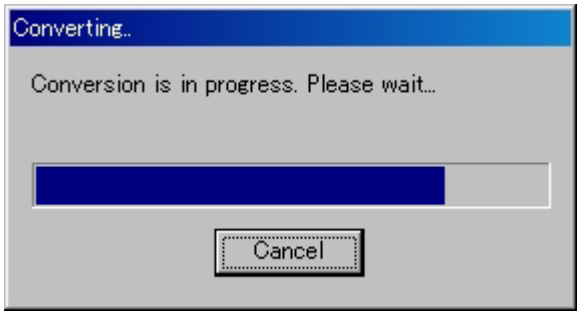


Figure 4.5.5-3 Conversion executing screen

   The Conversion executing screen is displayed from the start to the end of conversion.

4. When conversion is completed, click the **OK** button to return to the Convert screen.
   Two files of a file with the extension ".wvi" and a file with the extension ".wvd" are output and created in the file specified by the **Export Path** box after conversion.

4.5.6 Input file format

There are the following eight types of acceptable file for the Convert operation.

- ASCII1 format file
- ASCII2 format file
- ASCII3 format file
- The digitized file generated by the MS269x Digitizer (The digitizing capability of MS2690A/MS2691A/MS2692A, MS2830A or MS2840A signal analyzer)
- The waveform pattern formatted for MG3710A, MG3740A, MS269xA, MS2830A or MS2840A (MG3710/MG3740/MS269x/MS2830/MS2840 (to MG3700))
- The waveform pattern formatted for MG3700A, MS269xA, MS2830A or MS2840A (MG3700/MS269x/MS2830/MS2840 (to MG3710))
- The waveform pattern formatted for MG3700A, MS269xA, MS2830A or MS2840A (MG3700/MS269x/MS2830/MS2840 (to MG3740))
- The waveform pattern formatted for MG3700A, MG3710A, MG3740A, MS2830A or MS2840A (MG3710/MG3740/MG3700/MS2830/MS2840 (to MS269x))
- The waveform pattern formatted for MG3700A, MG3710A, MG3740A or MS269xA (MG3710/MG3740/MG3700/MS269x (to MS2830/MS2840))

This section describes the ASCII-format files.

ASCII format files contain the following data:

■ I-phase data

This is in-phase component data of the waveform pattern

■ Q-phase data

This is quadrature-phase component data of the waveform pattern

■ Marker data

This data is used to output marker signals from the AUX connector on the rear panel. There are three types of signal outputs: Marker 1, Marker 2, and Marker 3.
Each signal of marker data outputs either of the following TTL values:
0 = LO level
1 = HI level

When the Vector Signal Generator option uses waveform patterns, the difference between the marker data output timing and the timing the Vector Signal Generator option outputs the modulation data

corresponding to the output marker data from the RF Output connector is adjusted to be within approx. ±1 sample.

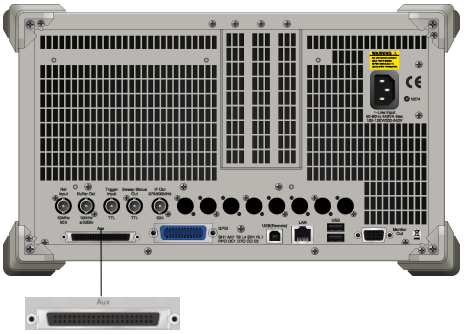


Figure 4.5.6-1 MS269xA AUX Connector On Rear Panel

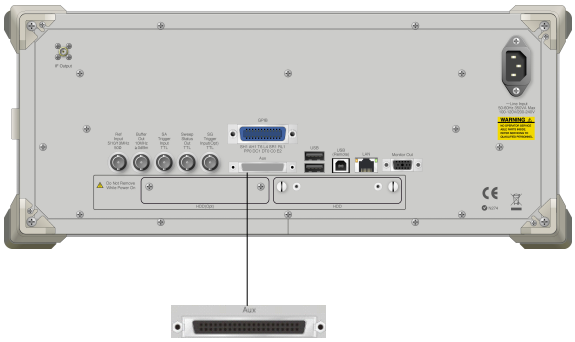


Figure 4.5.6-2 MS2830A/MS2840A AUX Connector On Rear Panel

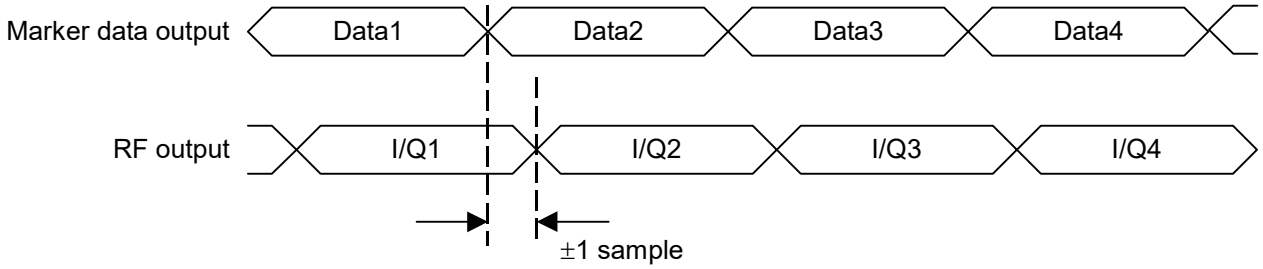


Figure 4.5.6-3 Marker data output and RF output

■ RF Gate

This data is used to execute pulse modulation for the RF output when using a Burst wave such as TDMA.
Each signal of RF Gate data indicates as follows:
0 = RF signal output On
1 = RF signal output Off

The RF Gate data is adjusted by the internal delay circuit of the Vector Signal Generator option so as to be input to the internal pulse modulator of the Vector Signal Generator option at almost the same time when the IQ-phase data corresponding to the RF Gate data is input to the pulse modulator. The pulse modulation timing for the RF output can be adjusted, therefore, by applying RF Gate = 0 at the same position with the IQ-phase data where the RF signal is required to be Off.
When the data for both the I and Q phases are set to 0000h and the RF output is set to Off instead of using this bit (i.e., RF Gate data = 1), the On/Off power ratio of the RF output signal becomes smaller than that in the case using the RF Gate data. Therefore, when a larger On/Off power ratio is required, set the data for both the I and Q phases to 0 and then set the RF output to Off using the RF Gate data. Note that the sample for which RF output is set to Off using the RF Gate data is excluded from RMS value calculation/adjustment when reading input file or generating waveform pattern file. Refer to Section 4.5.4 “Editing data in Convert screen” for details.

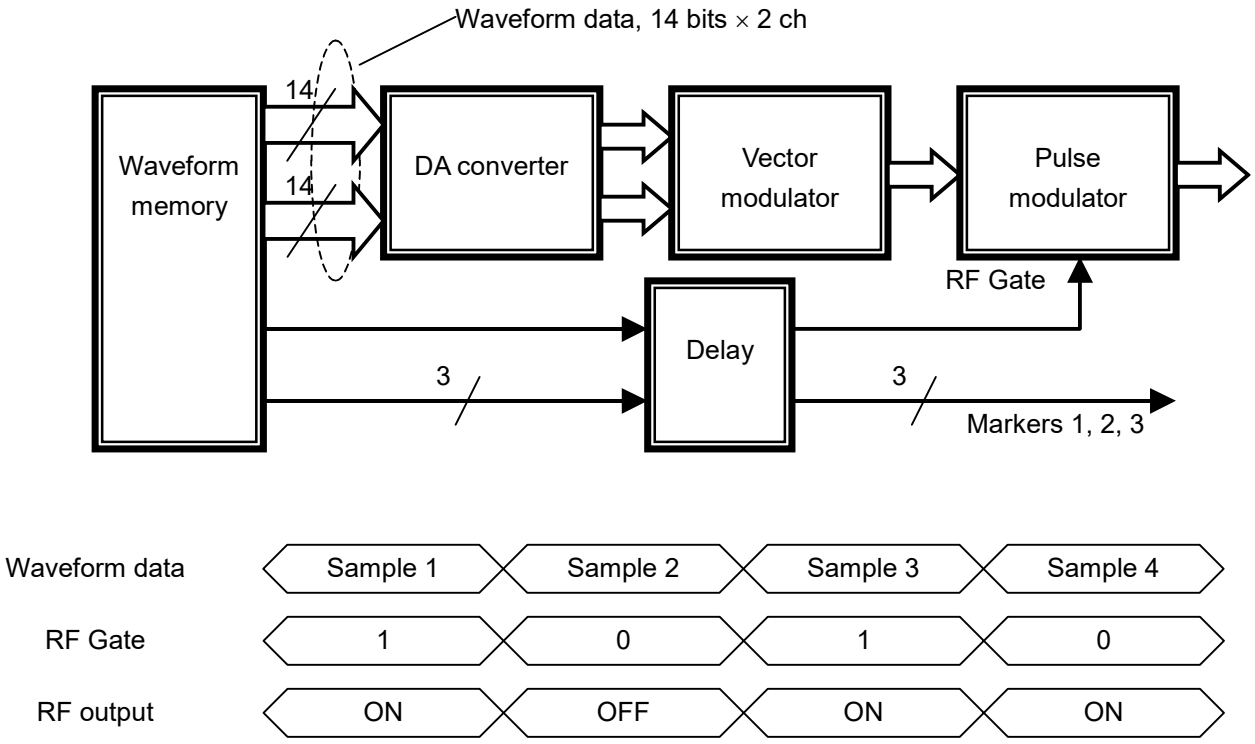


Figure 4.5.6-4 Configuration of waveform pattern output part in Vector Signal Generator option and signal output timing

The following describes details of the ASCII1, ASCII2, and ASCII3 formats:

■ ASCII1

Waveform patterns before conversion are configured in one file.
One line indicates one data. The data format is delimited by a comma, in the order of I-phase data, Q-phase data, Marker 1, Marker 2, Marker 3, and RF Gate.

I-phase data	Q-phase data	Marker1	Marker2	Marker3	RF Gate

Figure 4.5.6-5 ASCII1 data format

The values for Markers 1 to 3 and RF Gate can be omitted. If these values are omitted, Markers 1 to 3 are assumed to be 0 (low level) and RF Gate is assumed to be 1 (indicating that RF output is On). However, if the **Convert** screen is displayed in the MS2830A/MS2840A mode, the format for Markers 1 to 3 and RF Gate depends on whether the 15 or 16-bit data width is specified as described below.

When 15 bit is specified

The data format is delimited by a comma, in the order of I-phase data, Q-phase data, Marker 1, Marker 2, Marker 3, and RF Gate.

I-phase data	Q-phase data	Marker1	RF Gate

Figure 4.5.6-6 ASCII1 data format (when 15 bit is specified)

If the values for Marker 1 and RF Gate are omitted, they are assumed to be 0 and 1, respectively. In addition, if data is specified as shown in Figure 4.5.6-5, only the Marker 1 and RF Gate values are read. If the RF Gate value is omitted, it is automatically set to 1.

When 16 bit is specified

As shown in Figure 4.5.6-7, the data format consists of I-phase data followed by Q-phase data, and the values are delimited with a comma. Markers 1 to 3 are automatically set to 0, and RF Gate is automatically set to 1.

I-phase data	Q-phase data

Figure 4.5.6-7 ASCII1 data format (when 16 bit is specified)

In addition, if the information for Markers 1 to 3 and RF Gate is specified as shown in Figure 4.5.6-5, the information is ignored, Markers 1 to 3 are automatically set to 0, and RF Gate is automatically set to 1.

If the **RF Gate** check box is selected, RF Gate is automatically set according to the parameters specified for **RF On/Off Threshold** and **Minimum RF Gate Length**. However, if the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 16-bit width is specified, it is not possible to select the **RF Gate** check box.
Set '0' or '1' for Markers 1 through 3 and RF Gate. Markers 1 through 3 and RF Gate can also be omitted. If omitted, '0 (LO level)' is applied to Markers 1 through 3 and '1 (RF Output On)' to RF Gate.
A line starts with a character other than numeric, '+', or '–' is regarded as a comment line, and is ignored. I-phase data and Q-phase data can be expressed decimally, and also in exponents using e or E like "2.0E+3".

```
// IQ Data
Comment Line
–0.214178,–0.984242
–0.187286,–1.245890
–0.073896,–1.368888
0.091758,–1.316199
–0.073896,–1.368888,1          # Marker1 = 1 is output.
0.091758,–1.316199,0,1         # Marker2 = 1 is output.
0.248275,–1.089333,0,0,1       # Marker3 = 1 is output.
0.331432,–0.729580,0,0,0,0     # RF output becomes Off.
0.331432,–0.729580,,0,0,1      # Marker1 = 0 is output and RF output
                                 becomes On.
…
```

// IQ Data (when the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 15-bit width is specified)

```
Comment Line
–0.214178,–0.984242
–0.187286,–1.245890
–0.073896,–1.368888
0.091758,–1.316199
–0.073896,–1.368888,1
  # Marker1 = 1 is output and RF output becomes On.
0.091758,–1.316199,0,1
  # Marker1 = 0 is output and RF output becomes On.
0.248275,–1.089333,,0
  # Marker1 = 0 is output and RF output becomes Off.
0.331432,–0.729580,1,0,0
  # Marker1 = 1 is output and RF output becomes On.
0.331432,–0.729580,1,0,0,1
  # Marker1 = 1 is output and RF output becomes On.
  …
```

// IQ Data (when the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 16-bit width is specified)

```
Comment Line
–0.214178,–0.984242
–0.187286,–1.245890
–0.073896,–1.368888
0.091758,–1.316199,1,1,1,0
  # Marker1 to 3 = 0 is output and RF output becomes On.
  …
```

■ ASCII2

I-phase data is stored in one file, Q-phase data is stored in another, and the Marker data file for the ASCII3 format described below is excluded. When using this format, Markers 1 to 3 are set to 0, RF Gate is set to 1, and Marker output is all 0s. If the **RF Gate** check box is selected for this format, RF Gate is automatically set according to the parameters specified for **RF On/Off Threshold** and **Minimum RF Gate Length**. However, if the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 16-bit width is specified, it is not possible to select the **RF Gate** check box. If the **RF Gate** check box is not selected, RF output is On for all waveform pattern samples. In addition to displaying I-phase data and Q-phase data using decimal values, such data can be displayed using e or E and exponential notation (such as "2.0E+3").

■ ASCII3

For this format, pre-conversion waveform patterns are stored in three files. The patterns are divided such that I-phase data is stored in the first file, Q-phase data in the second, and Marker 1 to 3 and RF Gate data in the third. The Marker 1 to 3 and RF Gate data is stored in the following order, delimited by commas: Marker 1, Marker 2, Marker 3, and then RF Gate. Markers 1 to 3 can only be set to 0 and RF Gate can only be set to 1. The values for Markers 1 to 3 and RF Gate can be omitted. If these values are omitted, Markers 1 to 3 are assumed to be 0, and RF Gate is assumed to be 1. However, if the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 15-bit width is specified, the format for Marker 1 to 3 and RF Gate data differs from the above.

Because only Marker 1 and RF Gate are used when the 15-bit width is specified, the data consists only of the Marker 1 data followed by the RF Gate data, with the values delimited by a comma. If these values are omitted, Marker 1 is assumed to be 0 and RF Gate is assumed to be 1. If data for Markers 1 to 3 and RF Gate (a total of four data items) is specified, the Marker 2 and Marker 3 data is ignored, and only the Marker 1 and RF Gate data is read. If the RF Gate value is omitted, it is assumed to be 1.

If the **RF Gate** check box is selected, RF Gate is automatically set according to the parameters specified for **RF On/Off Threshold** and **Minimum RF Gate Length**.

In each file, the I-phase data, Q-phase data, and Markers 1 through 3 and RF Gate data are combined and described in one line delimited by <cr><lf> with the same line number. Therefore, when a comment line is added to the start of one of these files, it is necessary to adjust the number of lines among the files by adding a comment line or <cr><lf> to other files. An error occurs if the number of lines differs between the

I-phase data and Q-phase data. If Markers 1 through 3 and RF Gate data exists in a line where I-phase and Q-phase data do not exist, it is regarded that line has no data. If the data line of a different file is described in a comment line in a certain file, that data line is ignored. A line starts with a character other than numeric, '+', or '–' is regarded as a comment line, and is ignored. I-phase data and Q-phase data can be expressed decimally, and also in exponents using e or E like "2.0E+3".

File 1 (I-phase data)

```
// I Data
Comment Line
–0.214178
–0.187286
–0.073896
0.091758
0.248275
0.331432
…
```

File 2 (Q-phase data)

```
// Q Data
<cr><lf>            # Adjusting the line number since two comment lines
–0.984242           are added in the I-phase data.
–1.245890
–1.368888
–1.316199
–1.089333
–0.729580
…
```

File 3 (Marker data)

```
<cr><lf>
<cr><lf>
<cr><lf>          # Markers 1through 3 = 0 and RF Gate = 1 for the
<cr><lf>          third and fourth lines.
1         # Corresponds to the fifth line data in the I-phase
0,1       and Q-phase data.
0,0,1
1,0,0,1
…
```

When the **Convert** screen is displayed in the MS2830A/MS2840A mode and the 15-bit width is specified.

```
<cr><lf>
```

<cr><lf>
<cr><lf> Lines 3 and 4 are Marker = 0 and RF Gate = 1, respectively.
<cr><lf>
1 # Corresponds to the fifth line data in the I-phase and Q-phase data.
0,0 # Marker1 = 0 is output and RF output becomes On.
1,0,0 # Marker1 = 1 is output and RF output becomes On.
1,1,1,0 # Marker1 = 1 is output and RF output becomes 0.
…

4.5.7 Setting the RMS-value calculation range

By displaying the **Time Domain** screen from the **Convert** screen, the pre-conversion waveform pattern can be checked, the RMS-value calculation range can be set, and the RMS value of the read waveform can be recalculated.
However, the **Time Domain** screen can only be displayed if the file format is set to ASCII1, ASCII2, ASCII3, or MS269x/MS2830A/MS2840A Digitizer.

To display the **Time Domain** screen, click the **Time Domain** button.

Figure 4.5.7-1 Time Domain screen displaying button

For details about using the **Time Domain** screen to specify the RMS-value calculation range, see Section 4.9.13 "Displaying the **Time Domain** screen from the Convert screen".

When the RMS-value calculation range is set, the RMS value for the waveform pattern is recalculated, and the value in the **Peak Value** text box is updated.
Using the above function makes it possible to prevent the ratio between the Peak value of a wave for which RF Gate is not set and the RMS value from being reduced as well as the resulting clipping.

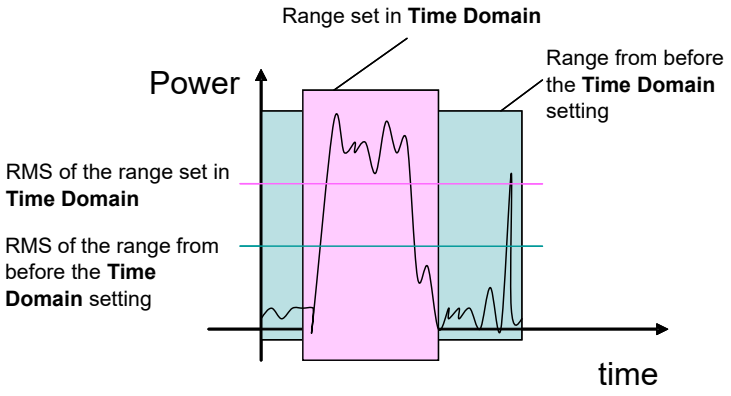


Figure 4.5.7-2 RMS-value calculation range

4.6 W-CDMA Downlink Waveform Pattern Generation Function

This function enables the generation of a waveform pattern to be used in cases such a W-CDMA reception sensitivity test, by changing some W-CDMA-related parameters of the MX269901A HSDPA/HSUPA IQproducer™.
It is possible to change the scrambling code number and channelization code number for a waveform pattern that is provided as a standard waveform pattern.

4.6.1 Activation

Select **W-CDMA Downlink (Standard)** from the **System** menu on the common platform screen. The W-CDMA Downlink setting screen is displayed separately.

4.6.2 W-CDMA Downlink setting screen

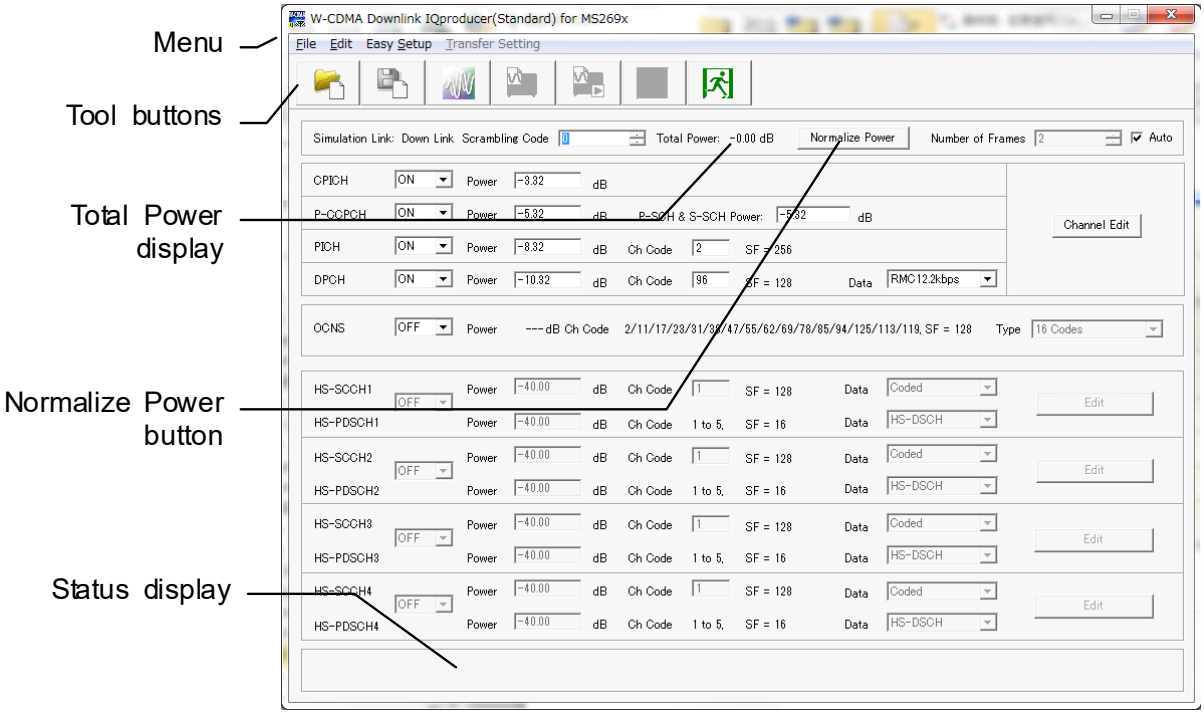


Figure 4.6.2-1 W-CDMA Downlink setting screen

■ **File** menu

The **File** menu contains the following items.

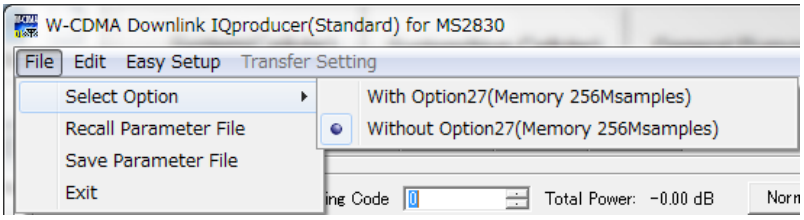


Figure 4.6.2-2 Screen when File is selected

- **Select Option**

  This menu item is enabled only if MS2830A/MS2840A was selected in Section 4.1 "Starting/Exiting IQproducer™".

  Select whether to enable/disable the ARB memory expansion option 256M samples for the Vector Signal Generator. Selecting With Option27 (Memory 256M samples) supports creation of larger waveform patterns. If the ARB memory expansion option 256M samples is not installed in the MS2830A or MS2840A, the generated waveform pattern may not be able to be used. Waveform patterns cannot be created with a size greater than 64Msamples when Without Option27 (Memory 256M samples) is selected. Select either With Option21 or Without Option21 according to whether the ARB memory expansion option 256Msamples is installed to be used.

- **Recall Parameter File**

  Sets the W-CDMA Downlink parameters according to the setting of the parameter files saved by Save Parameter File.

- **Save Parameter File**

  Saves the W-CDMA Downlink setting parameters to a file.

- **Exit**

  Exits the W-CDMA Downlink IQproducer™.

■ **Edit** menu

The **Edit** menu contains the following items.

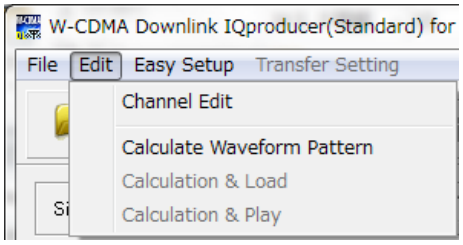


Figure 4.6.2-3 Screen when Edit is selected

- **Channel Edit**

  Displays the Channel Edit screen in which the P-CCPCH and DPCH parameters are set. This is the same operation with clicking the **Channel Edit** button on the screen.

- **Calculate Waveform Pattern**

  Starts waveform pattern generation based on the settings on the screen.

  The number of frames to be generated varies depending on the setting conditions for each channel, and the time required for generating a waveform pattern also varies accordingly. The number of frames to be generated is displayed on the calculation progress screen.

  Refer to Appendix B “Number of Frames to Be Generated” in the *MX269901A HSDPA/HSUPA IQproducer™ Operation Manual* for details on the number of frames to be generated in accordance with the downlink setting conditions.

  When a normal waveform pattern is generated, two files with the extensions “.wvi” and “.wvd” are created. When transferring a waveform pattern or loading a waveform pattern to a memory, select the *.wvi file for the target waveform pattern.

  Refer to Appendix B “Number of Frames to Be Generated” in the *MX269901A HSDPA/HSUPA IQproducer™ Operation Manual* for details about the classification of waveform patterns.

■ **Easy Setup** menu

The **Easy Setup** menu contains the following item.

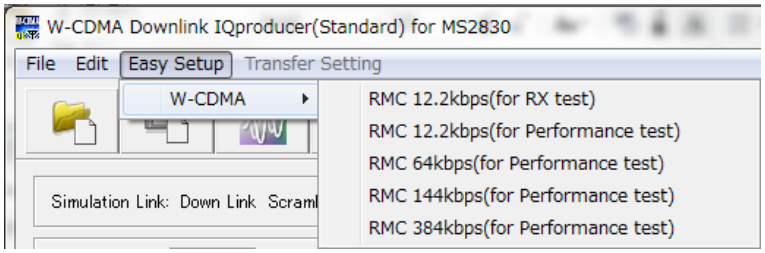


Figure 4.6.2-4 Screen when Easy Setup – W-CDMA is selected

Selects the bit rate setting for Reference Measurement Channels (RMC) specified in 3GPP TS25.101, TS25.104.

RMC 12.2kbps (for RX test)
RMC 12.2kbps (for Performance test)
RMC 64kbps (for Performance test)
RMC 144kbps (for Performance test)
RMC 384kbps (for Performance test)

Table 4.6.2-1 Physical channel powers for RMC 12.2 kbps (for RX test)

Physical Channel	Power ratio
P-CPICH	P-CPICH_Ec/DPCH_Ec = 7 dB
P-CCPCH	P-CCPCH_Ec/DPCH_Ec = 5 dB
SCH	SCH_Ec/DPCH_Ec = 5 dB
PICH	PICH_Ec/DPCH_Ec = 2 dB
DPCH	DPCH_Ec/Ior = –10.32 dB

Table 4.6.2-2 Physical channel powers for channels other than RMC 12.2 kbps (for RX test)

Physical Channel		Power ratio
P-CPICH		P-CPICH_Ec/Ior = –10 dB
P-CCPCH		P-CCPCH_Ec/Ior = –12 dB
SCH		SCH_Ec/Ior = –12 dB
PICH		PICH_Ec/Ior = –15 dB
DPCH	12.2 kbps	DPCH_Ec/Ior = –16.6 dB
	64 kbps	DPCH_Ec/Ior = –12.8 dB
	144 kbps	DPCH_Ec/Ior = –9.8 dB
	384 kbps	DPCH_Ec/Ior = –5.5 dB
OCNS		The power where the total of all the channels including OCNS is 0 dB.

■ Tool buttons

The following tool buttons are provided:

Recall Parameter File button

Save Parameter File button

Calculate Waveform Pattern button

Exit button

The function of each button is the same with the corresponding item in the **File** or **Edit** menu.

■ Total Power display

Figure 4.6.2-5 Total Power display

The total power of the channels that are set to ON (excluding OCNS) is displayed in this field. If the total power displayed here is out of ±0.01 dB when OCNS is OFF, the warning message shown below is displayed during total power calculation, prompting to normalize the total power.

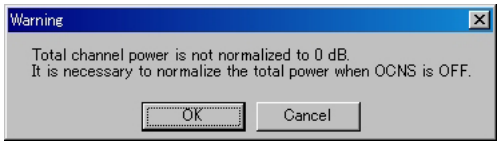


Figure 4.6.2-6 Waning message

■ Normalize Power button

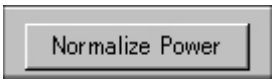


Figure 4.6.2-7 Normalize Power button

This button is enabled when OCNS is OFF. When this button is clicked, the value displayed in Total Power is subtracted from the power of each channel that is set to ON. As a result, the total power is normalized to 0 dB while retaining the power ratio between channels.

■ Status display

The status display on the bottom of the screen displays operation statuses such as a warning occurred during setting.

4.6.3 Details of setting parameters on W-CDMA Downlink setting screen

This section describes the details of the setting items on the W-CDMA Downlink setting screen.

Setting Item	Scrambling Code	
Functional Outline	Sets the downlink scrambling code number.	
Setting Parameters	Setting Range	
	Scrambling Code	0 to 8191
Details	The scrambling code set here is applied to the scramble of all the channels including CPICH, P-CCPCH, and PICH. Therefore, the primary scrambling code number should be set normally for this setting. The primary scrambling code number is expressed as follows: Primary scrambling code number = 16 × i (i = 0 to 511)	

Setting Item	CPICH	
Functional Outline	Performs settings related to CPICH.	
Setting Parameters	Setting Range	
	ON/OFF	ON or OFF
	Power	–40.00 to 0.00 (dB), setting resolution: 0.01 dB
Details	The channelization code of the CPICH is fixed to 0.	

Setting Item	P-CCPCH	
Functional Outline	Performs settings related to P-CCPCH.	
Setting Parameters	Setting Range	
	ON/OFF	ON or OFF
	Power	–40.00 to 0.00 (dB), setting resolution: 0.01 dB
	P-SCH & S-SCH Power	–40.00 to 0.00 (dB), setting resolution: 0.01 dB
Details	The channelization code of the P-CCPCH is fixed to 1. BCH is mapped for P-CCPCH.	

Setting Item	PICH	
Functional Outline	Performs settings related to PICH.	
Setting Parameters	Setting Range	
	ON/OFF	ON or OFF
	Power	–40.00 to 0.00 (dB), setting resolution: 0.01 dB
	Channelization Code	0 to 255

Setting Item	DPCH	
Functional Outline	Performs settings related to Downlink DPCH.	
Setting Parameters	Setting Range	
	ON/OFF	ON or OFF
	Power	–40.00 to 0.00 (dB), setting resolution: 0.01 dB
	Channelization Code	0 to SF – 1 SF (spreading factor) varies depending on the setting of **Data** as follows: RMC 12.2 kbps = 128 RMC 64 kbps = 32 RMC 144 kbps = 16 RMC 384 kbps = 8 AMR1/AMR2/AMR3 = 128 ISDN = 32 384 kbps Packet = 8
	Data	RMC 12.2 kbps/RMC 64 kbps/RMC 144 kbps/ RMC 384 kbps/AMR1/AMR2/AMR3/ISDN/ 384 kbps Packet
Details	The channel coding parameter of the DCH is set according to the standard format selected by **Data**. **RMC 12.2 kbps/RMC 64 kbps/RMC 144 kbps/RMC 384 kbps** Refer to 3GPP TS25.101 Annex A.3 DL reference measurement channel for details of these channels. See the next and subsequent pages for details of each parameter. **AMR1/AMR2/AMR3/ISDN** Refer to 3GPP TR25.944 4.1.1.3 Example for DCH for details of these channels. See the sections below for details of DTCH, DCCH, and Multiplexing. DTCH *AMR1: 4.1.1.3.1.2 Example for 12.2 kbps data (TFS = #1)* *AMR2: 4.1.1.3.1.2 Example for 12.2 kbps data (TFS = #2)* *AMR3: 4.1.1.3.1.2 Example for 12.2 kbps data (TFS = #3)* *ISDN: 4.1.1.3.1.6 Example for 64 kbps data* DCCH *AMR1/AMR2/AMR3/ISDN: 4.1.1.3.1.1 Example for 3.4 kbps data* Multiplexing *AMR1/AMR2/AMR3: 4.1.1.3.2.2 Example for multiplexing of 12.2 kbps data and 3.4 kbps data* *ISDN: 4.1.1.3.2.5 Example for multiplexing of 64 kbps data and 3.4 kbps data*	

♦ DL_RMC_12_2kbps channel coding parameters

Table 4.6.3-1 DL reference measurement channel 12.2 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	12.2
DPCH	ksps	30
Slot Format #i	–	11
TFCI	–	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	14.7

Table 4.6.3-2 DL reference measurement channel 12.2 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

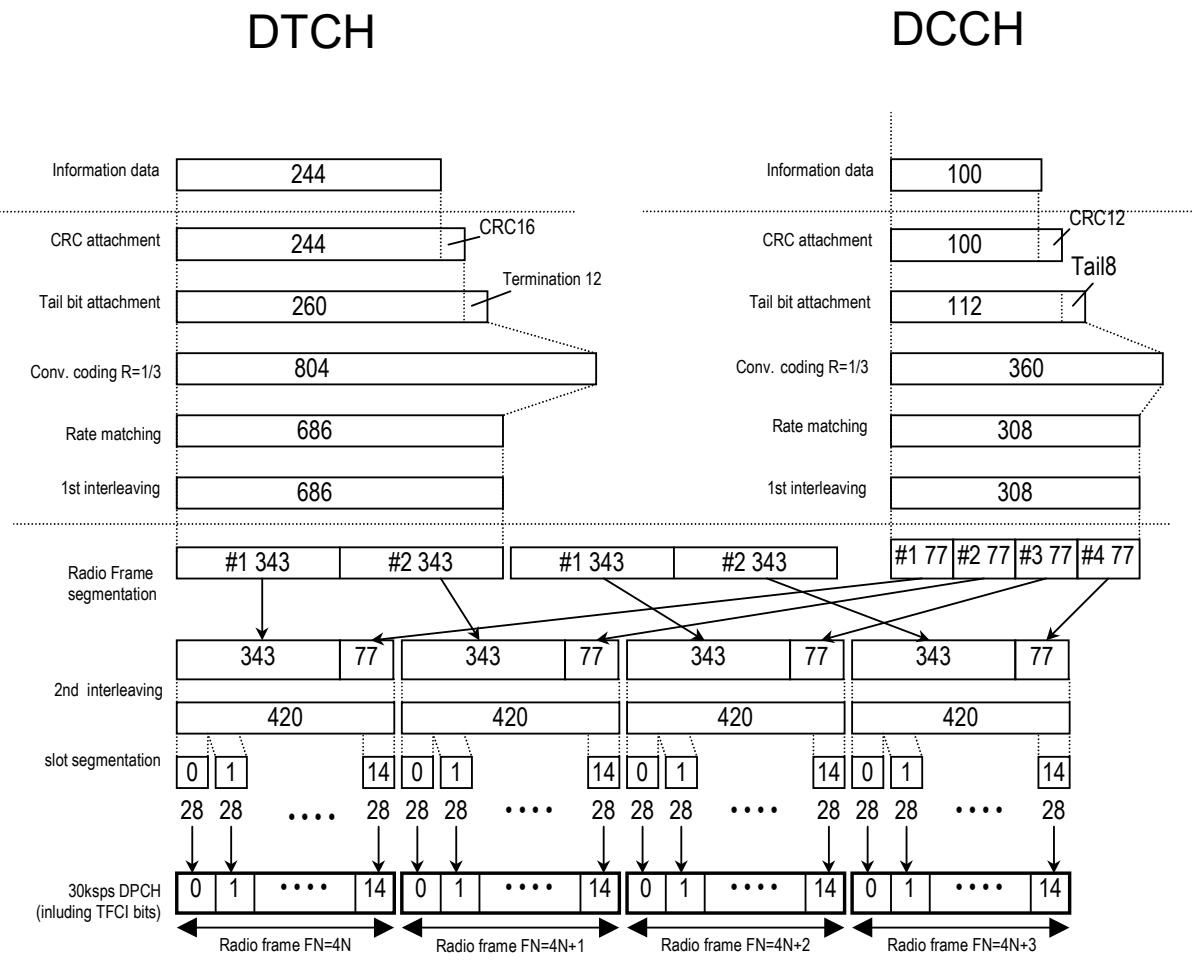


Figure 4.6.3-1 Channel coding for DL reference measurement channel 12.2 kbps

♦ DL_RMC_64kbps channel coding parameters

Table 4.6.3-3 DL reference measurement channel 64 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	64
DPCH	ksps	120
Slot Format #i	–	13
TFCI	–	On
Power offsets PO1, PO2 and PO3	dB	0
Repetition	%	2.9

Table 4.6.3-4 DL reference measurement channel 64 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	1280	100
Transport Block Set Size	1280	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

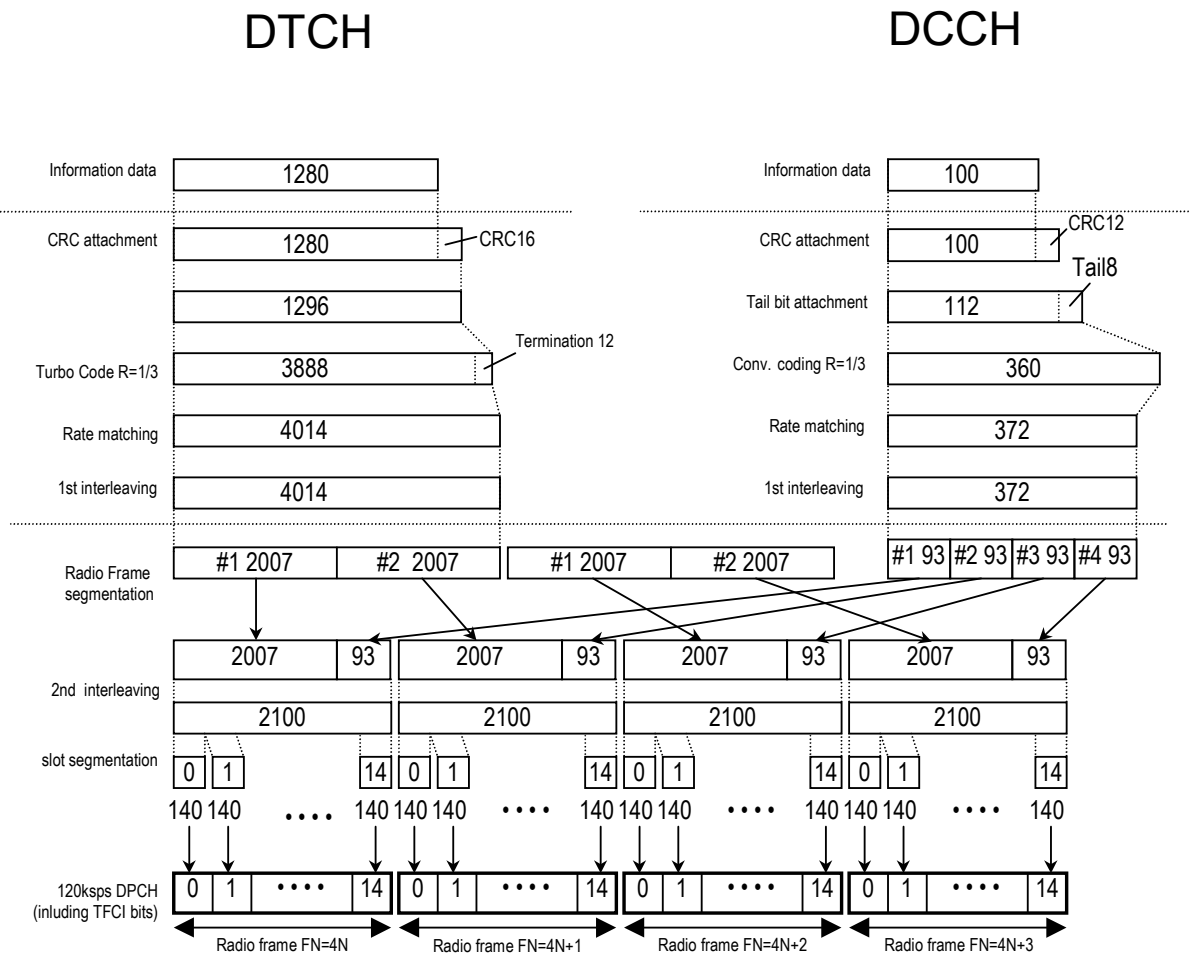


Figure 4.6.3-2 Channel coding for DL reference measurement channel 64 kbps

♦ DL_RMC_144kbps channel coding parameters

Table 4.6.3-5 DL reference measurement channel 144 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	144
DPCH	ksps	240
Slot Format #i	–	14
TFCI	–	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	2.7

Table 4.6.3-6 DL reference measurement channel 144 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2880	100
Transport Block Set Size	2880	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

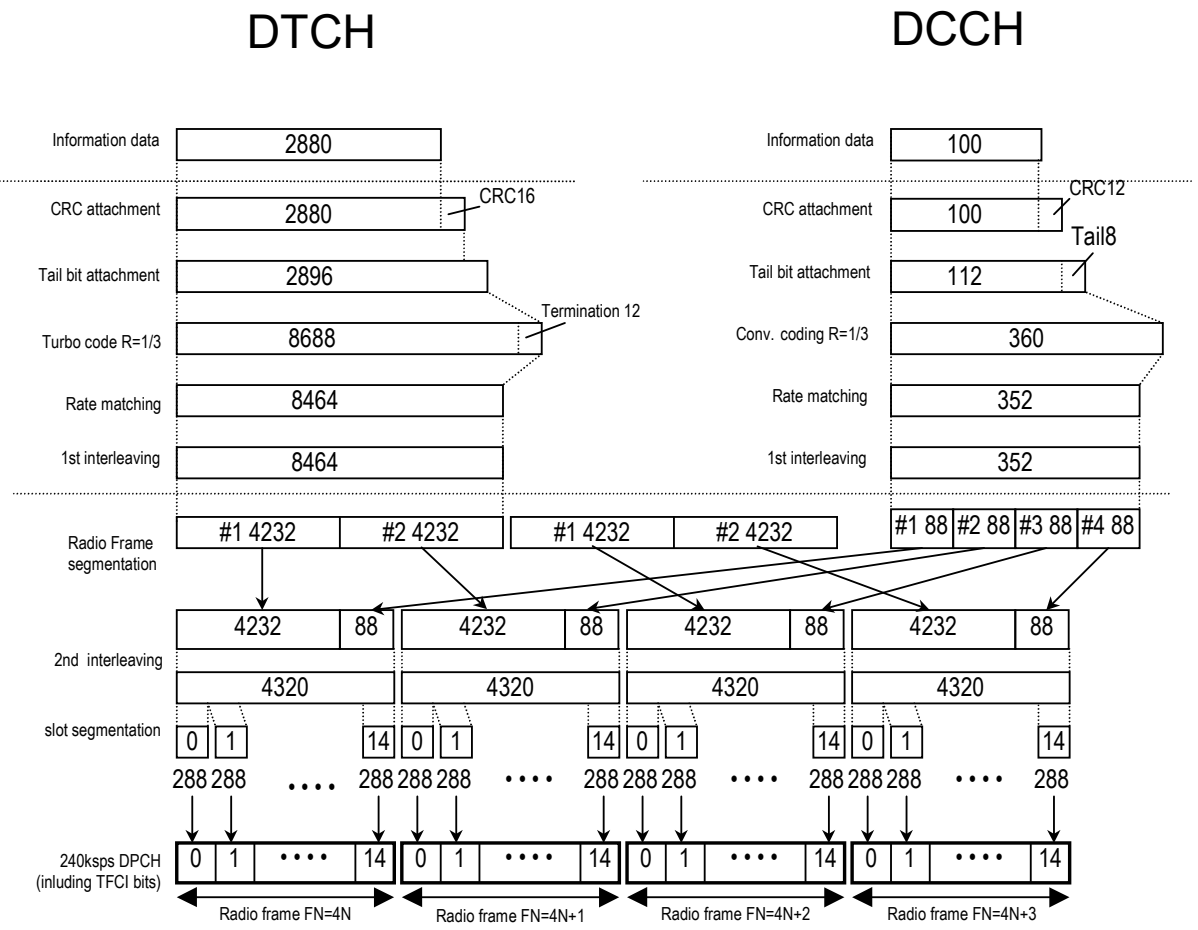


Figure 4.6.3-3 Channel coding for DL reference measurement channel 144 kbps

♦ DL_RMC_384kbps channel coding parameters

Table 4.6.3-7 DL reference measurement channel 384 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	384
DPCH	ksps	480
Slot Format #i	–	15
TFCI	–	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	22

Table 4.6.3-8 DL reference measurement channel 384 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	3840	100
Transport Block Set Size	3840	100
Transmission Time Interval	10 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

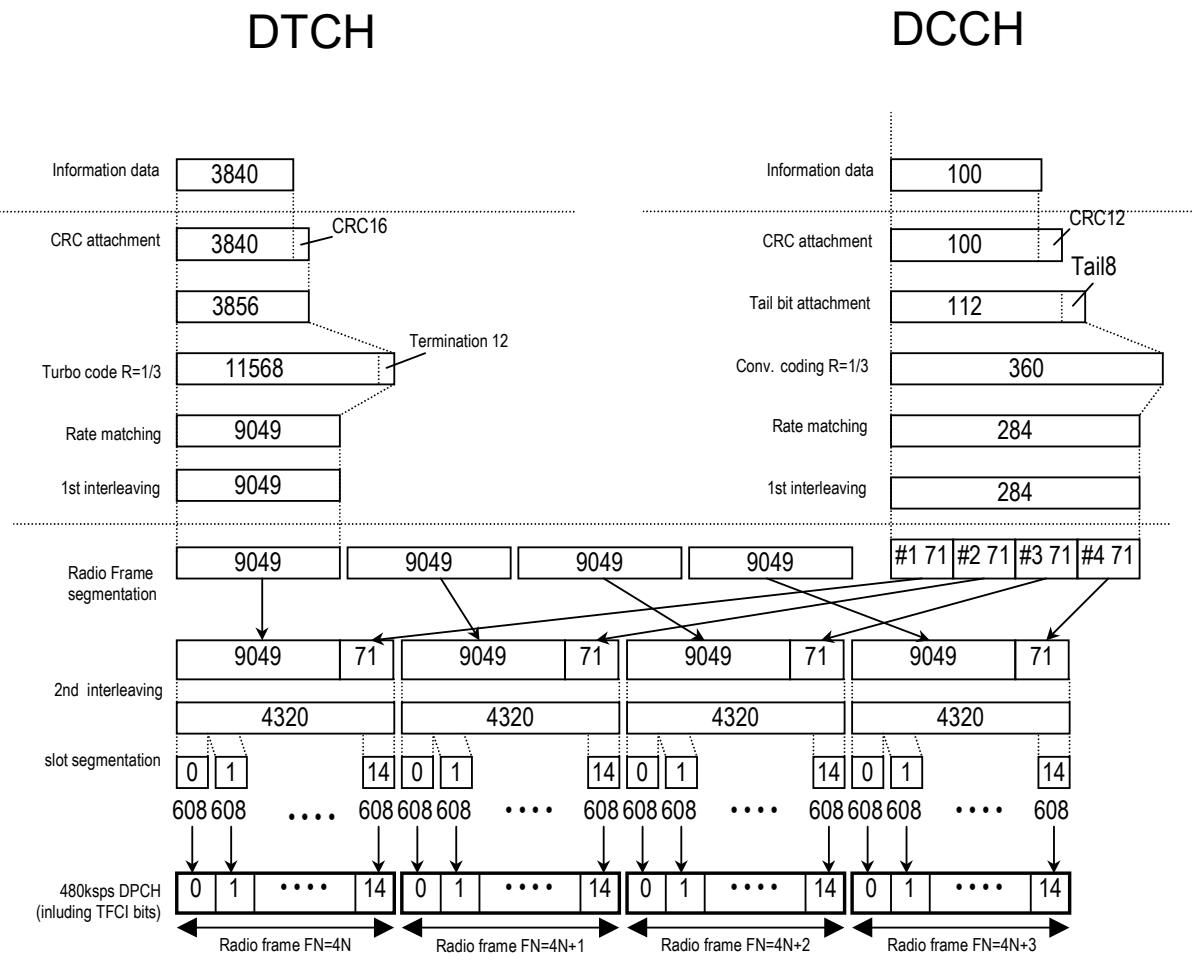
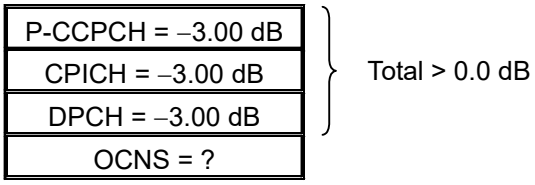


Figure 4.6.3-4 Channel coding for DL reference measurement channel 384 kbps

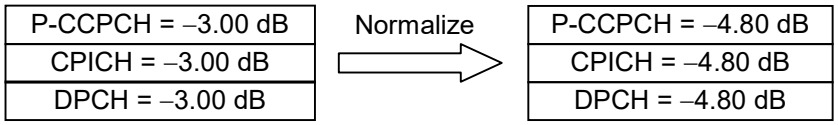
<table>
<tr><td>Setting Item</td><td colspan="2">OCNS</td></tr>
<tr><td>Functional Outline</td><td colspan="2">Sets OCNS ON/OFF.</td></tr>
<tr><td rowspan="3">Setting Parameters</td><td colspan="2">Setting Range</td></tr>
<tr><td>ON/OFF</td><td>ON or OFF</td></tr>
<tr><td>Type</td><td>16 Codes</td></tr>
<tr><td>Details</td><td colspan="2">When OCNS is set to ON, the power of OCNS (Orthogonal Channel Noise Simulator) is adjusted so that the total power of all the channels that are set to ON becomes 0 dB.

When the total power of all the channels that are set to ON (excluding OCNS) exceeds 0 dB while OCNS is set to ON, an error occurs and data generation is cancelled. The total power of all the channels that are set to ON (excluding OCNS) is displayed in Total Power on the screen.

To clear this error, set OCNS to OFF or attenuate the power of each channel. For example, when P-CCPCH, CPICH, and DPCH are set as follows, the total power of the channels except OCNS exceeds 0 dB. OCNS cannot be set to ON in this event, and it is regarded as an error.
An error may occur when the actual total power exceeds 0 dB at the thousandth or later places that are not displayed, even if 0.00 dB is displayed in Total Power on the screen.

When OCNS is set to OFF, click the Normalize Power button to adjust the power of each channel so that the total power of all the channels becomes 0 dB while retaining the power ratio between channels.

 
</td></tr>
</table>

Details (Cont'd)

OCNS consists of 16-channel (for Performance requirement) DPCH. The table below shows the parameters. Refer to 3GPP TS25.101 (Release 5) Table C.12 for details.

OCNS (16 channels)

Channelization Code at SF = 128	Relative Level Setting (dB)
2	–1
11	–3
17	–3
23	–5
31	–2
38	–4
47	–8
55	–7
62	–4
69	–6
78	–5
85	–9
94	–10
125	–8
113	–6
119	0

Displayed contents

An **OCNS** item **Power** displays the power of OCNS only. The total of this value and the value displayed in **Total Power** is always 0 dB.
The Channelization Code and SF (spreading factor) used by OCNS are also displayed.

4.6.4 Details of setting parameters on Channel Edit screen

When the **Channel Edit** button is clicked, the Channel Edit screen shown below is displayed. This section describes the details of the setting items on this screen.

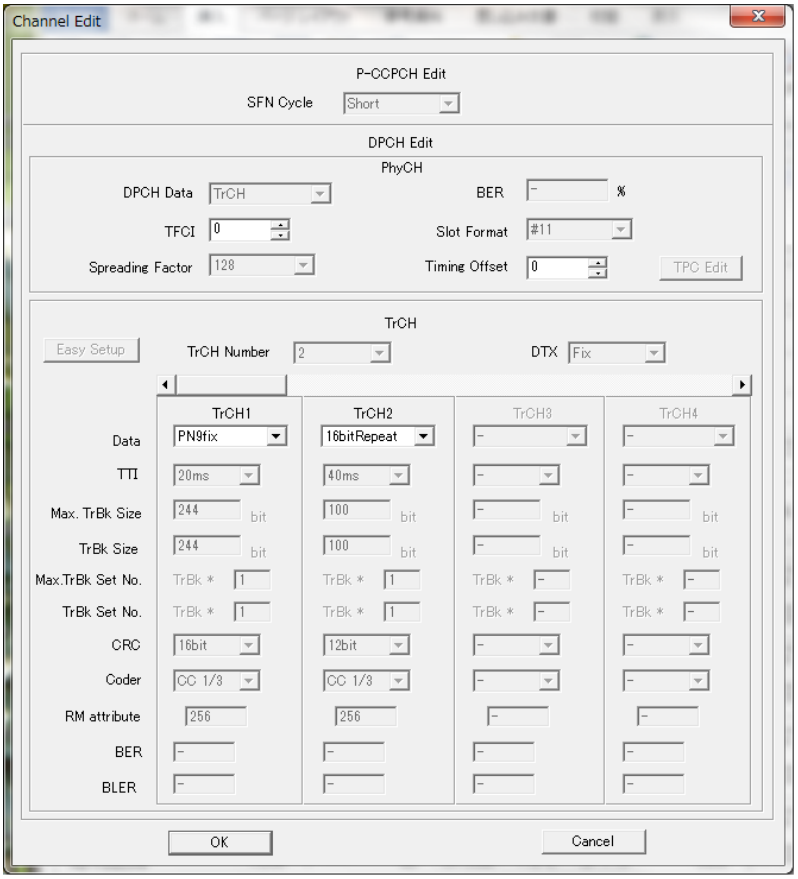


Figure 4.6.4-1 Channel Edit screen

■ OK and Cancel buttons

The **OK** and **Cancel** buttons are provided to close the Channel Edit screen after performing setting.

- When **OK** button is clicked:
  The Channel Edit screen is closed applying the settings.
- When **Cancel** button is clicked:
  The Channel Edit screen is closed ignoring the settings.

Setting Item	P-CCPCH Edit	
Functional Outline	Performs settings for P-CCPCH.	
Setting Parameters	Setting Range	
	SFN Cycle	Short (fixed)
Details	This is the cycle of SFN (System Frame Number) that is transmitted by BCH mapped to P-CCPCH, and is fixed to Short for the W-CDMA IQproducer™. The cycle of SFN becomes a common multiple of the maximum TTI cycle.	

Setting Item	DPCH Edit (PhyCH)	
Functional Outline	Performs settings for DL-DPCH physical channels.	
Setting Parameters	Setting Range	
	Timing Offset	0 to 149
	TFCI	0 to 1023

Setting Item	DPCH Edit (TrCh Edit)	
Functional Outline	Performs settings for TrCH.	
Setting Parameters	Setting Range	
	Data	PN9/PN9fix/PN15fix/16bitRepeat
Details	Data Selects the data to be inserted to Information Data of the transport channel. **PN9fix**/**PN15fix** is PN9/PN15 data reset at the last data of a signal. The last data of a signal and the first data of the next signal are not continuous.	

4.6.5 Saving/reading parameters

This numeric values and settings for each item can be saved in a parameter file by using the IQproducer™.

■ Saving parameter file

<Procedure>

1. Select **Save Parameter File** from the **File** menu or click the tool button to display the parameter file saving screen shown in Figure 4.6.5-1.
2. Enter a file name in the **File name** text box and click the **Save** button to save the parameter file.
   When the save destination is not changed in the **Save in** box, the parameter file is saved in the following directory with the entered file name:
   X:\IQproducer\W_CDMA*Entered file name*.prm
   ("X:\IQproducer" indicates the folder where the IQproducer™ is installed.)

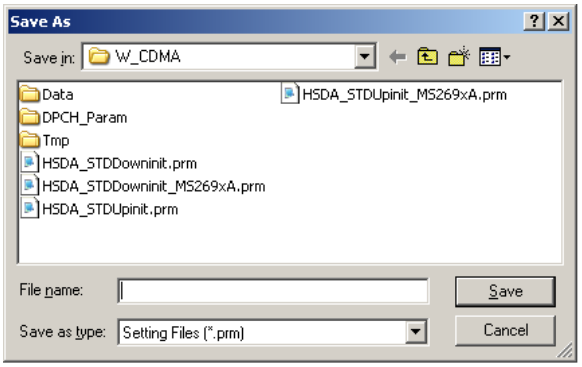


Figure 4.6.5-1 Parameter file saving screen

■ Reading parameter file

<Procedure>

1. Select **Recall Parameter File** from the **File** menu or click the tool button to display the parameter file reading screen shown in Figure 4.6.5-2.
2. Select a parameter file to be read from the file list, and then click the **Open** button to read the selected parameter file.

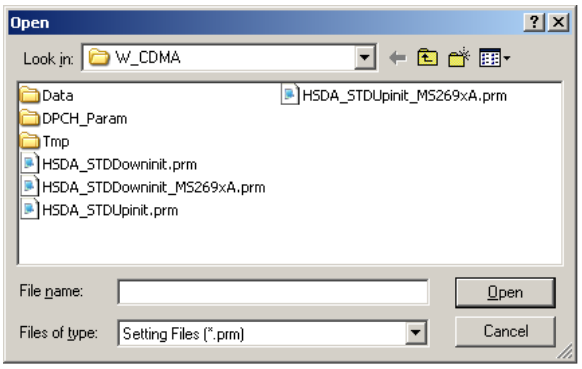


Figure 4.6.5-2 Parameter file reading screen

4.6.6 Generating waveform pattern file

A waveform pattern file to be used in the Vector Signal Generator option can be generated based on the setting values. In the screen shown in Figure 4.6.6-2, the waveform pattern name and comments can be entered and whether to enable or disable the RRC filter can be set.
The number of frames to be generated varies depending on the setting conditions for each channel, and the time required for generating a waveform pattern also varies accordingly.
Refer to Appendix B "Number of Frames to Be Generated" in the *MX269901A HSDPA/HSUPA IQproducer™ Operation Manual* for details on the number of frames to be generated in accordance with the downlink setting conditions.

<Procedure>

1. Select **Calculate Waveform Pattern** from the **Edit** menu or click the tool button.
   At this time, the Warning message shown below appears when **OCNS** is set to **OFF** and the value of **Total Power** is out of ±0.01 dB.

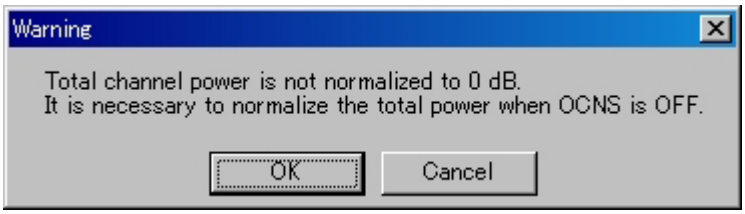


Figure 4.6.6-1 Warning message

Click the **OK** button to normalize the **Total Power** and proceed with the next step.

2. The file name input screen is displayed.

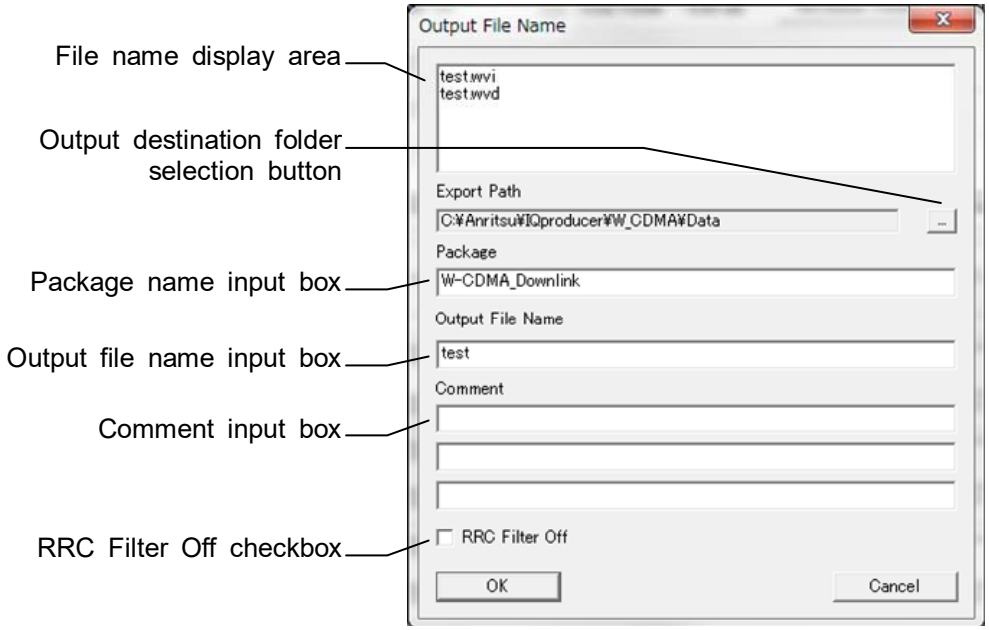


Figure 4.6.6-2 File name input screen

Enter a file name in the file name input box within 18 characters. 1-byte alphanumeric characters and the following symbols can be used for a file name:
! % & ( ) + = ` { } _ - ^ @ [ ]

When a file name is entered, the file to be generated is displayed in the file name display area in the following format:

File name format:

test.wvi
- Extension: wvi… Information file (text format)
  wvd… Data file (binary format)
- Entered file name

Enter a comment for the waveform pattern in a comment input box. Three comment input boxes are provided, and a comment can be entered in each line within 38 characters.
1-byte alphanumeric characters and symbols can be used for comments.
The contents of each comment are displayed on the screen when the corresponding waveform pattern is selected by the Vector Signal Generator option. Leave the comment boxes blank if not necessary.

When the **RRC Filter Off** check box is selected, symbol data that does not pass through the RRC filter is generated as a waveform pattern. You don't need to select this check box under normal conditions.

3. Click the **OK** button to start waveform pattern file generation. The calculation progress screen is displayed during the file generation progressing.

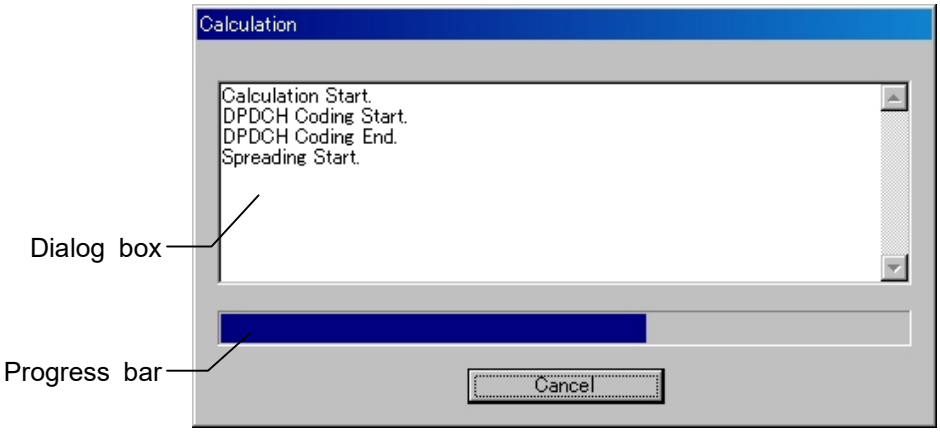


Figure 4.6.6-3 Calculation progress screen

The file generation processing statuses are displayed in the dialog box. The file generation progress status is indicated by the progress bar.

When started with MS269x, MS2830A, or MS2840A and when **MS269x** or **MS2830/MS2840** is selected in the **Select instrument** screen, waveform pattern files generated by this application are saved in the following directory:

Installed OS	Export destination folder
Windows Embedded Standard 7, Windows 10, Windows 11	C:\Anritsu\Signal Analyzer\System\Waveform
Other than above	C:\Program Files\Anritsu Corporation\Signal Analyzer\System\Waveform

In other cases, the output destination folder can be selected from the Browse for Folder screen shown in Figure 4.6.6-4, which is displayed by clicking the output destination folder selection button on the Output File Name screen (see Figure 4.6.6-2).

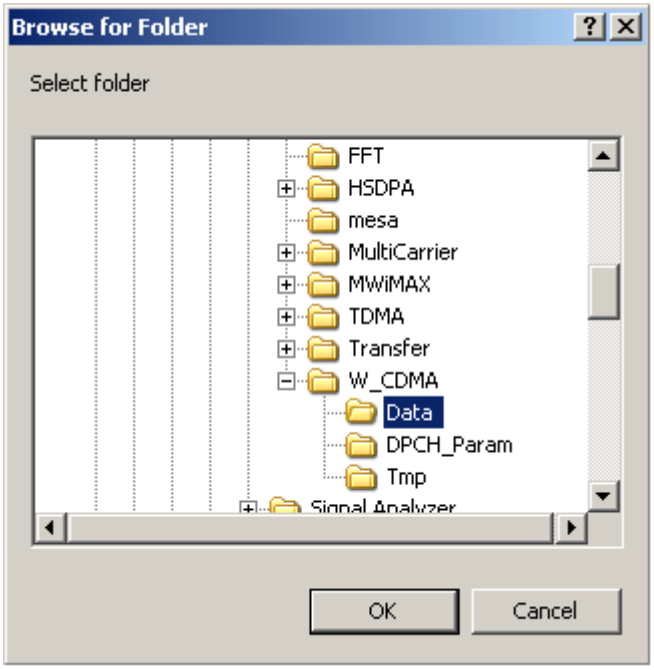


Figure 4.6.6-4 Browse for Folder screen

When the output destination folder is not specified, waveform pattern files are saved in the following directory:
X:\IQproducer\W_CDMA\Data
("X:\IQproducer" indicates the folder where the IQproducer™ is installed.)

Note:

The W-CDMA Uplink IQproducer waveform pattern file generation and the W-CDMA Downlink IQproducer waveform pattern file generation must be operated exclusively. An error dialog box will be displayed if the W-CDMA Uplink IQproducer waveform pattern file generation is started while the W-CDMA Downlink IQproducer waveform pattern file generation is operating, and vice versa. To start the W-CDMA Uplink/Downlink IQproducer waveform pattern file generation while the other is operating, cancel the other file generation or wait until the other file generation is completed.

4.6.7 Auxiliary signal output

When a waveform pattern generated by the W-CDMA Downlink IQproducer™ is selected by the Vector Signal Generator option, a marker signal synchronized with the RF signal is output from the AUX connector on the rear panel as an auxiliary signal. Refer to the *MS2690A/MS2691A/MS2692A and MS2830A/MS2840A Vector Signal Generator Operation Manual (Operation)* for details on the AUX connector. Frame Pulse (Marker 1) is output.

- Frame Pulse
  A 10-ms cycle pulse synchronized with the symbol at the beginning of the frame is output from Marker 1. The signal polarity can be changed by changing the polarity of Marker 1.

4.7 W-CDMA Uplink Waveform Pattern Generation Function

This function enables the generation of a waveform pattern to be used in cases such a W-CDMA reception sensitivity test, by editing some W-CDMA-related parameters of the MX269901A HSDPA/HSUPA IQproducer™.
It is possible to change the scrambling code number and channelization code number for a waveform pattern that is provided as a standard waveform pattern.

4.7.1 Activation

Select **W-CDMA Uplink (Standard)** from the **System** menu on the common platform screen. The W-CDMA Uplink setting screen is displayed separately.

4.7.2 W-CDMA Uplink setting screen

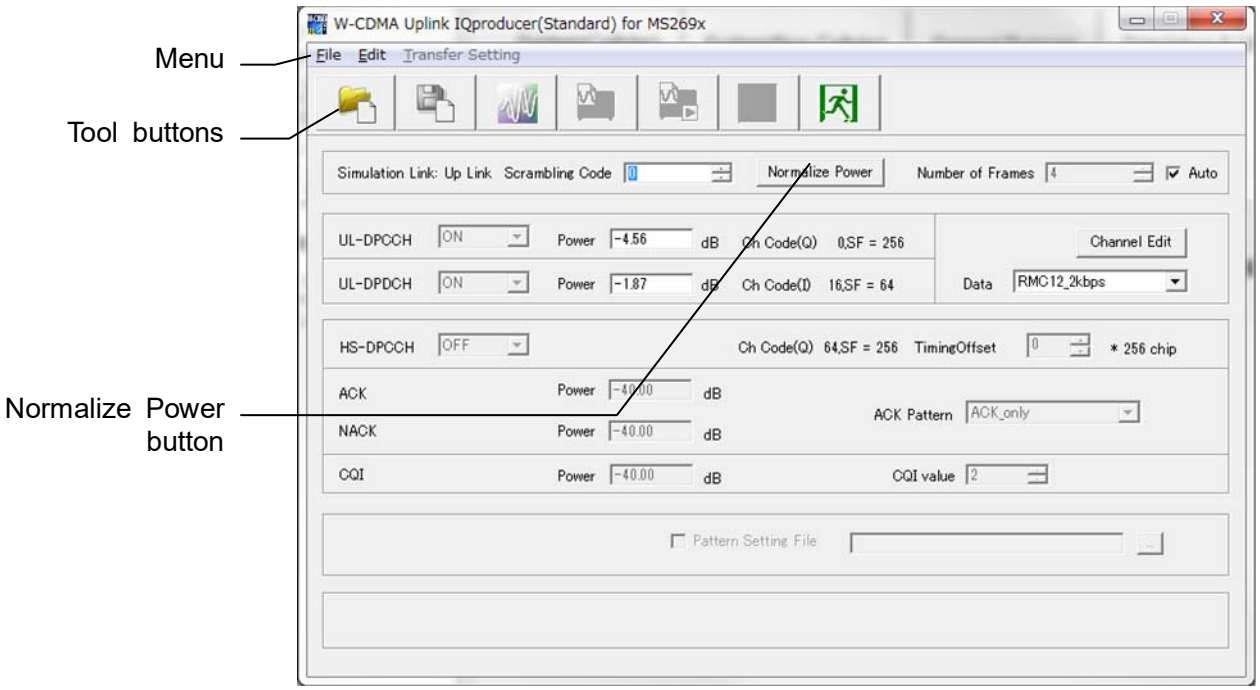


Figure 4.7.2-1 W-CDMA Uplink setting screen

■ **File** menu

The **File** menu contains the following items.

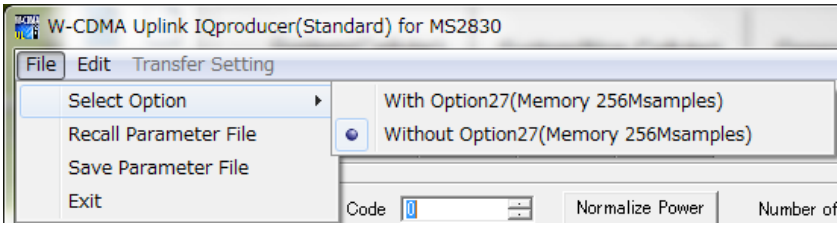


Figure 4.7.2-2 Screen when File is selected

- **Select Option**

  This menu item is enabled only if MS2830A/MS2840A was selected in 4.1 "Starting/Exiting IQproducer™".

  Select whether to enable/disable the ARB memory expansion option 256M samples for the Vector Signal Generator. Selecting With Option27 (Memory 256M samples) supports creation of larger waveform patterns. If the ARB memory expansion option 256M samples is not installed in the MS2830A or MS2840A, the generated waveform pattern may not be able to be used. Waveform patterns cannot be created with a size greater than 64Msamples when Without Option27 (Memory 256M samples) is selected. Select either With Option21 or Without Option21 according to whether the ARB memory expansion option 256Msamples is installed to be used.

- **Recall Parameter File**

  Sets the W-CDMA Uplink parameters according to the setting of the parameter files saved by Save Parameter File.

- **Save Parameter File**

  Saves the W-CDMA Uplink setting parameters to a file.

- **Exit**

  Exits the W-CDMA Uplink IQproducer™.

■ **Edit** menu

The **Edit** menu contains the following items.

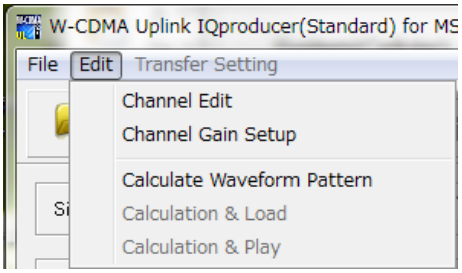


Figure 4.7.2-3 Screen when Edit is selected

- **Channel Edit**

  Displays the Channel Edit screen in which the DPCH parameters are set. This is the same operation with clicking the **Channel Edit** button on the screen.

- **Channel Gain Setup**

  Displays the Channel Gain Setup screen in which the power of each channel can be set using βc and βd parameters. The setting of Power in the main screen is changed in accordance with the channel power set in this screen.

- **Calculate Waveform Pattern**

  Starts waveform pattern generation based on the settings on the screen.

  The number of frames to be generated varies depending on the setting conditions for each channel, and the time required for generating a waveform pattern also varies accordingly.

  The number of frames to be generated is displayed on the calculation progress screen.

  Refer to Appendix B “Number of Frames to Be Generated” in the *MX269901A HSDPA/HSUPA IQproducer™ Operation Manual* for details on the number of frames to be generated in accordance with the uplink setting conditions.

■ Tool buttons

The following tool buttons are provided:

Recall Parameter File button

Save Parameter File button

Calculate Waveform Pattern button

Exit button

The function of each button is the same with the corresponding item in the **File** or **Edit** menu.

■ Normalize Power button

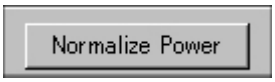


Figure 4.7.2-4 Normalize Power button

When this button is clicked, Total Power is subtracted from the power of each channel that is set to ON. As a result, the total power is normalized to 0 dB while retaining the power ratio between channels. The total power value displayed in Total Power is calculated from the total power of all the channels that are set to ON.

4.7.3 Details of setting parameters on W-CDMA Uplink setting screen

This section describes the details of the setting items on the W-CDMA Uplink setting screen.

Setting Item	Scrambling Code	
Functional Outline	Sets the scrambling code.	
Setting Parameters	Setting Range	
	Scrambling Code	0 to 16777215

Setting Item	UL-DPCCH, UL-DPDCH	
Functional Outline	Performs settings for DPCCH and DPDCH.	
Setting Parameters	Setting Range	
	Power	–40.00 to 0 (dB)
	Data	RMC 12.2 kbps/RMC 64 kbps/RMC 144 kbps/ RMC 384 kbps/AMR1/AMR2/AMR3/ISDN/ 64 kbps Packet
Details	RMC 12.2 kbps/RMC 64 kbps/RMC 144 kbps/RMC 384 kbps The channel coding parameter of the DCH is set according to the standard format selected by **Data**. Refer to 3GPP TS25.104 Annex A UL reference measurement channel for details of these channels. See the next and subsequent pages for details of each parameter. AMR1/AMR2/AMR3/ISDN Refer to 3GPP TR25.944 4.1.2.2 Example for DCH for details of these channels. See the sections below for details of DTCH, DCCH, and Multiplexing. DTCH *AMR1: 4.1.2.2.1.2 Example for 12.2 kbps data (TFS = #1)* *AMR2: 4.1.2.2.1.2 Example for 12.2 kbps data (TFS = #2)* *AMR3: 4.1.2.2.1.2 Example for 12.2 kbps data (TFS = #3)* *ISDN: 4.1.2.2.1.6 Example for 64 kbps data* DCCH *AMR1/AMR2/AMR3/ISDN: 4.1.2.2.1.1 Example for 3.4 kbps data* Multiplexing *AMR1/AMR2/AMR3: 4.1.2.2.2.2 Example for multiplexing of 12.2 kbps data and 3.4 kbps data* *ISDN: 4.1.2.2.2.5 Example for multiplexing of 64 kbps data and 3.4 kbps data*	

♦ UL_RMC_12_2kbps channel coding parameters

Table 4.7.3-1 UL reference measurement channel 12.2 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	12.2
DPDCH	kbps	60
DPCCH	kbps	15
DPCCH Slot Format #i	–	0
DPCCH/DPDCH power ratio	dB	–2.69
TFCI	–	On
Repetition	%	22

Table 4.7.3-2 UL reference measurement channel 12.2 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

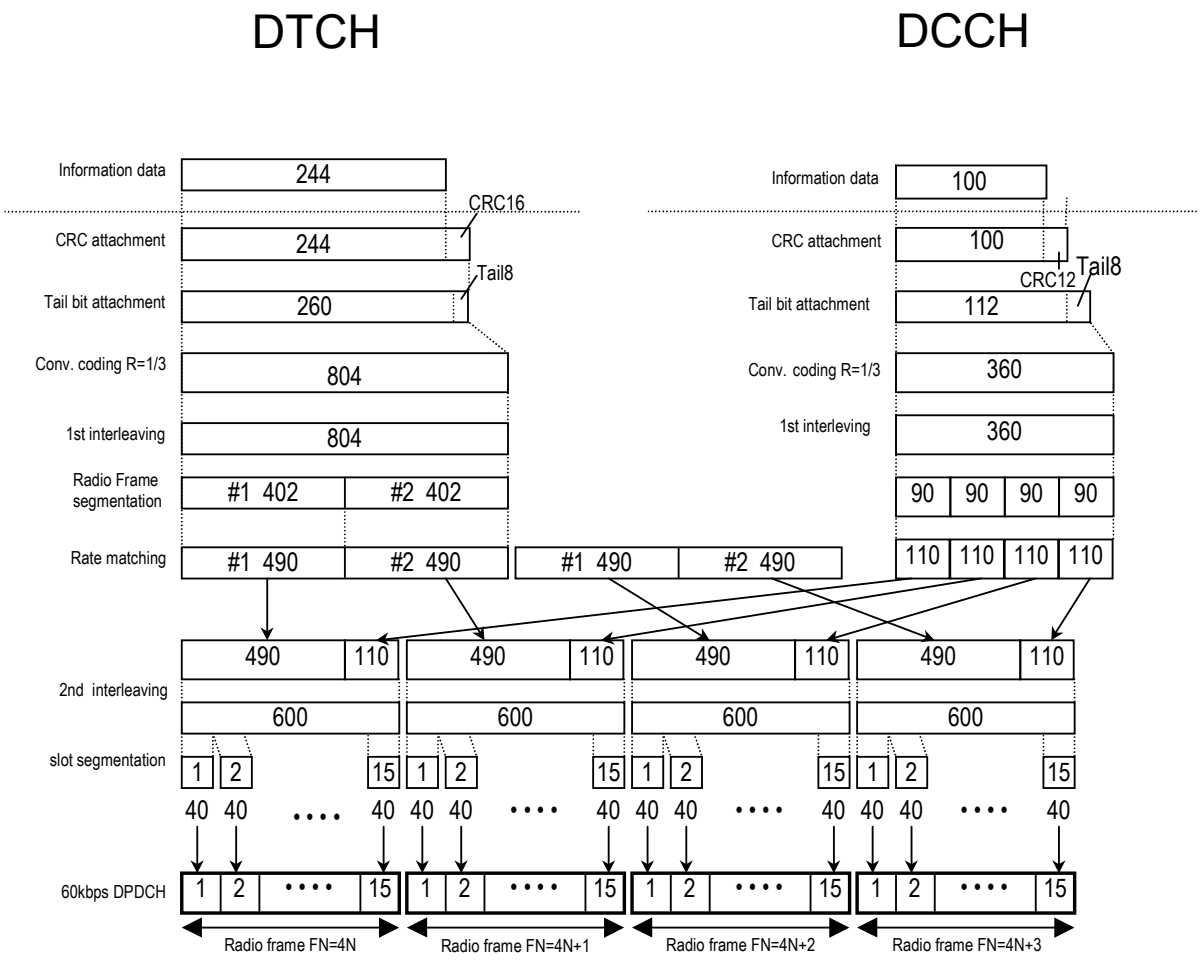


Figure 4.7.3-1 Channel coding for UL reference measurement channel 12.2 kbps

♦ UL_RMC_64kbps channel coding parameters

Table 4.7.3-3 UL reference measurement channel 64 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	64
DPDCH	kbps	240
DPCCH	kbps	15
DPCCH Slot Format #i	–	0
DPCCH/DPDCH power ratio	dB	–5.46
TFCI	–	On
Repetition	%	19

Table 4.7.3-4 UL reference measurement channel 64 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2560	100
Transport Block Set Size	2560	100
Transmission Time Interval	40 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

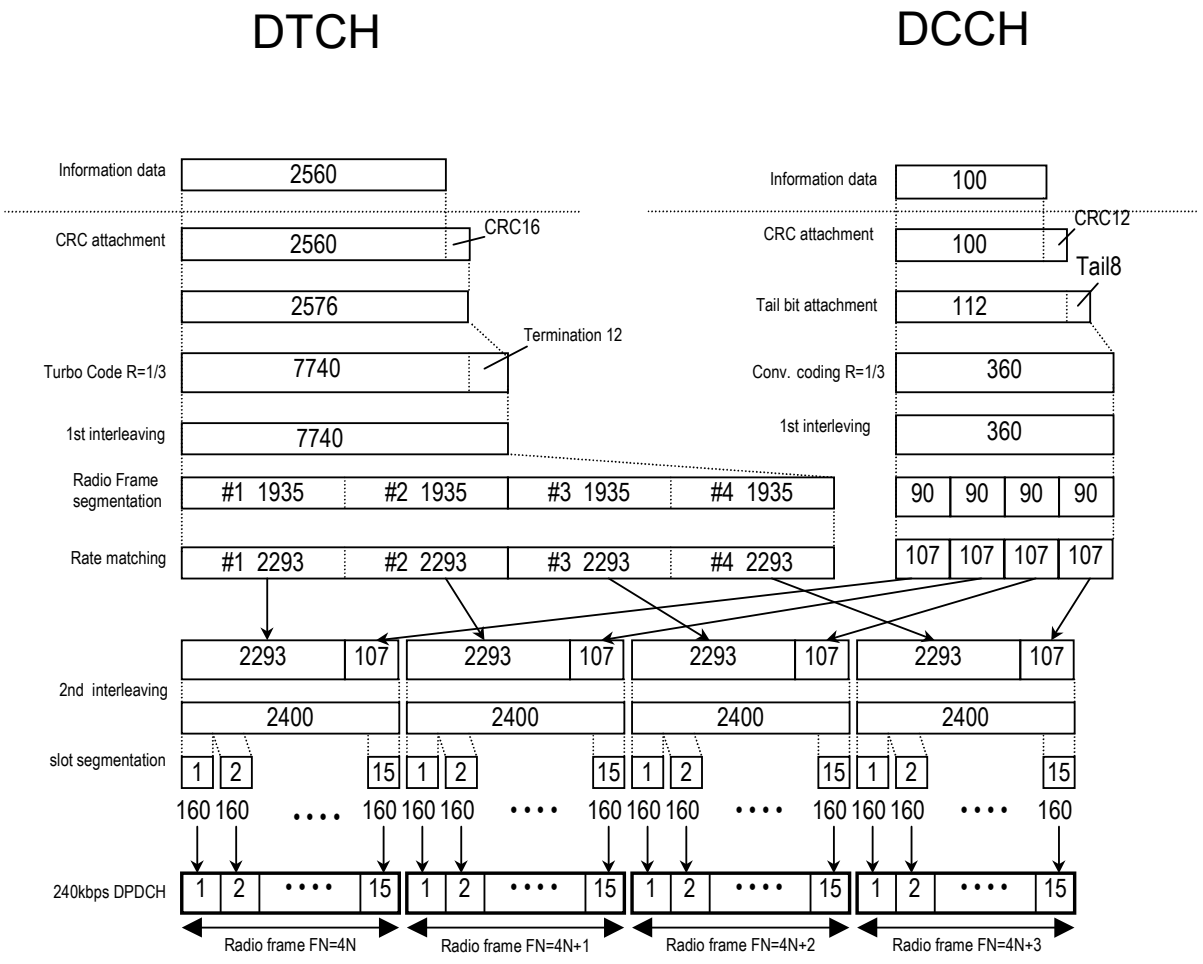


Figure 4.7.3-2 Channel coding for UL reference measurement channel 64 kbps

♦ UL_RMC_144kbps channel coding parameters

Table 4.7.3-5 UL reference measurement channel 144 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	144
DPDCH	kbps	480
DPCCH	kbps	15
DPCCH Slot Format #i	–	0
DPCCH/DPDCH power ratio	dB	–9.54
TFCI	–	On
Repetition	%	8

Table 4.7.3-6 UL reference measurement channel 144 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2880	100
Transport Block Set Size	5760	100
Transmission Time Interval	40 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

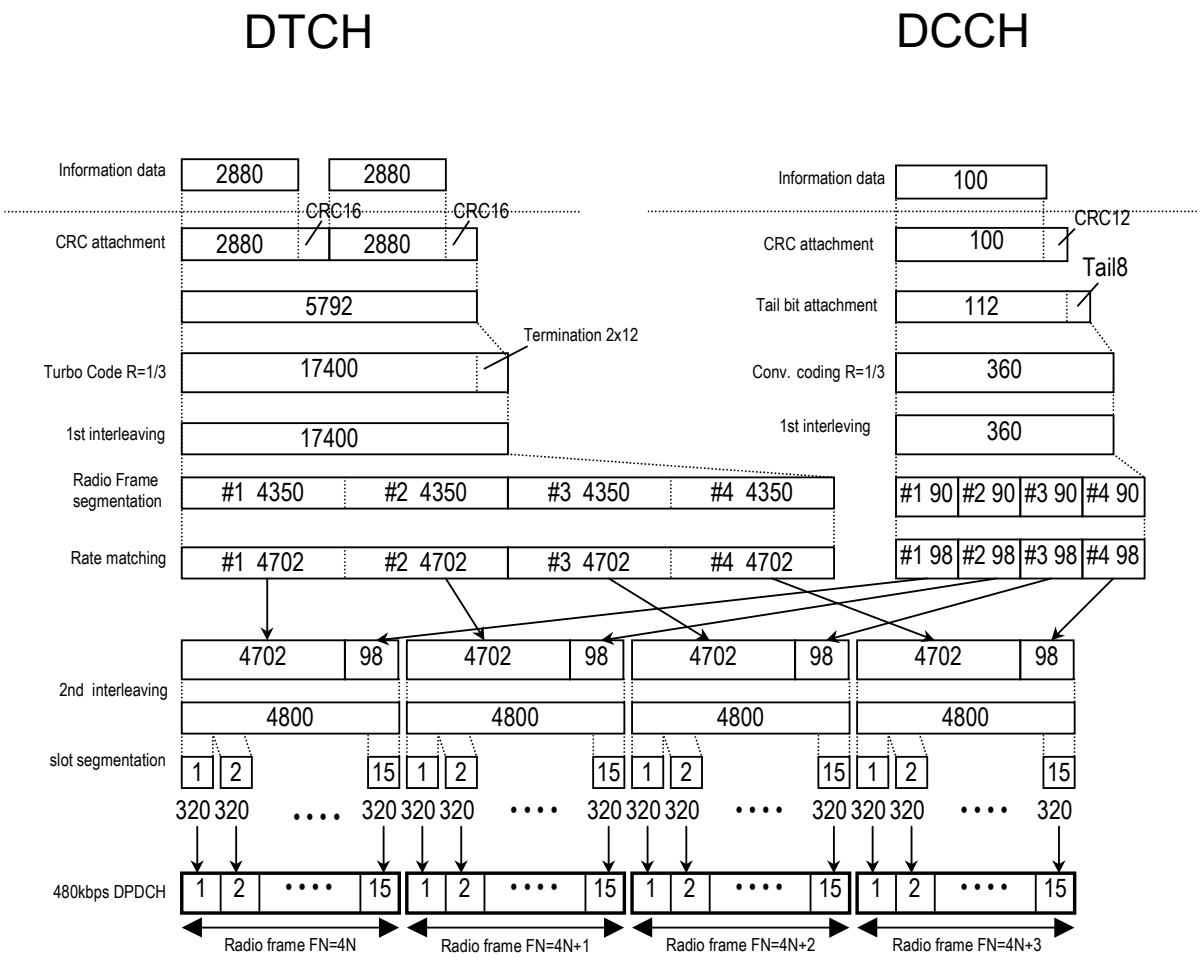


Figure 4.7.3-3 Channel coding for UL reference measurement channel 144 kbps

♦ UL_RMC_384kbps channel coding parameters

Table 4.7.3-7 UL reference measurement channel 384 kbps physical channel parameters

Parameter	Unit	Level
Information bit rate	kbps	384
DPDCH	kbps	960
DPCCH	kbps	15
DPCCH Slot Format #i	–	0
DPCCH/DPDCH power ratio	dB	–9.54
TFCI	–	On
Puncturing	%	18

Table 4.7.3-8 UL reference measurement channel 384 kbps transport channel parameters

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	3840	100
Transport Block Set Size	15360	100
Transmission Time Interval	40 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

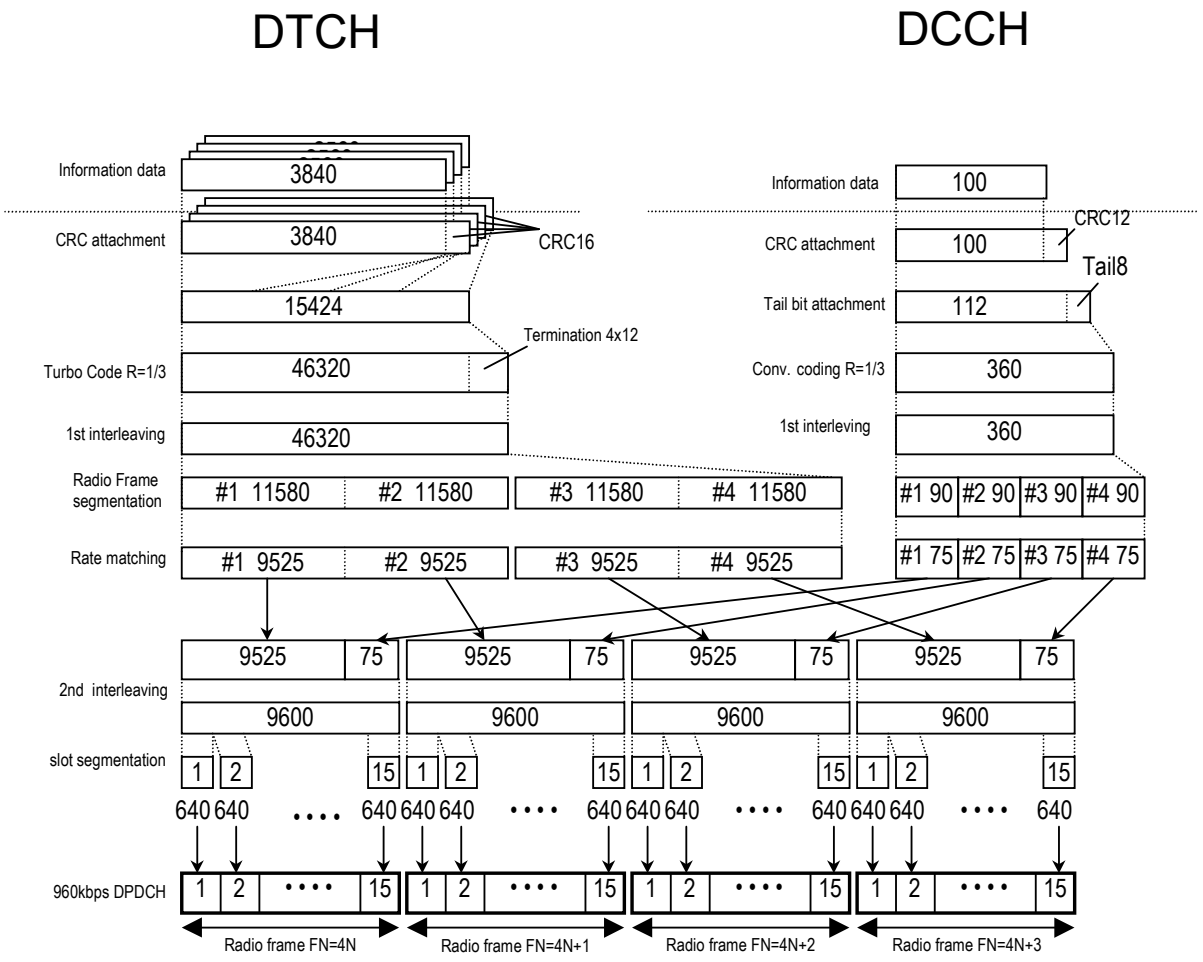


Figure 4.7.3-4 Channel coding for UL reference measurement channel 384 kbps

4.7.4 Details of setting parameters on Channel Edit screen

When the **Channel Edit** button is clicked, the Channel Edit screen shown below is displayed. This section describes the details of the setting items on this screen.

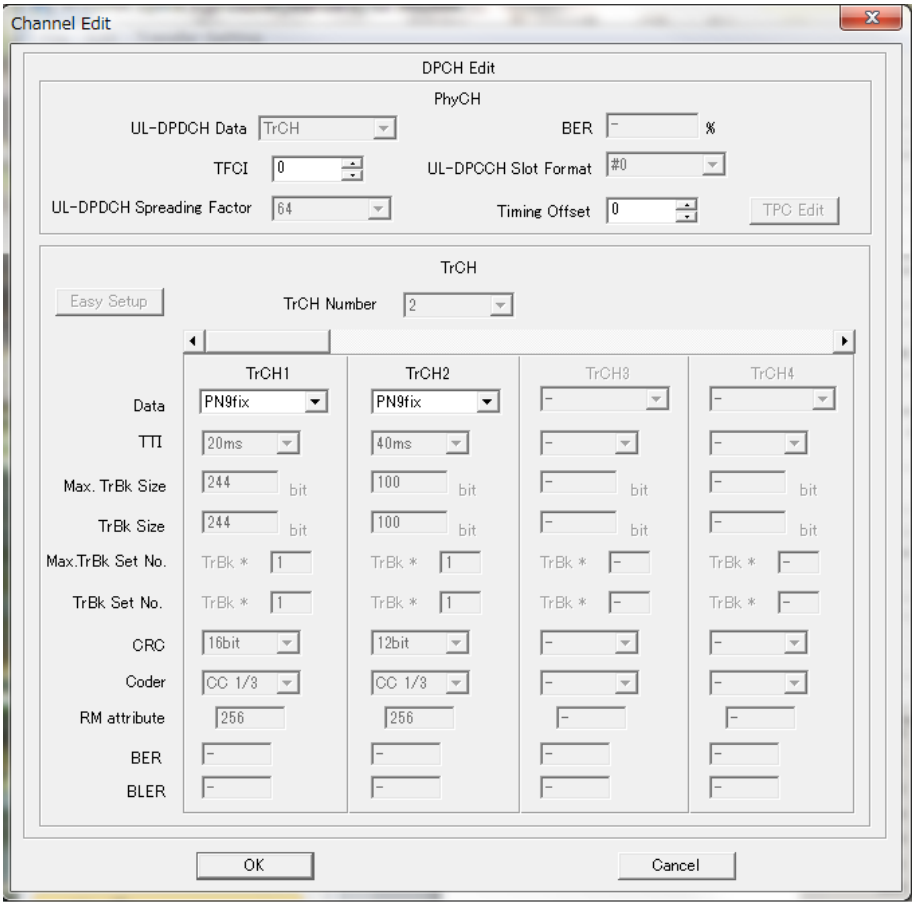


Figure 4.7.4-1 Channel Edit screen

■ OK and Cancel buttons

The **OK** and **Cancel** buttons are provided to close the Channel Edit screen after performing setting.

- When **OK** button is clicked:
  The Channel Edit screen is closed applying the settings.
- When **Cancel** button is clicked:
  The Channel Edit screen is closed ignoring the settings.

Setting Item	DPCH Edit (PhCH)	
Functional Outline	Performs settings for UL-DPCH.	
Setting Parameters	Setting Range	
	Timing Offset	0 to 149
	TFCI	0 to 1023

Setting Item	DPCH Edit (TrCh Edit)	
Functional Outline	Performs settings for TrCH of UL-DPCH.	
Setting Parameters	Setting Range	
	Data	PN9/PN9fix/PN15fix/16bitRepeat
Details	**Data** Selects the data to be inserted to Information Data of the transport channel. **PN9fix**/**PN15fix** is PN9/PN15 data reset at the last data of a signal. The last data of a signal and the first data of the next signal are not continuous.	

4.7.5 Details of setting parameters on Channel Gain Setup screen

When the **Channel Gain Setup** is selected from the **Edit** menu, the Channel Gain Setup screen shown below is displayed. This section describes the details of the setting items on this screen.

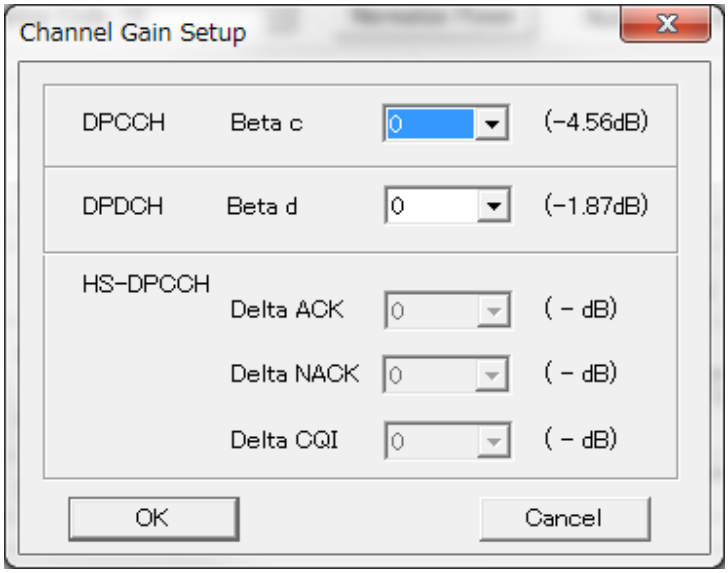


Figure 4.7.5-1 Channel Gain Setup screen

Setting Item	Channel Gain	
Functional Outline	Performs settings for each channel gain	
Setting Parameters	Setting Range	
	Beta c	0 to 15
	Beta d	0 to 15
Details	When the **OK** button is clicked after applying settings to close the Channel Gain Setup screen, the settings for each item are converted to dB units and displayed in the Channel Edit screen. When the **Cancel** button is clicked, the screen is closed without reflecting the settings for each item on the Channel Edit screen.	

4.7.6 Saving/reading parameters

This numeric values and settings for each item can be saved in a parameter file by using IQproducer™.

■ Saving parameter file

<Procedure>

1. Select **Save Parameter File** from the **File** menu or click the tool button to display the parameter file saving screen shown in Figure 4.7.6-1.
2. Enter a file name in the **File name** text box and click the **Save** button to save the parameter file.
   When the save destination is not changed in the **Save in** box, the parameter file is saved in the following directory with the entered file name:
   X:\IQproducer\W_CDMA*Entered file name*.prm
   ("X:\IQproducer" indicates the folder where the IQproducer™ is installed.)

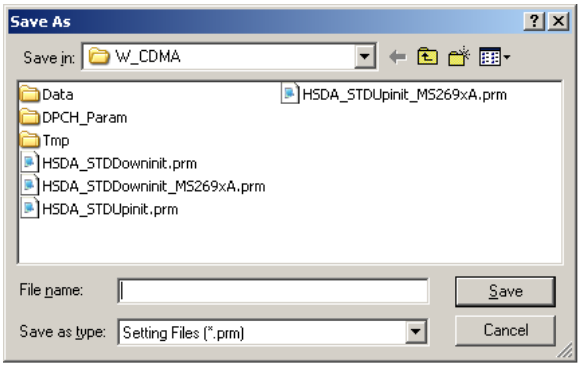


Figure 4.7.6-1 Parameter file saving screen

■ Reading parameter file

<Procedure>

1. Select **Recall Parameter File** from the **File** menu or click the tool button to display the parameter file reading screen shown in Figure 4.7.6-2.
2. Select a parameter file to be read from the file list, and then click the **Open** button to read the selected parameter file.

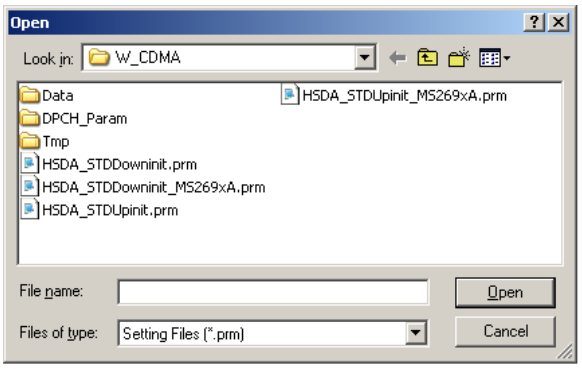


Figure 4.7.6-2 Parameter file reading screen

4.7.7 Generating waveform pattern file

A waveform pattern file to be used in the Vector Signal Generator option can be generated based on the setting values. In the screen shown in Figure 4.7.7-2, the waveform pattern name and comments can be entered and whether to enable or disable the RRC filter can be set.
The number of frames to be generated varies depending on the setting conditions for each channel, and the time required for generating a waveform pattern also varies accordingly.
Refer to Appendix B "Number of Frames to Be Generated" in the *MX269901A HSDPA/HSUPA IQproducer™ Operation Manual* for details on the number of frames to be generated in accordance with the uplink setting conditions.

<Procedure>

1. Select **Calculate Waveform Pattern** from the **Edit** menu or click the tool button.

   At this time, the Warning message shown below appears when the total power is not normalized by clicking the **Normalize Power** button.

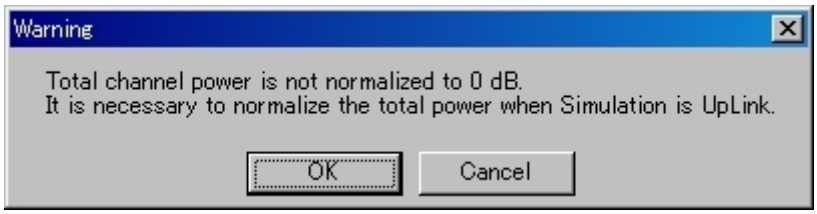


Figure 4.7.7-1 Warning message

   Click the **OK** button to normalize the total power and proceed with the next step.

2. The file name input screen is displayed.

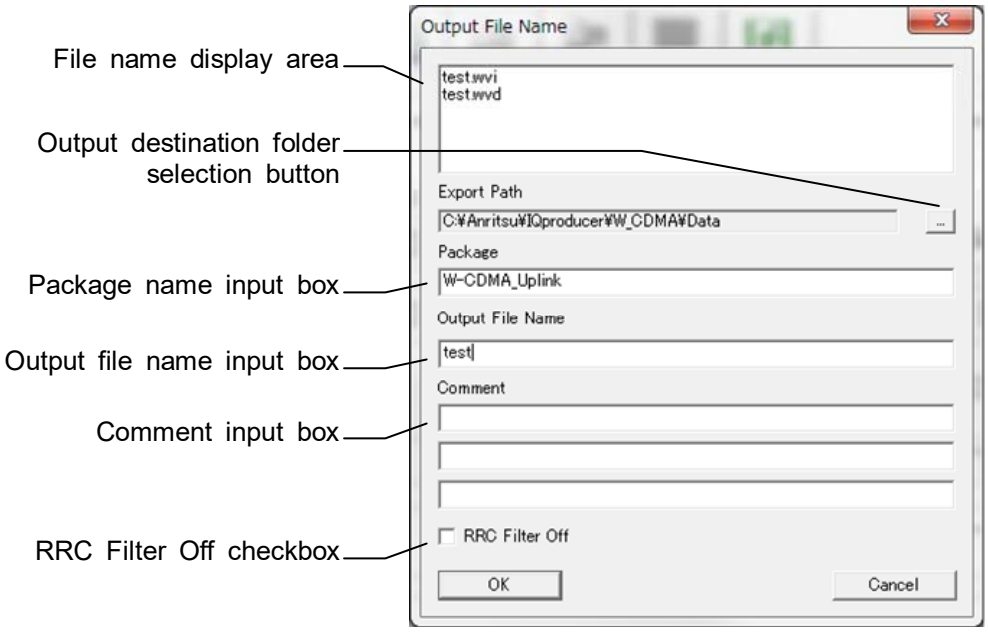


Figure 4.7.7-2 File name input screen

Enter a file name in the file name input box within 20 characters.
1-byte alphanumeric characters and the following symbols can be used for a file name:
! % & ( ) + = ` { } _ - ^ @ [ ]

When a file name is entered, the file to be generated is displayed in the file name display area.

File name format:

test.wvi
- Extension: wvi… Information file (text format)
  wvd… Data file (binary format)
- Entered file name

Enter a comment for the waveform pattern in a comment input box.
Three comment input boxes are provided, and a comment can be entered in each line within 38 characters.
1-byte alphanumeric characters and symbols can be used for comments.
The contents of each comment are displayed on the screen when the corresponding waveform pattern is selected by the Vector Signal Generator option. Leave the comment boxes blank if not necessary.

When the **RRC Filter Off** check box is selected, symbol data that does not pass through the RRC filter is generated as a waveform pattern. You don't need to select this check box under normal conditions.

3. Click the **OK** button to start waveform pattern file generation. The calculation progress screen is displayed during the file generation processing.

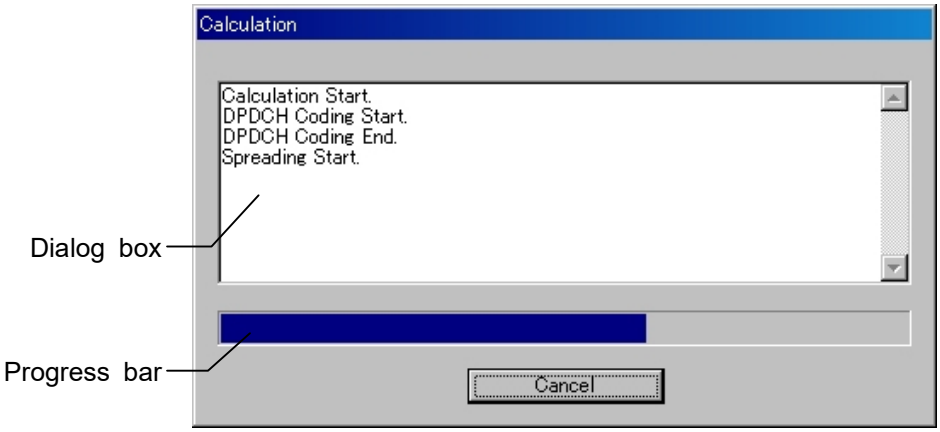


Figure 4.7.7-3 Calculation progress screen

The file generation processing statuses are displayed in the dialog box. The file generation progress status is indicated by the progress bar. When the file is generated completely, the information about the generated waveform pattern file is displayed in the dialog box.

When started with MS269x, MS2830A or MS2840A and when **MS269x** or **MS2830/MS2840** is selected in the **Select instrument** screen, waveform pattern files generated by this application are saved in the following directory:

Installed OS	Export destination folder
Windows Embedded Standard 7, Windows 10, Windows 11	C:\Anritsu\Signal Analyzer\System\Waveform
Other than above	C:\Program Files\Anritsu Corporation\Signal Analyzer\System\Waveform

In other cases, the output destination folder can be selected from the Browse for Folder screen shown in Figure 4.7.7-4, which is displayed by clicking the output destination folder selection button on the Output File Name screen (see Figure 4.7.7-2).

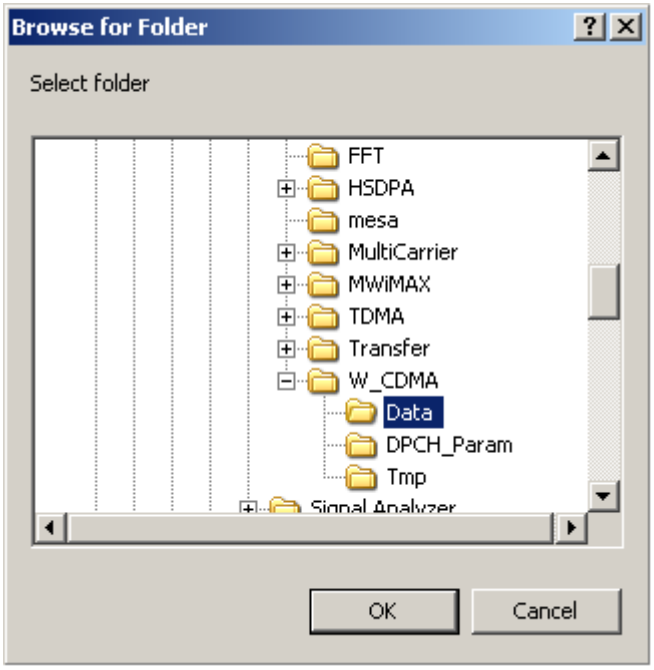


Figure 4.7.7-4 Browse for Folder screen

When the output destination folder is not specified, waveform pattern files are saved in the following directory:
X:\IQproducer\W_CDMA\Data
("X:\IQproducer" indicates the folder where the IQproducer™ is installed.)

Note:

The W-CDMA Uplink IQproducer waveform pattern file generation and the W-CDMA Downlink IQproducer waveform pattern file generation must be operated exclusively. An error dialog box will be displayed if the W-CDMA Uplink IQproducer waveform pattern file generation is started while the W-CDMA Downlink IQproducer waveform pattern file generation is operating, and vice versa. To start the W-CDMA Uplink/Downlink IQproducer waveform pattern file generation while the other is operating, cancel the other file generation or wait until the other file generation is completed.

4.7.8 Auxiliary signal output

When a waveform pattern generated by the W-CDMA Uplink IQproducer™ is selected by the Vector Signal Generator option, a marker signal synchronized with the RF signal is output from the AUX connector on the rear panel as an auxiliary signal. Refer to the *MS2690A/MS2691A/MS2692A and MS2830A/MS2840A Vector Signal Generator Operation Manual (Operation)* for details on the AUX connector. Frame Pulse (Marker 1) is output.

- Frame Pulse
  A 10-ms cycle pulse synchronized with the symbol at the beginning of the frame is output from Marker 1. The signal polarity can be changed by changing the polarity of Marker 1.

4.8 Help Screen

Click **Help** on the common platform screen.
This screen displays the version information.
Click **OK** to close the Help screen.

The following shows an example.

Figure 4.8-1 Help screen

4.9 Time Domain Graph Display

The time domain waveform of a waveform pattern can be displayed in a graph.

4.9.1 Activation

Select **Time Domain** from the **Simulation & Utility** tab on the common platform screen. The time domain graph display screen is displayed separately.

4.9.2 Time domain graph display screen

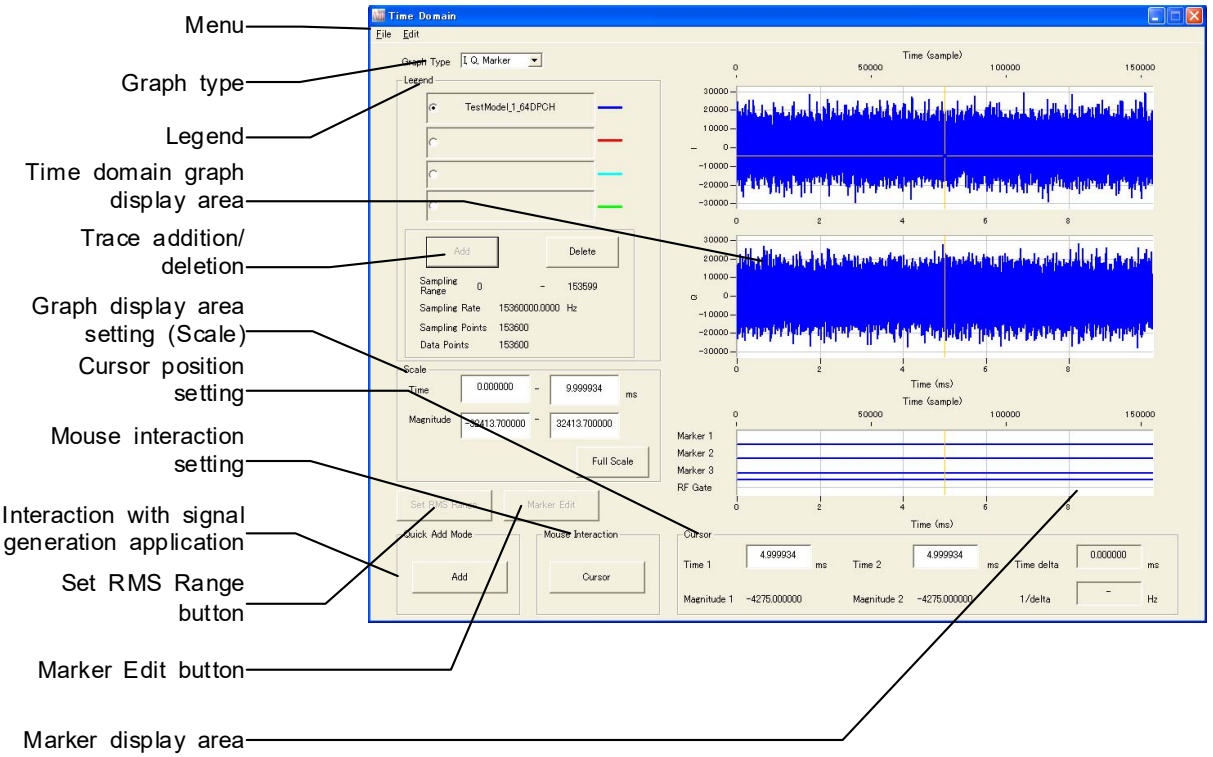


Figure 4.9.2-1 Time domain graph display screen

- Description of items in time domain graph display screen

(1) Menu

Trace addition, trace deletion, Marker Edit dialog box open, and time domain graph display close can be executed.

(2) Graph Type

The graph type can be selected from the drop-down list. Two graph types can be selected: "I, Q, Marker" and "Power, Marker".

(3) Legend

File name display for an added trace, selection of a displayed trace, and selection of a trace to be added/deleted can be executed.

(4) Time domain graph display area
A time domain graph is displayed in this area. Graph cursor move and graph zoom-in display can be executed.

(5) **Add/Delete** (trace addition/deletion)
A trace can be added/deleted.

(6) Cursor Position
The graph cursor position in the time domain graph display area can be specified by entering a value in the **Time** text box.

(7) Mouse Interaction
The mouse operation in the time domain graph display area can be set to either the graph cursor move function or the zoom-in function.

(8) Quick Add Mode (interaction with signal generation application)
Settings for displaying a trace of a waveform pattern generated by a signal generation application to the time domain display in conjunction with the signal generation application are configured.

(9) **Marker Edit** (Marker Edit dialog box open)
Clicking this button opens the Marker Edit dialog box.

(10) Marker display area
The value of each marker is displayed in this area.

(11) **Set RMS Range** button
When the **Time Domain** screen is displayed from the **Convert** screen, this button is used to set the RMS-calculation range.

4.9.3 Displaying time domain graph by reading file

A waveform pattern can be read and displayed in a time domain graph.

■ Time domain graph display using Add button

<Procedure>

1. Click one of the option buttons in the **Legend** dialog box to select the trace color of the waveform pattern in the CCDF graphical area.

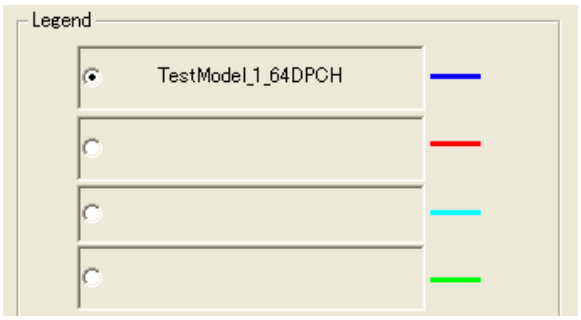


Figure 4.9.3-1 Selecting radio button in Legend

2. Click the **Add** button.

   The **Add** button is disabled when any other waveform pattern is already specified on the selected option button. In such a case, delete the waveform pattern by clicking the Delete button, or click one of other option button.

Figure 4.9.3-2 Add button

Otherwise, select **Add Trace** from the **File** menu.

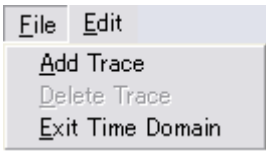


Figure 4.9.3-3 Add Trace in File menu

3. Click the .. button in the Add Trace screen, and select a waveform pattern for which a time domain graph is displayed.

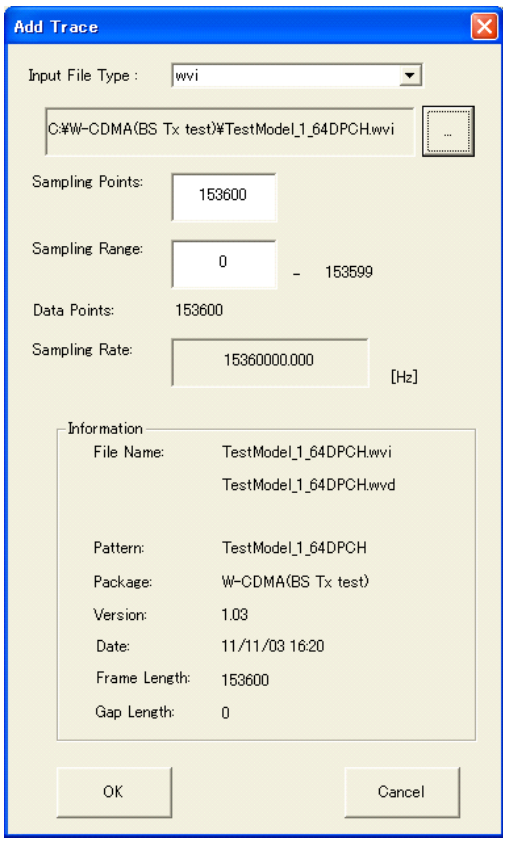


Figure 4.9.3-4 Add Trace screen

Waveform pattern files that have the formats below can be read. For details about the ASCII1, ASCII2, ASCII3, and MS269x/MS2830A/MS2840A Digitizer formats, see Section 4.5.6 “Input file format”.

- ASCII1
- ASCII2
- ASCII3
- MS269x/MS2830A/MS2840A Digitizer
- wvi

Also, a maximum of 1 Msample (= 1,048,576 samples) can be read.

When a waveform pattern is selected, either the data of the selected waveform pattern or “1 Msample” is displayed in the Sampling Points text box. The number of reading data can be changed by editing the value in the Sampling Points text box. Also, the waveform pattern reading start position can be specified by changing the value in the Sampling Range text box. If the ASCII1, ASCII2, or ASCII3 format was selected for waveform pattern display,

enter a value for **Sampling Rate**.

4. Click the **OK** button on the Add Trace screen to read the waveform pattern.
   When the waveform pattern has been read completely, the time domain graph display screen is displayed again with a trace in the color selected in **Legend**.

4.9.4 Deleting time domain graph

The time domain graph displayed in the screen can be deleted.

■ Deleting time domain graph using Delete button

<Procedure>

1. Click the option button in the **Legend** dialog box to select the trace to be deleted.

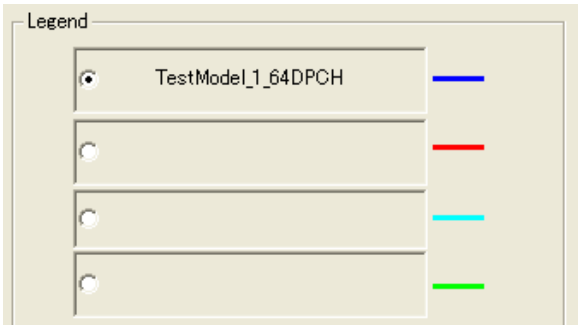


Figure 4.9.4-1 Selecting radio button in Legend

2. Click the **Delete** button to delete the graph corresponding to the selection in the **Legend** field.

Figure 4.9.4-2 Delete button

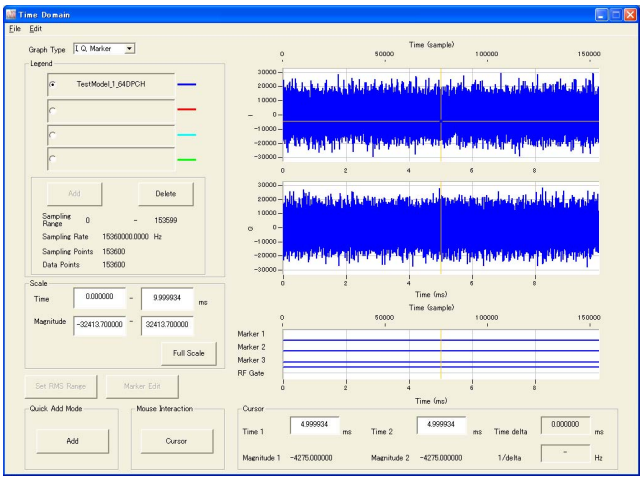
Otherwise, select **Delete Trace** from the **File** menu.

Figure 4.9.4-3 Delete Trace in File menu

4.9.5 Graph type

When “I, Q, Marker” is selected from the **Graph Type** drop-down list, the time domain waveform of the I-phase, Q-phase, and marker data of the selected waveform pattern is displayed.
When “Power, Marker” is selected, the time domain waveform of the marker data and the power based on the rms value (written in the wvi file) of the selected waveform pattern is displayed.

When “I, Q, Marker” is selected



When “Power, Marker” is selected

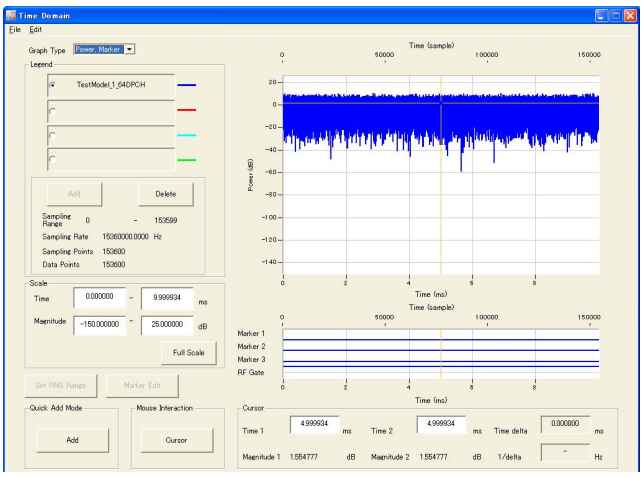


Figure 4.9.5-1 Time domain graph display according to Graph Type setting

4.9.6 Sampling information display

The sampling information on the trace selected by a radio button in the **Legend** field is displayed in the lower area of the **Legend** field.

The reading start sample and the reading end sample are displayed for **Sampling Range** (the first sample is "0").
The sampling rate of the waveform pattern to be read is displayed for **Sampling Rate**.
The number of read samples is displayed for **Sampling Points**.
The data point of the reading target waveform pattern is displayed for **Data Points**.

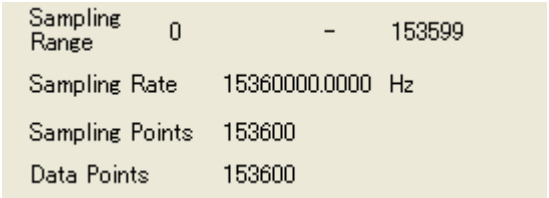


Figure 4.9.6-1 Trace sampling information

4.9.7 Selecting mouse interaction in time domain graph display area

Graph cursor move or graph zoom-in can be selected for a mouse dragging operation in the time domain graph display area.

Click the **Mouse Interaction** button to display the **Mouse Interaction** dialog box.

Cursor The mouse is used to move the cursor.

Zoom The mouse is used to set the zooming area.

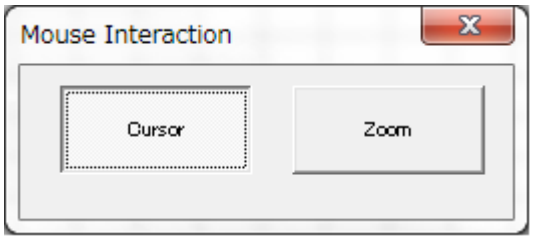


Figure 4.9.7-1 Mouse Interaction Dialog Box

4.9.8 Moving graph cursor

The graph cursor displayed in the time domain graph display area can be moved.

■ Moving graph cursor using mouse

When the black-line or yellow-line cursor in the Time Domain graph display area is dragged, the cursor is moved.

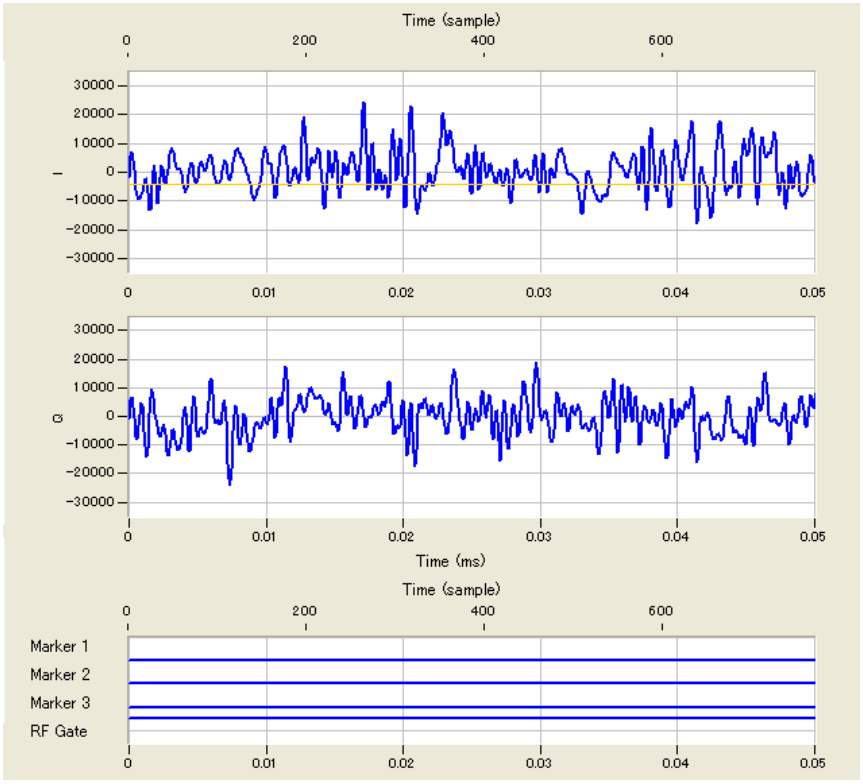


Figure 4.9.8-1 Graph cursor in time domain graph display area

The contents displayed in **Cursor** in the time domain graph display screen are updated as the graph cursor is moved.

■ Moving graph cursor changing Cursor value

When the **Time 1** value in the **Cursor** area of the **Time Domain** graph display screen is updated, the black-line cursor moves and the **Magnitude 1** value is updated.

Similarly, when the **Time 2** value is updated, the yellow-line cursor moves and the **Magnitude 2** value is updated.

When the black-line or yellow-line cursor is moved by changing the **Time 1** or **Time 2** value, respectively, the **Time delta** and **1/delta** values are updated. **Time delta** displays the result of subtracting the **Time 1** value from the **Time 2** value, and **1/delta** displays the reciprocal of the **Time delta** value.

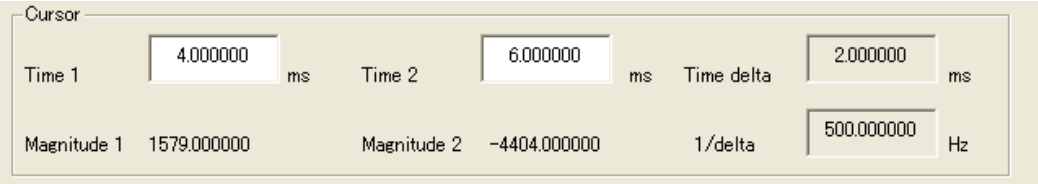


Figure 4.9.8-2 Cursor input

4.9.9 Changing graph scale

The scale of the graph currently displayed can be changed.

■ Changing graph display area scale

The scales for the time (X axis) and amplitude (Y axis) of the time domain graph display area are updated by changing the value(s) in the **Scale** field on the time domain graph display screen.
The values set in the **Time** text boxes (X axis) indicate the range of the sampled data displayed in a graph, and 0.0 ms represents the start of that data.

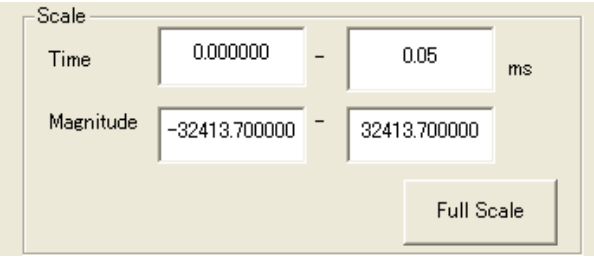


Figure 4.9.9-1 Scale input

<Procedure>

1. Click the **Time** text box and enter values from the keyboard to specify the time display range.
2. Click the **Magnitude** text box and enter values from the keyboard to specify the amplitude display range.

When the focus is moved to another control after changing the value(s) in the **Time** text box as shown in Step 1 above, the scale for the X axis in the time domain graph display area is updated.

Similarly, when the focus is moved after changing the value in the **Magnitude** text box as shown in Step 2 above, the scale for the Y axis in the time domain graph display area is updated.

In addition, the scale of both axes can be adjusted to display the entire **Time Domain** graph by clicking the **Full Scale** button.

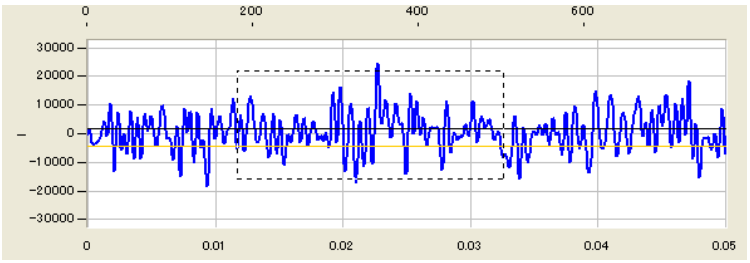


Figure 4.9.9-2 Graph scale change by mouse operation

■ Specifying display area by mouse operation

When **Zoom** is selected for **Mouse Interaction**, pointing and dragging an area in the time domain graph enlarges the selected area (within the dotted rectangle).

4.9.10 Values displayed on graph

This section describes how a trace on the I, Q, Power, and Marker graphs displays the data or marker of the waveform pattern, separately for each graph type.

■ I and Q graphs

On the I and Q graphs (displayed when "I, Q, Marker" is selected from the **Graph Type** drop-down list), the sample values of the read waveform pattern are plotted and adjacent samples are connected by linear interpolation.

Note that the sample-unit time scale above the I graph applies only to the trace selected by **Legend**, while the ms-unit time scale below the Q graph applies to any displayed traces.

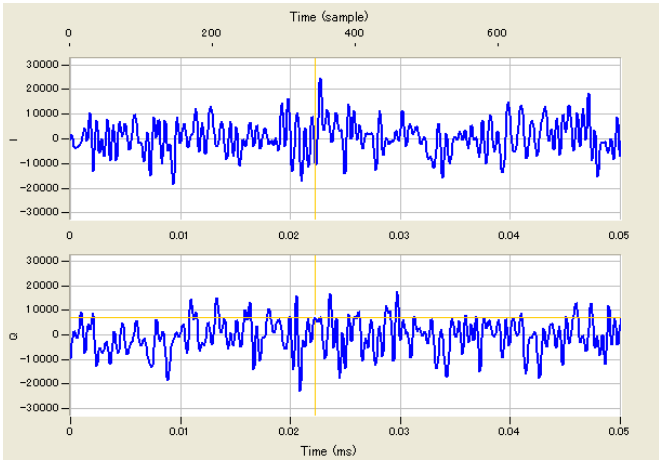


Figure 4.9.10-1 I and Q graph example

■ Power graph

On the Power graph (displayed when "Power, Marker" is selected from the **Graph Type** drop-down list), the sample values of the read waveform pattern are plotted as power and adjacent samples are connected by linear interpolation.

If ASCII1, ASCII2, ASCII3, or wvi is selected as the file format for waveform pattern display, The X axis of the Power graph is displayed with the RMS value of the waveform pattern as 0 dB. When the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A actually outputs a modulation signal, therefore, the output modulation signal is based on 0 dB of the Power graph.

Output level of MS2690A/MS2691A/MS2692A or MS2830A/MS2840A
= Display level of MS2690A/MS2691A/MS2692A or MS2830A/MS2840A
+ Level on Power graph

If MS269/MS2830A/MS2840A Digitizer is selected as the file format for waveform pattern display, the level recorded in the digitized file is displayed as is. Therefore, when this equipment is actually used to

output a modulated signal, the output signal does not necessarily use the 0 dB in the Power graph as a reference.

Note that the sample-unit time scale above the Power graph applies only to the trace selected by **Legend**, while the ms-unit time scale below the Power graph applies to any displayed traces.

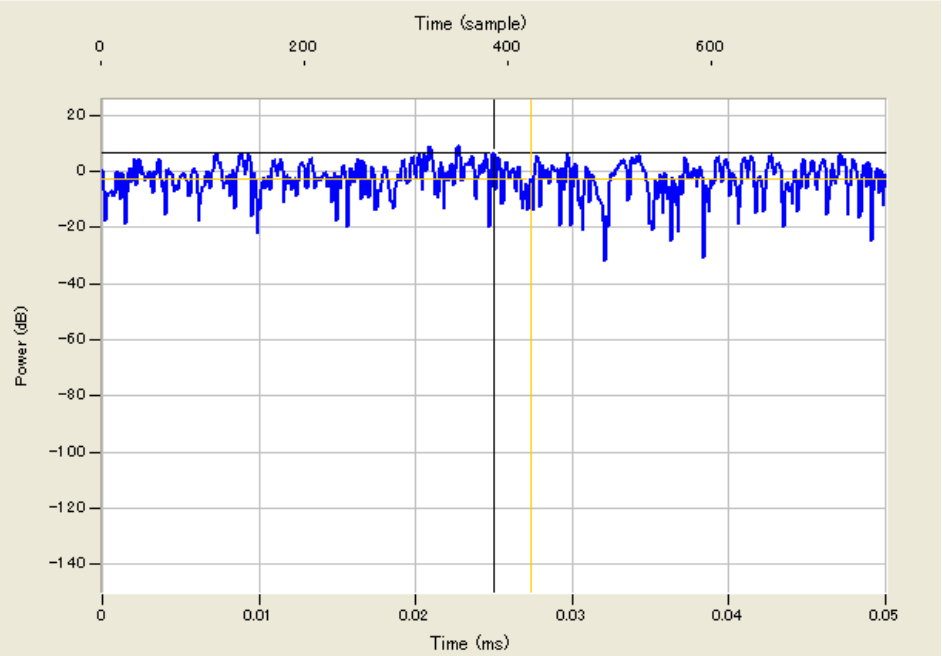


Figure 4.9.10-2 Power graph example

■ Marker graph

On the Marker graph, Markers 1, 2, 3, and RF Gate of the samples of the trace selected by **Legend** are displayed. Marker graphs are traced in a staircase pattern, where a line is drawn from a plotted point to the right. At Sample 115200 in Figure 4.9.10-3, for example, Marker 1 is 0 (LO), Markers 2 and 3 are 1 (HI), and RF Gate is 1 (RF On).
Note that the sample-unit time scale above the Marker graph applies only to the trace selected by **Legend**, while the ms-unit time scale below the Marker graph applies to any displayed traces.

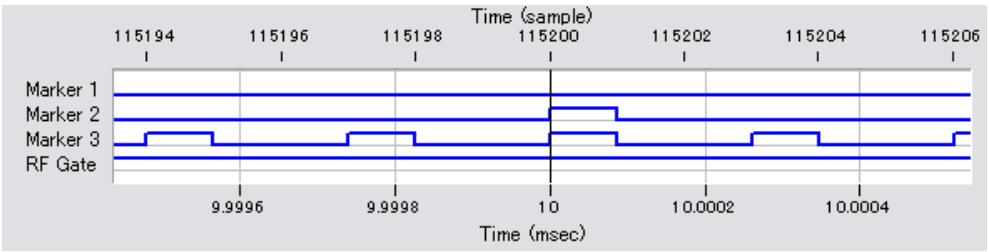


Figure 4.9.10-3 Marker graph example

4.9.11 Interaction with signal generation application (Quick Add Mode)

The method for updating the time domain graph display in conjunction with waveform pattern generation by a signal generation application can be set and changed. This function is enabled only when the time domain graph display function is activated.

Figure 4.9.11-1 Quick Add Mode

■ When Add is selected:

A trace is added to the time domain graph when **Time Domain** is selected from the **Simulation** menu or the **Time Domain** tool button is clicked after data generation by the signal generation application. Note that the time domain graph display will not be updated when the four traces are all used.

■ When Clear is selected:

A trace is deleted from the time domain graph and the time domain graph of the generated data is displayed when **Time Domain** is selected from the **Simulation** menu or the **Time Domain** tool button is clicked after data generation by the signal generation application.

■ When Off is selected:

The time domain graph display will not be updated even when **Time Domain** is selected from the **Simulation** menu or the **Time Domain** tool button is clicked after data generation by the signal generation application.

4.9.12 Marker edit function

A new waveform pattern can be created by reading an existing waveform pattern and editing the marker data and name with the marker edit function.
The marker edit function cannot be used if ASCII1, ASCII2, ASCII3, or MS269x/MS2830A/MS2840A Digitizer was selected as the file format for waveform pattern display.

Note:

When the waveform pattern bit width is 16 bits, the marker edit function is not available.

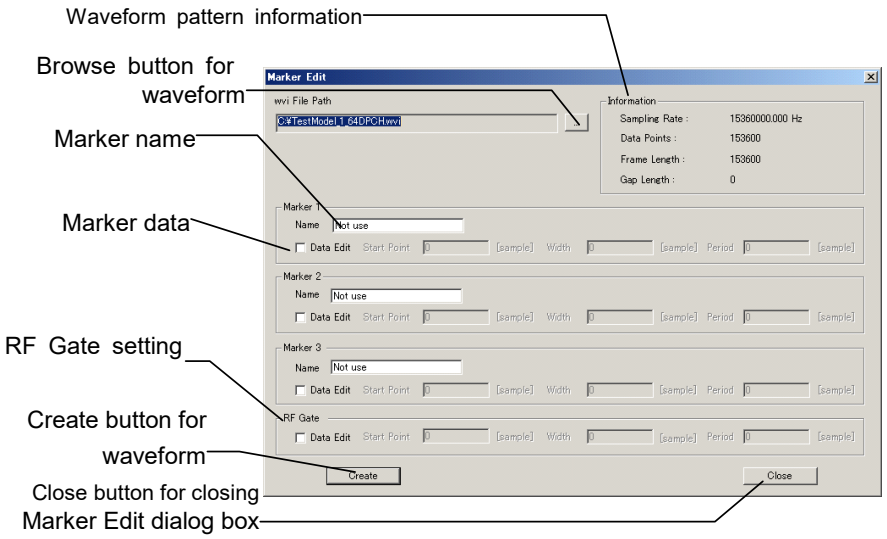


Figure 4.9.12-1 Marker Edit dialog box

• Description of items in Marker Edit dialog box

Waveform pattern information

Information about the read waveform pattern is displayed.

Browse button for waveform pattern selection

Clicking this button displays the dialog box for selecting a waveform pattern to be read.

Marker name setting

The name of each marker can be specified.

Marker data setting

Select or clear the **Data Edit** check box to specify whether to edit the data of the corresponding marker.
When it is cleared, marker data edit is disabled and the marker data of the read waveform pattern is used as is.
When it is selected, marker data edit is enabled, and the marker

data with the values set in the **Start Point**, **Width**, and **Period** text boxes are added to the new waveform pattern to be created.

Set the number of samples prior to the first marker signal output starting point to **Start Point**, the number of samples to output marker signals to **Width**, and the number of samples between the marker signal output starting points to **Period**.

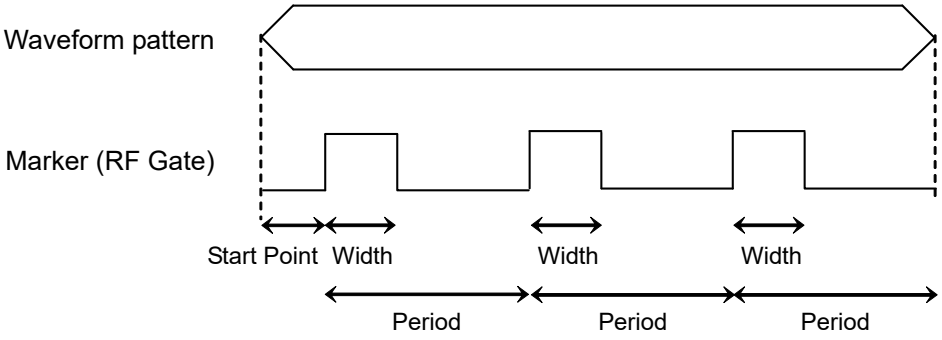


Figure 4.9.12-2 Parameters for setting Marker and RF Gate data

RF Gate setting

Select or clear the **Data Edit** check box to specify whether to edit the RF Gate data.
When it is cleared, RF Gate data edit is disabled and the RF Gate data of the read waveform pattern is used as is.
When it is selected, RF Gate data edit is enabled, and the RF Gate data with the values set in the **Start Point**, **Width**, and **Period** text boxes are added to the new waveform pattern to be created.
Set the number of samples prior to the first RF Gate data output starting point to **Start Point**, the number of samples to output RF Gate data to **Width**, and the number of samples between the RF Gate data output starting points to **Period**.

Create button (for waveform pattern generation)

This button is used to create a new waveform pattern according to the parameters set in the Marker Edit dialog box. Click the **Create** button to display the Export File dialog box, and then specify the output folder, output waveform pattern name, and package name in this dialog box.

When started with MS269x, MS2830A or MS2840A and when **MS269x** or **MS2830/MS2840** is selected in the **Select instrument** screen, waveform pattern files generated by this application are saved in the following directory:

Installed OS	Export destination folder
Windows Embedded Standard 7, Windows 10, Windows 11	C:\Anritsu\Signal Analyzer\System\Waveform
Other than above	C:\Program Files\Anritsu Corporation\Signal Analyzer\System\Waveform

Close button (for closing Marker Edit dialog box)

Click this button to close the Marker Edit dialog box.

Refer to Section 4.5.6 “Input file format” for details on marker data and RF Gate data.

4.9.13 Displaying the Time Domain screen from the Convert screen

By displaying the **Time Domain** screen from the **Convert** screen, the pre-conversion waveform pattern can be checked and the range for RMS calculation during conversion can be specified.
However, when the **Time Domain** screen is displayed from the **Convert** screen, traces cannot be added or deleted.

On the **Time Domain** screen, to specify the RMS-calculation range used for waveform conversion on the **Convert** screen, use the black-line and yellow-line cursors.

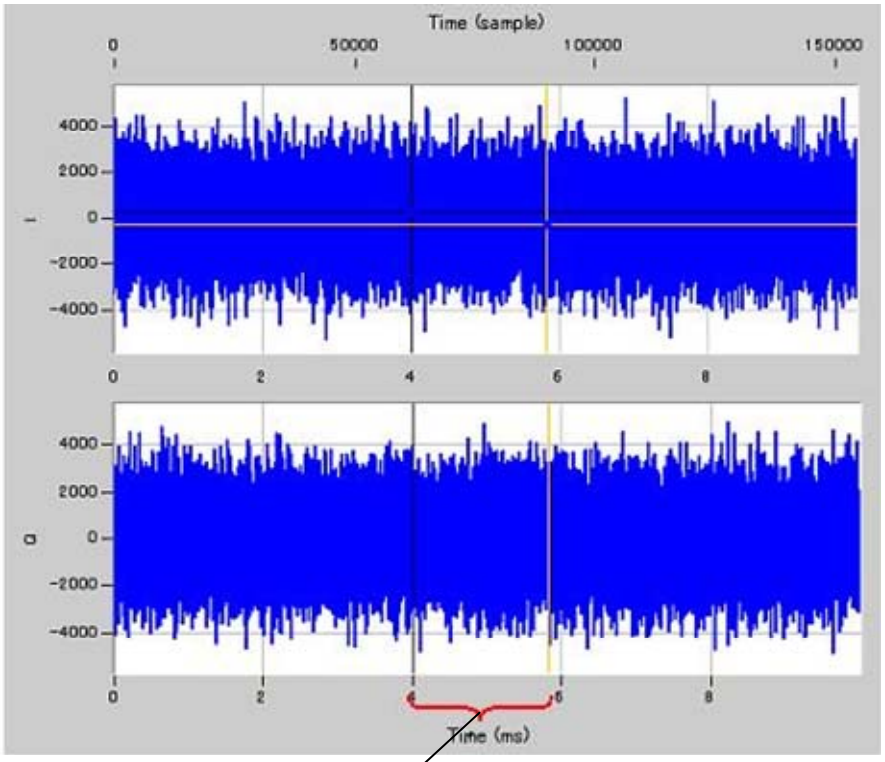


Figure 4.9.13-1 Setting the RMS-calculation range

After specifying the RMS-calculation range by using the black-line and yellow-line cursors, click the **Set RMS Range** button to specify the RMS-calculation range used when converting the waveform pattern on the **Convert** screen and close the **Time Domain** screen.

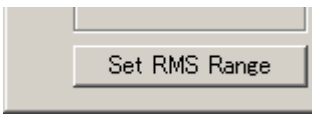


Figure 4.9.13-2 Set RMS Range button

4.10 Clipping Function

This function performs clipping processing for a waveform pattern generated by each signal generation application. Filter, bandwidth, and number of repetition times must be set to generate a clipping-processed waveform pattern. The generated waveform pattern consists of a waveform information file (text format file with the extension ".wvi") that stores the information related to the waveform pattern and a waveform data file (binary format file with the extension ".wvd").

4.10.1 Activation

Select **Clipping** from the **File Gen.** menu on the common platform screen. The Clipping setting screen is displayed separately.

4.10.2 Clipping setting screen

The parameters related to clipping processing can be set in the Clipping setting screen.

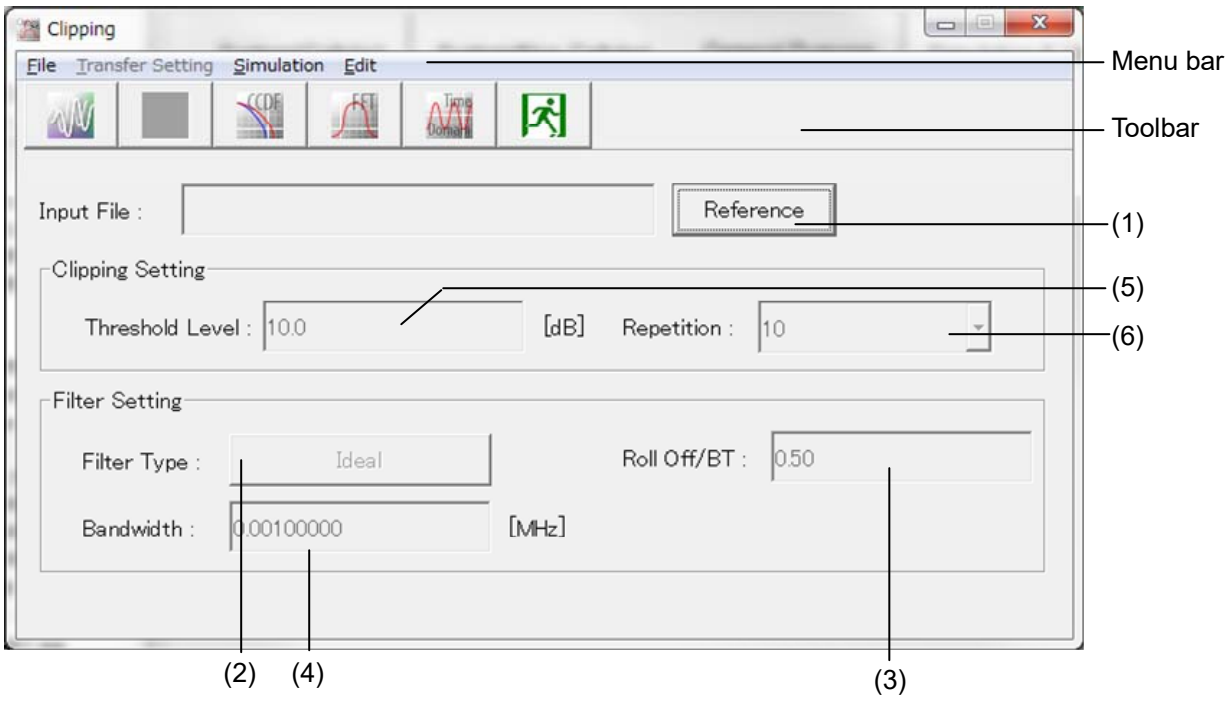


Figure 4.10.2-1 Clipping setting screen

■ Menu bar

The following menus are provided on the menu bar.

- The **File** menu contains the following item.
  - **Exit**
    Exits from the Clipping.

- The **Simulation** menu contains the following items.
  - **CCDF**
    Displays the CCDF graph display screen.
    The CCDF of a generated waveform pattern is displayed in a graph.
  - **FFT**
    Displays the FFT graph display screen.
    The spectrum where FFT processing is performed for a generated waveform pattern is displayed in a graph.
  - **Time Domain**
    Displays the time domain graph display screen.
    The time domain waveform of a generated waveform pattern can be displayed in a graph.

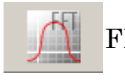
- The **Edit** menu contains the following item.
  - **Calculation**
    Performs waveform pattern generation.

■ Tool bar

The following tool buttons are provided on the tool bar. The function of each button is the same as the corresponding item in the menus.

Calculation button

CCDF button

 FFT button

Time Domain button

Exit button

■ Description of items on Clipping setting screen

(1) Reference button
Select the wvi file of the target waveform pattern.

(2) Filter Type
Set the filter type.

Setting options: Ideal, None, Nyquist, Root Nyquist, Gaussian

Initial setting: Ideal

Ideal indicates a low-pass filter, which suppresses the ripple to 0.01 dB or less within the range from –0.475 × Bandwidth to +0.475 × Bandwidth if Sampling Rate/Bandwidth is 50 or less.

(3) Roll Off/BT
Set the roll off ratio. This is enabled when Filter Type is set to Nyquist, Root Nyquist, or Gaussian.
Setting range: 0.10 to 1.00
Setting resolution: 0.01
Initial value: 0.50

(4) Bandwidth
Set the bandwidth.
Setting range: Sampling Rate/1000 or 0.00100000 (whichever is smaller) to Sampling Rate
Setting resolution: 0.00000001
Initial value: Bandwidth of the waveform pattern specified in the Input File text box

(5) Threshold Level
Set the threshold level for clipping.
Setting range: 0.0 to 20.0
Setting resolution: 0.1
Initial value: 10.0

(6) Repetition
Set the number of times to repeat clipping and filtering.
Setting range: 1 to 20
Setting resolution: 1
Initial value: 10

4.10.3 Setting method

<Procedure>

1. Click the Reference button to select the wvi file of the waveform pattern to be used. The full path of the selected wvi file is displayed in the **Input File** text box.
2. Set values in the **Filter Type**, **Roll Off/BT**, **Bandwidth**, **Threshold Level**, and **Repetition** text boxes.
3. Select **Calculation** from the **Edit** menu or click the button to complete setting.

4.10.4 Generating waveform pattern

When the parameter setting has been completed in the Clipping setting screen, select **Calculation** from the **Edit** menu or click the button to display the Export File screen shown in Figure 4.10.4-1. In this screen, set the waveform pattern export destination, package name, and file name, and then enter a comment (if necessary) to generate a clipping-processed waveform pattern. The Comment text box can be left blank for waveform pattern generation.

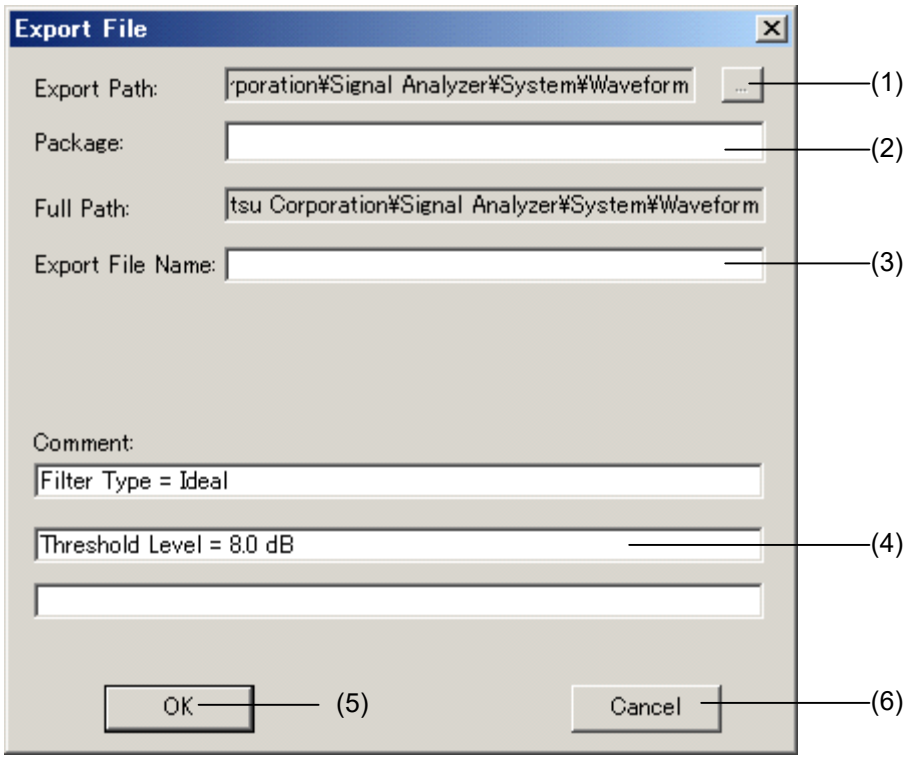


Figure 4.10.4-1 Export File screen

■ Description of items in Export File window

(1) Browse button

Click this button to select the output destination folder of the clipping-processed waveform pattern file.

When started with MS269x, MS2830A or MS2840A and when **MS269x** or **MS2830/MS2840** is selected in the **Select instrument** screen, waveform pattern files generated by this application are saved in the following directory:

Installed OS	Export destination folder
Windows Embedded Standard 7, Windows 10, Windows 11	C:\Anritsu\Signal Analyzer\System\Waveform
Other than above	C:\Program Files\Anritsu Corporation\Signal Analyzer\System\Waveform

(2) Package
Enter the name of the package of the clipping-processed waveform pattern to be generated. Up to 31 characters can be entered for a package name. Alphanumeric characters and the following symbols may be used:
! % & ( ) + = ` { } _ - ^ @ [ ]

(3) Export File Name
Enter the name of the clipping-processed waveform pattern file to be generated (common to wvi and wvd files). Up to 20 characters can be entered. The usable characters are the same as those for the package name.

(4) Comment
The comment entered here is displayed in the Comment area on the MS2690A/MS2691A/MS2692A or MS2830A/MS2840A screen when the clipping-processed waveform pattern to be generated is output from the MS2690A/ MS2691A/MS2692A or MS2830A/MS2840A. Up to 38 characters can be entered.
When the Export File screen is displayed for the first time, the settings of Filter Type and Threshold Level are initially displayed in the upper and middle lines, respectively. Edit them, if necessary.

(5) OK
Click this button to start clipping-processed waveform pattern generation.

(6) Cancel
Click this button to close the Export File screen and return to the setting screen.

<Procedure>

1. The output destination of the clipping-processed waveform pattern file is displayed in the **Export Path** text box.
2. Set the name of the package of the clipping-processed waveform pattern in the **Package** text box.
3. Set the clipping-processed waveform pattern file name in the **Export File Name** text box.
4. In the **Comment** text boxes, enter information on the clipping-processed waveform pattern to be displayed (if necessary).
5. Click the **OK** button to start waveform pattern generation. Click the **Cancel** button to return to the setting screen.

6. When waveform pattern generation starts, the waveform generation execution screen shown in Figure 4.10.4-2 appears. When the **Cancel** button at the bottom of the screen is clicked, waveform generation stops and the setting screen is displayed again. When waveform generation completes (when "Calculation Completed" is displayed), click the **OK** button to close the waveform generation screen and return to the setting screen.

Figure 4.10.4-2 Waveform generation execution screen

7. The clipping-processed waveform pattern file is generated in the destination specified in the **Export Path** text box, with the file name (common to wvi and wvd files) specified in the **Export File Name** text box.

4.10.5 Clipping-processed waveform pattern simulation examples

This section provides a simulation example of the spectrum and CCDF graphs of the clipping-processed waveform pattern in Figs 4.10.5-1 and 4.10.5-2, respectively. In this example, the original waveform pattern is generated by the MX269905A Mobile WiMAX IQproducer, and clipping processing is performed with the following settings:

Filter Type: Ideal
Bandwidth: 10.00000000 (MHz)
Threshold Level: 8.0
Repetition: 20

The red line on Figure 4.10.5-2 indicates the CCDF graph before clipping.

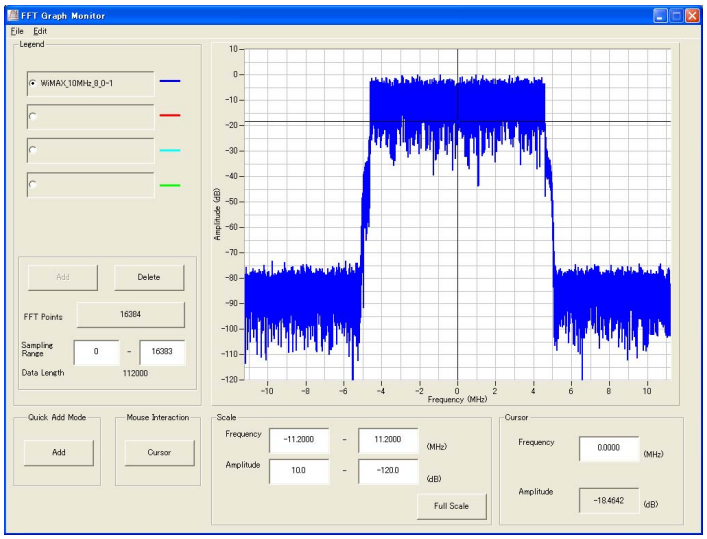


Figure 4.10.5-1 Spectrum after clipping processing

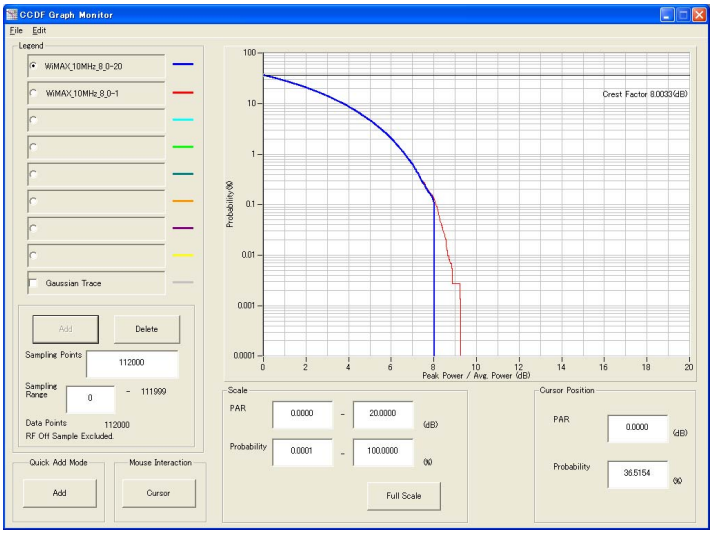


Figure 4.10.5-2 CCDF graph after clipping processing

4.10.6 Details of clipping processing

During clipping processing, clipping and filtering are performed repeatedly, as shown in Figure 4.10.6-1. The clipping processing clips the peaks that exceed Threshold Level, referencing on RMS_{IQ} as the basis (0 dB). Figure 4.10.6-2 shows a schematic diagram of the clipping processing at this time.

RMS_{IQ} that is used as the basis of the clipping processing is calculated from the following expression.

$$\mathrm{RMS_{IQ}} = \sqrt{\frac{1}{N}\sum_{n}\left(I_n^2 + Q_n^2\right)}$$

wherein, Σ is the sum of the target waveform patterns (excluding samples for which RF output is set to Off by the RF Gate setting).

When clipping and filtering are performed, RMS_{IQ} is calculated again, and the next clipping processing is performed based on the recalculated RMS_{IQ}.

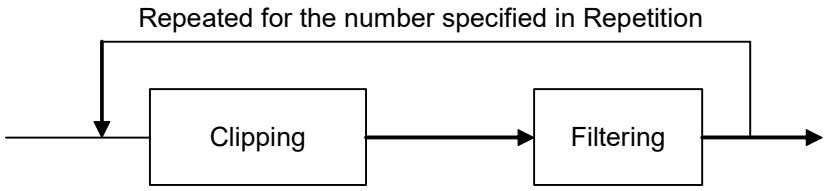


Figure 4.10.6-1 Clipping processing

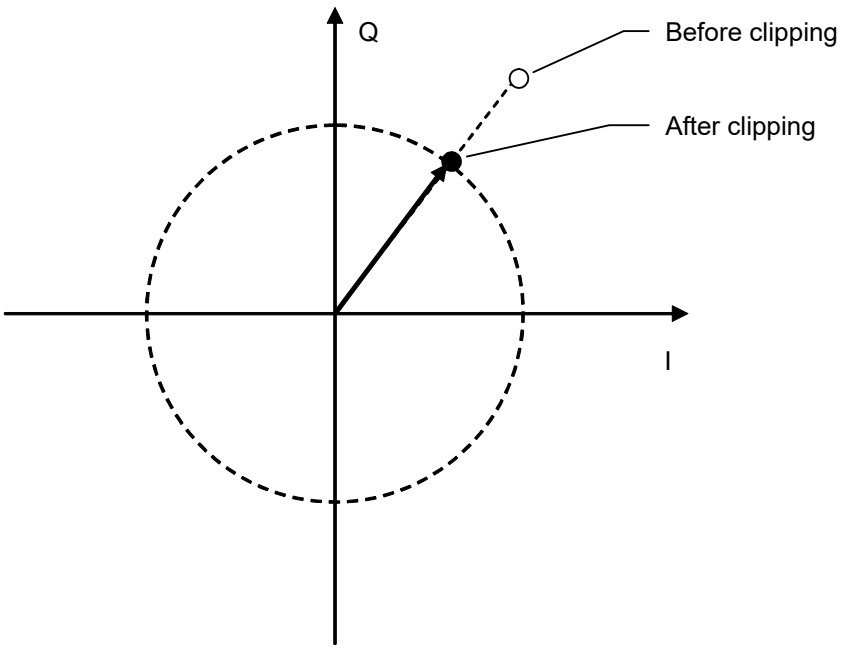


Figure 4.10.6-2 Schematic diagram of clipping processing

When filtering is performed after clipping, the peak becomes larger than that when only clipping is performed (see Figure 4.10.6-3), and the crest factor of the generated waveform pattern may exceed the level set by Threshold Level. Figure 4.10.6-3 shows a simulation example of the CCDF graph where a waveform pattern is generated with Repetition = 1 and the other parameters are set the same as in Section 4.10.5 “Clipping-processed waveform pattern simulation examples”.
For the sake of comparison, Figure 4.10.6-4 shows a CCDF simulation example where Repetition is changed to 1, 2, and 20. In this example, it can be seen that the crest factor comes closer to the level set by Threshold Level as the number of repetition times of clipping and filtering increases.

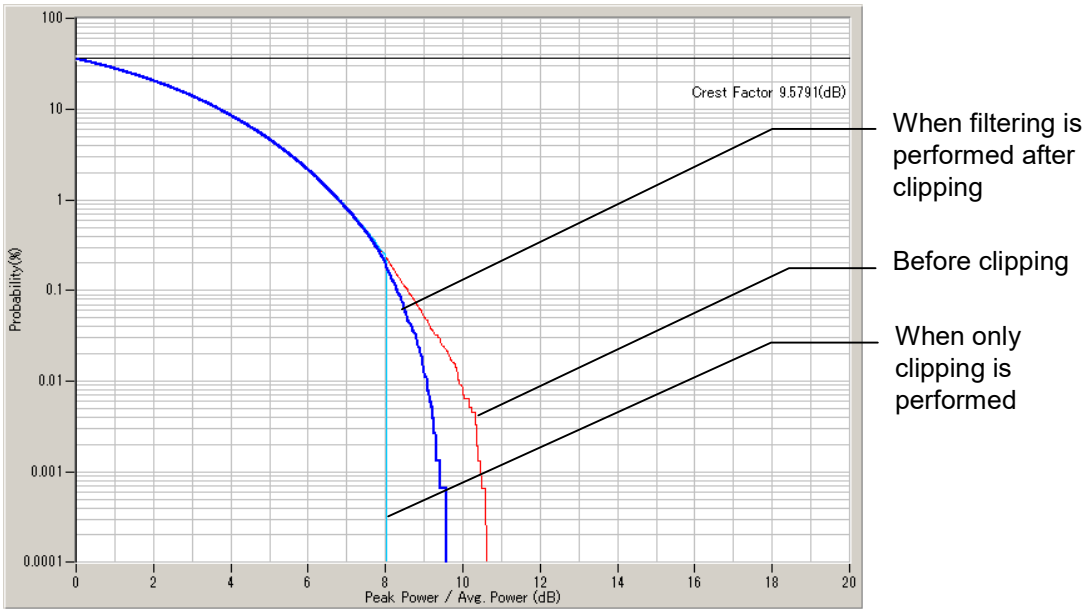


Figure 4.10.6-3 Comparison among clipping methods (when Repetition = 1)

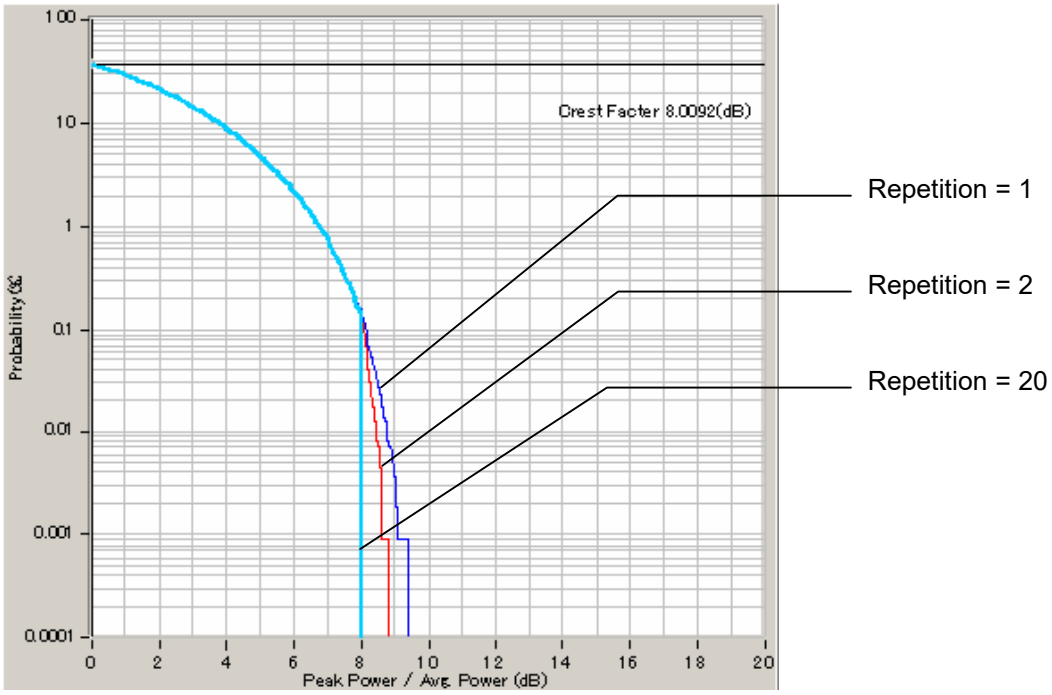


Figure 4.10.6-4 CCDF graph when changing Repetition

Chapter 5 Waveform Pattern Generation

This chapter describes in particular the operating procedures for important functions that pertain to the functions that can be operated by the IQproducer™.

5.1 Generating Waveform Pattern 5-2

5.1 Generating Waveform Pattern

This section describes a series of operations for converting an ASCII-format waveform pattern generated by external simulation software to a waveform pattern that can be used by the Vector Signal Generator option using the Convert function of the IQproducer™.

Refer to Section 4.5 “File Conversion on Convert Screen” for details of setting parameters.

<Procedure>

1. Click the **Reference** button on the Convert screen and read the file to be converted.
2. The parameters related to the waveform pattern are enabled to be input after reading the waveform pattern file. Input these parameters as required according to the type and applications of the waveform pattern.
3. Set the sampling rate.
   The sampling rate indicates the speed of reading the waveform pattern from an arbitrary waveform memory in the Vector Signal Generator option. Note that it is not the speed after processing the interpolator within the Vector Signal Generator option.
   When reading a W-CDMA waveform pattern having the over sampling of ×4, for example, set the sampling rate as follows:
   3.84 Mcps × 4 = 15.36 MHz
4. Set Unit Symbol.
   Set the set unit for Trigger Delay and other parameters of the Vector Signal Generator option. The set unit display for Trigger Delay is changed depending on this setting.
5. Set Over Sampling.
   Set the over sampling rate for the waveform pattern to be input. It is recommended to use an over sampling rate of at least 1.2. If the over sampling rate is less than 1.2, the image signal element may exceed –60 dBc. The symbol rate is the output rate for the data that has been mapped in the physical channel of each communication system before the Route Nyquist processing is performed. The sampling rate is calculated by multiplying the symbol rate by the over sampling rate.
6. Set Spectrum.
   The spectrum relationship between the IQ signal and RF signal may be reversed according to the modulator configuration and the communication system. Set Reverse for IS-95 and cdma2000.

7. Enter a comment.
   Enter a comment into the Comment Lines 1/2/3 if necessary. The character string entered here is displayed on the screen when the corresponding waveform is selected by the Vector Signal Generator option.

8. Set Marker Name.
   Set a name for Makers 1, 2, and/or 3 to be used if necessary. The marker output is displayed in the Vector Signal Generator option screen with the name specified here when the corresponding waveform pattern is selected.

9. Set Burst Setting.
   The Burst Setting includes two settings: Frame Length and Gap Length. The input waveform pattern is divided into frames of the number of data set by Frame Length, and a gap (burst off period in which the burst wave is not output) of the number of data set by Gap Length is inserted between frames (see Figure 5.1-1).

   It is not necessary any longer to output the burst off period as a waveform pattern when using this setting. For example, when outputting only the first slot in the system where one frame consists of five slots, the memory length required for the waveform pattern is reduced to 1/5 of that when the Gap Frame setting is not used.
   When an external trigger signal is used, the Frame Length setting is also used to synchronize the external trigger and the signal output timing in the Vector Signal Generator option. Refer to Section 2.6.2 "Setting Start and Frame trigger" in the *MS2690A/MS2691A/MS2692A or MS2830A/MS2840A Vector Signal Generator Operation Manual (Operation)* for details.
   Set Gap Length to 0 for continuous waves.

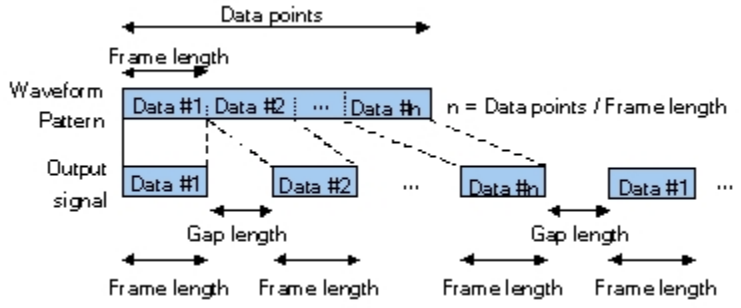


Figure 5.1-1 Frame Length and Gap Length Settings

10. Click the **Convert** button to start data conversion.
    The converted data output destination and file name are set, and waveform pattern generation is started.

Appendix A Error Messages

A list of error messages is shown below. n_0, n_1, n_2, n_3, and n_4 are numbers.

Error Message	Description
Platform	
Application is not found from APPINFO Manager.	The application was not found from the application information.
Application is not found. ("*Activated application name*")	—
Application starting timeout. ("*Activated application name*")	—
Application termination timeout. ("*Application name*") Shutdown application?	—
IQproducer is already running.	—
("*Application name*") is already running.	—
Request shutdown was not completed. ("*Application name*")	—
FFT	
Initialization error	—
Selection of an inaccurate file. ("File name")	—
Can not open file. ("File name")	—
Invalid file format. ("File name")	—
The data of a Wave-form file is unusual.	—
Can not write file. ("File name")	—
Can not read file.	—
An "IQproducer" is down. Application is shutdown.	—
Can not open the setting file. ("File name")	—
The Setting value is invalid ("Parameter name")	—
The Setting value is out of range ("Parameter name (minimum value – maximum value)")	—
The length of "FFT Points" is longer than that of the waveform data. Trace data couldn't be read. ("File name")	—
The length of "FFT Points" is longer than that of the waveform data. "FFT Points" was set as suitable value. ("File name")	—
Invalid parameter value.	—
There is a request from the other IQproducer application for drawing a trace. Delete the displayed trace and draw a new trace?	—
You have filled up all the trace available. Delete some traces, or set "Quick Add Mode" to "clear" before adding a trace."	—

Error Message	Description
There is no trace to output.	CSV output is impossible since no graph is displayed.
If the “FFT Points” is changed, all the trace displayed will be recalculated. Are you sure to change the “FFT Points”?	—
Sampling Rate is different. Do you clear the graph already displayed and display new graph?	—
If the “Sampling Range” is changed, all the trace displayed will be recalculated. Are you sure to change the “Sampling Range”?	—

Error Message	Description
Convert	
Initialization error	—
Selection of an inaccurate file. (“File name”)	—
Can not open file. (“File name”)	—
Invalid file format. (“File name”)	—
The data of a Wave-form file is unusual.	—
Can not open file. (“File name”)	—
Can not read file.	—
An “IQproducer” is down. Application is shutdown.	—
Can not open the setting file. (“File name”)	—
The Setting value is invalid (“Parameter name”)	—
The Setting value is out of range (“Parameter name (minimum value – maximum value)”)	—
Can not create the output file. (“File name”)	—
File not found. (“File name”)	—
The detail area is a maximum of 6 lines, 56 characters per line. (“File name”)	—
Fail to copy the detail file. (“File name”)	—
The read data is shorter than Data Points. (“File name”)	Data conversion is impossible since the input file is smaller than the number of data points (Data Points).
The Data Points are too large. The Maximum Data Points are 268435456 samples.	Conversion is not possible because the set Data Points value exceeds the maximum number of samples.
The Data Points are too large. The Maximum Data Points are either 67108864 samples (without Option 27) or 268435456 samples (with Option 27).	Conversion is not possible because the set Data Points are longer than the number of maximum samples.
When the Burst Setting checkbox is checked, The value of Frame Length must be equal or less than the value of Data Points.	—
The waveform pattern to be generated should be above n_0, otherwise it will be clipped.	Clipping will be performed because the data to convert is larger than n_0 and has overflowed.
RMS value of waveform data is not in range n_1 to n_2 RMS value. The value will be changed.	The RMS value for the read waveform pattern will be changed because it is outside the setting range from n_1 to n_2.
The RMS value of this waveform pattern is outside the range of n_3 to n_4. Note that the output level accuracy of RF output is not guaranteed when the RMS value of a waveform pattern is outside the range of n_3 to n_4.	The output level accuracy of the waveform pattern to output is not guaranteed because the RMS value of the pattern is outside the range from n_3 to n_4.
The dgz file size is too large. The Maximum Data Points is 268435456 samples.	The size of the digitized file exceeds 268,435,456 samples.

Error Message	Description
W-CDMA Downlink/Uplink	
Initialization error	—
Selection of an inaccurate file. (“File name”)	—
Can not open file. (“File name”)	—
Invalid file format. (“File name”)	—
The data of a Wave-form file is unusual.	—
Can not write file. (“File name”)	—
Can not read file.	—
Can not open the parameter file. (“File name”)	—
The Setting value is invalid “Parameter name”	—
The Setting value is out of range “(Parameter name (Min – Max.))”	—
Total channel power except OCNS is over 0 dB.	—
An initial parameter file was not able to be read.	—
All Channels are OFF.	—
Input File Name.	—
Value is set up at 800 steps.	—
DTCH information data is changed to the data truncated every one frame (PN9fix).	—
Total channel power is not normalized to 0 dB. It is necessary to normalize the total power when OCNS is OFF.	—
Total channel power is not normalized to 0 dB. It is necessary to normalize the total power when Simulation is UpLink.	—
Memory option cannot be turned on in MS269x mode.	—

Error Message	Description
Time Domain	
Initialization error	—
Selection of an inaccurate file. (“File name”)	—
Can not open file. (“File name”)	—
Invalid file format. (“File name”)	—
The data of a Wave-form file is unusual.	—
Can not write file. (“File name”)	—
Can not read file.	—
A “IQProducer” is down. Application is shutdown.	—
Can not open the setting file. (“File name”)	—
The Setting value is invalid (“Parameter name”)	—
The Setting value is out of range (“Parameter name (minimum value – maximum value)”)	—
Invalid parameter value.	—
There is a request from the other IQproducer application for drawing a trace. Delete the displayed trace and draw a new trace?	—
You have filled up all the trace available. Delete some traces, or set “Quick Add Mode” to “clear” before adding a trace.”	—
If the “Graph Type” is changed, all the trace displayed will be recalculated. Are you sure to change the “Graph Type”?	—
Marker edit function cannot be used because the selected file does not include marker signal.	If a 16-bit file is selected: The marker editing function cannot be used because the file does not include a marker signal.

Error Message	Description
Clipping	
Can not open file.	—
Can not write file.	—
Can not read file.	—
Input File is not selected.	—
The Setting value is out of range (“Parameter name (minimum value – maximum value)”)	—
The Waveform data file is not generated.	—
Wrong pattern license.	—
This pattern cannot use. Because, “Internal FIR” is used.	—
The number of samples is over 256M samples.	—
Input Package Name.	—
Input Export File Name.	—
The data of a Wave-form file is unusual.	—
Exception error.	—

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