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R3681 Series OPT73

3GPP Multi-carrier Generator

User's Guide

MANUAL NUMBER   FOE-8440164C00

Applicable Models
R3681
R3671

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LIST OF TABLES

1. INTRODUCTION

This chapter introduces you to the organization of this document and a product overview of the R3681 Series Signal Analyzer (Option 73) to help you get the most out of this document.

1.1 Organization of This Document

The contents of each chapter of this manual are as follows:

For more information on the basic operating method, functions, and remote programming of the signal analyzer, refer to 1.3, "Other Manuals Pertaining to This Instrument."

Chapter 1, "INTRODUCTION"	Introduces you to the organization of this document and a product overview to help you get the most out of this document.
Chapter 2, "PRE-OPERATION TIPS"	Provides preliminary tips on using this instrument. Read this chapter before using this instrument.
Chapter 3, "SETUP"	Explains how to set up this instrument on delivery. After installing this instrument in position, switch it on to make sure that it starts up successfully.
Chapter 4, "QUICK START"	Describes the functions of each part of the panel and screen of this instrument. You can learn the basic operating method of this instrument by basic operation.
Chapter 5, "FUNCTION DESCRIPTION"	Explains the menu configuration and function of the soft keys.
Chapter 6, "SPECIFICATIONS"	Describes the specifications of option 73.
Chapter 7, "PERFORMANCE VERIFICA-TION"	Describes the performance test items and performance test procedures of option 73. Provides a performance test record sheet.
APPENDIX	Provides the following information: • Error Codes

1.2   Product Overview

The 3GPP multi carrier generation option (OPT73) easily generates test model signals, which complies with the 3GPP, by using the GUI software.

It also generates high ACLR signals because it has a dedicated baseband filter for 3GPP multi carrier signals.

The main features of this instrument are shown below:

- Test model signals can be generated easily by using the dedicated software.

- High ACLR signals can be generated by using the dedicated baseband filter.

1.3   Other Manuals Pertaining to This Instrument

Available manuals pertaining to the R3681 Series include:

- User's Guide (Part Code: {ER3681SERIES/U}, English)

  Contains information prerequisite to using the R3681 Series Signal Analyzer, ranging from setup to basic operation, applied measurement, functionality, specifications, and maintenance.

- Programming Guide (Part Code: {ER3681SERIES/P}, English)

  Covers programming information to use the R3681 Series Signal Analyzer to automate measurement sequences, including a remote control overview, SCPI command references, and sample application programs.

- Performance Test Guide (Part Code: {ER3681SERIES/T}, English)

  Covers information necessary to verify the performance of the R3681 Series Signal Analyzer, including performance test procedures and specifications.

- R3681 Series OPT72 Digital Signal Generation Module User's Guide (Part Code: {ER3681 OPT72}, English)

  This manual describes the information required to use the R3681 Series OPT72 digital signal generation module. It includes the setup, basic operation, function descriptions, remote control overview, SCPI command, specifications, and maintenance of the signal generation module.

1.4 Conventions of Notation Used in This Document

In this document, panel keys, on-screen buttons and menus are represented by the following symbols:

On-panel hard keys

| Sample | Represents an on-panel hard key labeled "Sample."

Example: | START |, | STOP |

On-screen system menus

[Sample] Represents an on-screen menu, tab, button or dialog box that is labeled "Sample" and that is selected or executed when touched.

Example: **[File]** menu, **[Normal]** tab, **[Option]** button

On-screen function buttons

{Sample} Represents an on-screen function button labeled "Sample."

Example: **{FREQ}** button, **{SWEEP}** button

On-screen side menu

Sample Represents an on-screen side menu key labeled "Sample."

Example: Center key, Span key

On-screen system menu key operation

[File]→[Save As...] Indicates a touch on the **[File]** menu followed by a choice of **[Save As...]**.

Sequential key operation

{FREQ}, Center Indicates a touch on the **{FREQ}** button followed by a touch on the Center key.

Toggle key operation

ΔMarker On/Off (On) Indicates a touch on the ΔMarker On/Off key to turn on the ΔMarker.

NOTE: *Screen displays and diagrams such as external view of the main unit in this manual are those of the R3681 in the R3681 series.*

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2. PRE-OPERATION TIPS

This chapter provides preliminary tips on using this instrument. Read this chapter before using this instrument.

2.1 If Faults Should Occur

If this instrument is found to smoke or deliver offensive odors or abnormal noises, switch off the power breaker and remove the power cable from the AC power connector to power off this instrument. Then, contact your dealer or us immediately.

2.2 Removing of Case

The case should not be opened except by service personnel of our company.

WARNING:	*High-voltage and high-temperature parts inside. You may get electrical shocks or burnt if you touch them.*

2.3 Overcurrent Protection

This instrument is protected from overcurrent flow by a power breaker.

Located on the rear panel, the power breaker automatically forces an interruption of the power supply when an overcurrent flows through this instrument. When the power breaker has turned off, remove the power cable from the AC power connector to power off this instrument. Then, call upon your dealer or us for repair services to fix a possible fault that has occurred in this instrument.

2.4 Hard Disk Drive

This instrument has a built-in hard disk drive. When handling the hard disk drive, take notice of these instructions.

* Do not impact or vibrate the hard disk drive.

  Damage to the disk on which data is stored could result, increasing the chances of malfunctioning or failing during operations.

* Do not switch off this instrument while the HDD access lamp is lit.

  The data being accessed might be damaged.

CAUTION:	*We do not assume any responsibility for the loss or corruption of data stored on the hard disk drive that might result from its faults.*

2.5 Handling the Touch Screen

This instrument has a touch screen. When handling the touch screen, take notice of these instructions.

- Do not give strong impacts or apply undue force to the screen.
  The glass could be cracked.

- Use the stylus pen included with this instrument to operate the screen.
  Use of a hard-pointed material (such as a mechanical pencil or ballpoint) could scratch the screen surface.

2.6 Getting the Software Running with Stability

The R3681 Series Signal Analyzer has Microsoft Windows XP pre-installed.

The measuring function of this instrument is dependent on the Windows environment. Do not alter the Windows operating environment in any way other than as described in this manual.

Furthermore, this instrument is not a data processor. Operate it only as described in this manual.

1. Non-permitted actions:

   - Installing other application programs.

   - Changing or deleting items in the control panel (except for A.2, "Installing the Printer Driver" and A.3, "Setting up the Network" of the R3681 Series User's Guide).

   - Opening or operating the existing files on the C drive.

   - Operating other application programs during the measurement.

   - Upgrading the Windows operating system.

   - If this instrument does not function correctly due to any of the above, re-install the system using the system recovery disk.
     For the method for recovery, refer to section 8.7, "System Recovery Procedure" of the R3681 Series User's Guide.

2. Computer viruses

   Depending on the operating environment and method, the system can be contaminated by a computer virus.

   To use the system securely, it is recommended to take the following countermeasures:

   - Run a virus check before loading a file or media from an outside source.

   - Make sure that any network has safety measures against computer viruses before connecting.

   [If infected with a computer virus:]

   - Delete all files on the D drive. Re-install the system using the recovery disk.
     For more information on the system recovery method, refer to section 8.7, "System Recovery Procedure" of the R3681 Series User's Guide.

2.7 Tip on Transportation

This instrument is heavy, so two or more people should carry it or a dolly should be used to transport it.

2.8 Electromagnetic Interference

This instrument may cause electromagnetic interference and affect television and radio reception.
If this instrument's power is turned off and the electromagnetic interference is reduced, then this instrument has caused the problem.

Electromagnetic interference may be prevented by doing the following:

- Change the direction of the antenna of the television or radio.

- Place this instrument on the other side of the television or radio.

- Place this instrument away from the television or radio.

- Use different lines for the power sources for the television or radio and this instrument.

2.9 Note for Power-on

At power-on, do not connect the DUT to this instrument.

2.10 Notes for Removing and Attaching the Panel

This instrument can be used separately after removing the panel.
When removing the panel, take notice of these instructions.

MEMO: To use this instrument after removing the panel, a separately sold connecting cable is required.

- If this instrument's power is turned on, turn off the power, remove the power cable, and then make sure that the operation of this instrument is terminated.

- When removing or attaching the panel, take care not to jam your finger.

- Place this instrument on a level and steady table when removing or attaching the panel.

- Take out the four screws that are exposed on the side of the front panel of this instrument.

- When taking out the screws, put a hand on the panel so that the panel will not unexpectedly fall off.

- After all four screws have been taken out, pull the panel forward.

- Remove the cable connecting the panel and the body of this instrument.

- Replace the cable with another one that is suitable for your use condition.

- If you have lost screws, use the following screws.

    - For the 2 screws on the key side: flat-head Phillips screws M4X35 (steel or stainless steel)

    - For the 2 screws on the liquid-crystal display: flat-head Phillips screws M4X14 (steel or stainless steel)

2.10 Notes for Removing and Attaching the Panel
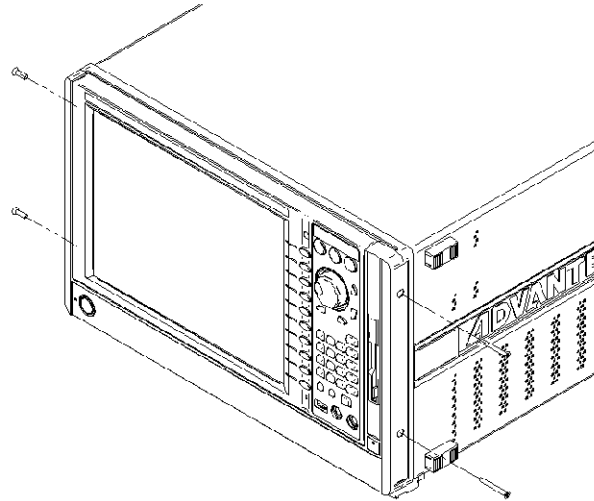
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3. SETUP

This chapter explains how to set up this instrument on delivery. Topics covered in this chapter are:

- 3.1 Unpacking Inspection
- 3.2 Locating This Instrument
- 3.3 Connecting Accessories
- 3.4 Supply Description
- 3.5 Operation Check

3.1 Unpacking Inspection

When the product is delivered, check it for its appearance and accessories included by following these steps:

1. Check to see if the box or the cushioning material in which the product was shipped has been damaged during transit.

   > *IMPORTANT:* *If the box or the cushioning material is found damaged, leave them in their original condition until the inspection described below completes.*

2. Check the product surfaces for any damage.

   > *WARNING:* *Do not power on this instrument if the cover, panels (front and rear), LCD display, power switch, connector or any other key component is found damaged. Electrical shock hazards could result from using damaged components.*

3. Make sure that all of the standard accessories are included and they are free from any damage, in accordance with the List of Table 3-1 Standard Accessories (OPT73).

Contact your dealer or us in any of the following situations:

- The box or the cushioning material in which the product was shipped was damaged during transit, or there is evidence of a massive force having been applied to the cushioning material.
- The product surfaces are damaged.
- One or more standard accessories are missing or damaged.
- Defects have been detected in a subsequent product verification test.

Table 3-1   Standard Accessories (OPT73)

Name	Model	Quantity
R3681 Series OPT73 User's Guide	ER3681OPT73	1

3.2 Locating This Instrument

This section describes the installation environment in which this instrument runs successfully.

3.2.1 Operating Environment

This instrument should only be used in a place that satisfies the following conditions:

*   Ambient temperature: +5°C to +40°C (operating temperature)
                         -20°C to +60°C (storage temperature range)
*   Relative humidity: RH80% or less (no condensation)
*   An area free from corrosive gas
*   An area away from direct sunlight
*   A dust-free area
*   An area free from vibrations
*   A low noise area

    Although this instrument has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise.
    Use a noise filter when ambient noise is unavoidable.

*   An area allowing unobstructed airflow

    There is an exhaust-cooling fan on the rear panel and exhaust vents on both sides and the bottom (toward the front) of this instrument. Never block these vents. The resulting internal temperature rise will affect measurement accuracy. Keep the rear panel 10 centimeters away from the wall. In addition, do not attempt to use this instrument when it is standing on its rear panel or on either side panel.
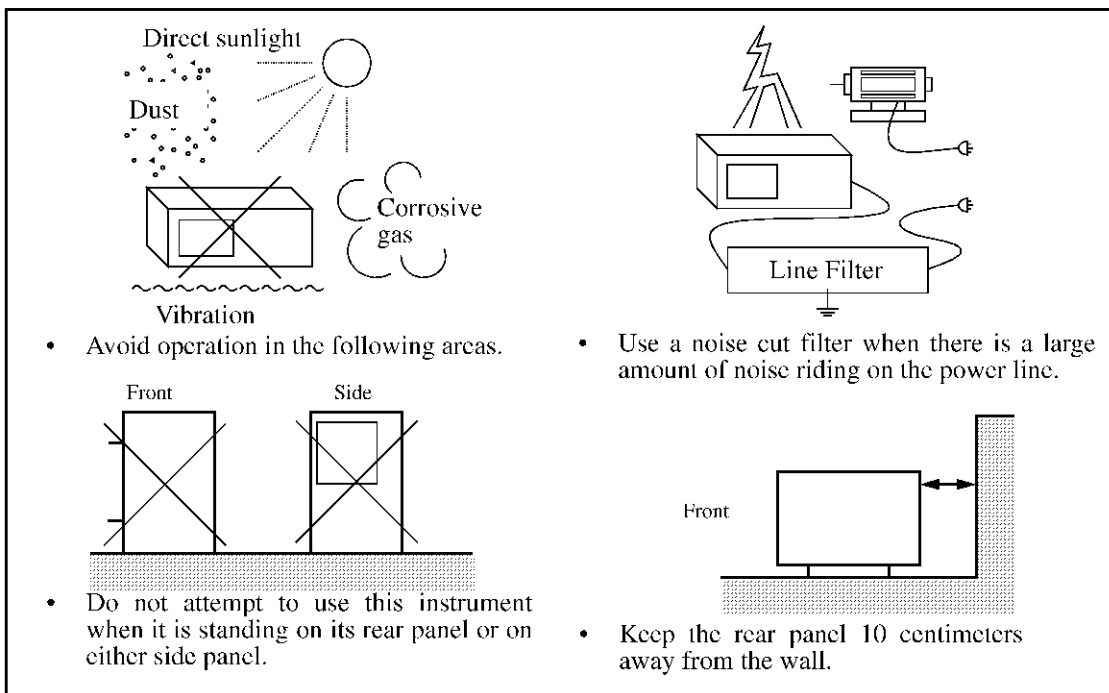
Figure 3-1   Operating Environment

3.2.2   Prevention of Electrostatic Buildup

To prevent damage to semiconductor parts from electrostatic discharge (ESD), the precautions shown below should be taken. We recommend that two or more countermeasures are combined to provide adequate protection from ESD.

(Static electricity can easily be built up when a person moves or an insulator is rubbed.)

Table 3-2   ESD Countermeasures

Operator	Use a wrist strap (see Figure 3-2).
Floor in the work area	Installation of a conductive mat, the use of conductive shoes, and grounding (see Figure 3-3).
Workbench	Installation of a conductive mat and grounding (see Figure 3-4).
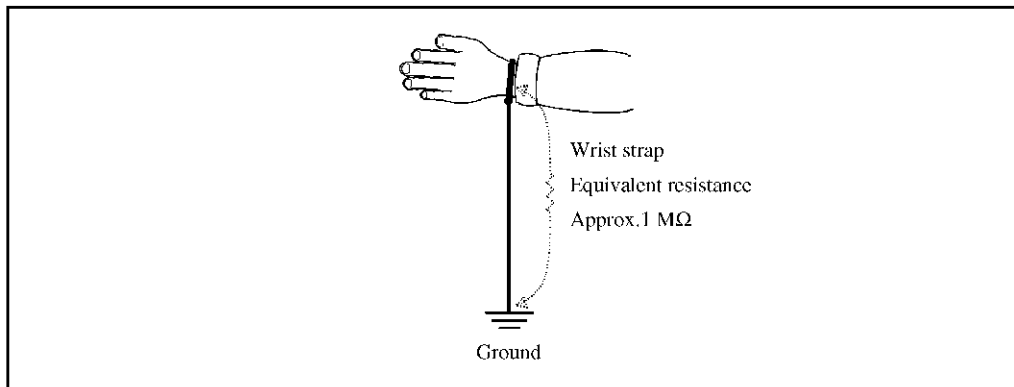
Figure 3-2   Countermeasures for Static Electricity of Human Body
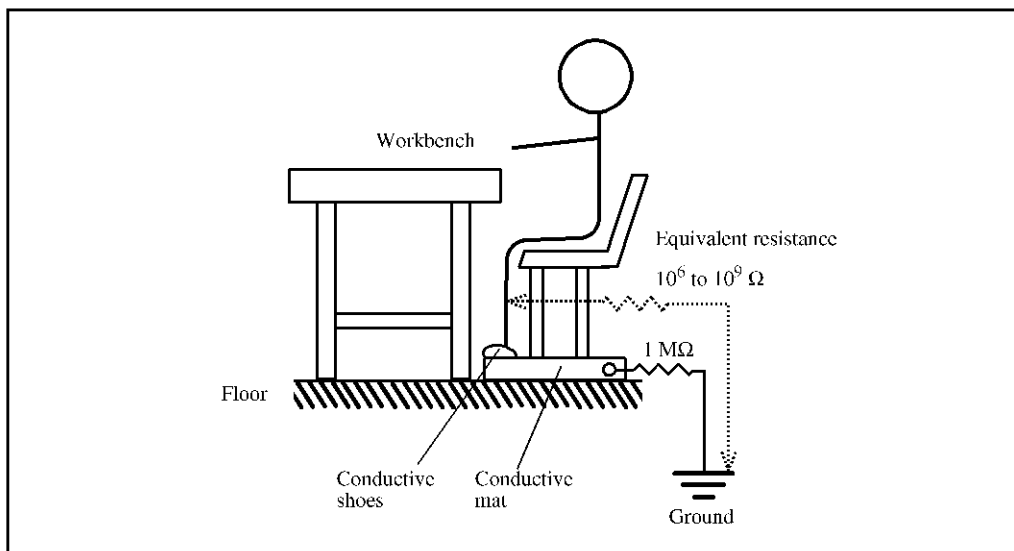
Figure 3-3   Countermeasures for Static Electricity on Work Floor

3.2.2 Prevention of Electrostatic Buildup
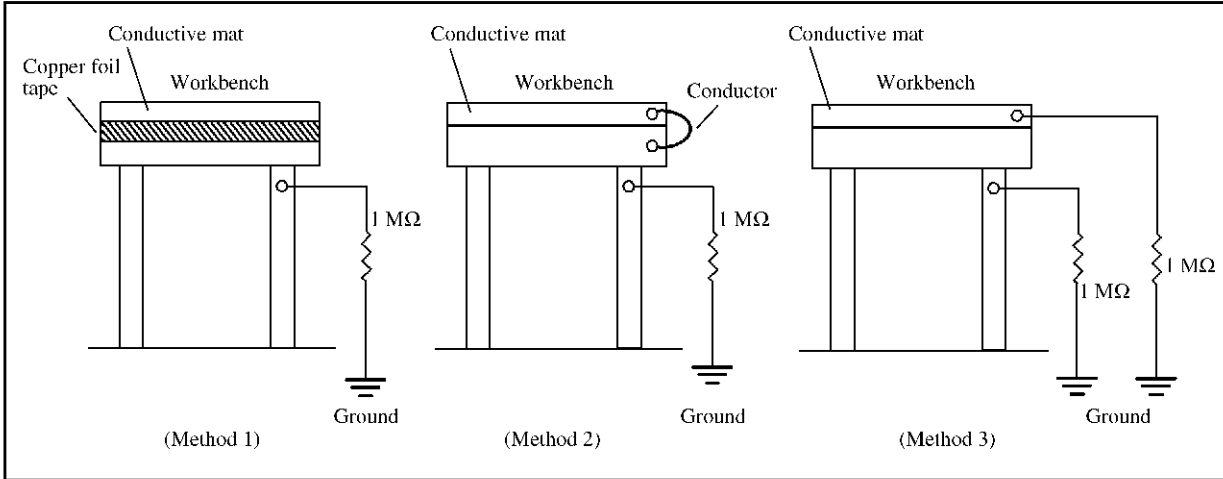
Figure 3-4   Countermeasures for Static Electricity on Workbench

3.3   Connecting Accessories

This section explains how to connect accessories to this instrument to run it.

3.3.1   Connecting the Keyboard and Mouse

Connect the keyboard and mouse to their respective front-panel connectors (KEYBOARD and MOUSE connectors).
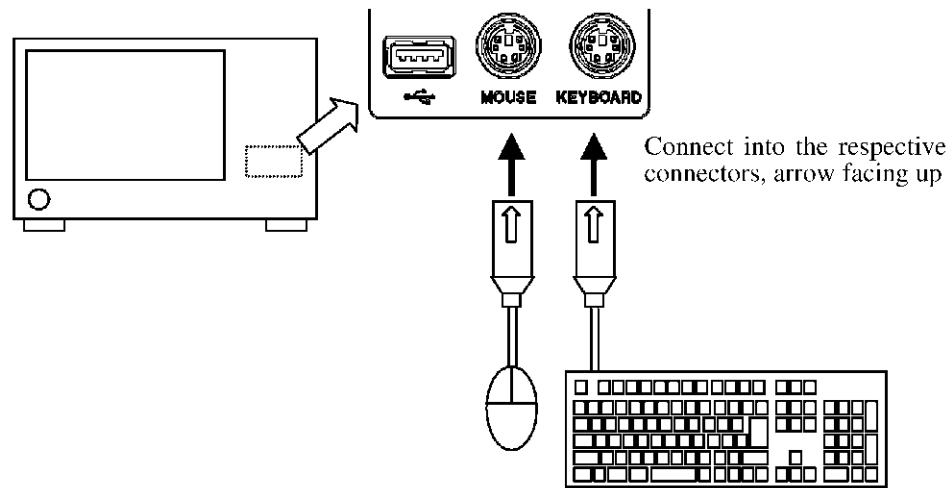
Figure 3-5   Connecting the Keyboard and Mouse

CAUTION: *The keyboard and mouse must be connected before turning on this instrument.*

3.4 Supply Description

This section explains how to check the power supply specifications and connect the power cable.

3.4.1 Check the supply power

Table 3-3 summarizes the power supply specifications for this instrument. Make sure that the power supply available to this instrument meets these specifications.

Table 3-3   Power Supply Specifications

	100 VAC Operation	200 VAC Operation	Remarks
Input voltage range	90 V to 132 V	198 V to 250 V	Automatically switches between input levels of 100 VAC and 200 VAC.
Frequency range	47 Hz to 63 Hz		
Power consumption	450 VA or below		

WARNING: *Be sure to provide a power supply that meets the specified power supply specifications for this instrument. Failure to meet the specifications could cause damage to this instrument.*

3.4.2 Connecting the Power Cable

This instrument comes with a three-core power cable with a grounding conductor. To guard against electrical shock hazards, ground this instrument by plugging the power cable into a three-pole power outlet.

1. Check the power cable included with this instrument for any damage.

   WARNING: Never use a damaged power cable. Electrical shock hazards could result.

2. Plug one end of the power cable included with this instrument into the AC power connector on this instrument rear panel and the other into a three-pole power outlet having a protecting grounding terminal (see Figure 3-6).
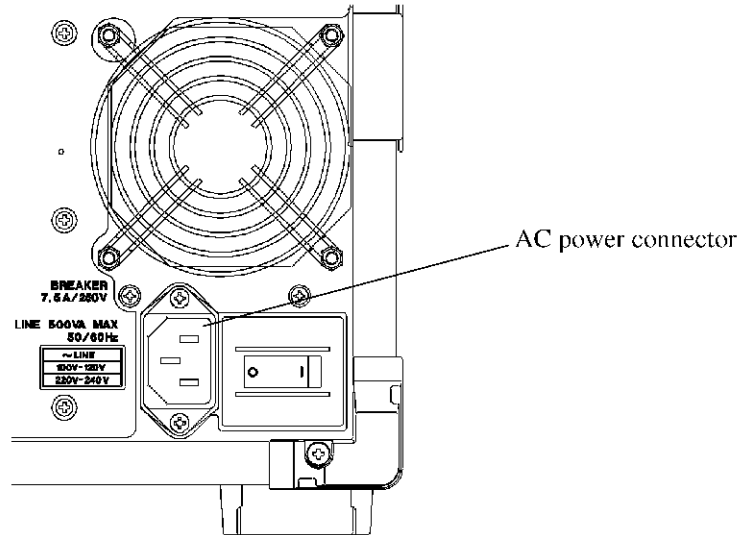
Figure 3-6   Connecting the Power Cable

WARNING:

1. *Use a power cable rated for the voltage being used. Be sure however to use a power cable conforming to the safety standards of your country when using this instrument overseas (Refer to "Safety Summary").*

2. *Plug the power cable into a three-pole power outlet having a protecting grounding terminal to guard against electrical shock hazards. Use of an extension cord without a protecting grounding terminal would override the protective grounding.*

3.5   Operation Check

This section explains how to make a simple operation check on this instrument by using its built-in autocalibration feature. To verify that this instrument runs correctly, follow these steps:

Starting up this instrument

1.   Connect the power cable as instructed in 3.4.2 "Connecting the Power Cable."

2.   Switch on the power breaker on the rear panel.
      Then wait for 3 seconds or more.

3.   Press the | **POWER** | switch to switch on the power.
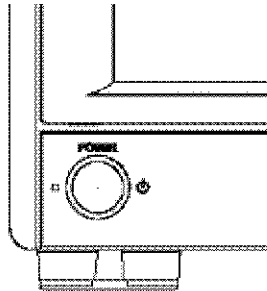
Figure 3-7   **POWER** Switch

CAUTION:

1.   If this instrument is abruptly powered off while in operation, such as by pulling the power cable out of position, the hard disk drive could fail. Even when the hard disk drive does not fail, Scandisk launches to check for possible corruptions in the data stored on it the next time this instrument starts up.

2.   About Scandisk
If this instrument has been powered off without being shut down, Scandisk will launch to check for corruptions automatically. Do not abort Scandisk while it is running. If Scandisk locates corruptions, take appropriate remedial action as recommended by the display messages. The software in this instrument resumes automatically when Scandisk ends.

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4.   The power-on diagnostic program launches to carry out self-diagnostics.
      The self-diagnostics take about 1 minute to complete.

5.   The initial screen shown in Figure 3-8 is displayed unless this instrument is tested faulty.
      The initial screen may give a different look from Figure 3-8, depending on the settings in effect the last time this instrument was powered off.

MEMO: If any error message is displayed as a result of the self-diagnosis, refer to Chapter 8, "MAINTENANCE" in the R3681 Series User's Guide, "APPENDIX" in the R3681 Series OPT72 Digital Signal Generation Module User's Guide, and "APPENDIX" in this manual.
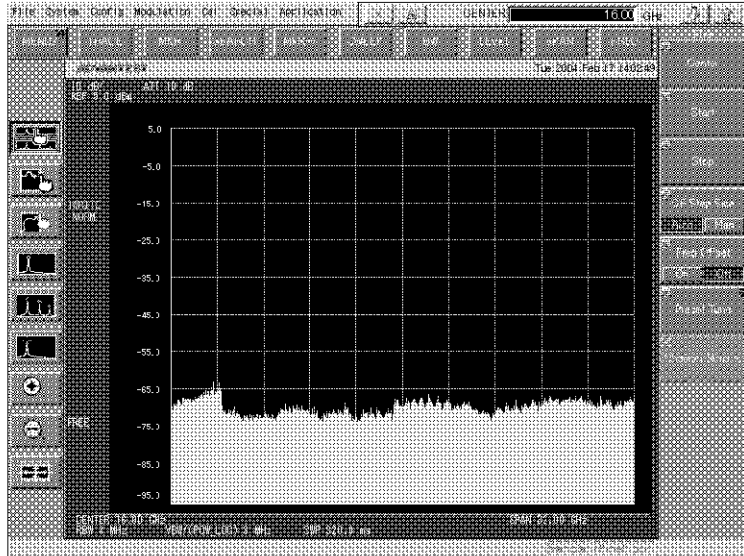
Figure 3-8   Initial Setting Screen

Executing auto calibration

6.   Touch the **[Config]** button on the menu bar and select **[AWG+SG Option]** on the drop down menu. The screen shown in Figure 3-9 will be displayed.

Depending on the state of setting when the power supply was turned off last time, the display screen may differ from Figure 3-9.
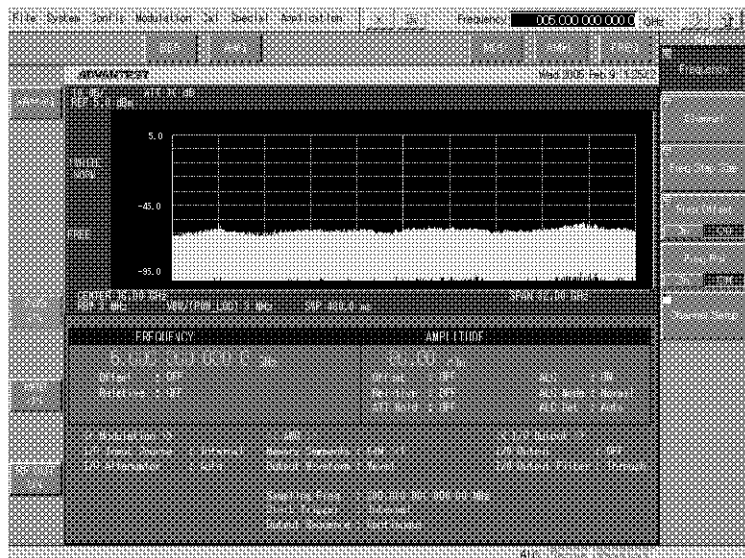
Figure 3-9   AWG+SG Initial Setting Screen

3.5 Operation Check

IMPORTANT: *Execute auto-calibration after it has warmed up for 30 minutes or longer.*

---

7. Touch the **[Cal]** button on the menu bar of this instrument and select **[AWG Cal]** on the drop down menu.

8. Auto calibration will be executed.

    It takes approximately 3 minutes to complete auto calibration.

9. Verify that no error message is displayed as the result of auto calibration.

MEMO: *If any error message is displayed by auto calibration, refer to "APPENDIX" in the R3681 Series OPT72 Digital Signal Generation Module User's Guide.*

Switching off power

10. Press the [**POWER**] switch of this instrument.

    The final processing of the system is performed and the power is automatically turned off.

4. QUICK START

This chapter describes the functions of this software and setting examples to allow users to perform basic operations.

To operate this software, use the touch screen or mouse.

4.1 Starting the Software

The menu bar of this instrument contains the following menus:

[File]	[System]	[Config]	[Modulation]	[Cal]	[Special]	[Application]

To start the software, select **[Application]** → **[3GPP Waveform Generator]** from the menu bar.
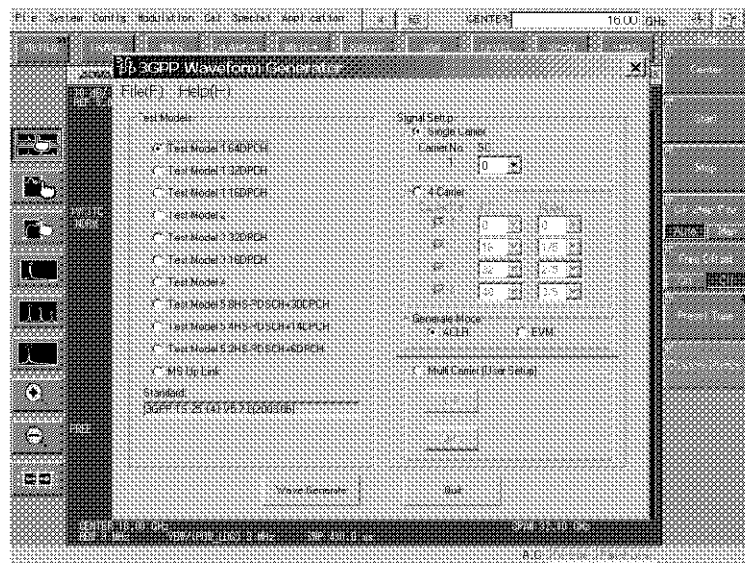
Figure 4-1   After the Software has Started

MEMO: The display after the software has started differs depending on the previous settings.

4.1.1   Screen Descriptions
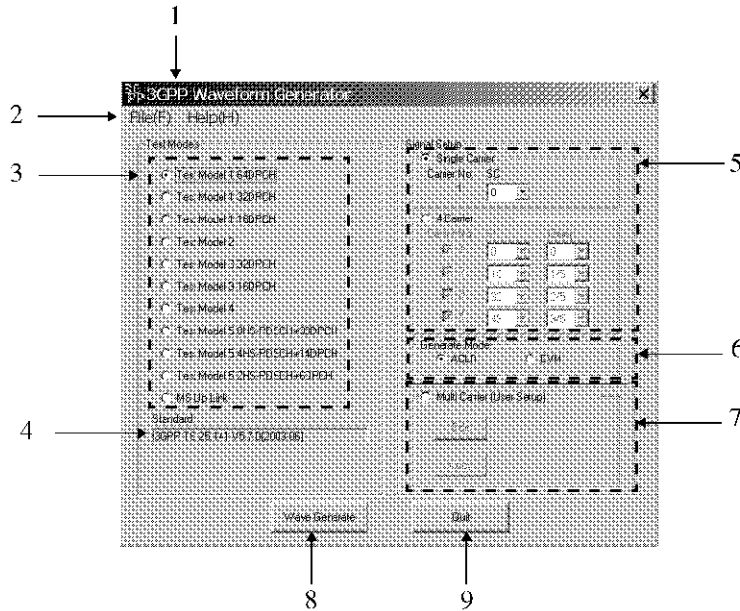
Figure 4-2   Software Screen

1. Title bar   Indicates the software title.

2. Menu bar   Indicates the menus.

3. Test Models option button   Select which test model to generate.

4. Standard field   Indicates the number of the standard of the test model.

5. Signal Setup (Single Carrier, 4 Carrier)
                                                Set the scrambling codes and slot timings of the test model.

6. Generate Mode   Select whether to give upon generation priority to either the modulation accuracy or ACLR.

7. Multi Carrier   Sets the scrambling code and slot timing of the test model and the output level difference of each carrier.

8. Wave Generate button   Outputs a waveform data file.

9. Quit button   Exits from the software.

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4.2 How to Operate the Software

4.2 How to Operate the Software

This section describes the following basic operating procedures to allow the user to familiarize themselves with the operation of this software.

4.2.1 Operation for Generating the 1-Carrier Waveform Data of Test Model 4

4.2.2 Operation for Generating the 4-Carrier Waveform Data of Test Model 3 (32DPCH)

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)

4.2.1 Operation for Generating the 1-Carrier Waveform Data of Test Model 4

This section describes the operating procedures for generating the 1-carrier waveform data of the test model 4.

|Settings|

- Test model
  Test Model 4

- Signal setting
  Scrambling code: 16

- Waveform generation mode
  EVM mode

|Starting the Software|

1. Select **[Application]** → **[3GPP Waveform Generator]** from the menu bar.
   The software starts.

|Initialization|

2. Select **[File]** → **[Initialize]** from the menu bar to initialize the setup parameters.
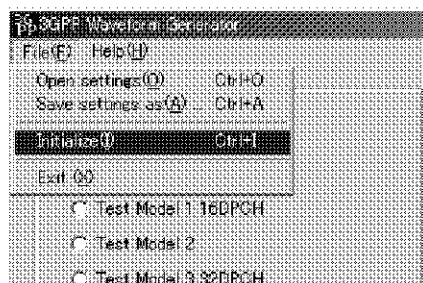
Figure 4-3   **[File]** → **[Initialize]** Menu

4-3

3. Displays the dialog box which requests confirmation of whether to initialize the settings. Select **[Yes]**.
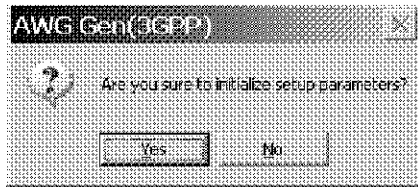
Figure 4-4 **[File]** → **[Initialize]** Menu

[Setting]

4. Touch the **[Test Model 4]** option button in **[Test Models]**.

   The number of the standard of the selected test model in the **[Standard]** field is displayed.

Figure 4-5 Selecting the Test Model and Displaying the Standard

5. Touch the **[Single Carrier]** option button on the **[Signal Setup]**.

6. Set **[SC]** to 16.
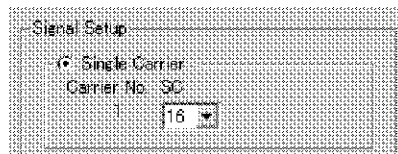
Figure 4-6 Signal Setup Screen

7. Touch the **[EVM]** option button on **[Generate Mode]**.
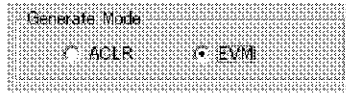
Figure 4-7   Generate Mode Screen

[Waveform generation]

8. Press the **[Wave Generate]** button. The file dialog box appears. Waveform data is output to the hard disk by pressing the **[Save]** button on the file dialog box.

MEMO: *File names can be edited by using the keyboard if one is connected.*
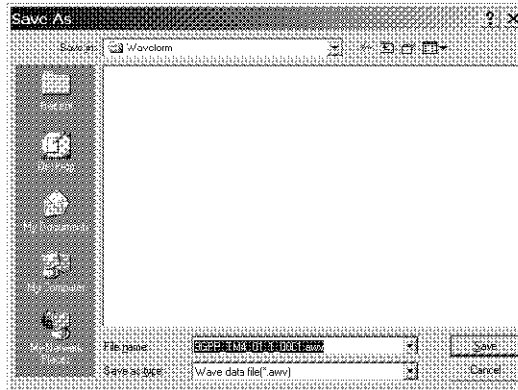
Figure 4-8   File Dialog Box

[Loading the waveform to AWG]

9. For more information, refer to Section 4.3, "How to Load the Waveform to the AWG."

4.2.2 Operation for Generating the 4-Carrier Waveform Data of Test Model 3 (32DPCH)

This section describes the operating procedures for generating the 4-carrier waveform data of the test model 3.

|Settings|

- Test model

  Test Model 3 (32DPCH)

- Signal setting

Carrier No.	Carrier ON/OFF	Scrambling code	Slot timing
1	ON	0	0
2	ON	16	1/5
3	ON	32	2/5
4	ON	48	3/5

- Waveform generation mode

  ACLR mode

[Starting the Software]

1. Select **[Application]** → **[3GPP Waveform Generator]** from the menu bar.
   The software starts.

[Initialization]

2. Select **[File]** → **[Initialize]** from the menu bar to initialize the setup parameters.
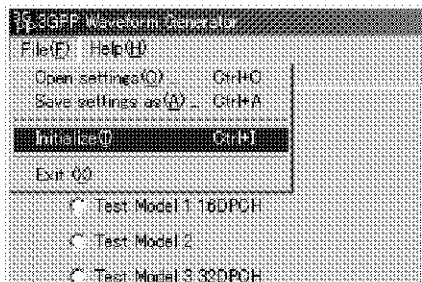
Figure 4-9   **[File]** → **[Initialize]** Menu

4.2.2 Operation for Generating the 4-Carrier Waveform Data of Test Model 3 (32DPCH)

3. Displays the dialog box which confirms whether to initialize the setup parameters. Select **[Yes]**.
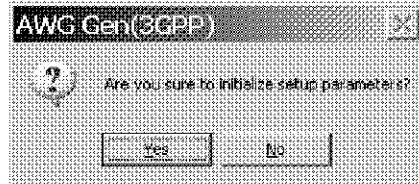
Figure 4-10   **[File]** → **[Initialize]** Menu

[Setting]

4. Touch the **[Test Model 3 32DPCH]** option button in **[Test Models]**.

Selecting the **[Test Model 3 32DPCH]** option button displays the number of the standard of the selected test model in the **[Standard]** field.
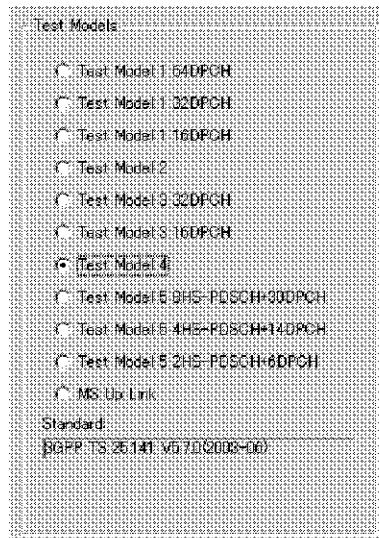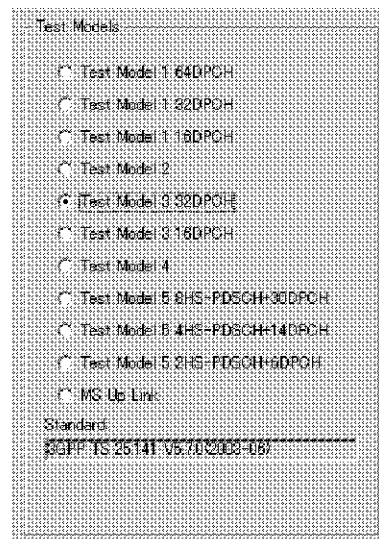

Figure 4-11   Selecting the Test Model and Displaying the Standard

5. Touch the **[4 Carrier]** option button on **[Single Setup]**.

6. Verify that the **[1]** check box of **[Carrier No.]** has been checked. If it is not checked, touch the check box to check it.

7. Verify that the **[2]** check box of **[Carrier No.]** has been checked. If it is not checked, touch the check box to check it.

8. Verify that the **[3]** check box of **[Carrier No.]** has been checked. If it is not checked, touch the check box to check it.

9. Verify that the **[4]** check box of **[Carrier No.]** has been checked. If it is not checked, touch the check box to check it.

4.2.2 Operation for Generating the 4-Carrier Waveform Data of Test Model 3 (32DPCH)

10. Verify that 0 is selected in [SC] of [Carrier No.] [1].
    If 0 is not selected, select 0.

11. Verify that 16 is selected in [SC] of [Carrier No.] [2].
    If 16 is not selected, select 16.

12. Verify that 32 is selected in [SC] of [Carrier No.] [3].
    If 32 is not selected, select 32.

13. Verify that 48 is selected in [SC] of [Carrier No.] [4].
    If 48 is not selected, select 48.

14. Verify that 0 is selected in [Timing] of [Carrier No.] [1].
    If 0 is not selected, select 0.

15. Verify that 1/5 is selected in [Timing] of [Carrier No.] [2].
    If 1/5 is not selected, select 1/5.

16. Verify that 2/5 is selected in [Timing] of [Carrier No.] [3].
    If 2/5 is not selected, select 2/5.

17. Verify that 3/5 is selected in [Timing] of [Carrier No.] [4].
    If 3/5 is not selected, select 3/5.
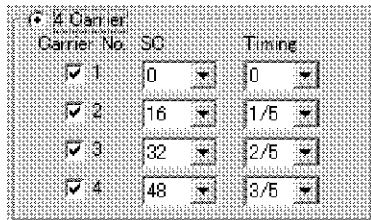
Figure 4-12   Signal Setup Screen

18. Touch the [ACLR] option button on [Generate Mode].
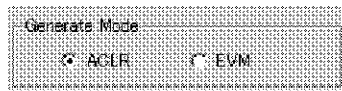
Figure 4-13   Generate Mode Screen

4.2.2 Operation for Generating the 4-Carrier Waveform Data of Test Model 3 (32DPCH)

[Waveform generation]

19. Press the **[Wave Generate]** button. Pressing the **[Wave Generate]** button displays the file dialog box. Waveform data is output to the hard disk by pressing the **[Save]** button on the file dialog box.

*MEMO:* *File names can be edited by using the keyboard if one is connected.*

Figure 4-14   File Dialog Box

[Loading the waveform to the AWG]

20. For more information, refer to Section 4.3, "How to Load the Waveform to the AWG."

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)

This section describes the operating procedure for generating the 12-carrier waveform data of test model 1.

[Settings]

- Test model

  Test Model 1 (64DPCH)

- Signal setting

Carrier No.	Carrier ON/OFF	Offset frequency [MHz]	Scrambling code	Slot timing	Output level [dB]
1	ON	-27.500	0	0	0.00
2	ON	-22.500	16	1/5	0.00
3	ON	-17.500	32	2/5	0.00
4	ON	-12.500	48	3/5	0.00
5	ON	-7.500	0	0	0.00
6	ON	-2.500	16	1/5	0.00
7	ON	2.500	32	2/5	0.00
8	ON	7.500	48	3/5	0.00
9	ON	12.500	0	0	0.00
10	ON	17.500	16	1/5	0.00
11	ON	22.500	32	2/5	0.00
12	ON	27.500	48	3/5	0.00

[Starting Software]

1. Select **[Application]** → **[3GPP Waveform Generator]** from the menu bar.
   The software starts.

[Initialization]

2. Select **[File]** → **[Initialize]** from the menu bar to initialize the setup parameters.

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)
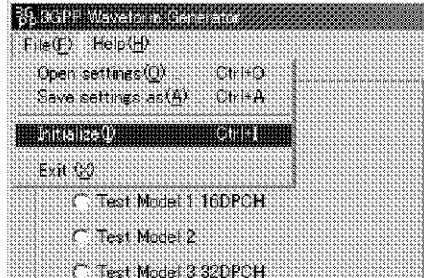
Figure 4-15   [File] → [Initialize] Menu

3. Displays the dialog box which confirms whether to initialize the setup parameters. Select [Yes].
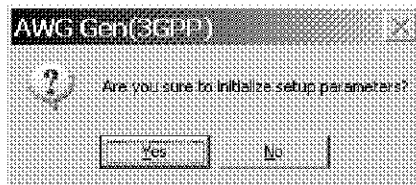
Figure 4-16   [File] → [Initialize] Menu

[Setting]

4. Touch the [Test Model 1 64DPCH] option button in [Test Models].

The standard number of the selected test model, [Test Model 1 64DPCH], is displayed in the [Standard] field.
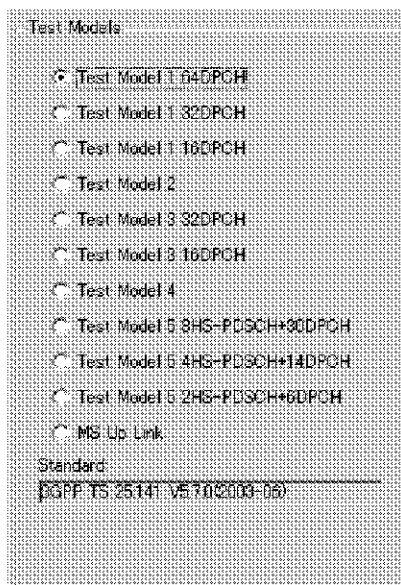
Figure 4-17   Selecting the Test Model and Displaying the Standard

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)

5. Touch the [Edit] button in [Multi Carrier].
   The [Carrier Setup] dialog box is displayed.
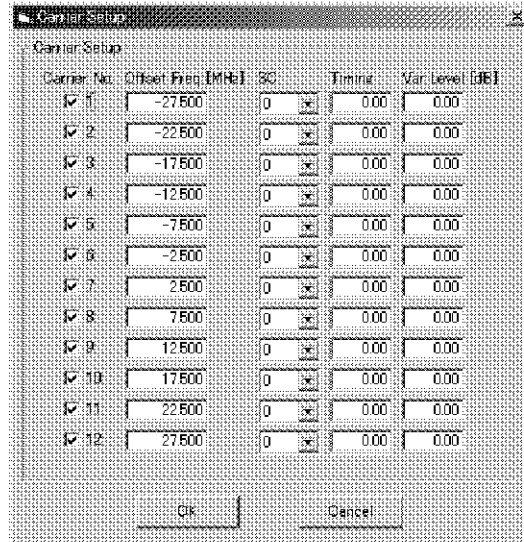
Figure 4-18　[Carrier Setup] Dialog Box

6. Check that [Carrier No.] checkboxes [1] to [12] are all selected.
   If any are unselected, enter a check by touching the boxes.

7. Check that 0 is selected in [SC] for [Carrier No.] [1], [5], and [9].
   If any other value is displayed, select 0.

8. Select 16 in [SC] for [Carrier No.] [2], [6], and [10].

9. Select 32 in [SC] for [Carrier No.] [3], [7], and [11].

10. Select 48 in [SC] for [Carrier No.] [4], [8], and [12].

11. Check that 0.00 is set in the [Timing] text boxes for [Carrier No.] [1], [5], and [9].
    If any other value is displayed, press [0], [.], [0], [0], and [ENT] by using the keypad.

12. Enter [0], [.], [2], [0], and [ENT] in the [Timing] text boxes for [Carrier No.] [2], [6], and [10], by using the keypad.

13. Enter [0], [.], [4], [0], and [ENT] in the [Timing] text boxes for [Carrier No.] [3], [7], and [11], by using the keypad.

14. Enter [0], [.], [6], [0], and [ENT] in the [Timing] text boxes for [Carrier No.] [4], [8], and [12], by using the keypad.

15. Check that 0.00 is set in the [Var Level] text boxes for [Carrier No.] [1] to [12].
    If any other value is displayed, press [0], [.], [0], [0], and [ENT] by using the keypad.

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)
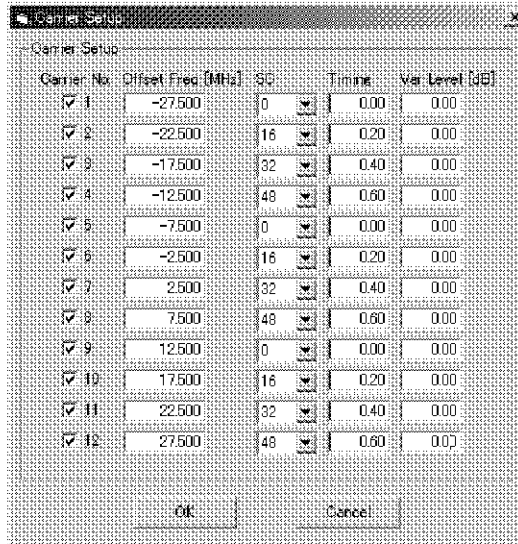
Figure 4-19   Setting the **[Carrier Setup]** Dialog Box

16. Touch the **[OK]** button in the **[Carrier Setup]** dialog box to close the **[Carrier Setup]** dialog box.

[Waveform generation]

17. Press **[Wave Generate]**. The file dialog box is displayed. Pressing the **[Save]** button in the file dialog box outputs waveform data to the hard disk.

MEMO: File names can be edited when the key board is connected.
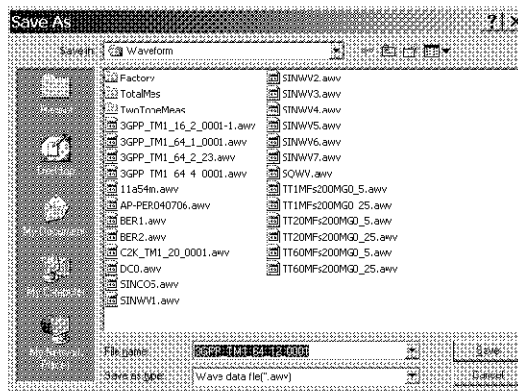
Figure 4-20   File Dialog Box

4.2.3 Operation for Generating the 12-Carrier Waveform Data of Test Model 1 (64DPCH)

[Loading the Waveform to AWG]

18. For more information, refer to Section 4.3, "How to Load the Waveform to the AWG."

4.3 How to Load the Waveform to the AWG

This section describes the operating procedures for loading the waveform data generated by using this software to the AWG.

MEMO: *For more information on how to use the AWG, refer to "R3681 Series OPT72 Digital Signal Generator Module User's Guide."*

---

1. Touch **[Config]** on the menu bar and select **[SG+AWG Option]**.
   Selecting **[SG+AWG Option]** displays the SG screen.

MEMO: *The display differs depending on the state of when the screen was last used.*
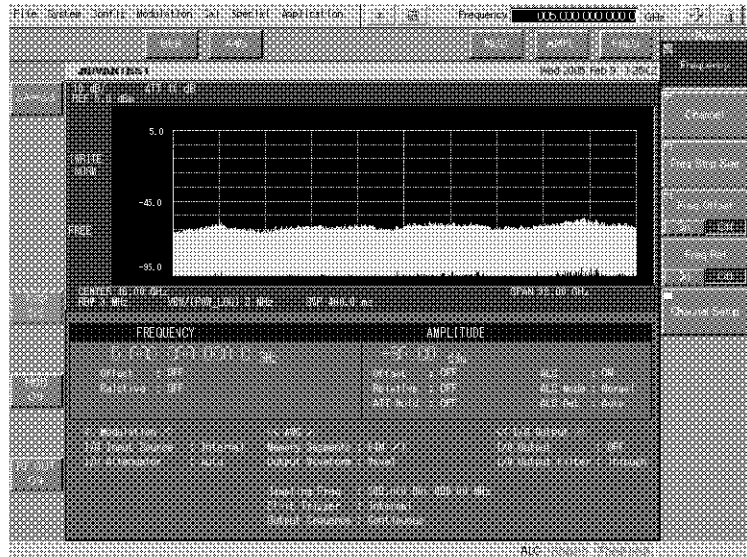
Figure 4-21   SG Screen

2. Touch the **{AWG}** button on the function bar.

3. Touch the **Waveform Setup** key on the soft menu bar.
   The **[Waveform Setup]** dialog box appears.

Figure 4-22   **[Waveform Setup]** Dialog Box

4. Touch [16M Word ×4] on [Memory Segments].

    A dialog box, which requests confirmation of changing [Memory Segments], is displayed. Touch the OK button.
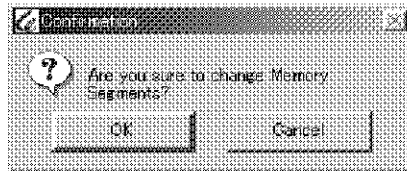
Figure 4-23   [Memory Segments] Change Inquiry Message Box

5. Select Wave 1 from [Map Number] in [Load Waveform].

6. Verify that the [Auto Load] check box of [Load Waveform] has been checked.

    If it is not checked, touch the check box to check it.

7. Touch the [Load File] button.

    The [Select Waveform] dialog box appears.
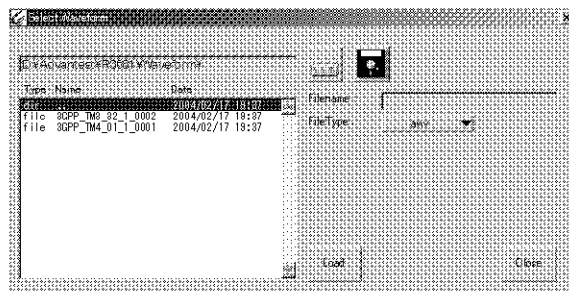
Figure 4-24   [Select Waveform] Dialog Box

8. Select the waveform data which is generated by using this software.

    The selected file name is displayed in the [Filename] text box.

9. Touch the [Load] button.

    The file starts loading.

    When the file has loaded, the [Select Waveform] dialog box closes.
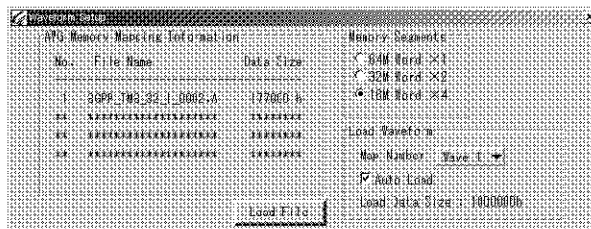
Figure 4-25   [Waveform Setup] Dialog Box

10. Check the number, the loaded file name and the data size which are displayed on [AWG Memory Mapping Information] in the [Waveform Setup] dialog box.

11. Touch the close button 🗷 on the [**Waveform Setup**] dialog box to close the dialog box.

12. By pressing the │ **START** │ button on the front panel, the I/Q signal is output.

To stop the I/Q output, press the │ **STOP** │ button.

IMPORTANT:

1. *Once the waveform data which is generated by using this software has loaded, the sampling frequency and output levels of the AWG are set automatically.*

2. *If the waveform data which is generated by this software is used, the external IQ output level is different from the output level set by the AWG.*
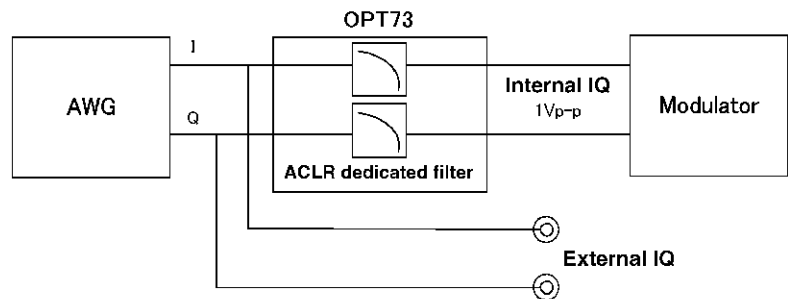
Figure 4-26   Internal Block Diagram

This option includes an additional ACLR dedicated filter. Because the IQ output after passing the ACLR filter is set to 1 V_{p-p} automatically, the external IQ output level consists of a voltage, which is equal to the loss while passing through the ACLR dedicated filter, and 1 V_{p-p}

This specification applies only to the waveform data which is generated by using this software. As for user-created data, the external IQ output level is equal to the output level set by the AWG.

5. FUNCTION DESCRIPTION

This chapter describes the functions of each part of the screen.

5.1 Names of Each Part of the Screen

This section describes the names of each part of the software screen.
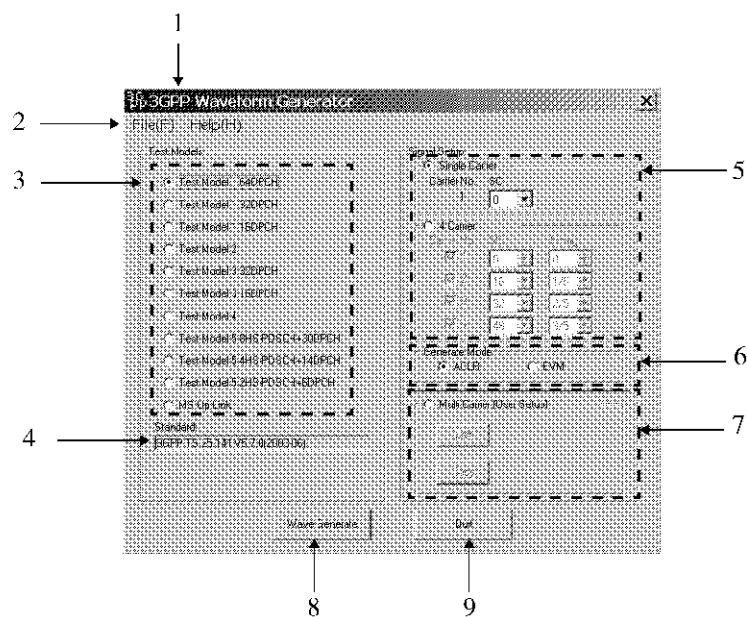
Figure 5-1   Software Screen

1.	Title bar	Displays the software title.
2.	Menu bar	The system menus can be opened from here. There are two menus, **[File]** and **[Help]**. For more information, refer to Section 5.2, "Menu Bar Configuration."
3.	Test Models option button	Select which test model to generate. The test models comply with the 3GPP TS 25.141 V5.7.0 (2003-06) standard. Test Model 1 to Test Model 5 can be selected. The MS Up Link test signal can be also selected. For more information, refer to Section 5.3, "Test Model Details."
4.	Standard field	Displays the standard with which the test model selected with the test model option button complies.

> MEMO: *If the details of the test model are changed according to the changes to the standard, the changes can be reflected in this field by updating the model file (data file of this software). The standard display field display the standard to which each test model corresponds.*

5.1 Names of Each Part of the Screen

5.	Signal Setup	Sets up which test model to generate. In Signal Setup, either "Single Carrier" can be selected to generate a single-carrier waveform or "4 Carrier" can be selected to generate a four-carrier waveform . When "Single Carrier" is selected, the scrambling code can be set. When "4 Carrier" is selected, ON/OFF, scrambling code, and slot timing can be set for each carrier. For more information, refer to Section 5.4, "Signal Setting Function."
6.	Generate Mode	By selecting this mode, the signal can be output with respect to either the modulation accuracy or ACLR. For more information, refer to Section 5.5, "Waveform Generation Mode."
7.	Multi Carrier	Generates the waveform that includes up to 12 carriers. In Multi Carrier, ON/OFF, scrambling code, slot timing, and output level can be set for each carrier. For more information, refer to Section 5.6, "Multi-Carrier Signal Setting Function."
8.	Wave Generate button	Generates a waveform data. Pressing this button generates a waveform based on the information that is set in the test model selection option box, signal setting, and waveform generation mode selection, and outputs the waveform data to the hard disk of the R3681 series main unit.
9.	Quit button	Pressing this button exits from the software. This button performs the same function as selecting **[File]** → **[Exit]** from the menu bar.

5.2 Menu Bar Configuration

[File]	This menu contains file operations.
├── **[Open settings...]**	Reads the file in which the setting state is saved and reflects the setting on the screen.
├── **[Save settings as...]**	Saves the settings on the screen in a file. (NOTE)
├── **[Initialize]**	Initializes the settings on the screen.
└── **[Exit]**	Exits from this software.
[Help]	Displays the software information.
└── **[Version]**	Displays the version number of the software.

NOTE: Deleting a file in which the setting conditions are saved
Select [File] then [Save settings as...] to delete the file in which the settings on the screen are saved. Specify the file in the dialog box.
Press the right mouse button to display the pop-up menu and click [Delete].

5.3 Test Model Details

The standard used for this option is the 3GPP TS 25.141 V5.7.0 (2003-06). Figure 5-2 shows the configuration of the test model selection option button.

[Test Models]
[Test Model 1 64DPCH]
[Test Model 1 32DPCH]
[Test Model 1 16DPCH]
[Test Model 2]
[Test Model 3 32DPCH]
[Test Model 3 16DPCH]
[Test Model 4]
[Test Model 5 8HS-PDSCH+30DPCH]
[Test Model 5 4HS-PDSCH+14DPCH]
[Test Model 5 2HS-PDSCH+6DPCH]
[MS Up Link]
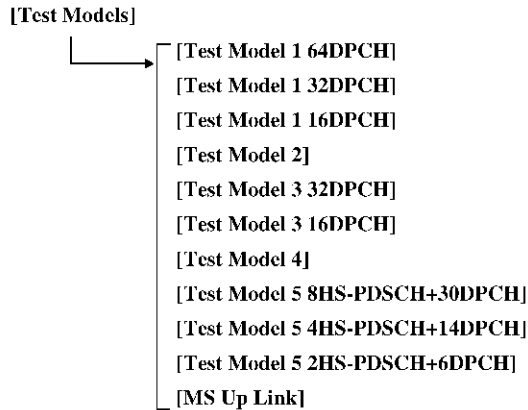
Figure 5-2   Configuration of the Test Model Selection Option Button

1. Test Model 1 64DPCH/32DPCH/16DPCH

The signal configuration of this test model is as shown in Table 5-1.

For more information, refer to the written standards of 3GPP TS 25.141 V5.7.0 (2003-06).

Table 5-1   Test Model 1 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset $(x256T_{chip})$
P-CCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	1.6	-18	16	120
S-CCPCH containing PCH (SF=256)	1	1.6	-18	3	0
DPCH (SF=128)	16/32/64	76.8 in total	See Table 5-2	See Table 5-2	See Table 5-2

Table 5-2   DPCH Spreading Code, Timing offsets and level settings for Test Model 1 (1 of 2)

Code	Timing offset $(x256T_{chip})$	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)	Level settings (dB) (64 codes)
2	86	-10	-13	-16
11	134	-12	-13	-16
17	52	-12	-14	-16
23	45	-14	-15	-17
31	143	-11	-17	-18
38	112	-13	-14	-20
47	59	-17	-16	-16
55	23	-16	-18	-17
62	1	-13	-16	-16
69	88	-15	-19	-19
78	30	-14	-17	-22
85	18	-18	-15	-20
94	30	-19	-17	-16
102	61	-17	-22	-17
113	128	-15	-20	-19
119	143	-9	-24	-21
7	83		-20	-19
13	25		-18	-21
20	103		-14	-18
27	97		-14	-20
35	56		-16	-24
41	104		-19	-24
51	51		-18	-22
58	26		-17	-21
64	137		-22	-18
74	65		-19	-20
82	37		-19	-17
88	125		-16	-18
97	149		-18	-19
108	123		-15	-23
117	83		-17	-22
125	5		-12	-21

5.3 Test Model Details

Table 5-2   DPCH Spreading Code, Timing offsets and level settings for Test Model 1 (2 of 2)

Code	Timing offset $(x256T_{chip})$	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)	Level settings (dB) (64 codes)
4	91			-17
9	7			-18
12	32			-20
14	21			-17
19	29			-19
22	59			-21
26	22			-19
28	138			-23
34	31			-22
36	17			-19
40	9			-24
44	69			-23
49	49			-22
53	20			-19
56	57			-22
61	121			-21
63	127			-18
66	114			-19
71	100			-22
76	76			-21
80	141			-19
84	82			-21
87	64			-19
91	149			-21
95	87			-20
99	98			-25
105	46			-25
110	37			-25
116	87			-24
118	149			-22
122	85			-20
126	69			-15

2. Test Model 2

The signal configuration of this test model is as shown in Table 5-3.

For more information, refer to 3GPP TS 25.141 V5.7.0 (2003-06).

Table 5-3 Test Model 2 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset (x256T_{chip})
P-CCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	5	-13	16	120
S-CCPCH containing PCH (SF=256)	1	5	-13	3	0
DPCH (SF=128)	3	2 x 10,1 x 50	2 x -10, 1 x -3	24, 72,120	1,7,2

3. Test Model 3 16DPCH/32DPCH

The signal configuration of this test model is as shown in Table 5-4.

For more information, refer to 3GPP TS 25.141 V5.7.0 (2003-06).

Table 5-4 Test Model 3 Active Channels

Type	Number of Channels	Fraction of Power (%) 16/32	Level settings (dB)16/32	Channelization Code	Timing offset (x256T_{chip})
P-CCPCH+SCH	1	12,6/7,9	-9 / -11	1	0
Primary CPICH	1	12,6/7,9	-9 / -11	0	0
PICH	1	5/1.6	-13/-18	16	120
S-CCPCH containing PCH (SF=256)	1	5/1.6	-13/-18	3	0
DPCH (SF=256)	16/32	63,7/80,4 in total	See Table 5-5	See Table 5-5	See Table 5-5

5.3 Test Model Details

Table 5-5 DPCH Spreading Code, Toffset and Power for Test Model 3

Code	T_{offset}	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)
64	86	-14	-16
69	134	-14	-16
74	52	-14	-16
78	45	-14	-16
83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

4. Test Model 4

The signal configuration of this test model is as shown in Table 5-6.

For more information, refer to 3GPP TS 25.141 V5.7.0 (2003-06).

Table 5-6   Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH when Primary CPICH is disabled	1	1.6	-18	1	0
PCCPCH+SCH when Primary CPICH is enabled	1	0.8	-21	1	0
Primary CPICH1	1	0.8	-21	0	0

5. Test Model 5

The signal configuration of this test model is as shown in Table 5-7.

For more information, refer to 3GPP TS 25.141 V5.7.0 (2003-06).

Table 5-7   Test Model 5 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset $(x256T_{chip})$
P-CCPCH+SCH	1	7.9	-11	1	0
Primary CPICH	1	7.9	-11	0	0
PICH	1	1.3	-19	16	120
S-CCPCH containing PCH (SF=256)	1	1.3	-19	3	0
DPCH (SF=128)	30/14/6 (*)	14/14.2/14.4 in total	See Table 5-8	See Table 5-8	See Table 5-8
HS-SCCH	2	4 in total	See Table 5-9	See Table 5-9	See Table 5-9
HS-PDSCH (16QAM)	8/4/2 (*)	63.6/63.4/63.2 in total	See Table 5-10	See Table 5-10	See Table 5-10

*:   2 HS-PDSCH shall be taken together with 6 DPCH, 4 HS-PDSCH shall be taken with 14 DPCH, and 8 HS-PDSCH shall be taken together with 30 DPCH.

5.3 Test Model Details

Table 5-8　DPCH Spreading Code, Timing offsets and level settings for Test Model 5

Code (SF=128)	Timing offset $(x256T_{chip})$	Level settings (dB) (30 codes)	Level settings (dB) (14 codes)	Level settings (dB) (6 codes)
15	86	-20	-17	-17
23	134	-20	-19	-15
68	52	-21	-19	-15
76	45	-22	-20	-18
82	143	-24	-18	-16
90	112	-21	-20	-17
5	59	-23	-25	
11	23	-25	-23	
17	1	-23	-20	
27	88	-26	-22	
64	30	-24	-21	
72	18	-22	-22	
86	30	-24	-19	
94	61	-28	-20	
3	128	-27		
7	143	-26		
13	83	-27		
19	25	-25		
21	103	-21		
25	97	-21		
31	56	-23		
66	104	-26		
70	51	-25		
74	26	-24		
78	137	-27		
80	65	-26		
84	37	-23		
88	125	-25		
89	149	-22		
92	123	-24		

Table 5-9   HS-SCCH Spreading Code, Timing offsets and level settings for Test Model 5

Code (SF=128)	Timing offset (x256T$_{chip}$)	Level settings(dB)
9	0	-15
29	0	-21

Table 5-10   HS-PDSCH Spreading Code, Timing offsets and level settings for Test Model 5

Code (SF=16)	Timing offset (x256T$_{chip}$)	Level settings (dB) (8 codes)	Level settings (dB) (4 codes)	Level settings (dB) (2 codes)
4	0	-11	-8	-5
5	0	-11	-8	
6	0	-11		
7	0	-11		
12	0	-11	-8	-5
13	0	-11	-8	
14	0	-11		
15	0	-11		

5.4 Signal Setting Function

Figure 5-3 shows the configuration of the signal setting function.

```
[Signal Setup]
          ┌─ [Single Carrier] ──→ [Carrier No.1] ──→ [SC]
       ──→│
          └─ [4 Carrier]    ┌─→ [Carrier No.1] ──→[SC]
                            │                    └→[Timing]
                            │
                            ├─→ [Carrier No.2] ──→[SC]
                            │                    └→[Timing]
                            │
                            ├─→ [Carrier No.3] ──→[SC]
                            │                    └→[Timing]
                            │
                            └─→ [Carrier No.4] ──→[SC]
                                                 └→[Timing]
```
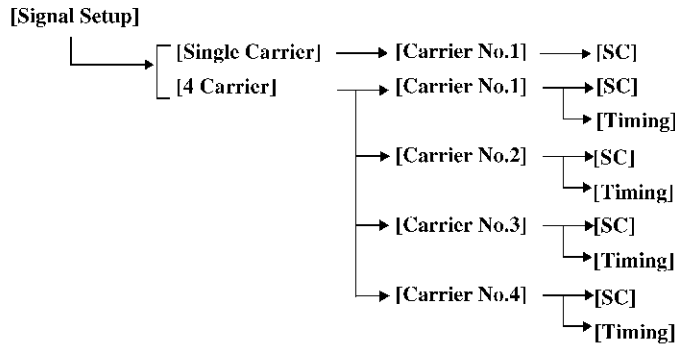
Figure 5-3   Configuration of the Signal Setting Function

[Signal Setup] is used to set the scrambling code and slot timing for each carrier.

[Single Carrier]	Selecting the [Single Carrier] option button generates a single-carrier signal.
[4 Carrier]	Selecting the [4 Carrier] option button generates 4-carrier signals.

[Single Carrier] Selected
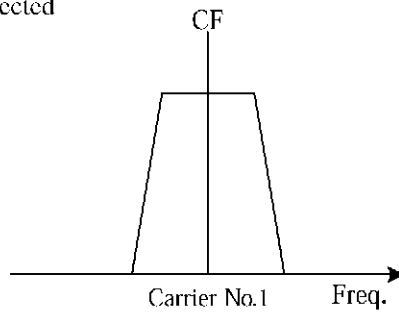
[4 Carrier] Selected

Figure 5-4   Relationship between Each [Carrier No.] when [Single Carrier] or [4 Carrier] Is Selected

[Carrier No.1] to [Carrier No.4]

When **[4 Carrier]** is selected, each carrier can be set to ON or OFF by checking or clearing each check box from **[Carrier No.1]** to **[Carrier No.4]**.
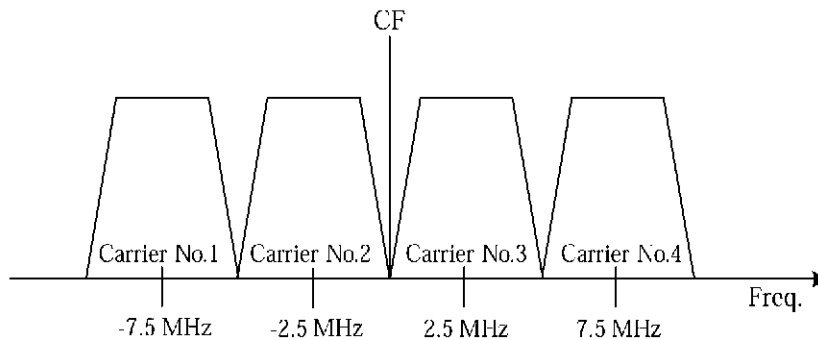The checked carrier is output.

CAUTION:	*If [Single Carrier] is set, the carrier output is always set to ON.*

[SC]

Selects the scrambling code for each carrier.
The scrambling code can be selected from 0, 16, 32, or 48.

CAUTION:	*If [4 Carrier] is set, the same scrambling code cannot be allocated to each carrier.*

[Timing]

Sets the slot timing between each carrier.
The slot timing for **[Carrier No.1]** is fixed to 0 slot.
Each slot timing from **[Carrier No.2]** to **[Carrier No.4]** can be selected from 1/5, 2/5, or 3/5 slot.

CAUTION:	*The same slot timing cannot be allocated to each carrier.*

5.5 Waveform Generation Mode

There are two waveform generation modes.

[Generate Mode]
└──────→ ┌ [ACLR]
         └ [EVM]
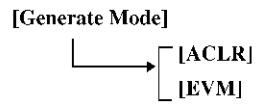
Figure 5-5   **[Generate Mode]** Configuration

[Generate Mode] is used to select the waveform type.

[ACLR]	By selecting this mode, the hardware low pass filter in this option is inserted, and the waveform is output with respect to ACLR.
[EVM]	By selecting this mode, the waveform is output with respect to the modulation accuracy.

5.6 Multi-Carrier Signal Setting Function

Figure 5-6 shows the configuration of the multi-carrier signal setting function.
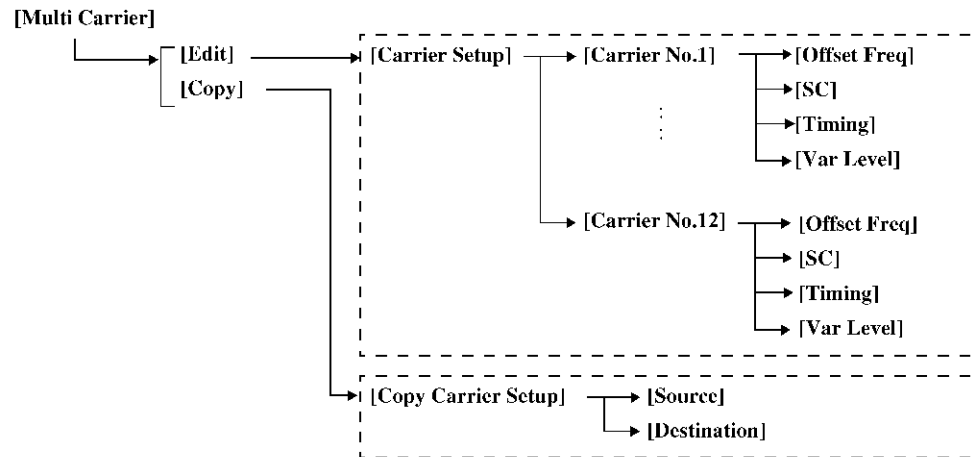

Figure 5-6   Software Screen

In **[Multi Carrier]**, the scrambling code, slot timing, output level can be set for each carrier up to 12 carriers.

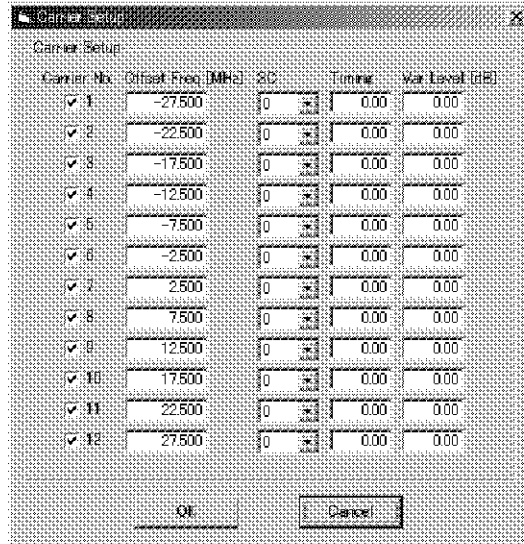|	
[Multi Carrier]	Generates a signal that includes up to 12 carriers by selecting the **[Multi Carrier]** option button.
[Edit]	Pressing this button opens the **[Carrier Setup]** dialog box.

5.6 Multi-Carrier Signal Setting Function

Figure 5-7 **[Carrier Setup]** Dialog Box

[Carrier Setup]

In **[Carrier Setup]**, the scrambling code, timing, and output level can be set for each carrier.

[Carrier No.1] to **[Carrier No.12]**

Each carrier from **[Carrier No.]** 1 to 12 can be set to ON or OFF by selecting or clearing its check box.
The carriers whose check boxes are selected are output.

[Offset Freq]

Sets the offset frequency for center frequency of each carrier.

[SC]

Selects the scrambling code of each carrier.
The scrambling code can be selected from 0, 16, 32, and 48.

[Timing]

Sets the slot timing between each carrier.
The number of slots that the timing varies by can be set in "Timing". Therefore, setting 0.20 varies the timing by 1/5 slots.

Table 5-11 **[Timing]** Setting Example

Slot timing	**[Timing]** setting value
0slot	0.00
1/5slot	0.20
2/5slot	0.40
3/5slot	0.60

[Var Level]

In **[Var Level]**, the output level between each carrier can be set by using a carrier as a reference.
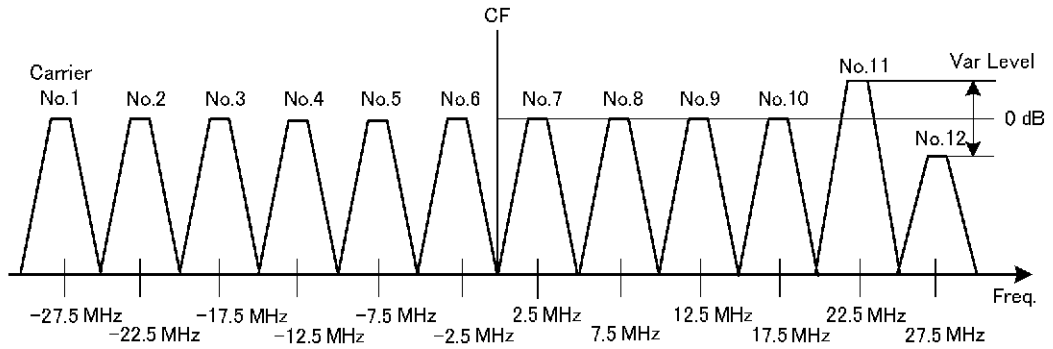
Figure 5-8 Relationships between **[Carrier No.]**, Offset Frequency, and Output Level

[Copy]   Pressing this button opens the **[Copy Carrier Setup]** dialog box.
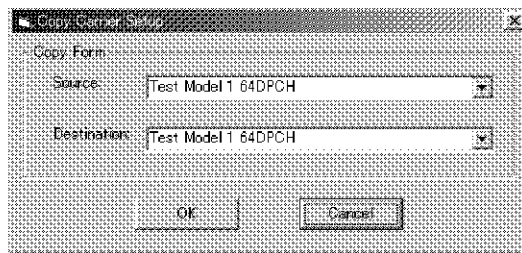
Figure 5-9 **[Copy Carrier Setup]** Dialog Box

[Copy Carrier Setup]   Copies the scrambling code, timing, and output level of the multi-carrier, which are set for one test model, to another test model.

[Source]   Specifies the source test model whose data (scrambling code, timing, and output level) is copied.

[Destination]   Specifies the destination test model to which data is copied.

5.7 Waveform Generation Button

Pressing the **[Wave Generate]** button generates a waveform based on the information that is set in the test model selection option box, signal setting, and waveform generation mode selection.

Pressing the **[Wave Generate]** button displays the file dialog box and the default file name. This file is named according to the following rules:

3GPP_TM*x*_dpch_*c*_*fn*.awv

x:	Test model number
dpch:	Number of the multiplexed DPCH (The test Model 2 and 4 are fixed to 01)
c:	Number of carriers
fn:	File number given automatically by this software

MEMO: File names can be edited from the keyboard if a keyboard is connected.

---

6. SPECIFICATIONS

This chapter describes the specifications of this instrument.

The performance of this instrument is guaranteed when used under the following conditions unless noted specially.

- The instrument is calibrated at regular calibration periods.

- The instrument has been warmed up for 30 minutes or more after power is turned on under the specified environmental conditions.

- Autocalibration has been performed.

The reference data is provided not to show you the guaranteed performance but to help you use this instrument efficiently. The data contains the following notations:

Specifications (spec.):	Indicate the performance guaranteed by the product. The specifications are determined in consideration of possible irregularities of quality among individual products, inaccurate measurements at the time of calibration, and performance changes due to environmental factors.
Typical value (typ.):	Indicates the average performance of the product. Possible irregularities of quality among individual products, inaccurate measurements at the time of calibration, and performance changes due to environmental factors are not considered.
Nominal value (nom.):	Indicates the general or expected performance of the product.

6.1 OPTION 73 3GPP Multi-Carrier Generation Performance Specification

6.1.1 Application Software (3GPP Waveform Generator)

Item	Specification
The maximum number of carrier generation	12 waveforms
The test models that can be generated	Test Model 1 (64DPCH) Test Model 1 (32DPCH) Test Model 1 (16DPCH) Test Model 2 Test Model 3 (32DPCH) Test Model 3 (16DPCH) Test Model 4 Test Model 5 (8HS-PDSCH+30DPCH) Test Model 5 (4HS-PDSCH+14DPCH) Test Model 5 (2HS-PDSCH+6DPCH)
	Compliance with the 3GPP TS 25.141 V5.7.0 (2003-6)
Scrambling codes that can be set	0, 16, 32, 48
Slot timings that can be set	0, 1/5, 2/5, and 3/5 slot (when 4 Carrier is selected) Any other (when Multi Carrier is selected)
Waveform generation mode	ACLR and EVM modes

6.1.2 Hardware

Item	Specification
ACLR	<-63 dBc offset 5 MHz (3GPP ACP) (When the waveform data 3G1CACP for performance verification is used: output frequency 2 GHz, output level 0 dBm)
EVM	<4% (When the waveform data 3GPPEVM for performance verification is used: output frequency 2 GHz, output level 0 dBm)

6.1.3   General Specifications

Item	Specifications
Operating environmental range	Ambient temperature: +5°C to +40°C Relative humidity: 80% or less (no condensation)
Storage environmental range	Ambient temperature: -20°C to +60°C Relative humidity: 80% or less (no condensation)

7. PERFORMANCE VERIFICATION

7.1 Introduction

This chapter describes the performance verification procedure.

1. Test environment and conditions

   Conduct performance verification under the following conditions:

* In a 20°C to 30°C environment, after turning on the power and letting it warm up for 30 minutes or longer

* After automatic calibration has been performed on all of the SA, AWG, and SG

2. Required equipment

   Table 7-1 shows the required equipment for the test.

   If the user's instruments meet the specifications described in the table, these instruments can be used instead of the recommended models.

CAUTION: *The connection of instruments and test procedures are described assuming that the "OPT3681MD+50 3GPP (HSDPA) modulation analysis software" is installed.*
If the relevant option is not installed in the R3681 series main unit, a modulation analysis device is required for the EVM measurement (purchased separately).

---

3. Performance verification period

   It is recommended that the performance verification is conducted once a year to check whether this option meets its specifications.

4. Performance verification sheets

   Performance verification sheets are provided at the end of this chapter for a user to record values, which are measured in the performance verification test.

   When conducting performance verification, it is recommended that copies of the sheets are made for the test results, and the sheets stored as test records.

7.1 Introduction

Table 7-1   Required Instruments List

No.	Instrument	Requirements		Recommended model	Quantity	
					R3681	R3671
1	Modulation analysis device	3GPP signal modulation analysis Residual EVM: <1.5%		OPT3681MD+50 ADVANTEST	1	1
2	BNC cable	Impedance: Connector: Length:	50 Ω BNC(m)-BNC(m) 1.5 m	A01037-1500 ADVANTEST	1	1
3	Adaptor	Connector:	N(m)-BNC(f)	JUG-201A/U HIROSE	1	1
4	Adaptor	Connector:	SMA(f)-SMA(f)	HRM-501 HIROSE	1	0
5	Adaptor	Connector:	SMA(m)-BNC(f)	HRM-517 (09) HIROSE	1	0
6	Adaptor	Connector:	N(m)-BNC(f)	JUG-201A/U HIROSE	0	1

7.2 Performance Verification Procedure

This section describes the performance verification procedure.

7.2.1 Loading Waveform Data

[Overview]

At first, load the waveform data that is necessary for performance verification to the waveform storing memory of the AWG.

Load the waveform file to each map shown in the list below.

Waveform storing memory split mode	Map	Waveform file
16M × 4 waveform mode	Wave 1	3G1CACP
	Wave 2	3GPPEVM

The waveform file is stored in advance in the following directory of the built-in hard disk of this instrument.

> D\Advantest\R3681\Waveform\

For more information on how to load the waveform data, refer to "R3681 Series OPT72 Digital Signal Generation Module User's Guide" in addition to this manual.

[Procedure]

1. Preset this instrument.
   Operation: **[Special]** → **[Preset]** → **[All]**

2. Select the AWG Option.
   Operation: **[Config]** → **[SG+AWG Option]**

3. Display the setting dialog box which is related to loading the waveform data.
   Operation: **{AWG}**, **Waveform Setup**

4. Set the waveform storing memory split mode to the 16M × 4-waveform mode.
   Operation: **[Memory Segments]**, **[16M Word ×4]**

5. The message box which requests confirmation of changing the waveform storing memory split mode is displayed. Confirm the change by pressing the OK button.
   Operation: **[Confirmation]**, **[OK]**

6. Select the map which loads the waveform data.
   Operation: **[Load Waveform]**, **[Map Number]**, **[Wave 1]**

7. Display the dialog box which specifies the waveform file to be loaded.
   Operation: **[Waveform Setup]**, **[Load File]**

8. Select the waveform file to be loaded by touching it.

9. Waveform data loading starts.

   Operation: **[Select Waveform]**, **[Load]**

10. When the waveform data loading is complete, the **[Select Waveform]** dialog box closes and the number, the loaded file name, and data size are displayed in **[AWG Memory Mapping Information]** of the **[Waveform Setup]** dialog box.

11. Change the map and repeat steps 6 to 11 to load the waveform data to Wave 2 as well.

12. After the two waveform data are loaded, close the **[Waveform Setup]** dialog box.

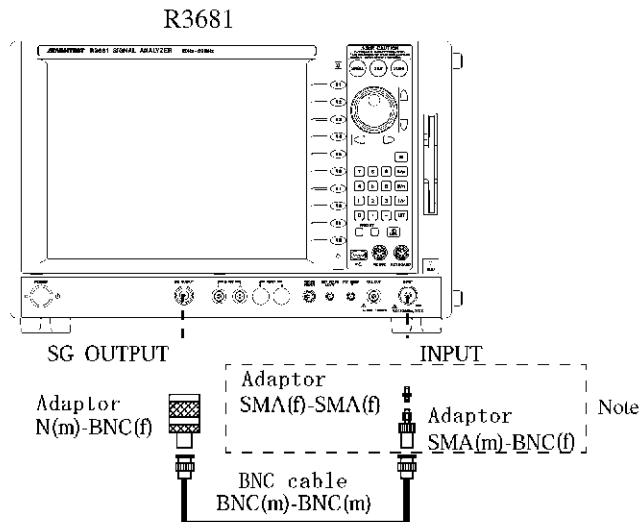   Operation: **[Waveform Setup]**, ▨

7.2.2 Checking the Operations of the Baseband Filter

|Overview|

Check the switching operation of the baseband filter by making a signal output from SG and measuring the ACP or EVM.

Check two baseband filters.

|Connection diagram|

R3681

SG OUTPUT   INPUT

Adaptor
N(m)-BNC(f)

Adaptor
SMA(f)-SMA(f)

Adaptor
SMA(m)-BNC(f)

Note

BNC cable
BNC(m)-BNC(m)

NOTE: The R3671 uses the N(m)-BNC(f) adapter.

Figure 7-1   Connection diagram

[Connecting the instruments]

1. Connect the instruments as shown in Figure 7-1.

CAUTION:	The connection of the instruments is described assuming that the "OPT3681MD+50 3GPP (HSDPA) modulation analysis software" is installed. If the relevant option is not installed in the R3681 series main unit, a modulation analysis device is required to measure the EVM in the step [Verifying the through filter] (purchased separately).

|Verifying the ACLR filter|
Setting the SA

2. Activate the SA.
   Operation: **[SA⇔SG]**

3. Set the SA center frequency to 2 GHz.
   Operation: **{FREQ}**, **CENTER**, **[2]**, **[GHz]**

4. Set the frequency span to 30 MHz.
   Operation: **{SPAN}**, **Span**, **[3]**, **[0]**, **[MHz]**

5. Set the reference level to -15 dBm.
   Operation: **{LEVEL}**, **Ref Level**, **[-]**, **[1]**, **[5]**, **[ENT]**

6. Set the resolution bandwidth to 30 kHz.
   Operation: **{BW}**, **RBW Auto/Man** (Man), **[3]**, **[0]**, **[kHz]**

7. Set the video bandwidth to 300 kHz.
   Operation: **{BW}**, **VBW Auto/Man** (Man), **[3]**, **[0]**, **[0]**, **[kHz]**

8. Sets the measurement mode to ACP.
   Operation: **{MENU2}**, **{POWER}**, **ACP**

Setting the AWG and SG

9. Activate the SG.
   Operation: **[SA⇔SG]**

10. Set the waveform data output from the AWG to Wave 1.
    Operation: **{AWG}**, **Output Setup**, **[Output Waveform Select]**, **[Wave 1]**

11. After the setting is complete, close the **[Output Setup]** dialog box.
    Operation: **[Output Setup]**, ☒

12. Output the signal from the AWG.
    Operation: **[AWG ON]**

7.2.2 Checking the Operations of the Baseband Filter

13. Set the output level of the SG to 0 dBm.

    Operation: {ANPL}, [Amplitude], [0], [ENT]

14. Set the frequency of the output signal to 2 GHz.

    Operation: {FREQ}, [Frequency], [2], [GHz]

15. Turn on the quadrature modulator.

    Operation: [MOD ON]

16. Output the signal from the SG.

    Operation: [RF OUT ON]

ACP Measurement

17. On the measurement screen of the Adjacent Channel Power, confirm that Lower and Upper are -63 dBc or less.

18. Stop the SG output.

    Operation: [RF OUT ON]

19. Turn off the quadrature modulator.

    Operation: [MOD ON]

20. Stop the output from the AWG.

    Operation: [AWG ON]

|Verifying the through filter|
Setting the SA

21. Activate the SA.

    Operation: [SA⇔SG]

22. Select the modulation analysis option.

    Operation: [Config] → [Modulation Analyzer]

Setting the AWG and SG

23. Activate the SG.

    Operation: [3GPP DL⇔SG]

24. Set the waveform data output from the AWG to Wave 2.

    Operation: {AWG}, Output Setup , [Output Waveform Select], [Wave 2]

25. After the setting is complete, close the [Output Setup] dialog box.

    Operation: [Output Setup], ☒

26. Output the signal from the AWG.

    Operation: [AWG ON]

27. Turn on the quadrature modulator.

Operation: **[MOD ON]**

28. Output the signal from the SG.

Operation: **[RF OUT ON]**

EVM measurement

29. Activate the modulation analysis.

Operation: **[3GPP DL⇔SG]**

30. Performs a modulation analysis.

Operation: **SINGLE**

31. On the measurement screen of the Total Result (1st Carrier), confirm that the EVM is 4% or less.

32. Activate the SG.

Operation: **[3GPP DL⇔SG]**

33. Stop the SG output.

Operation: **[RF OUT ON]**

34. Turn off the quadrature modulator.

Operation: **[MOD ON]**

35. Stop the output from the AWG.

Operation: **[AWG ON]**

7.3 Performance Verification Sheets

Baseband filter	Measuring item	Measured value	Verified value	Pass / Fail
ACLR filter	-5 MHz POWER		< -63 dBc	
	+5 MHz POWER		< -63 dBc	
Through	EVM		< 4%	

APPENDIX

This section describes the following items:

* A.1 Error Codes

A.1   Error Codes

This section describes error messages indicated for this option.

Descriptions are made for the following items:

* Error number
* Displayed message

Error number	Displayed message
0	Successfully completed.
1000	The error occurred.
1060	The carrier is not chosen.
1065	SC of a multi carrier overlaps.
1066	Timing of a multi carrier overlaps.
1100	Memory allocation was failed.
1101	Memories are insufficient.
1150	This file has already existed.
1151	Fail to write the file.
1152	Fail to read the pattern file.
1158	It is not the file saved by this program.
1200	Boundary error in the communication packet with the waveform generation DLL.
1201	Waveform data generation was canceled.
1202	Since old DLL is used, it cannot start normally.
1203	Since the modular version is different, it cannot start normally.

ALPHABETICAL INDEX

Alphabetical Index

IMPORTANT INFORMATION FOR ADVANTEST SOFTWARE

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(1) You may not use the SOFTWARE for any purpose other than for the use of the PRODUCTS.

(2) You may not copy, modify, or change, all or any part of, the SOFTWARE without permission from Advantest.

(3) You may not reverse engineer, de-compile, or disassemble, all or any part of, the SOFTWARE.

Liability

Advantest shall have no liability (1) for any PRODUCT failures, which may arise out of any misuse (misuse is deemed to be use of the SOFTWARE for purposes other than it's intended use) of the SOFTWARE. (2) For any dispute between you and any third party for any reason whatsoever including, but not limited to, infringement of intellectual property rights.

LIMITED WARRANTY

1. Unless otherwise specifically agreed by Seller and Purchaser in writing, Advantest will warrant to the Purchaser that during the Warranty Period this Product (other than consumables included in the Product) will be free from defects in material and workmanship and shall conform to the specifications set forth in this Operation Manual.

2. The warranty period for the Product (the "Warranty Period") will be a period of one year commencing on the delivery date of the Product.

3. If the Product is found to be defective during the Warranty Period, Advantest will, at its option and in its sole and absolute discretion, either (a) repair the defective Product or part or component thereof or (b) replace the defective Product or part or component thereof, in either case at Advantest's sole cost and expense.

4. This limited warranty will not apply to defects or damage to the Product or any part or component thereof resulting from any of the following:

    (a) any modifications, maintenance or repairs other than modifications, maintenance or repairs (i) performed by Advantest or (ii) specifically recommended or authorized by Advantest and performed in accordance with Advantest 's instructions;

    (b) any improper or inadequate handling, carriage or storage of the Product by the Purchaser or any third party (other than Advantest or its agents);

    (c) use of the Product under operating conditions or environments different than those specified in the Operation Manual or recommended by Advantest, including, without limitation, (i) instances where the Product has been subjected to physical stress or electrical voltage exceeding the permissible range and (ii) instances where the corrosion of electrical circuits or other deterioration was accelerated by exposure to corrosive gases or dusty environments;

    (d) use of the Product in connection with software, interfaces, products or parts other than software, interfaces, products or parts supplied or recommended by Advantest;

    (e) incorporation in the Product of any parts or components (i) provided by Purchaser or (ii) provided by a third party at the request or direction of Purchaser or due to specifications or designs supplied by Purchaser (including, without limitation, any degradation in performance of such parts or components);

    (f) Advantest's incorporation or use of any specifications or designs supplied by Purchaser;

    (g) the occurrence of an event of force majeure, including, without limitation, fire, explosion, geological change, storm, flood, earthquake, tidal wave, lightning or act of war; or

    (h) any negligent act or omission of the Purchaser or any third party other than Advantest.

5. **EXCEPT TO THE EXTENT EXPRESSLY PROVIDED HEREIN, ADVANTEST HEREBY EXPRESSLY DISCLAIMS, AND THE PURCHASER HEREBY WAIVES, ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, (A) ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND (B) ANY WARRANTY OR REPRESENTATION AS TO THE VALIDITY, SCOPE, EFFECTIVENESS OR USEFULNESS OF ANY TECHNOLOGY OR ANY INVENTION.**

6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**

7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

8. **OTHER THAN THE REMEDY FOR THE BREACH OF WARRANTY SET FORTH HEREIN, ADVANTEST SHALL NOT BE LIABLE FOR, AND HEREBY DISCLAIMS TO THE FULLEST EXTENT PERMITTED BY LAW ANY LIABILITY FOR, DAMAGES FOR PRODUCT FAILURE OR DEFECT, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLEGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

CUSTOMER SERVICE DESCRIPTION

In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, Advantest recommends a regular preventive maintenance program under its maintenance agreement.

Advantest's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest 's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

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