ADVANTEST®

ADVANTEST CORPORATION

R3681 Series
User's Guide

MANUAL NUMBER   FOE-8440090H00

Applicable Models
R3681
R3671

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1. INTRODUCTION

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

1.1 Organization of This Document

This document addresses a broad spectrum of audiences, from first-time users of this instrument to experienced users. You may read through the document in sequence, beginning with Chapter 1, to gain an all-round knowledge of this instrument or you may refer to the table of contents found at the beginning of each chapter first and jump to sections of interest to you.

This document is organized into the following chapters:

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	Focuses on the functions of this instrument's panel and the individual screen components, and guides the reader through the basic operating sequence and a simple measurement example to develop a basic working knowledge of this instrument.
Chapter 5. MENU MAP, FUNCTIONAL EXPLA-NATION	Explains the menu configuration and function of the soft keys.
Chapter 6. SPECIFICATIONS	Summarizes the specifications of this instrument.
Chapter 7. OPTIONS AND ACCESSORIES	Introduces the separately sold options and measurement accessories that can be used with this instrument.
Chapter 8. MAINTENANCE	Explains what daily customer care procedures (such as cleaning, calibration, and storage) are needed to sustain the performance and functionality of this instrument. Also covers instructions on how to troubleshoot this instrument and recover the system.
APPENDIX	Provides the following information: • Principles of measurement • Glossary • Network configuration • How to install the printer driver • Setting up file sharing

1.2   Product Overview

The R3681 Series Signal Analyzer is a signal analysis platform solution to the tasks of the upcoming era of digital wireless communication. In addition to offering key performance that addresses the needs for a broader signal range, a wider dynamic range, and a multi-carrier architecture, this instrument comes with a signal analysis software option to address a broad range of wireless communication systems.

Key features of this instrument are summarized below:

*   Wide frequency measurement range: 20 Hz - 32 GHz (R3681) / 20 Hz - 13 GHz (R3671)

*   Superb noise level: -158 dBm (typical @10 MHz to 1 GHz)

*   Low distortion: TOI +26 dBm (typical @2 to 3.5 GHz)

*   Excellent signal purity: -120 dBc/Hz (@800 MHz, 10 kHz offset)

*   Broad modulation analysis bandwidth: >20 MHz

*   Built-in attenuator 5 dB step

*   By adding the optional wideband demodulator, the resolution bandwidth in the CCDF measurement function can be expanded to 50 MHz.

1.3   Other Manuals Pertaining to This Instrument

Available manuals pertaining to this instrument include:

*   User's Guide (Part Code: {ER3681SERIES/U}, English, this manual)
    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.

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").
    - 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 more information on the system recovery method, refer to section 8.7, "System Recovery Procedure."

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."

2.7 Tip on Transportation

Extreme care as described below must be taken when carrying this instrument.

- This instrument is heavy and must be carried by two or more workers, or on a transportation cart.

- If using a cart, ensure this instrument is secure.

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
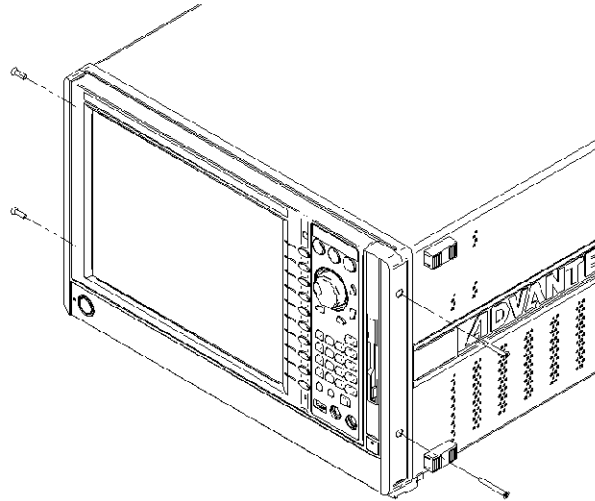
2.11 Limitations Imposed when Using Windows XP

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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. Check against the list in Table 3-1 that this instrument comes complete with all the standard accessories.

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.

3.1 Unpacking Inspection

Table 3-1   Standard Accessories

Name	Model	Quantity		Remarks
		R3681	R3671	
Power cable	A01402	1	1	
Input cable (50 Ω)	A01037-0300	1	1	
K (f)-K (f) adapter	5A-SFF40(A)	1	0	
SMA (f)-SMA (f) adapter	HRM-501	1	0	
SMA (m)-BNC (m) adapter	HRM-517(09)	1	0	
N (m)-BNC (f) adapter	JUG-201A/U	0	1	
Stylus pen	ST-PEN	1	1	
Ferrite core	ESD-SR-12	2	2	
R3681 Series User's Guide	ER3681SERIES/U	1	1	
R3681 Series Programming Guide	ER3681SERIES/P	1	1	
R3681 Series Performance Test Guide	ER3681SERIES/T	1	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.
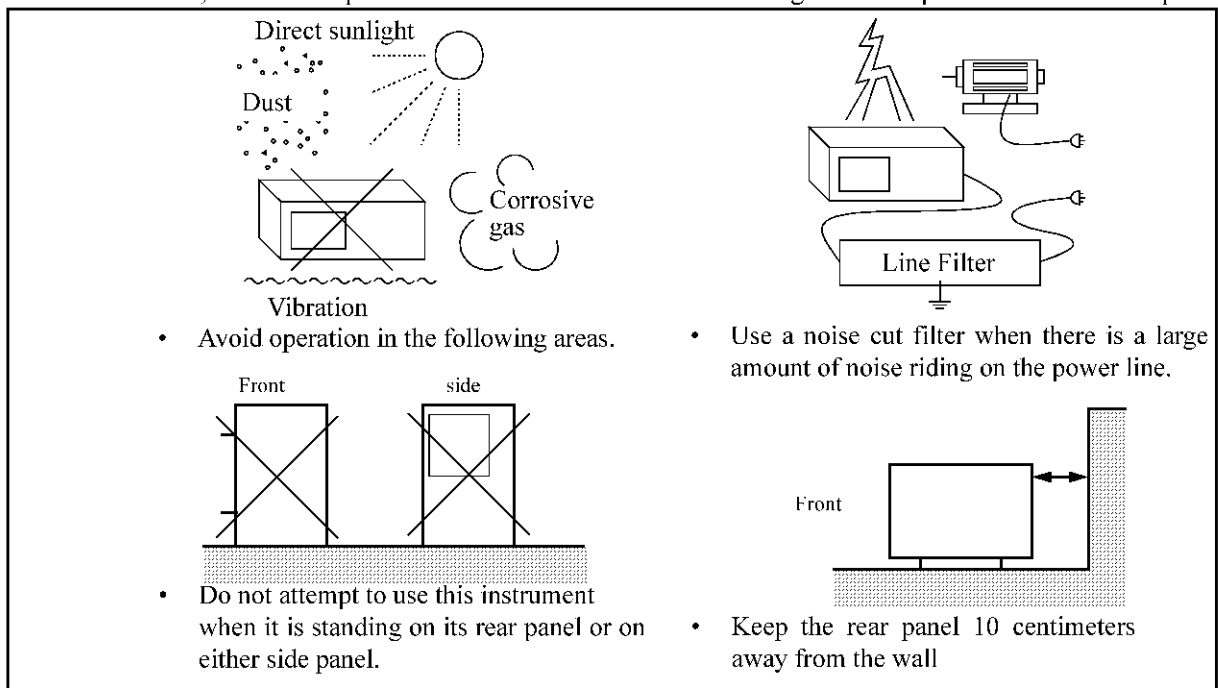

Figure 3-1   Operating Environment

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

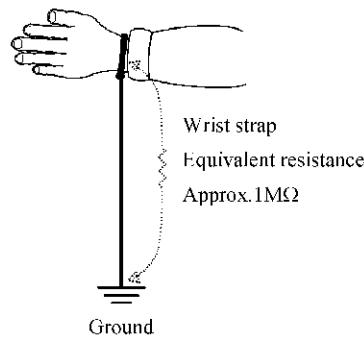| Operator	Use a wrist strap (see Figure 3-2).
Floor in the work area	Installation of a conductive mat, the use of conductive shoes, and grounding (see Figure 3-3).
Workbench	Installation of a conductive mat and grounding (see Figure 3-4).

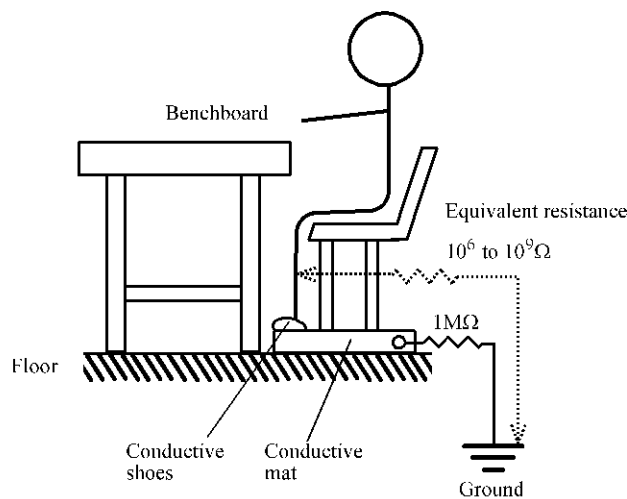Figure 3-2   Countermeasures for Static Electricity of Human Body

Figure 3-3   Countermeasures for Static Electricity on Work Floor

Figure 3-4 Countermeasures for Static Electricity on Work Bench

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

Plug the keyboard and mouse into their respective front-panel connectors (KEYBOARD and MOUSE connectors). The keyboard and mouse must be plugged before turning on this instrument.
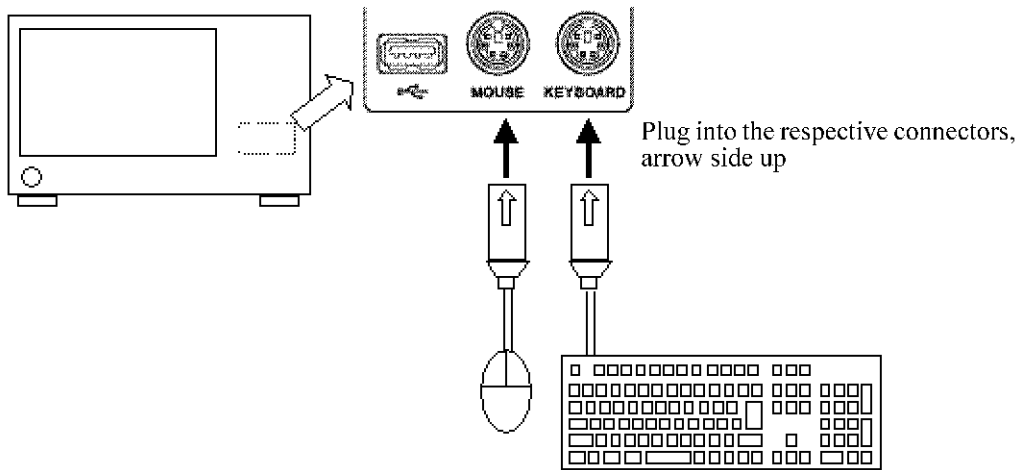

Figure 3-5   Connecting the Keyboard and Mouse

3.3.2　　Caution when Connecting Peripherals

Use shielded cables to connect peripherals to this instrument.

Attach a ferrite core (ESD-SR-12 produced by the Tokin Corporation) before connecting the Ethernet cable and the Probe power cable as show in the Figure 3-6.
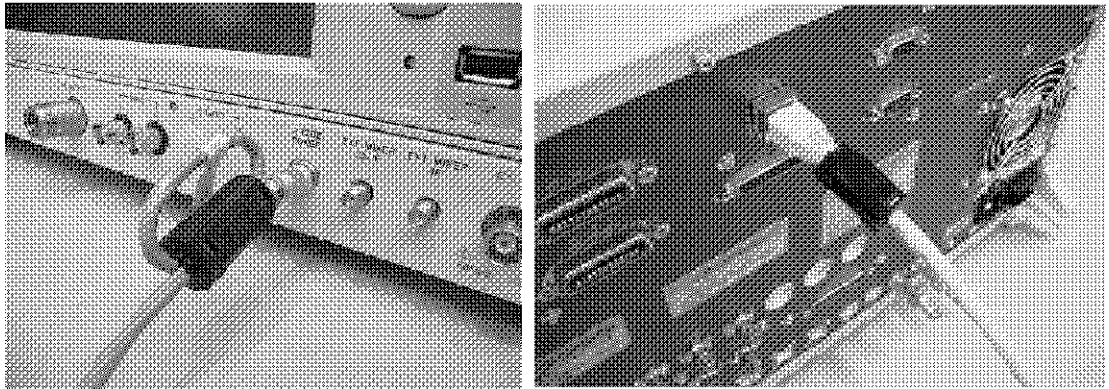

Figure 3-6　　Ferrite Core

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 3-7).

AC power connector
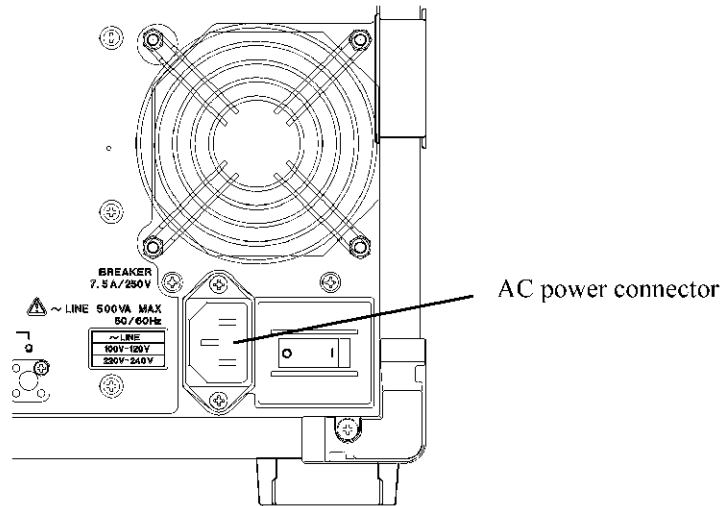
Figure 3-7   Connecting the Power Cable

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.

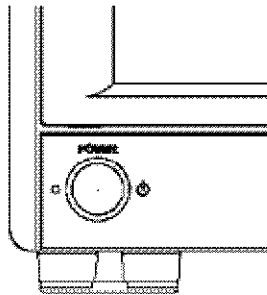3. Press the ⌈**POWER**⌉ switch to switch on the power.

Figure 3-8   **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 3-9 is displayed unless this instrument is tested faulty. The initial screen may give a different look from Figure 3-9, depending on the settings in effect the last time this instrument was powered off.

MEMO: Refer to Chapter 8, "MAINTENANCE" if error messages are displayed as a result of the self-diagnostics.

Figure 3-9   Initial Setup Screen
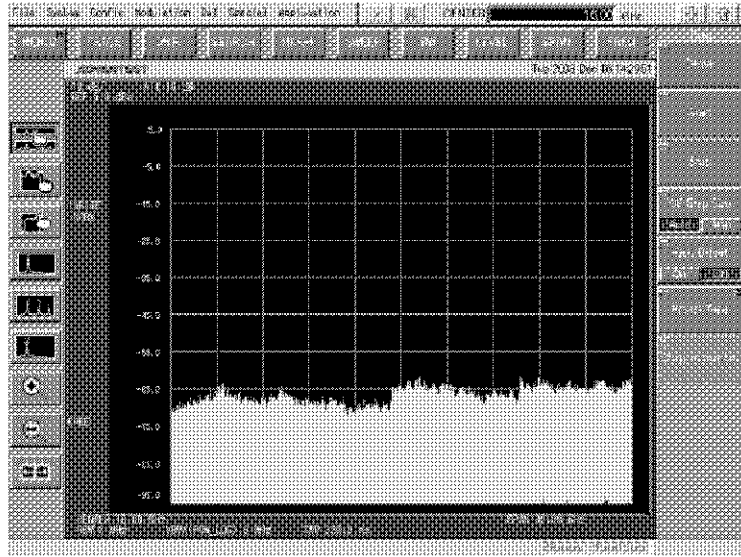
Running autocalibration

6.   <R3681>
Hook up this instrument as shown in Figure 3-10 by using the SMA (f)-SMA (f) adapter, SMA (m)-BNC (f) adapter, and input cable (A01261-30) that come with this instrument as standard.

<R3671>
Hook up this instrument as shown in Figure 3-10 by using the N (m)-BNC (f) adapter, and input cable (A01261-30) that come with this instrument as standard.
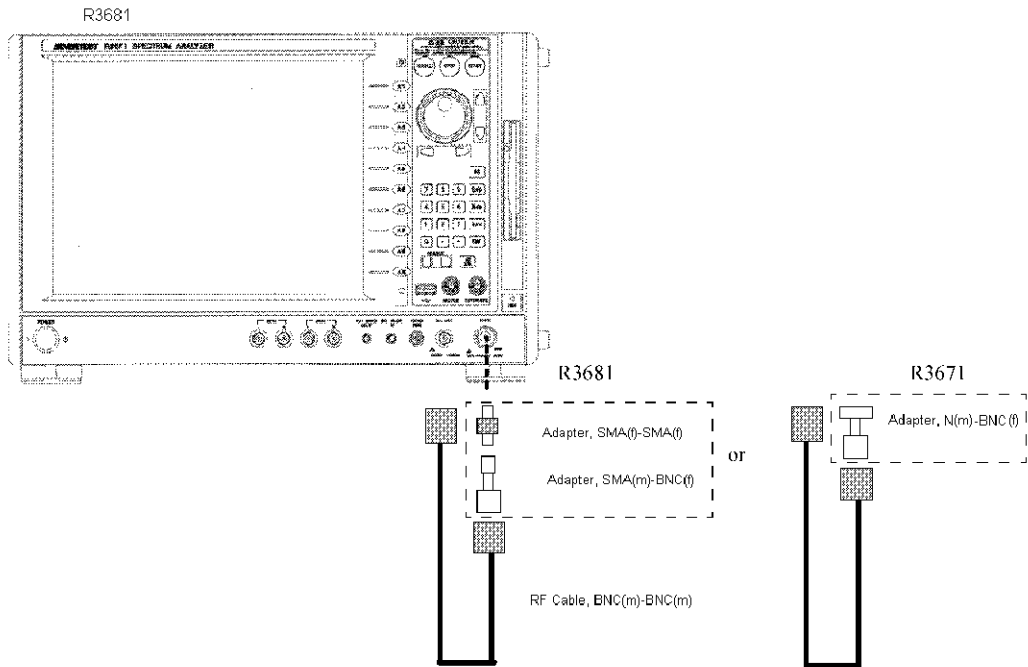
Figure 3-10   Autocalibration

IMPORTANT: *Allow this instrument to warm up for at least 30 minutes before running the autocalibration. For more information on how to use the autocalibration, refer to Section 4.3.1, "Autocalibration."*

---

7. Touch the **[Cal]** button on this instrument's menu bar to select **[SA Cal]** from the dropdown menu.

8. Autocalibration runs.
   The autocalibration takes about 1 minute to complete.

9. Make sure that no error messages are displayed as a result of the autocalibration.

MEMO: *Refer to Chapter 8, "MAINTENANCE" if error messages are displayed as a result of the autocalibration.*

Switching off power

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 panels of this instrument, the function of each component on the screen, and the basic operation of the instrument, using the example of measurement.

4.1 Description of the Panels and the Screen

The following sections describe the name and function of each component on the front panel, displays on the screen, and the rear panel.

4.1.1 The Name and Functions of Each Component on the Front Panel

This subsection describes the name and function of each component on the front panel.
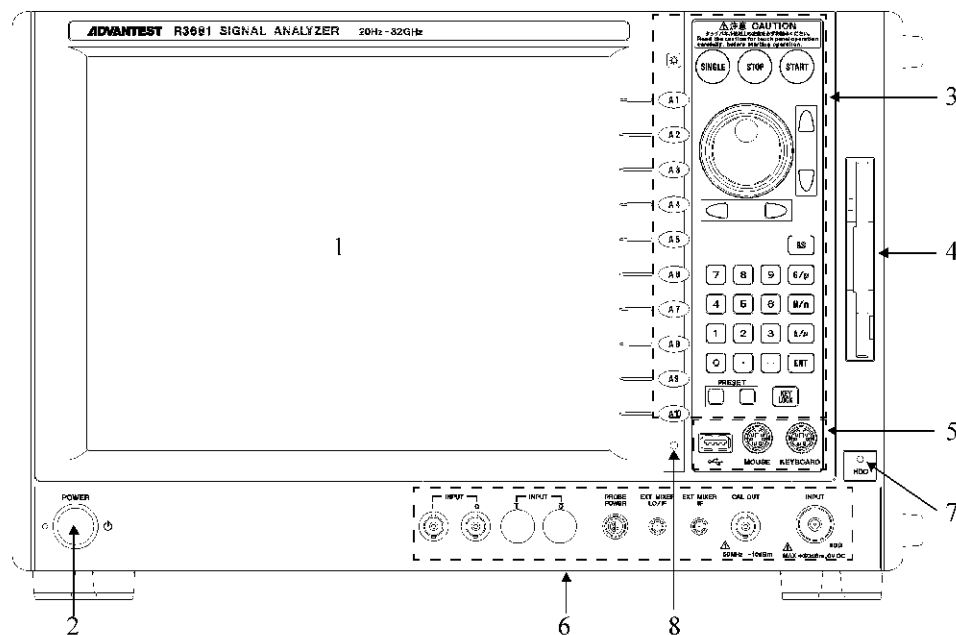

Figure 4-1   Front Panel

1.	Touch screen display	Displays measurement data, setting conditions, and other information items. The setting conditions can be changed by the functions of the touch screen.
2.	POWER switch	Turns on or off the power of this instrument. When you turn off this switch, the system terminates before power turns off.
3.	Entry key block	Used for changing settings
4.	Floppy disk drive	A 3.5" floppy disk drive
5.	I/F connector block	An I/F connector block for a keyboard and a mouse

4.1.1 The Name and Functions of Each Component on the Front Panel

6. I/O connector block   An I/O connector block for measurement

7. HDD (hard disk drive) access lamp
                                 Lights up while access is being made to the hard disk

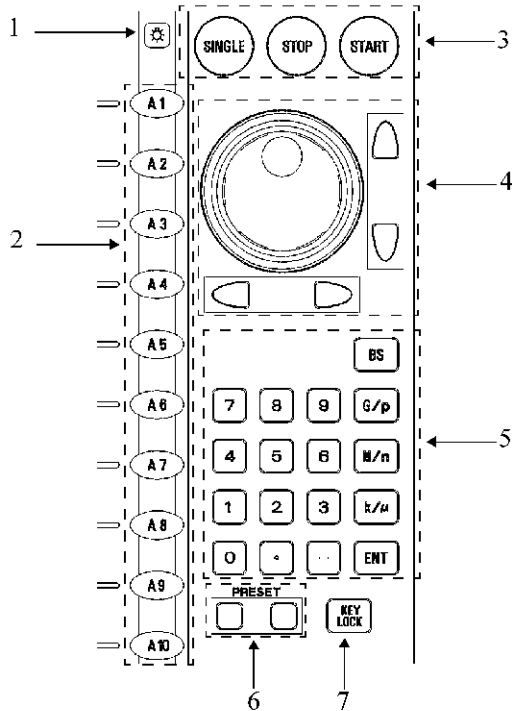8. Power lamp   Lights up while power is on

Figure 4-2   Entry Key Block

1. Back light key   Turns on or off the display back light

2. Application keys   Select soft menu bars for display

3. Program keys   Control measurement.

    SINGLE: Press for a single measurement.

    STOP: Press to stop continuous measurement.

    START: Press to start continuous measurement.

4. Data knob and step keys   A data knob and step keys

IMPORTANT: Changing of the settings for numeric entry may fail if you continuously press the data knob too quickly to allow the system to follow.

5.	Ten-key pad	Used to enter numeric values
		BS:	Back space key
		G/p:	Units key of GHz for frequency and psec for time
		M/n:	Units key of MHz for frequency and nsec for time
		K/μ:	Units key of kHz for frequency and μsec for time
		ENT:	Basic units key of Hz for frequency and msec for time

6. Preset keys — The initialization key of this instrument
To initialize the instrument, press the left key while you are pressing the right key.

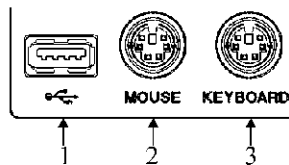7. Key lock key — The toggle key that locks and unlocks key entry]

Figure 4-3   I/F Connector Block

1. USB connector — A USB connector for accessories

2. MOUSE connector — A mouse connector

3. KEYBOARD connector — A connector for an external keyboard

IMPORTANT: Connect the mouse and keyboard before power-on.
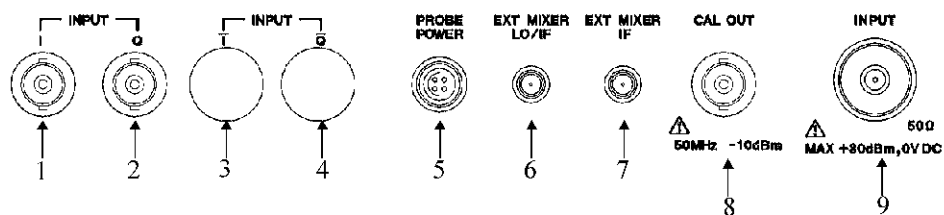
Figure 4-4   I/O Connector Block

1. INPUT I connector — The input connector for the base band I signal

2. INPUT Q connector — The input connector for the base band Q signal

3. INPUT /I connector — Reserved for options

4. INPUT /Q connector — Reserved for options

5. PROBE POWER connector — Power connector for the probe (±15 V output)

6. EXT MIXER LO/IF — Reserved for options
Connects an external mixer to expand the frequency range for measurement (supports two ports)

4.1.1 The Name and Functions of Each Component on the Front Panel

7.	EXT MIXER IF connector	Reserved for options Connects an external mixer to expand the frequency range for measurement (supports three ports)
8.	CAL OUT connector	Outputs calibration signals
9.	INPUT connector	Receives measurement signals

> *NOTE:*   *Do not apply an RF level or direct current that exceeds the respective limit value to the INPUT connector.*
> *If you do, the input attenuator or the mixer may burn out.*

4.1.2 The Name and Function of Each Component on the Screen

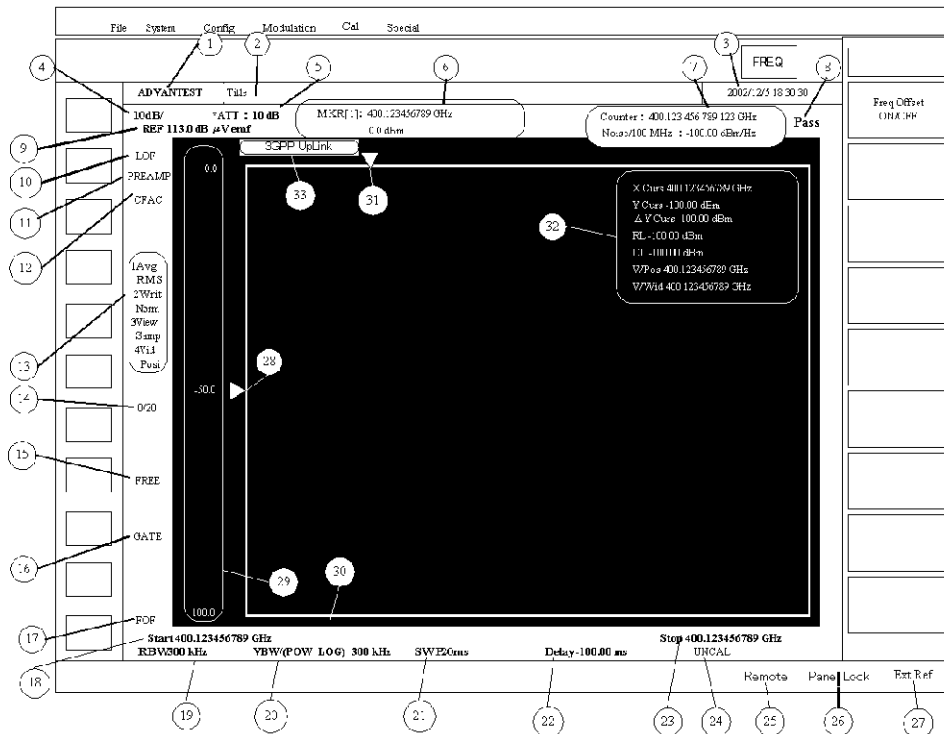This subsection describes the name and function of each component on the screen.

Figure 4-5   Screen Display

1. ADVANTEST logo mark   Display of ADVANTEST logo mark

2. Title   The display area of the description of measurement data and other information

3. Date   The current date and time

4. Amplitude scale in log mode or in linear mode
The setting of the amplitude scale in the log mode

5. RF attenuator   The setting of the attenuator
An asterisk (*) appears before ATT when setting is made manually.

6. Marker area   Displays the marker frequency (time) and the level

7. Measurement function area   Displays the noise/Hz, frequency counter readings, and %AM measurement results

8. Pass/Fail judgment   Displays pass/fail judgment results determined by limit lines

9. Reference level   Displays the setting of the reference level

10. Level offset   Displays the reference offset value when reference offset is On

4.1.2 The Name and Function of Each Component on the Screen

11. Preamplifier   Displayed when preamplifier is On

12. Correction factor   Displayed when correction factor is On

13. Trace and trace detector   Displays the selected trace mode and trace detector mode

14. Averaging count   Displays the set averaging count and the current averaging count

15. Trigger source   Displays the selected trigger source

16. -   -

17. Frequency offset   Displayed when frequency offset is On

18. Center frequency or start frequency
                                     Displays the center frequency or start frequency

19. Resolution bandwidth (RBW)   Displays the set resolution bandwidth
                                     An asterisk (*) appears before RBW when setting is made manually.

20. Video bandwidth (VBW)   Displays the set video bandwidth
                                     An asterisk (*) appears before VBW when setting is made manually. If an input signal to VBW is power log, (POW_LOG) is displayed following the VBW, or (VOLT) is displayed if the signal is voltage.

21. Sweep time   Displays the set sweep time
                                     An asterisk (*) appears before SWP when setting is made manually.

22. Trigger delay time   Displays trigger delay time or pre-trigger time

23. Frequency span or stop frequency Displays the frequency span or stop frequency

24. UNCAL message   Displayed when manual setting is inappropriate

25. Remote   Displayed in the GPIB remote status

26. Panel lock   Displayed while the panel key is being locked

27. External reference signal   Displayed when an external reference signal is input
                                     If the external reference setting is set to manual mode, "*" is displayed in front of Ext Ref.

28. Trigger position   Displays video trigger positions and Ext2 trigger positions

29. Level scale   Displays level scales

30. Sweep indicator   Displays sweep positions

31. Trigger delay position   Displays "<" for the trigger delay and "V" for pre-triggering

32. Display function area   Displays cursor, display line, reference line, and measuring window values

33. Standard name area   Displays the standard's name.

4.1.3 The Name and Function of Each Component on the Rear Panel

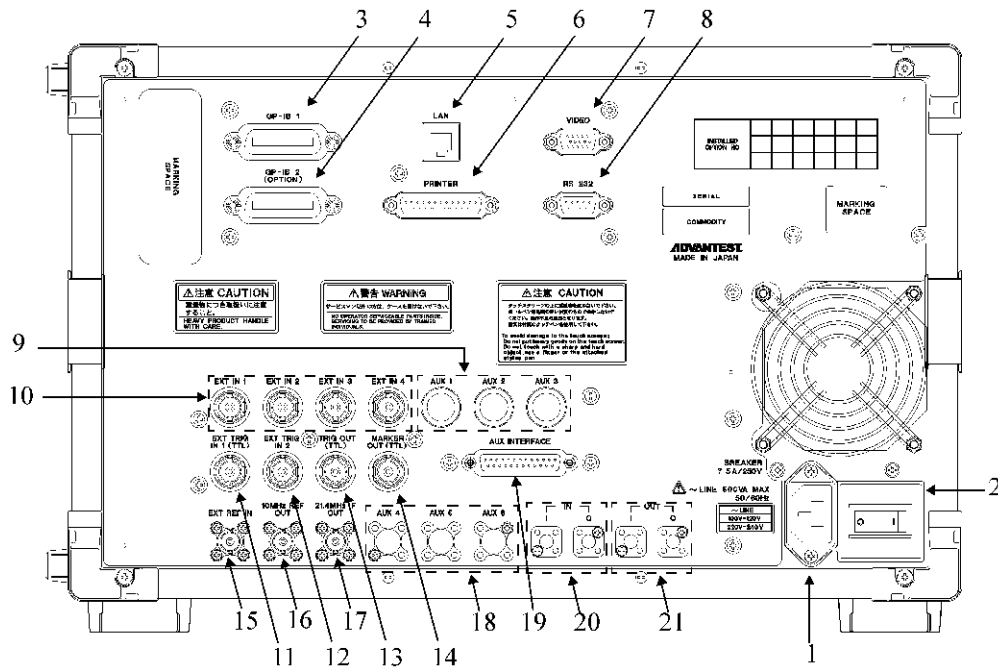This subsection describes the name and function of each component on the rear panel.

Figure 4-6 Rear Panel

1.	AC power connector	Connects this instrument to the AC power outlet via the accessory power cable
2.	Power breaker	The power breaker forced to turn off if over-currents flow.
3.	GP-IB connector 1	Connects this instrument to an external controller when remote control is made through the GP-IB interface
4.	GP-IB connector 2	Reserved
5.	LAN connector	LAN connector for 10BaseT
6.	Printer connector	Connects this instrument to a printer
7.	VIDEO connector	Connects this instrument to an external monitor of VGA specifications
8.	RS-232 connector	Reserved for options
9.	AUX 1 connector	Reserved for options
	AUX 2 connector	Reserved for options
	AUX 3 connector	Reserved for options

4.1.3 The Name and Function of Each Component on the Rear Panel

10.	EXT IN 1 connector	Reserved for options
	EXT IN 2 connector	Reserved for options
	EXT IN 3 connector	Reserved for options
	EXT IN 4 connector	Reserved for options
11.	EXT TRIG IN 1 (TTL) connector	Inputs external trigger signals (TTL level)
12.	EXT TRIG IN 2 connector	Inputs external trigger signals (variable levels)
13.	TRIG OUT (TTL) connector	Outputs synchronized signals with trigger signals (TTL level)
14.	MARKER OUT (TTL) connector	Reserved for options
15.	EXT REF IN connector	Inputs external reference signals
16.	10MHz REF OUT connector	Outputs 10 MHz reference signals
17.	21.4MHz IF OUT connector	Outputs 3rd IF (21.4 MHz) signals
18.	AUX 4 connector	Reserved for options
	AUX 5 connector	Reserved for options
	AUX 6 connector	Reserved for options
19.	AUX INTERFACE connector	Reserved for options
20.	I IN connector	Reserved for options
	Q IN connector	Reserved for options
21.	I OUT connector	Reserved for options
	Q OUT connector	Reserved for options

4.2   Basic Operation

This section describes menu operation, data entry, and use of the basic measurement functions.

4.2.1   Menu Operation and Data Entry

This subsection describes operations of the panel keys and touch screen.

1. On-screen Menus

The screen displays ten kinds of menu. Use the touch screen or the mouse for menu operation. The on-screen side menus can also be handled by the panel keys.
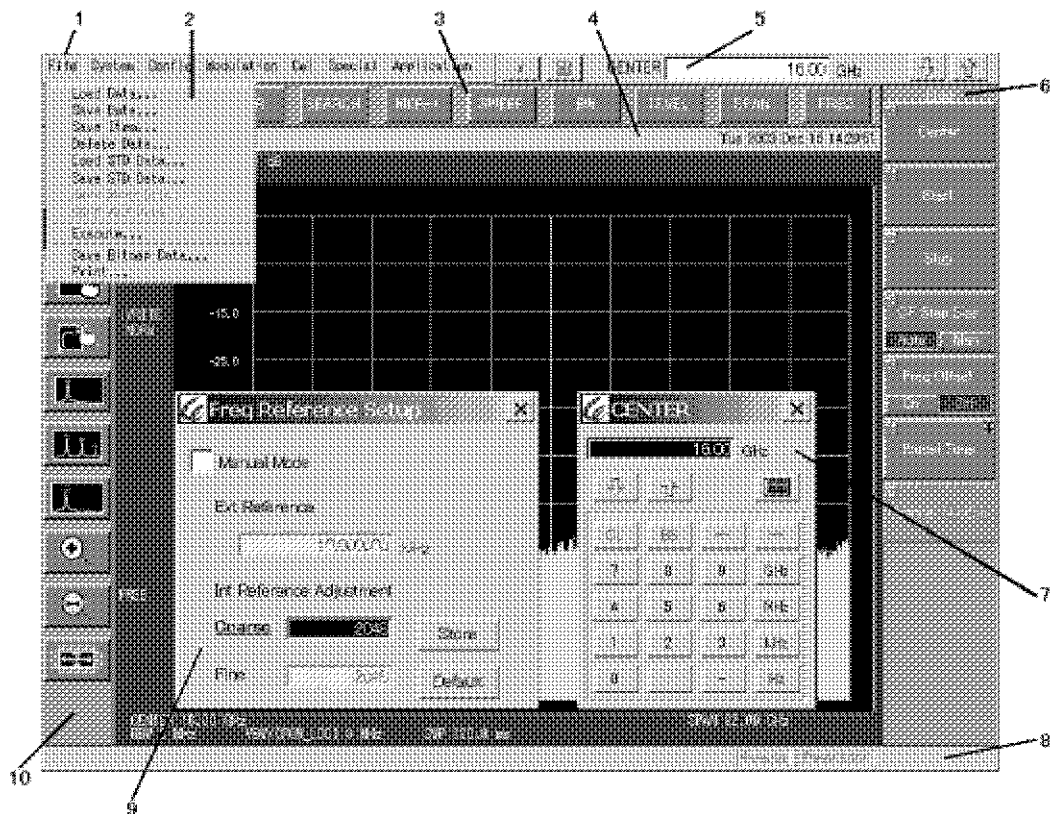

Figure 4-7   Description of On-Screen Menus

1. Menu bar

Provides the on-screen system menus of this instrument.
When you click a menu on the bar, a dropdown menu is displayed

2. Dropdown menu

Menu items are displayed classified by functions.
When you click an item marked by "..." a dialog box is displayed

3. Function bar

This area provides a set of function buttons classified by basic functions of this instrument.
When you click a function button, the display of the soft menu in the soft menu bar area is switched

4.	User's title bar	The user defined screen title and present time are displayed.
5.	Entry box 1	A box to enter numeric data This box is displayed only when you press an application key that involves numeric data entry or when the numeric data entered in entry box 2 is determined
6.	Soft menu bar	When you click a function button on the function bar, the associated soft menu is displayed in this area. The soft menu provides various operations associated with the basic function groups classified by function buttons
7.	Entry box 2	A box to enter numeric data This box is displayed only when you click a soft key that involves numeric data entry. When numeric data entry is determined, this box disappears and entry box 1 appears. The entered data is passed to entry box 1
8.	Status bar	Displays measurement status and operation status of this instrument
9.	Dialog box	Contains entry boxes for data for each function as well as switches and buttons for item selection
10.	Measurement tool bar	An area that displays buttons that facilitate measurements by this instrument. A button for zoomed display is an example

2. Data input

When a set value is displayed in entry box 1, you can change it using the numeric keys, step keys, data knob, or entry box 2.

- Data input using the numeric keys

  Enter data using the numeric keys, decimal point key, back space (BS) key, and minus sign (-) key.

  If you pressed the wrong numeric keys, delete each digit by pressing the BS key, enter the correct data, and at the end press the appropriate units key.

- Data input using the step keys

  The step keys allow you to enter data with a constant interval increasing or decreasing data.

- Data input using the data knob

  The data knob allows you to enter data in continuous mode. It works as a handy tool for minute adjustment of input data.

- Data input using entry box 2

  When you press a soft menu key, entry box 2 may appear at the left of the button for changing a set value.

  Set values can be changed as follows:

  [↑] key: for one push of the step up key

  [↓] key: for one push of the step down key

When you click the numeric value part in entry box 2, input keys associated with the current unit system will appear. Enter data using these keys. If you made an input error, delete the wrong digits one by one by pressing the BS key and enter the correct data.

IMPORTANT: The data you keyed in will be invalid if you press any other menu key before pressing a units key to finish your data input.

---

3. Display of a dialog box

A dialog box is displayed in response to the pressing of some soft menu keys.

In the dialog box, you can select items, enter numeric values, and perform other operations:

- Selection of items

  Use the step keys.

- Selection of set data

  Rotate the data knob to select data and then press the ENT key to confirm the data.

- Entering numeric values

  Use the numeric keys and units keys.

- Terminating the dialog box

  Most of the dialog boxes are terminated by touching (clicking) the close button (⊠) on the title bar. However, some of the dialog boxes that involve operation of the soft menu bar are terminated by touching (clicking) the **Return** menu on the soft menu bar.)

4.3 Basic Measurement

This section describes the following examples of basic measurement so that you will get accustomed to the operations of this instrument.

4.3.1 Autocalibration

4.3.2 Display of Spectrum and Operation of Markers

4.3.3 Measuring Frequencies by Frequency Counter

4.3.4 How to Cancel an UNCAL Message

4.3.1 Autocalibration

This subsection describes how to use the built-in autocalibration feature for measurements on the precision level guaranteed by this instrument.
Autocalibration is available in the following two types:

- **[SA Cal]**

  CAL OUT and INPUT must be connected on the front panel.
  The autocalibration takes about one minute to complete.

- **[SA Cal without ATT]**

  CAL OUT and INPUT need not be connected on the front panel because this autocalibration uses only the internal Cal signal.
  The autocalibration takes about one minute to complete.

The following is a description of how to run the **[SA Cal]** autocalibration.

IMPORTANT: Allow this instrument to warm up for at least 30 minutes before running the autocalibration.

Equipment to be used

        R3681
        Conversion adapter: SMA (f)- SMA (f)
        Conversion adapter: SMA (m)-BNC (f)
        Input cable: BNC (m)-BNC (m)

        R3671
        Conversion adapter: N (m)- BNC (f)
        Input cable: BNC (m)-BNC (m)

Switching on power

1. Make sure that the power breaker is OFF on the rear panel.

2. Connect the power cable in the accessory package to the AC power connector on the rear panel.

CAUTION: *To protect it from breakage, do not apply input voltages or frequencies over the specified range to this instrument.*

---

3. Connect the power cable to the wall socket.

4. Turn on the power breaker on the rear panel.
   Then wait for 3 second or more.

5. Turn on the power switch on the front panel. On completion of the self-test, the start up screen is displayed.

MEMO: *The display after power is turned on depends on the status of the previous use of this instrument.*

Initialization

Initialize the settings of this instrument.

6. Press the left preset key while pressing the right preset key.
   Initialization conditions are read out.

Figure 4-8   Initialization Screen

Connection of input signals

Connect the calibration signal used for measurement.

7. <R3681>
    Install the SMA (f)-SMA (f) adapter on the INPUT connector on the front panel.
    Then install the SMA (m)-BNC (f) adapter on the SMA (f)-SMA (f) adapter.
    Connect the SMA (m)-BNC (f) adapter to the CAL OUT connector with the
    accessory input cable.

    <R3671>
    Install the N (m)-BNC (f) adapter on the INPUT connector on the front panel.
    Connect the N (m)-BNC (f) adapter to the CAL OUT connector with the acces-
    sory input cable.
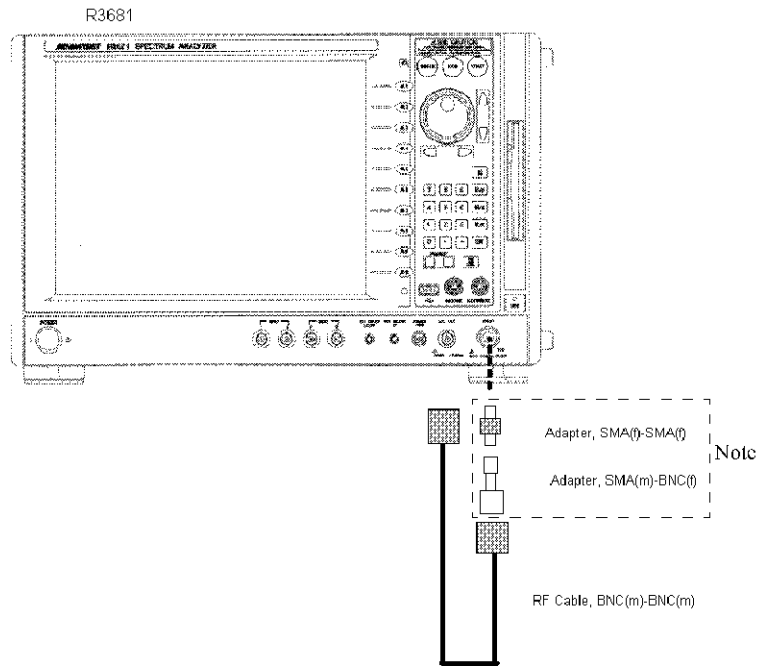
Note: The R3671 uses the N(m)-BNC(f) adapter.

Figure 4-9   Connection of CAL Signal

8. Touch [Cal] on the menu bar.
    The Cal dropdown menu is displayed. Select [SA Cal].

9. The SA Cal autocalibration runs.
    The calibration takes about one minute to complete.

4.3.2 Display of Spectrum and Operation of Markers

This section describes display of spectrum and operation of markers using the CAL signal of this instrument.

As for operation of markers, frequency differences are measured between the peak point of the CAL signal and a point 3 dB below the peak, and between the peak point and a point 60 dB below the peak point, using a delta marker.

Equipment to be used

R3681
Conversion adapter: SMA (f)- SMA (f)
Conversion adapter: SMA (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

R3671
Conversion adapter: N (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

Switching on power

IMPORTANT: Use this instrument in the range of specified temperatures for correct measurement. Allow this instrument to warm up for at least 30 minutes before running the autocalibration.

---

1. Make sure that the power breaker is OFF on the rear panel.

2. Connect the power cable in the accessory package to the AC power connector on the rear panel.

CAUTION: To protect it from breakage, do not apply input voltages or frequencies over the specified range to this instrument.

---

3. Connect the power cable to the wall socket.

4. Turn on the power breaker on the rear panel.
   Then wait for 3 second or more.

5. Turn on the power switch on the front panel. On completion of the self-test, the start up screen is displayed.

MEMO: The display after power is turned on depends on the status of the previous use of this instrument.

Initialization

Initialize the settings of this instrument.

6. Press the left preset key while pressing the right preset key.
    Initialization conditions are read out.
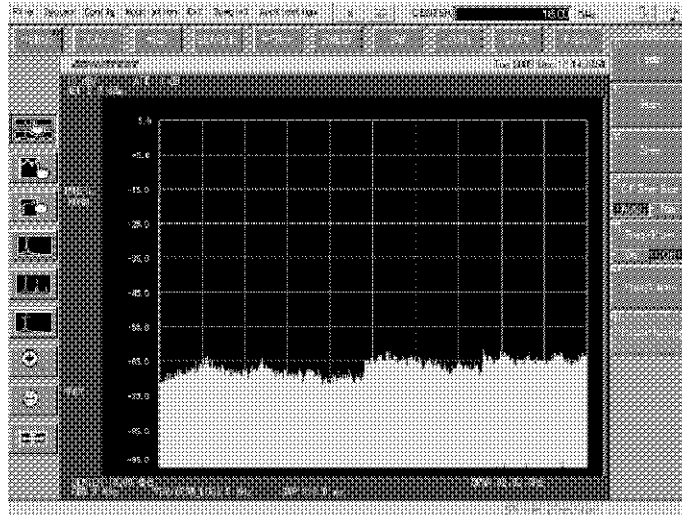

Figure 4-10   Initialization Screen

Connection of input signals

Connect the calibration signal used for measurement.

7. <R3681>
    Install the SMA (f)-SMA (f) adapter on the INPUT connector on the front panel.
    Then install the SMA (m)-BNC (f) adapter on the SMA (f)-SMA (f) adapter.
    Connect the SMA (m)-BNC (f) adapter to the CAL OUT connector with the
    accessory input cable.

    <R3671>
    Install the N (m)-BNC (f) adapter on the INPUT connector on the front panel.
    Connect the N (m)-BNC (f) adapter to the CAL OUT connector with the acces-
    sory input cable.
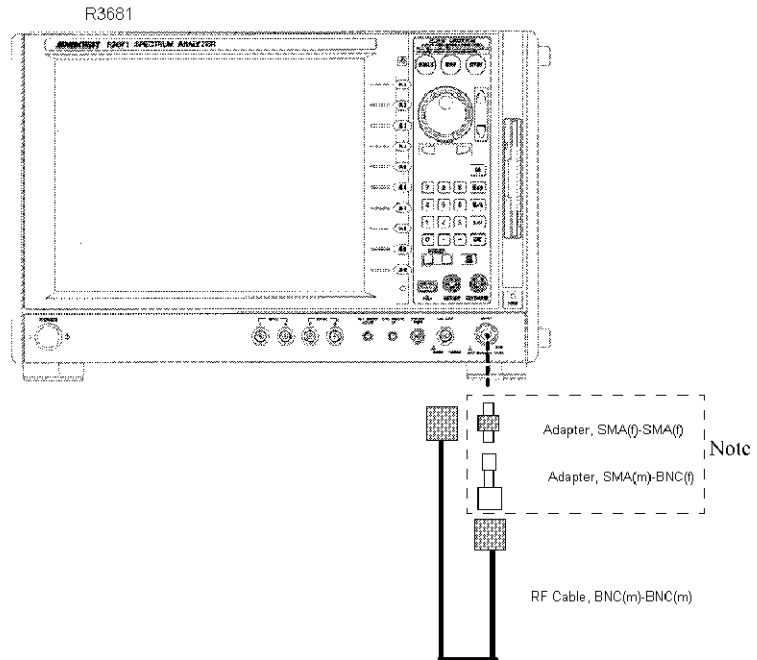
Note: The R3671 uses the N(m)-BNC(f) adapter.

Figure 4-11   Connection of CAL Signal

Setting measurement conditions

Set measurement conditions for easy observation of input signals.

8.   Press {Freq}. The current center frequency is displayed in entry box 1 and you are ready to change frequency settings.
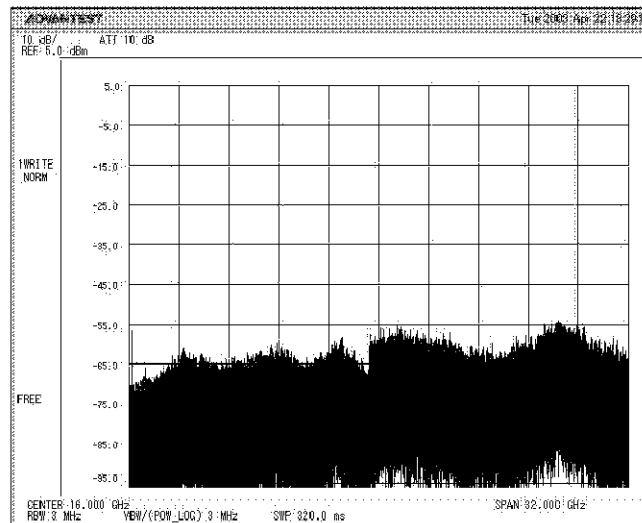
Figure 4-12   Output of CAL Signal

9. Press 5 , 0 , and M/n in this order.
    The center frequency is set to 50 MHz.
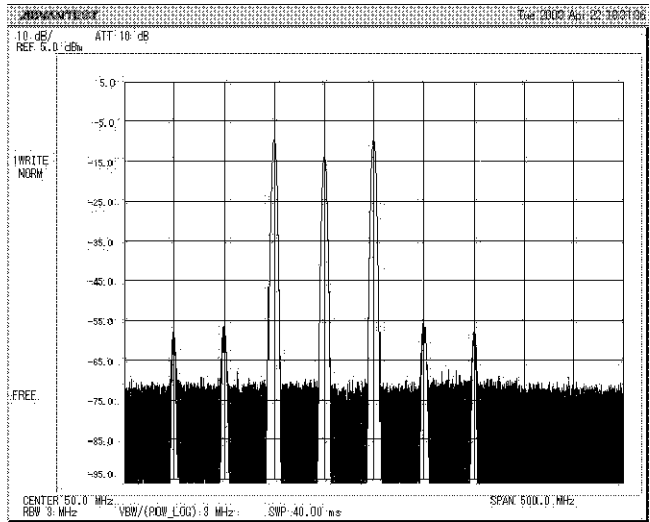
Figure 4-13　Frequency Setting Change Screen

10. Press {SPAN}.
    The current frequency span is displayed in entry box 1 and you are ready to
    change frequency span settings.

11. Press 2 , 0 , and M/n in this order.
    The frequency span is set to 20 MHz.

12. Press {LEVEL}.
    The current reference level is displayed in entry box 1 and you are ready to
    change reference level settings.

13. Press - , 1 , 0 , and ENT in this order. The reference level is set to -10 dBm.
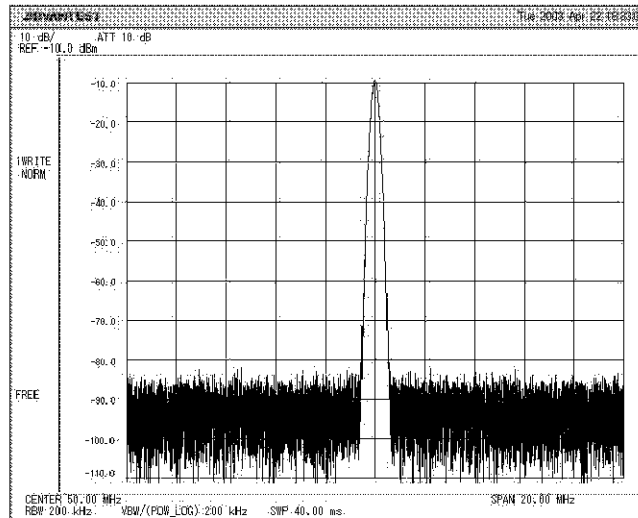
Figure 4-14   Completion of Setting of Measurement Conditions

Display of markers

14. Press {**Search**}.
A normal marker is displayed at the peak, and in the marker area the marker frequency (about 50 MHz) and the level (about -10 dBm) are displayed.
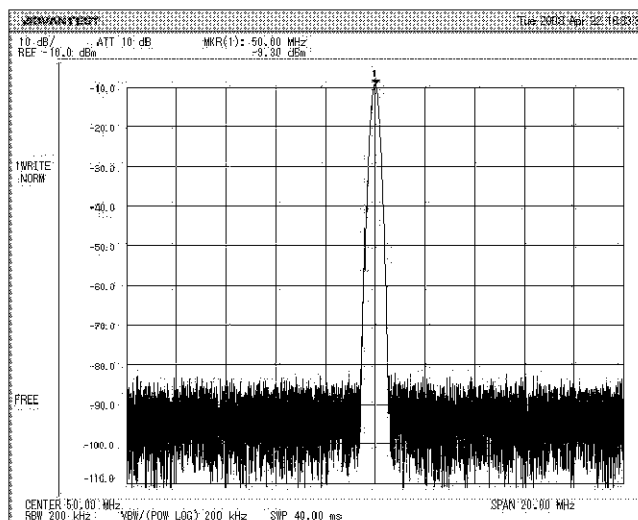
Figure 4-15   Display of Peak Search

4.3.2 Display of Spectrum and Operation of Markers

Display of the delta marker

15. Press {MKR} and then **Delta Marker** .
The Delta Marker menu is displayed. The delta marker is displayed, and in the marker area the frequency and level differences (relative values) between the normal marker and the delta marker are displayed.

16. Move the marker with the data knob to a position where the level reads -3 dB, viewing the level indication in the marker area. (When setting to the exact value is difficult due to limits by the resolution, the closest possible value may do.) The frequency indicated in the marker area is the frequency difference between the peak value and that 3 dB below the peak value (relative value).
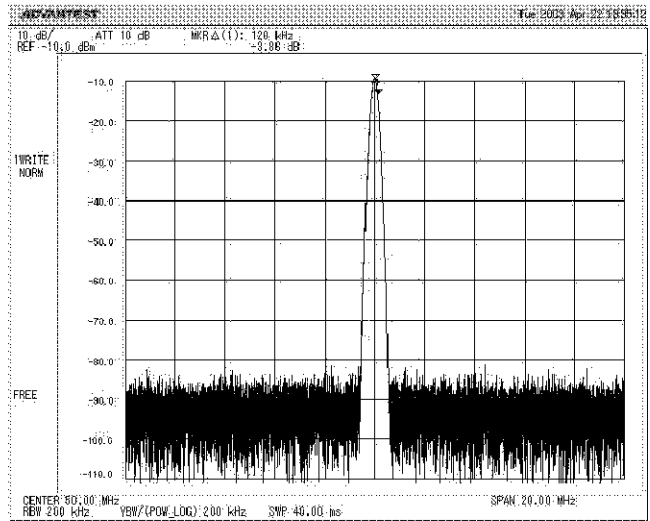
Figure 4-16   Frequency Difference between Peak and a Point 3 dB below Peak

17. Move the marker again using the data knob to a point where the level reads -60 dB. The frequency in the marker area at this time indicates the frequency difference between the peak and a point 60 dB below the peak value.
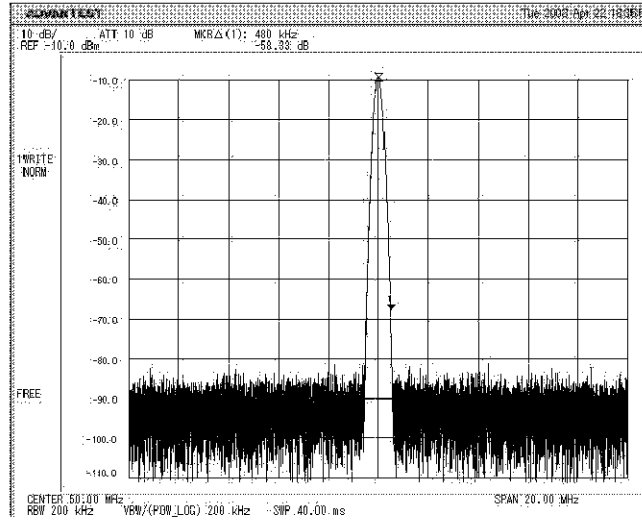
Figure 4-17   Frequency Difference between Peak and a Point 60 dB below Peak

4.3.3   Measuring Frequencies by Frequency Counter

This section describes the operating procedure of the frequency counter function using the CAL signal of this instrument.

The frequency counter is a function that measures not the marker frequency but the frequency of the signal on which the marker is positioned at high accuracy.

The amplitude value indicates that measured at the point of the marker. The highest resolution of the counter is 0.01 Hz.

Equipment to be used

> R3681
> Conversion adapter: SMA(f)-SMA(f)
> Conversion adapter: SMA (m)-BNC (f)
> Input cable: BNC (m)-BNC (m)
>
> R3671
> Conversion adapter: N (m)-BNC (f)
> Input cable: BNC (m)-BNC (m)

LIMIT: Accurate measurements are not made unless the S/N>50 dB requirement of the signal to be measured is fulfilled.

Switching on power

1.   Turn on the power of this instrument.

Initialization

Initialize the settings of this instrument.

2.   Press the left preset key while pressing the right preset key.
     Initialization conditions are read out.

Connection of input signals

3.   Connect the calibration signal used for measurement.

Setting measurement conditions

Set measurement conditions for easy observation of input signals.

4.   Press {**Freq**}, 5 , 0 , and M/n in this order.
     The center frequency is set to 50 MHz.

5.   Press {**SPAN**}, 5 , 0 , and M/n in this order.
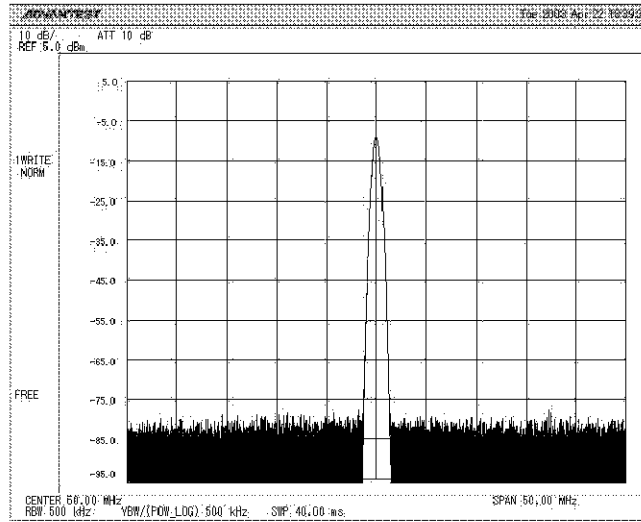   The frequency span is set to 50 MHz.

Figure 4-18   Setting Measurement Conditions

Measuring frequencies by frequency counter

Measure frequencies using the frequency counter function.

6.   Touch **|MENU2|**.
MENU2 is displayed.

7.   Press **{MEAS}** and then **Counter** .
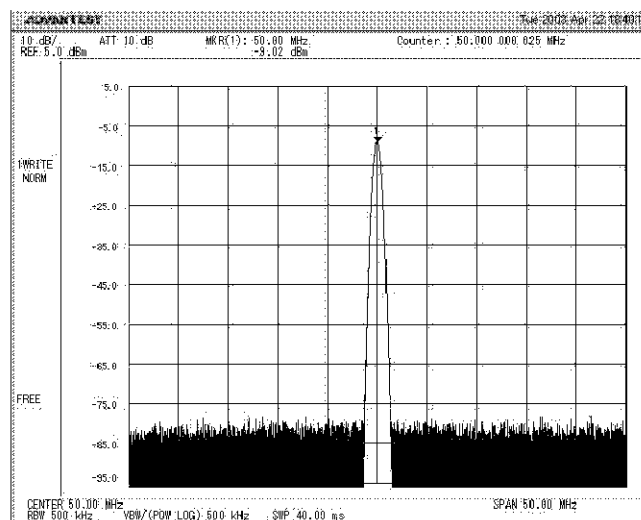Measurement by the frequency counter begins.

Figure 4-19   Measurement by Frequency Counter

4.3.4 How to Cancel an UNCAL Message

Settings of resolution bandwidth (RBW), video bandwidth (VBW), frequency span (Span), and sweep time are mutually influential.
An UNCAL message is displayed in the frequency area if combinations of settings of these items are inappropriate. Accuracy of the measurement level is not guaranteed when the UNCAL message is displayed. Cancel the UNCAL message by changing the settings of the following items.

- Expand the resolution bandwidth (RBW).

- Expand the video bandwidth (VBW).

- Make the sweep time slower.

- If RBW or VBW is difficult to change, make the frequency span narrower.

IMPORTANT: *An accurate measurement is not made if measurement is done with an UNCAL message displayed.*

The following is a description of how to cancel the UNCAL message displayed because the set sweep time was too short, by changing the setting of RBW.

Equipment to be used

          R3681
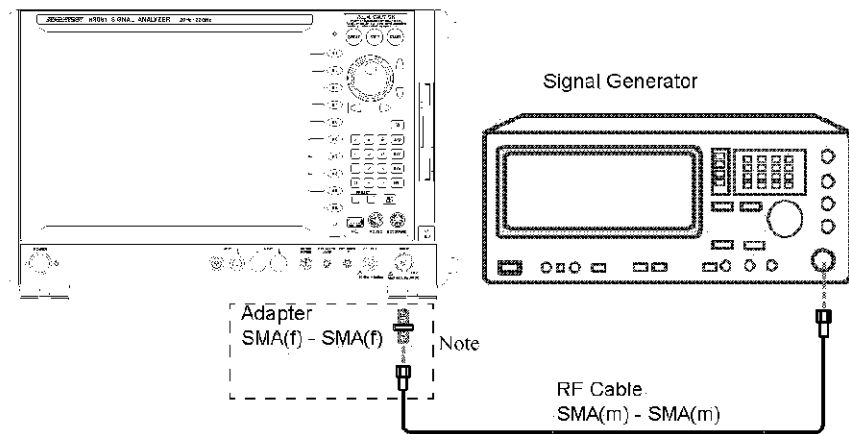   Signal generator
          Conversion adapter: SMA(f)-SMA(f)
          Input cable: SMA (m)- SMA (m)

          R3671
          Signal generator
          Conversion adapter: N(m)-SMA(f)
          Input cable: SMA (m)- SMA (m)

Equipment hook-up

    1.   Connect the equipment as shown in Figure 4-20.

Note: The R3671 uses the N(m)-SMA(f) adapter.

Figure 4-20   Connection for Signal Measurement

Switching on power

2.   Turn on the power of this instrument.

Initialization

Initialize the settings of this instrument.

3.   Press the left preset key while pressing the right preset key.
Initialization conditions are read out.

Setting measurement conditions

Set measurement conditions for easy observation of input signals.

4.   Press {**Freq**}, **Center** , [1], and [G/p] in this order.
The center frequency is set to 1 GHz.

5.   Press {**SPAN**}, **Span** , [5], [0], and [k/μ] in this order.
The frequency span is set to 50 kHz.

6.   Press {**Sweep**}, **Sweep Time Auto/Man** (Man), and [2], [0], [**msec**] from entry
box 2. The sweep time is set to 20 msec and an UNCAL message is displayed.

4.3.4 How to Cancel an UNCAL Message

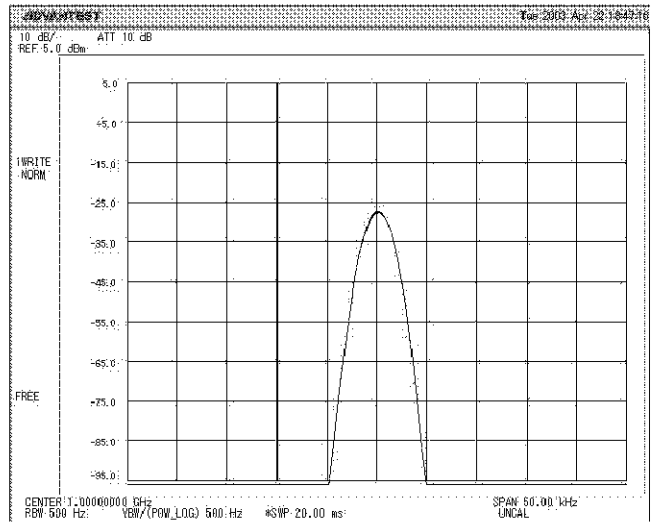A sweep time of 20 msec is too short for the set conditions.

Figure 4-21   Display of UNCAL Message

How to cancel the UNCAL message

7. Press {BW}, **RBW Auto/Man** (Man), $\boxed{1}$, $\boxed{0}$, and $\boxed{k/\mu}$. When RBW is set to 10 kHz, the UNCAL message is cancelled because a sweep time of 20 msec meets the appropriate conditions.

5. MENU MAP, FUNCTIONAL EXPLANATION

This chapter describes the configurations and functions of the soft keys displayed on the touch screen.

MEMO:

- *[.....] Used to enclose a menu name, key name, item name in the dialog box, button name, or the name of selected items in lists and menus.*
- *{....} Shows a function button on the function bar.*
- *Shows a soft key on the soft menu bar.*
- *A dialog box is surrounded by a broken line.*
- *Operations are supposed to be made through a touch screen, and "touch" means to press a button or a key.*

5.1 Menu Index

5.1 Menu Index

5.2 Menu Bar

This section describes the functions displayed on the menu bar.

The following shows the details of the system menu bar: **[File]**, **[System]**, **[Config]**, **[Modulation]**, **[Cal]**, and **|Special|** are displayed on the menu bar.

When you touch the menu bar, a drop down menu is displayed. Select the required item from the drop down menu.

[File]	[System]	[Config]	[Modulation]	[Cal]	[Special]
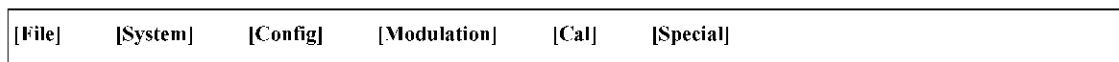
[File]	Executes save/recall, print, and application software.
[System]	Sets the GPIB address and networks and system functions such as addition of printer drivers, etc.
[Config]	Sets the operation mode of this instrument. The available operation modes differ depending on the options configuration of this instrument. An abbreviation of the word "Configuration".
[Modulation]	Available when the modulation analysis option is equipped. When "Modulation Analyzer" is selected in the Config menu, the modulation analysis option is selected.
[Cal]	Performs calibration of this instrument. An abbreviation of the word "Calibration".
[Special]	Executes supplementary functions.

5.2.1 [File]

This subsection describes the drop down menu items comprising the [File] menu bar.
When you touch the [File] menu bar, the following drop down menu items are displayed:

```
[File]
  └───►┌ [Load Data...]
       │ [Save Data...]
       │ [Save Item...]
       │ [Delete Data...]
       │ [Load STD Data...]
       │ [Save STD Data...]
       │ [Execute...]
       │ [Save Bitmap Data...]
       └ [Print...]
```
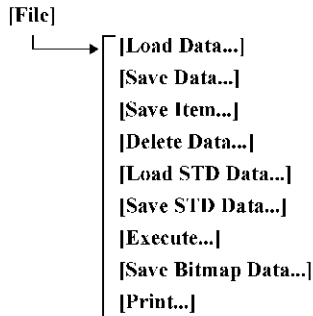
| Load Data... |

Loads the saved setting conditions of this instrument.
When you select [Load Data...], the following dialog box is displayed. The setting conditions are loaded by selecting the name of the file to be loaded and executing [Load].
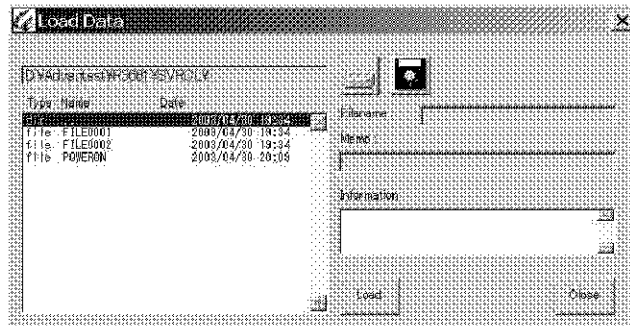
Displays the contents of the standard directory in the file list.

Displays the contents of the floppy disk in the file list.

[Filename]

Enter the name of the file to be read out.

> *MEMO:* *You can select a file by touching the name of the file. You can move directories by touching twice in quick succession (double clicking).*

[Memo]

The memo information on the selected file is displayed.

[Information]

The information on the selected file is displayed.

[Load]

Performs loading.

[Close]

Closes a dialog box.

[Save Data...]

Saves the setting conditions of this instrument as a file.
When you select |Save Data...|, the following dialog box is displayed:
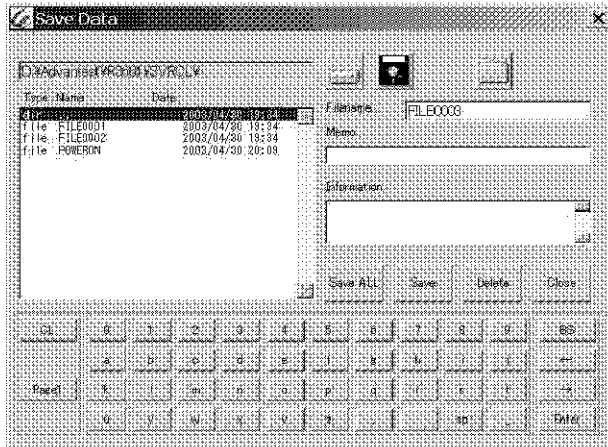
Displays the contents of the standard directory in the file list.

Displays the contents of the floppy disk in the file list.

Adds a folder to the directory being displayed. The following software keyboard is displayed to create a folder. You can name the folder any name.

|CL|

Clears the input contents.

|BS|

Deletes the character before the cursor.

[sp]

Inserts a space.

[Page1/2]

Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by [Page1] and single-byte uppercase alphabetical characters are entered by [Page2].

[Filename]
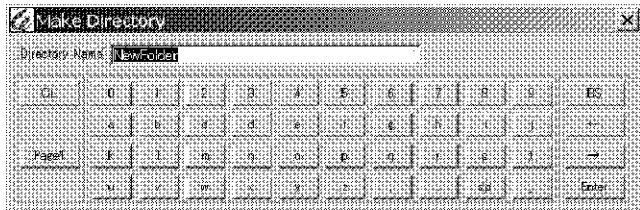
Enter the name of the file to be saved.

[Memo]

Enter the memo information on the file.

[Information]

The information on the selected file is displayed.

|Save ALL|

Saves all items regardless of the setting of |Save Item...|.

|Save|

Selects and saves the items to be saved according to the setting of |Save Item...|.

5.2.1 [File]

MEMO: *The items corresponding to the current operation mode specified in the [Config] or [Modulation] menu are to be saved. Therefore, even if data is selected to be saved in [Save Item...], only the data corresponding to the operation mode will be saved.*

[Delete]   Deletes the selected file.

[Close]   Closes a dialog box.

[Save Item...]   Selects the setting conditions and the type of data to be saved. When you select **[Save Item...]**, the following dialog box is displayed:
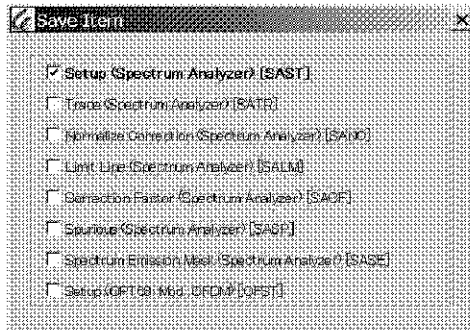
|Delete Data...| Deletes the file in which the setting conditions are saved. When you select |**Delete Data...**|, the following dialog box is displayed:
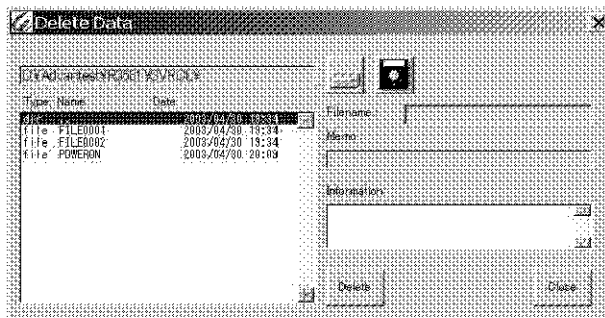
   Displays the contents of the standard directory in the file list.

   Displays the contents of the floppy disk in the file list.

[Filename]   The name of the selected file is displayed.

MEMO: *You can select a file by touching the name of the file. You can move directories by touching twice in quick succession (double clicking).*

|Memo| The memo information on the selected file is displayed.

|Information| The information on the selected file is displayed.

[Delete]	Deletes a file.
|Close|	Closes a dialog box.
|Load STD Data...|	Loads the setting condition file of the standard, which is saved by using the |Save STD Data...|, and creates or renews the user file. This user file is automatically selected as the default value of the standard.

When |Load STD Data...| is selected, the following dialog box appears. The setting conditions are loaded by selecting the file name to be loaded and executing [Load].

> *MEMO:* *The [Load STD Data...] menu is displayed only if the Standard information file exists in a folder whose name is D:\Advantest\R3681\STD_Param\Standard name.*
> *(The standard name, such as cdma2000, must be entered.)*

	Displays the details of the standard directory in the file list.
	Displays the details of the floppy disk in the file list.
|Load|	Loads the setting condition file of the Standard.
|Close|	Closes the dialog box.
[Save STD Data...]	Writes the selected Standard setting in a file.

When |Save STD Data...| is selected, the following dialog box appears.

> *MEMO:* *The [Save STD Data...] menu is displayed only if the Standard information file exists in a folder whose name is D:\Advantest\R3681\STD_Param\Standard name.*
> *(The standard name, such as cdma2000, must be entered.)*

5.2.1 [File]
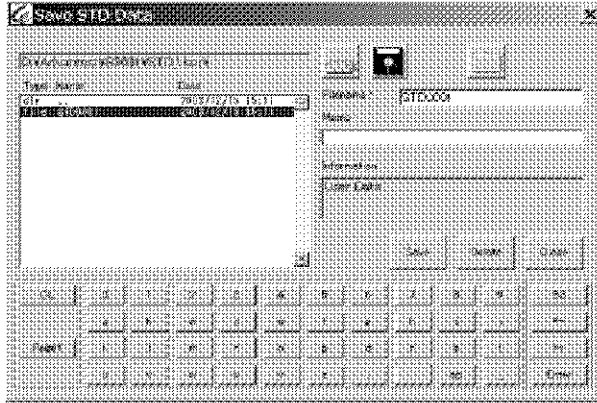
Displays the details of the standard directory in the file list.

Displays the details of the floppy disk in the file list.

Adds a folder to the current directory. The following virtual keyboard appears and a new folder can be created.
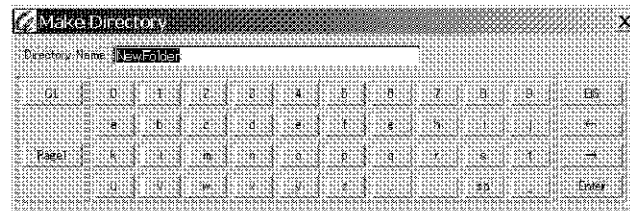
[CL]	Clears all characters in the input window.
[BS]	Deletes one character to the left of the cursor.
|sp|	Enters a space.
|Page1/2|	Switches between the character types used. Single-byte lowercase alphabetic characters can be entered when |Page1| is selected, and single-byte uppercase alphabetic characters can be entered when |Page2| is selected.
[Filename]	The selected file name is displayed.

MEMO: The file can be selected by touching the file name. The directories can be moved by touching twice in quick succession (double clicking).

[Memo]	The selected file memo information is displayed.
[Information]	The selected file information is displayed.
[Save]	Writes the setting conditions of the Standard in a file.
[Delete]	Deletes a file.
[Close]	Closes the dialog box.

[Execute...]   Selects an execution file and executes it.
When you select [Execute...], the following dialog box is displayed:
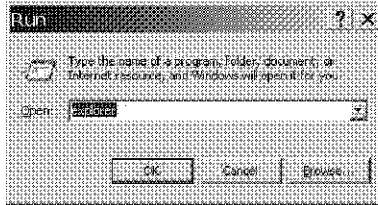
[Open]   Enter the name of the execution file to be executed.

[OK]   Executes the execution file entered.

[Cancel]   Closes a dialog box.

[Browse...]   Displays a dialog in the Windows Explorer format. When the execution file name or the folder name in which it is stored is unknown, browse and specify it.

[Save Bitmap Data...]   Saves the screen data of this instrument in a file.
When you select [Save Bitmap Data...], the following dialog box is displayed:
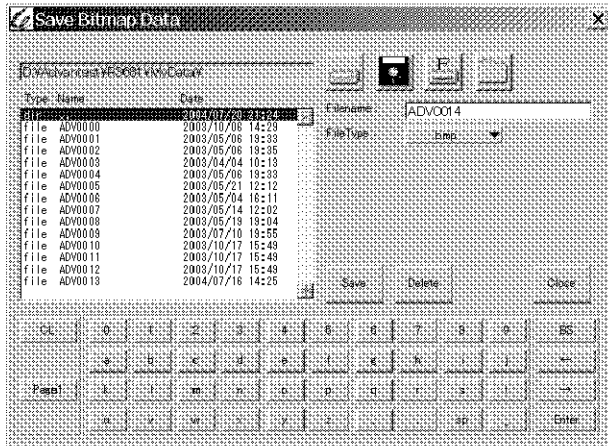
Displays the contents of the standard directory in the file list.

Displays the contents of the floppy disk in the file list.

Displays the contents of the external disk F in the file list.

Adds a folder to the directory being displayed. The following software keyboard is displayed to create a folder. You can name the folder any name.

5.2.1 [File]
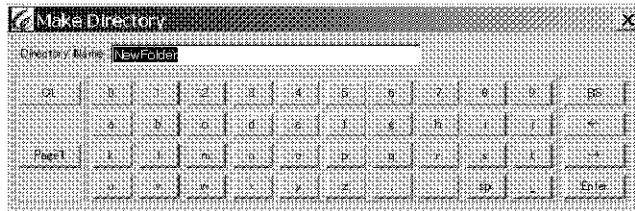
|CL| Clears the input contents.

|BS| Deletes the character before the cursor.

|sp| Inserts a space.

|Page1/2| Switches the type of characters to be entered. Single-byte lower-case alphabetical characters are entered by [Page1] and single-byte uppercase alphabetical characters are entered by [Page2].

[Filename]   Enter the name of the file to be saved.

> **MEMO:** *You can select a file by touching the name of the file. You can move directories by touching twice in quick succession (double clicking).*

[File Type| Specifies the file type to be saved. There are two file types available: the bit map file (bmp) format and the portable network graphics (png) format.

[Save| Executes save.

[Delete| Deletes the selected file.

[Close]   Closes a dialog box.

[Print...| Outputs the screen data of this instrument to the printer.
When you select [Print|, the following dialog box is displayed. The following example shows the condition in which the printer driver is already installed:
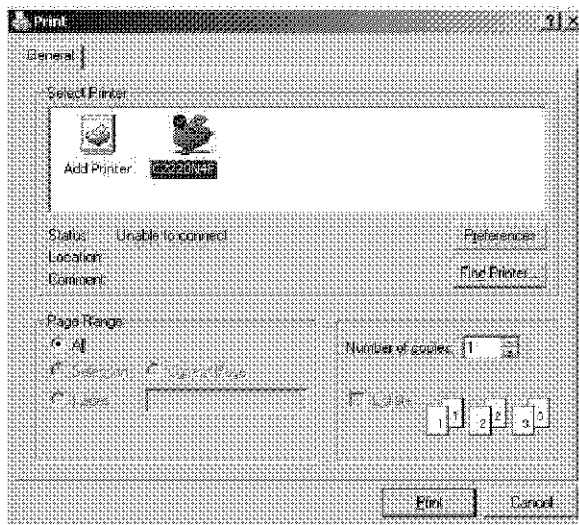
5.2.2   [System]

This subsection describes the drop down menu items comprising the **[System]** menu bar.
When you touch the **[System]** menu bar, the following drop down menu items are displayed:

[System]

    [GPIB Address...]
    [Network Setup...]
    [Guest Account...]
    [Printers Setup...]
    [Date and Time...]
    [Freq Reference...] ⟶   **[Freq Reference Setup]**
    [Display...]   Manual Mode
    [Title...]   Ext. Reference
    [Explorer...]   Int. Reference Adjustment
                                         Coarse
                                         Fine
                                         Store
                                         Default

                                    [Display Setup]
                                         Date
                                         Format
                                             YMD, MDY, DMY
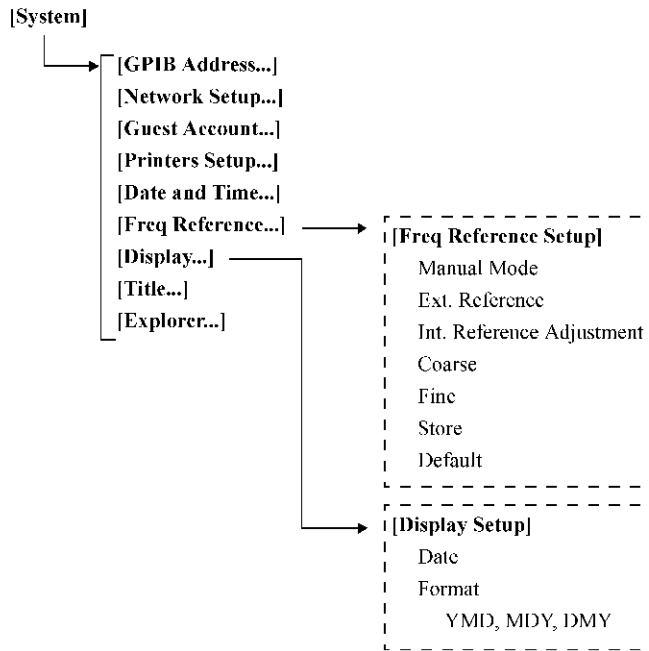
[GPIB Address...]   Sets the GPIB Address of this instrument.
                                     When you select **[GPIB Address...]**, the following dialog box is
                                     displayed:

[Network Setup...]   Sets the LAN network information of this instrument.
When you select [Network Setup...], the following dialog box is displayed.For more information on each setting item, refer to "APPENDIX A.3 Setting up the Network."
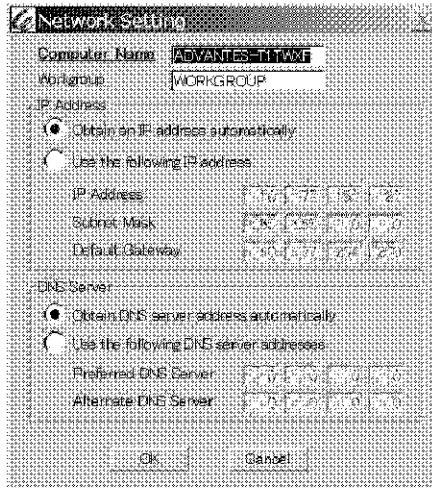
[Guest Account...]   Sets the Guest Account.
When you select [Guest Account...], the following dialog box is displayed.To refer to a file on this instrument from an external PC, it is necessary to set the Guest Account. For more information on the Guest Account settings, refer to "APPENDIX A.4 Setting the Guest Account."
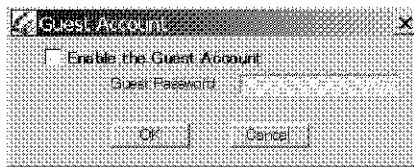
[Printers Setup...]   Installs the printer driver.
When you select [Printers Setup...], the following dialog box is displayed. The following example shows the condition in which the printer driver is already installed:
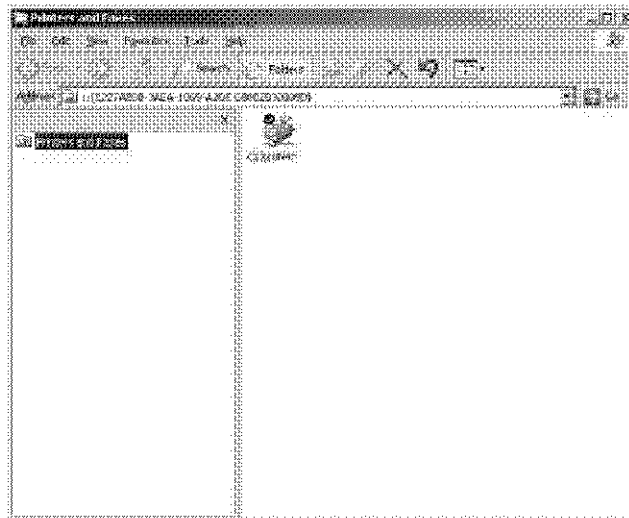
[Date and Time...]   Sets the date, time and time zone of this instrument.
                                      When you select [Date and Time...], the following dialog box is
                                      displayed:
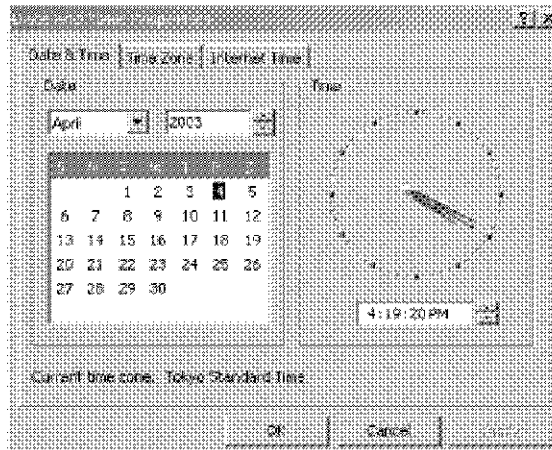
[Freq Reference...]   Selects whether to use the internal or external frequency source as
                                      the reference, and performs fine frequency adjustment of the 10
                                      MHz internal frequency reference source.
                                      When you select [Freq Reference...], the following dialog box is
                                      displayed:
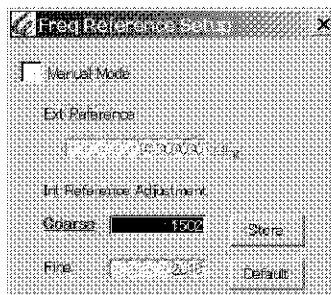
|Manual Mode| When the check box is not checked, the frequency synchroniza-
                                      tion reference source mode is set to the internal/external reference
                                      signal auto-switching mode. When the auto-switching mode is
                                      set, the reference frequency source is fixed to 10 MHz. Therefore,
                                      input into |Ext Reference| is prohibited.When the check box is
                                      checked, connection to the external reference source at the fre-
                                      quency specified in [Ext Reference] is required.When the check
                                      box is checked and the external reference source is not connected,
                                      an error message indicating that phase lock is off is displayed.

|Ext. Reference| When the frequency synchronization reference mode is not set to
                                      the auto-switching mode, it is fixed to the external reference
                                      source. In this case, the frequency of the external reference source
                                      can be set between 5 MHz and 20 MHz.

|Int. Reference Adjustment| Performs frequency adjustment of the internal reference fre-
                                      quency source.

|Coarse| Performs rough adjustment of the internal reference frequency
                                      source.
                                      The setting range is between 0 and 4095.

5.2.2 [System]

[Fine]	Performs fine adjustment of the internal reference frequency source. The setting range is between 0 and 4095. This setting becomes valid when the high-precision frequency reference source option is equipped.
[Store]	Stores the above value of **[Int. Reference Adjustment]** set for adjustment of the internal frequency reference source to make the adjustment value valid even when the power is off.
[Default]	Discards the adjustment value stored by **[Store]** above, and restores the default setting.
[Display...]	Sets the date display on the screen on/off and the display format. When you select **[Display...]**, the following dialog box is displayed:
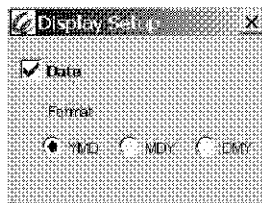
[Date]	When the check box is checked, the date data is displayed on the screen. When displaying the date, select a format from the following three formats: year/month/day, month/day/year, or day/month/year.
[Format]	A format can be selected from YMD (year/month/day), MDY (month/day/year), or DMY (day/month/year).
[Title...]	Enter title characters on the screen of this instrument. When you select **[Title...]**, the following software keyboard is displayed:
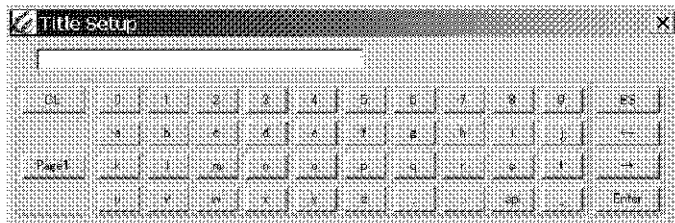
[CL]	Clears the input contents.
[BS]	Deletes the character before the cursor.
[sp]	Inserts a space.
[Page1/2]	Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[Explorer...]   Displays the following dialog box for file operation:
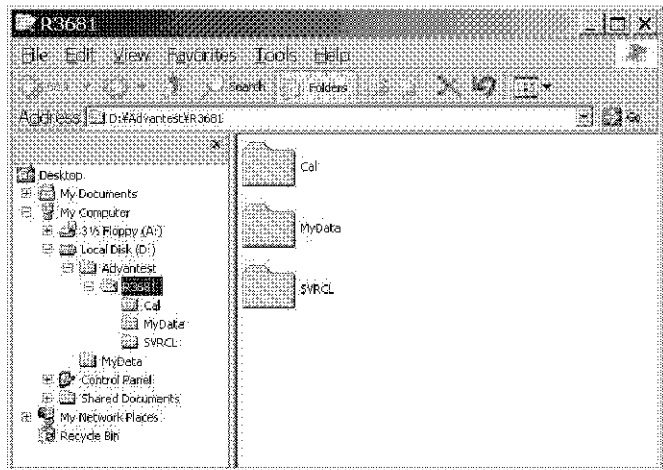
5.2.3   [Config]

This subsection describes the drop down menu items comprising the [Config] menu bar.
When you touch the [Config] menu bar, the following drop down menu items are displayed:

[Config]
└───▶┌ |Spectrum Analyzer|
     └ [Modulation Analyzer]
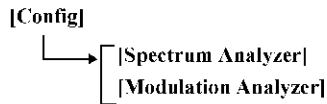
|Spectrum Analyzer|

Sets the operation mode of this instrument to the Spectrum Analyzer mode.When you select this mode, the screen of this instrument is switched to the Spectrum Analyzer screen.

[Modulation Analyzer]

Sets the operation mode of this instrument to the Modulation Analyzer mode. This mode is available when the various modulation analysis options are equipped. The modulation analysis option has multiple options. An analyzable modulation format, etc. are displayed depending on the option equipped in the [Modulation] menu bar.Select a modulation format to be analyzed, etc. using the [Modulation] menu bar before switching to the Modulation Analyzer mode by this menu.

5.2.4   [Modulation]

This subsection describes the drop down menu items comprising the [Modulation] menu bar.

When you touch the [Modulation] menu bar, drop down menu items are displayed depending on the modulation analysis options equipped at that time. Following is an example of the menu displayed when the OFDM modulation analysis option is equipped:
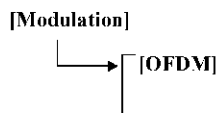
[Modulation]
└───▶┌ [OFDM]
     └

|OFDM|

Sets the modulation analysis operation mode of this instrument to the OFDM mode (displayed only when the option is equipped). When you select the [Modulation Analyzer] menu on the [Config] menu bar in this mode, the screen of this instrument is switched to the Modulation Analyzer screen for OFDM.

5.2.5   [Cal]

This subsection describes the drop down menu items comprising the [Cal] menu bar.
When you touch the [Cal] menu bar, the following drop down menu items are displayed:

```
|Cal|
  └───→ ┌ [SA Cal]
        └ [SA Cal without ATT]
```
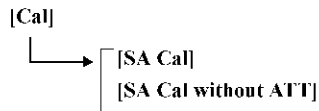
[SA Cal]   Performs self-calibration of this instrument in the Spectrum Ana-
                                  lyzer mode.When performing self-calibration, connection to the
                                  external Cal signal is required.

[SA Cal without ATT]   Performs self-calibration of this instrument in the Spectrum Ana-
                                  lyzer mode. Because this calibration uses only the internal Cal
                                  signal, connection to the external Cal signal is not required.

5.2.6   [Special]

This subsection describes the drop down menu items comprising the [Special] menu bar.
When you touch the |Special| menu bar, the following drop down menu items are displayed:

```
|Special|
  └───→ ┌ |Self Test...|
        │ [Status...]
        │ |Log...|
        │ |Service...|
        │ [Meas Control...] ──────→ ┌─────────────────┐
        │ [STD...]                  │ |[Meas Control]  │
        └ |Preset| ───────┐         │   Single         │
                          │         │   Stop           │
                          │         │   Start          │
                          │         └─────────────────┘
                          └───→ ┌ [Current]
                                └ [All]
```
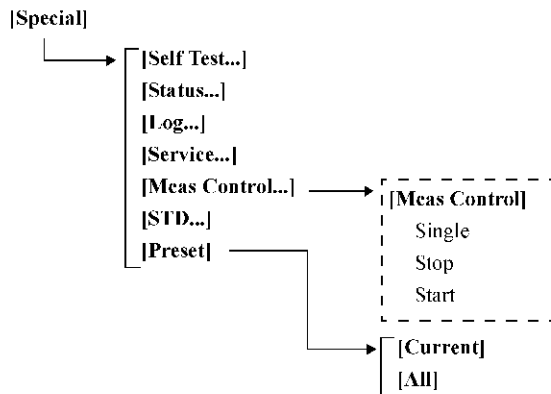
[Self Test...]   Displays self-diagnostic dialog of this instrument.

---

*MEMO: Self-diagnostics can be executed in the Spectrum Analyzer
          mode.*

[Status...]   Displays the model name, serial number, software revision infor-
                                  mation, and option configuration of this instrument.

[Log...]   Displays the log of conditions of this instrument. When you select
                                  [Log...], the following dialog is displayed:

5.2.6 [Special]
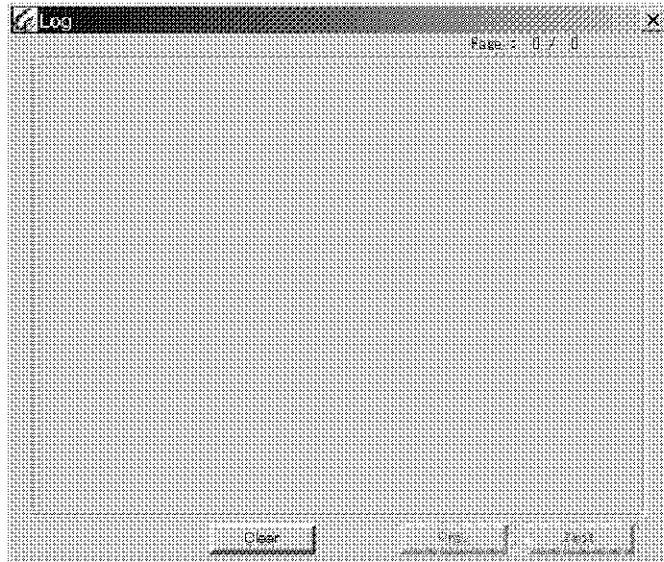
[Clear]	Deletes the log.
[Prev]	Displays the log of the previous page.
[Next]	Displays the log of the next page.
[Service...]	Displays the maintenance menu that only our service engineers are allowed to use. When you select [Service...], the following dialog is displayed:

[Meas Control...]	Controls measurement. When you select [Meas Control...], the following dialog box is displayed:

[Single]	Starts measurement in the single measurement mode.
[Stop]	Stops sweep.
[Start]	Starts measurement in the continuous sweep mode.
[STD...]	Selects a Standard. When [STD...] is selected, the following dialog box appears.

[Type]	Selects a Standard. When [Type] is set to OFF, the Standard data is not used.

[Meas. Mode]	Selects the measurement mode (such as Up Link, Down Link, Band Class) from the Standard selected by **[Type]**.
[Apply]	Applies the current **[Type]** and **[Meas. Mode]** settings. The channel setting and the default value of the measurement function are set in accordance with the selected Standard.
[Preset]	Presets this instrument. When you touch the **[Preset]** menu bar, the following drop down menu items are displayed:
[Current]	Presets the currently active operation mode.
[All]	Presets all operation modes.

5.3 Function Bar

This section describes the functions of each function button displayed on the function bar. The configuration of the function buttons of this instrument is as follows:

MENU2>>	TRACE	MKR	SEARCH	MKR→	SWEEP	BW	LEVEL	SPAN	FREQ

MENU1>>		DISPLAY	PASS/FAIL	MEAS	POWER	BW	LEVEL	SPAN	FREQ

When you touch a function button on the function bar, the associated soft key is displayed on the side menu bar.

The explanation starts from the function button on the right of MENU1 and moves toward the left.

5.3.1 {FREQ}

When you touch the {FREQ} button, the Freq. menu that enables setting of the center frequency is displayed.
The following shows the menu map:

{FREQ}

```
      ┌─ Center ────────────┐   ┌─ Auto Tune
      │  Start              │   │  Manual Tune
      │  Stop               │   │
      │  CF Step Size Auto/Man   │
      │  Freq Offset On/Off │   │
      │  Preset Tune ───────┘   │
      │  Channel Number         │
      │                         │
      │                         │
      └─                        └─ Return
```
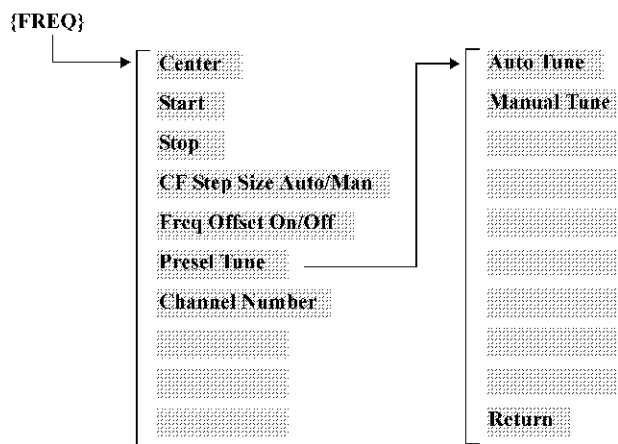
Center   Activates the center frequency setting.
                            The frequency range is displayed by the center frequency and frequency span.

Start   Activates the start frequency setting.

Stop   Activates the stop frequency setting. The frequency range is displayed by the start frequency and stop frequency.

CF Step Size Auto/Man   Switches auto setting and manual setting of the step size for changing the center frequency by the step key.

                            Auto: Automatically sets the step size to 1/10 of the span width.

                            Man: Sets the step size manually.

Freq Offset On/Off   Switches On and Off the frequency offset function.

On: Sets the offset value and changes only the display of frequency by the offset value. (Displayed value of frequency = Set value + Offset value)

Off: Cancels the offset function.

Presel Tune   Displays the Presel Tune menu.

Auto Tune   Automatically tunes the preselector according to the peak frequency.

Manual Tune   Tunes the preselector manually.

Return   Returns to the above layer menu.

Channel Number   When the channel number is set, the center frequency is automatically set by using the following formula.
(Center frequency) = (Channel interval) × (Channel number + Channel offset) + (Start frequency)
The parameters such as the channel interval and the channel number setting range depend on the Standard selected by [Special]→[STD...]. If the Standard selection is set to OFF, the channel number cannot be set.

5.3.2   {SPAN}

When you touch the {SPAN} button, the Span menu that enables setting of the frequency span is displayed. The center frequency and frequency span are displayed in the annotation field below the scale.
The following shows the menu map:

{SPAN}
- Span
- Full Span
- Zero Span
- Last Span
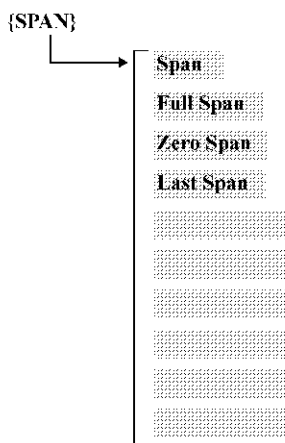
Span   Activates the frequency span setting.
The frequency range is displayed by the center frequency and frequency span.

Full Span   Makes the frequency span full.

Zero Span   Sets zero span mode for the center frequency.

Last Span   Returns the frequency span to the previous value.
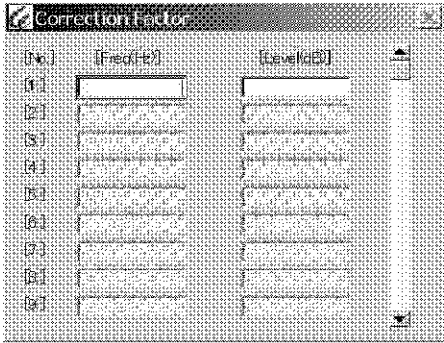
5.3.3   {LEVEL}

When you touch the {LEVEL} button, the Level menu that enables setting of the amplitude display is displayed.
The following shows the menu map:

{LEVEL}

Ref Level	
dB/div	
Linear	
Units [dBm]	→ dBm
ATT Auto/Man	dBmV
Min ATT On/Off	dBμV
Preamp On/Off	dBμVemf
Ref Offset On/Off	dBpW
More 2/2	Watts
	Volts
	Return

Correction Factor On/Off	Insert
Edit Correction Factor	Delete
More 1/2	Sort
	Init
	Return
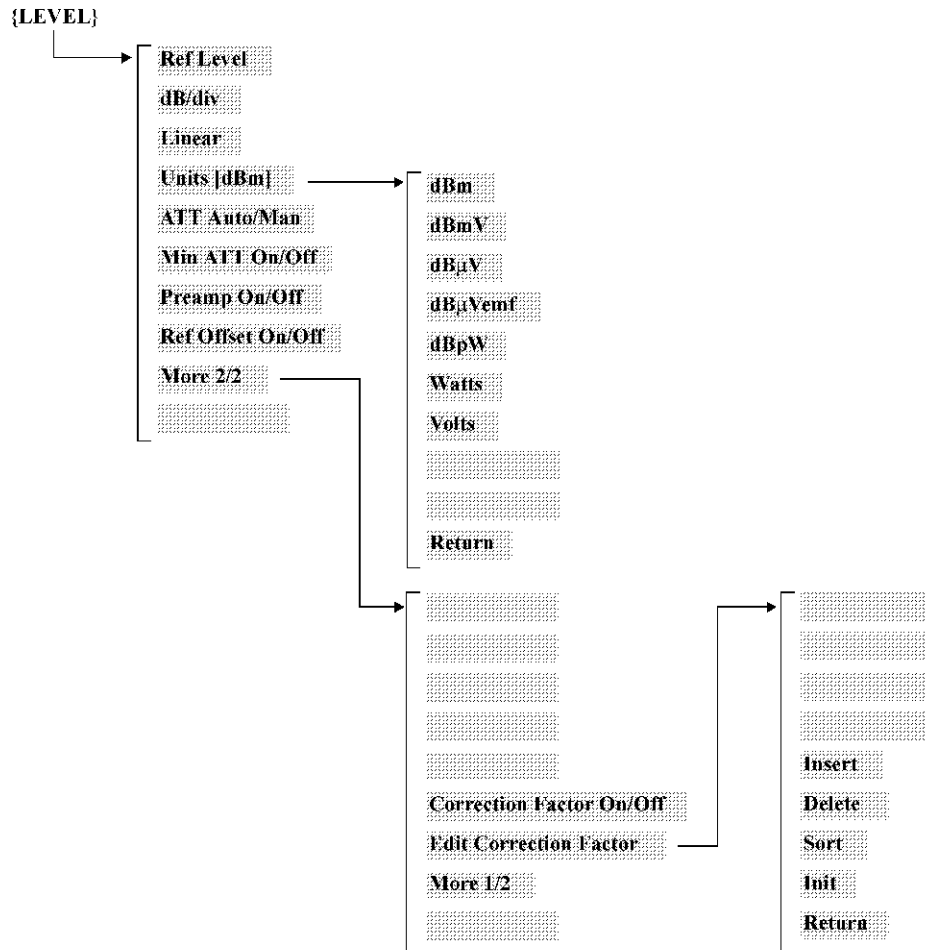
Ref Level	Activates the reference level setting.
dB/div	Activates dB/div setting and displays waveform data in log scale.
Linear	Displays waveform data in linear scale.
Units [dBm]	Displays the Units menu.
dBm	Sets the display unit to dBm.
dBmV	Sets the display unit to dBmV.
dBμV	Sets the display unit to dBμV.
dBμVemf	Sets the display unit to dBμ Vemf.
dBpW	Sets the display unit to dBpW.

Watts	Sets the display unit to Watts.
Volts	Sets the display unit to Volts.
Return	Returns to the above layer menu.
ATT Auto/Man	Switches auto setting and manual setting of the attenuator function.

Auto: Automatically sets the attenuator value based on the reference level.

Man: Sets the attenuator value manually.

Min ATT On/Off   Switches On and Off the Min ATT function.

On: Sets the minimum attenuator value and implements control regardless of ATT Auto/Man.

Off: Cancels the Min ATT mode.

Preamp On/Off   Switches On and Off the high-sensitivity input function.

On: Turns On the built-in preamp with gain of 20 dB or more. Here, the preamp gain is corrected at each frequency and therefore it does not need to be considered in level measurement.

Off: Turns Off the built-in preamp.

Ref Offset On/Off   Switches On and Off the reference level offset function.

On: The range of the offset level can be set to 0 - ±100.0 dB.The relation among the displayed reference level, set reference level, and offset is as follows:
Reference level (displayed) = Reference level (set) + Offset

Off: Cancels offset.

More 2/2   Displays Level menu (2/2).

Correction Factor On/Off   Switches On and Off the level correction function.

Edit Correction Factor   Displays the Edit menu and the following |**Correction Factor**| dialog box:

Insert   Inserts the same value as that at the cursor position in the dialog box.

Delete   Deletes the line where the cursor is positioned in the dialog box.

5.3.3 {LEVEL}

Sort	Sorts the data input into the dialog box in the order of frequency.
Init	Deletes all data in the set dialog box.
Return	Closes the dialog box and returns to the above layer menu.
More 1/2	Displays Level menu (1/2).

5.3.4   {BW}

When you touch the {BW} button, the BW menu used to change the resolution bandwidth (RBW) and video bandwidth (VBW) is displayed. When the resolution bandwidth is manually set, setting of the resolution bandwidth is enabled.
The following shows the menu map:

{BW}

```
        ┌──► ┌ RBW Auto/Man ──────┐    ┌─► ┌ Auto
        │    │                    │    │   │
        │    │ VBW Auto/Man       │    │   │ Narrow
        │    │                    │    │   │
        │    │ Auto All           │    │   │ Medium
        │    │                    │    │   │
        │    │ Span/RBW Auto/Man  │    │   │ Wide
        │    │                    │    │   │
        │    │ VBW/RBW Auto/Man   │    │   │
        │    │                    │    │   │
        │    │                    │    │   │
        │    │ ADC Dither On/Off  │    │   │
        │    │                    │    │   │
        │    │                    │    │   │
        │    │ PLL BW [Auto] ─────┘    │   │
        │    │                        │   │
        │    └                        └   └ Return
```
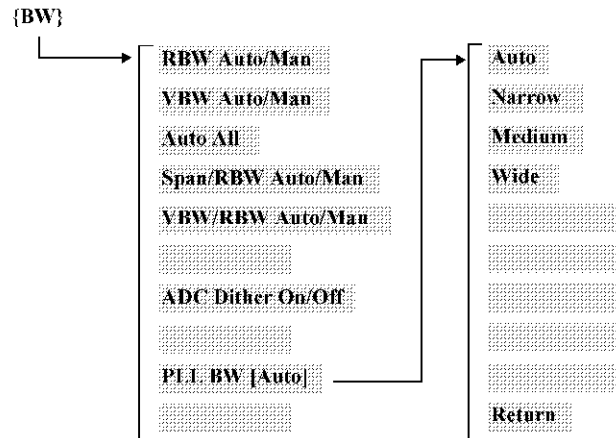
RBW Auto/Man	Switches auto setting and manual setting of the RBW.
	Auto: Automatically sets the optimum RBW based on the frequency span.
	Man: Sets the RBW manually.
VBW Auto/Man	Switches auto setting and manual setting of the VBW.
	Auto: Automatically sets the optimum VBW based on the RBW.
	Man: Sets the VBW manually.
Auto All	Automatically sets the RBW, VBW and sweep time based on the frequency span.
Span/RBW Auto/Man	Switches auto setting and manual setting of the RBW vs. frequency span function. Available only when auto setting is applied to the RBW.
	Auto: The RBW/frequency span value is fixed to 100.
	Man: The RBW vs. frequency span ratio can be changed.
VBW/RBW Auto/Man	Switches auto setting and manual setting of the VBW vs. RBW function. Available only when auto setting is applied to the VBW.
	Auto: The VBW/RBW value is fixed to 1.
	Man: The VBW vs. RBW ratio can be changed.
ADC Dither On/Off	Switches On and Off the ADC Dither function.
	On: Enables ADC Dither.
	Off: Cancels ADC Dither.

5.3.4 {BW}

> **MEMO:** *When the ADC Dither is set to On, the ADC linearity for low level signal is improved and the internally-occurred inter-modulation distortion is effectively restrained. When measuring the intermodulation distortion, set ADC Dither to On. On the other hand, the ADC Dither adversely affects the displayed average noise level. For the lower noise level measurement, set the ADC Dither to Off.*

PLL BW [Auto] Displays the PLL BW menu used to select the loop filter bandwidth in a PLL circuit.

Auto Automatically sets the filter to get the optimum phase noise characteristic corresponding to the frequency span.

Narrow Sets a narrow bandwidth filter.

Medium Sets a medium bandwidth filter.

Wide Sets a wide bandwidth filter.

> **MEMO:** *When the PLL BW is set to Narrow, Medium or Wide, the phase noise may worsen according to the set frequency span. In such a case, set Auto.*

Return Returns to the above layer menu.

5.3.5   {SWEEP}

When you touch the **{SWEEP}** button, the Sweep menu that enables setting of sweep conditions is displayed.
The following shows the menu map:

{SWEEP}

Sweep Time Auto/Man	Free Run
Trigger Source [Free Run]	IF Power [50%]
Trigger Slope +/-	Video [0.00dBm]
Trigger Delay	Ext 1
Gated Sweep Setup	Ext 2 [2.5 V]
Gated Sweep On/Off	Line
	Link
	IF Monitor On/Off
	Return

Gate Source [Free Run]	Free Run
Gate Slope +/-	IF Power [50%]
Gate Delay	Ext 1
Gate Width Auto/Man	Ext 2 [2.5 V]
Gated Sweep On/Off	Link
Sweep Time	
Trigger Delay	
Gated Sweep Setup Quit	
Return	Return

Sweep Time Auto/Man   Switches auto setting and manual setting of the sweep mode.

Auto: Automatically sets the sweep time for span.

Man: Sets the sweep time manually.

Trigger Source [Free Run]   Activates the trigger condition.
The initial value is **[Free Run]**.

Free Run   Repeats sweep automatically.

IF Power [50%]   Performs sweep synchronizing with the IF signal.
The initial value is **[50%]**.

Video [0.00dBm]   Performs sweep synchronizing with the video signal.
The initial value is **[0.00dBm]**.

Ext 1   Performs sweep synchronizing with the external trigger signal (EXT1 terminal).

Ext 2 [2.5 V]   Performs sweep synchronizing with the external trigger signal (EXT2 terminal).
The initial value is **[2.5V]**.

5.3.5 {SWEEP}

Line	Performs sweep synchronizing with the AC power frequency.
Link	Performs the sweep synchronized with the trigger of an optional function.

> *MEMO:*   *For more information on how to use the link trigger, refer to the manual for the option that uses the link trigger.*

IF Monitor On/Off	Monitors the internal IF signal. This function is enabled to specify trigger level when setting the trigger by using the IF signal.
Return	Returns to the above layer menu.
Trigger Slope +/-	Switches the polarity (+/-) of the trigger slope. Available for the video trigger, external trigger, IF trigger and link trigger.

+:   Starts sweep at the rise of a trigger.

-:   Starts sweep at the fall of a trigger.

Trigger Delay	Sets the delay time from a trigger point. This menu item is available when the video trigger, external trigger, IF trigger, or link trigger is the trigger condition in the zero span mode.
Gated Sweep Setup	Displays the Gated Sweep menu and displays two screens. The gated sweep screen is displayed in the upper screen and the gate signal, gate position, and gate width are displayed in the lower screen.

> *MEMO:*   *When the gate signal mode is set to Auto, the gate width is not displayed.*

Gate Source [Free Run]	Activates the trigger condition of the gated sweep. The initial setting is **[Free Run]**.
Free Run	Repeats sweep automatically.
IF Power [50%]	Performs sweep synchronizing with the IF signal. The initial value is **[50%]**.
Ext 1	Performs sweep synchronizing with the external trigger signal (EXT1 terminal).
Ext 2 [2.5 V]	Performs sweep synchronizing with the external trigger signal (EXT2 terminal). The initial value is **[2.5V]**.
Link	Performs the sweep synchronized with the trigger of an optional function.

> *MEMO:*   *For more information on how to use the link trigger, refer to the manual for the option that uses the link trigger.*

Return	Returns to the above layer menu.
Gate Slope +/-	Switches the trigger slope polarity between + and -. This menu item is available when the external trigger or IF trigger is used.

	+: Starts sweep at the rise of a trigger.
	-: Starts sweep at the fall of a trigger.
Gate Delay	Sets the delay time from a trigger point. The delay time is used as the gate position at the gated sweep.
Gate Width Auto/Man	Switches the gate signal mode between the auto setting and manual setting when the gated sweep is performed.

Auto: Adjusts the gate width automatically to correspond with the width of the rectangular part of the gate signal source. A signal, whose ON period is variable, is automatically adjusted.

Man: Sets the gate width (time) manually when the gated sweep is performed.

Gated Sweep On/Off   Switches the gated sweep on and off.

On: Performs the gated sweep according to the set gate conditions (gate position and width).

Off: Cancels the gated sweep.

Sweep Time   Sets the sweep time.

Trigger Delay   Sets the delay time from a trigger point.

Gated Sweep Setup Quit   Clear the trigger condition setting screen and displays the Sweep menu.

Return   Returns to the above layer menu.

Gated Sweep On/Off   Switches the gated sweep on and off.

On: Performs the gated sweep according to the set gate conditions (gate position and width).

Off: Cancels the gated sweep.

5.3.6   {MKR→}

When you touch the {**MKR→**} button, the MKR→menu (1/2) used to use the active marker data (frequency, level, etc.) as the data for other functions is displayed.
The following shows the menu map:

{MKR→}

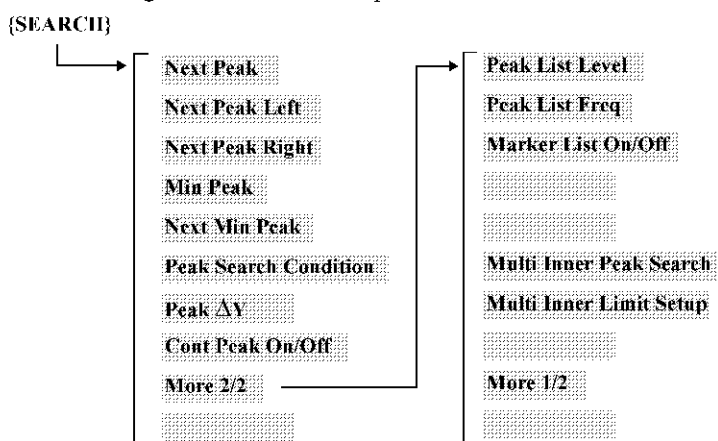| Marker→CF | | Mkr→CF Step |
Marker→Ref		Mkr→Mkr Step
Peak→CF		ΔMarker→CF Step
Peak→Ref		ΔMarker→Mkr Step
ΔMarker→CF		
ΔMarker→Span		
More 2/2		More 1/2
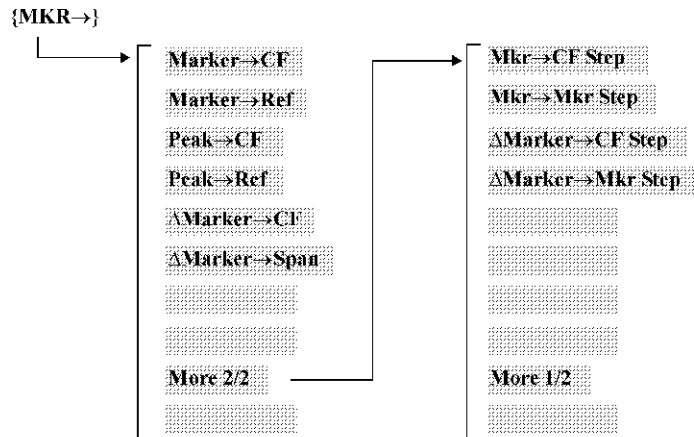
Marker→CF	Sets the frequency of the active marker to the center frequency.
Marker→Ref	Sets the level of the active marker to the reference level.
Peak→CF	Displays the marker at the highest peak in the targeted search range and sets the frequency of the marker to the center frequency.
Peak→Ref	Displays the marker at the highest peak in the targeted search range and sets the level of the marker to the reference level.
ΔMarker→CF	Sets the frequency difference between the delta marker and the normal marker to the center frequency.
ΔMarker→Span	Sets the frequency difference between the delta marker and the normal marker to the frequency span.
More 2/2	Displays the MKR→ menu (2/2).
Mkr→CF Step	Sets the frequency of the marker to the step size of the center frequency.
Mkr→Mkr Step	Sets the frequency of the marker to the step size of the marker.
ΔMarker→CF Step	Sets the frequency difference between the delta marker and the normal marker to the step size of the center frequency.
ΔMarker→Mkr Step	Sets the frequency difference between the delta marker and the normal marker to the step size of the marker.
More 1/2	Displays the MKR→ menu (1/2).

5.3.7   {SEARCH}

When you touch the {SEARCH} button, the Search menu is displayed.
The following shows the menu map:

{SEARCH}

Next Peak
Next Peak Left
Next Peak Right
Min Peak
Next Min Peak
Peak Search Condition
Peak ΔY
Cont Peak On/Off
More 2/2

Peak List Level
Peak List Freq
Marker List On/Off

Multi Inner Peak Search
Multi Inner Limit Setup

More 1/2

Next Peak	Moves the marker to the next highest peak from the current marker position in the targeted search range.
Next Peak Left	Moves the marker to the next lower frequency peak (on the left) of the current marker position in the targeted search range.
Next Peak Right	Moves the marker to the next higher frequency peak (on the right) of the current marker position in the targeted search range.
Min Peak	Moves the current marker to the minimum peak of the trace in the targeted search range.
Next Min Peak	Moves the marker to the next minimum peak from the current marker position in the targeted search range.
Peak Search Condition	Displays the **[Peak Search Condition]** dialog box. Specifies the targeted search range for execution of the peak search function using the marker. The targeted range is the full range of the wave-form screen by default.
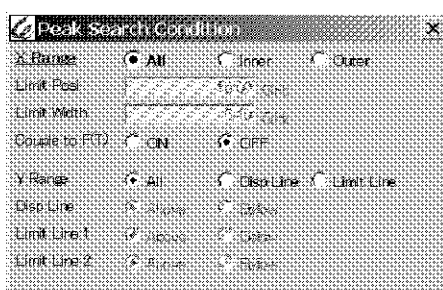
[X Range]	Specifies the search range of the horizontal axis in the waveform screen.
	All: Specifies the full range as the search range.

5.3.7 {SEARCH}

	Inner:	The search range is the range specified by **[Limit Posi]** and **[Limit Width]**.
	Outer:	The search range is outside of the range specified by **[Limit Posi]** and **[Limit Width]**.
[Limit Posi]		When Inner or Outer is specified by **[X Range]**, specifies the center position (when frequency span is used) or start position (when zero span is used) of the range.
[Limit Width]		When Inner or Outer is specified by **[X Range]**, sets the search width whose center position is specified by the value set by **[Limit Posi]** (when frequency span is used), or the search width whose start position is specified by **[Limit Posi]** (when zero span is used).
[Couple to F(T)]		Specifies the display mode of the window indicating the search range.
	ON:	The window indicating the set search position and range moves in line with the center frequency and span. The values of **[Limit Posi]** and **[Limit Width]** are not recalculated. The window position indicating the search range moves in line with the set frequency and span.
	OFF:	The values of **[Limit Posi]** and **[Limit Width]** are recalculated according to the set center frequency and span, and automatically reset so that the display position and width of the window in the waveform screen will always remain the same.
[Y Range]		Specifies the search range of the vertical axis in the waveform screen.
	All:	Specifies the full range as the search range.
	Disp Line:	Displays a display line, and sets only the range above or below the display line as the search range according to the condition specified by **[Disp Line]**.
	Limit Line:	Sets only the range above or below the limit line as the search range according to the condition specified by **[Limit Line 1]** and **[Limit Line 2]**.When both limit lines 1 and 2 are displayed, the search is performed based on the AND condition.
[Disp Line]		Specifies the range either above or below the display line as the search range.
	Above:	Specifies the range above the display line as the search range.
	Below:	Specifies the range below the display line as the search range.
[Limit Line 1]		Specifies the range either above or below limit line 1 as the search range.
	Above:	Specifies the range above limit line 1 as the search range.
	Below:	Specifies the range below limit line 1 as the search range.

[Limit Line 2] Specifies the range either above or below limit line 2 as the search range.

Above: Specifies the range above limit line 2 as the search range.

Below: Specifies the range below limit line 2 as the search range.

Peak ΔY Activates the setting of level difference of the signal to be judged as the peak point during peak search. The level difference set here is used as the threshold value for the peak point search.
This set value is used for Next Peak and as multipoint peak search by the multimarker.

Cont Peak On/Off Switches On and Off the continuous peak search function.

On: Performs the peak search repeatedly each time a sweep is performed.

Off: Cancels the continuous peak search function.

More 2/2 Displays the Search menu (2/2).

Peak List Level Displays a list of levels and frequencies in the order of peak levels.

Peak List Freq Displays a list of levels and frequencies in the order of the frequency of the peak levels.

Marker List On/Off Switches On and Off the display of the multimarker list.

On: Displays a list of frequencies and levels in the order of marker numbers.

Off: Deletes the display of the multimarker list.

Multi Inner Peak Search Executes multi inner peak search.
This function defines multiple areas and performs a batch search for the maximum value in those areas. The areas must be specified by Multi Inner Limit Setup before executing this function.

Multi Inner Limit Setup Sets the search range for executing the multi inner peak search function. Displays the [Multi Inner Limit Setup] dialog box for setting.
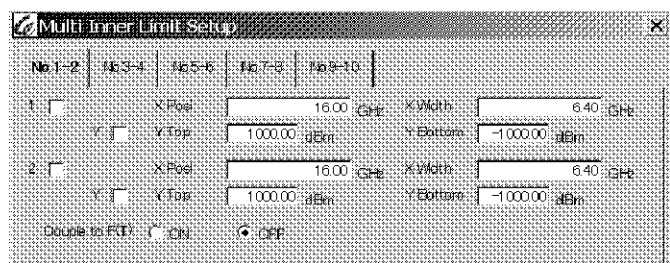
[1] to [10] When the check box is checked, setting of the target range is enabled, and a window is displayed in the corresponding area.
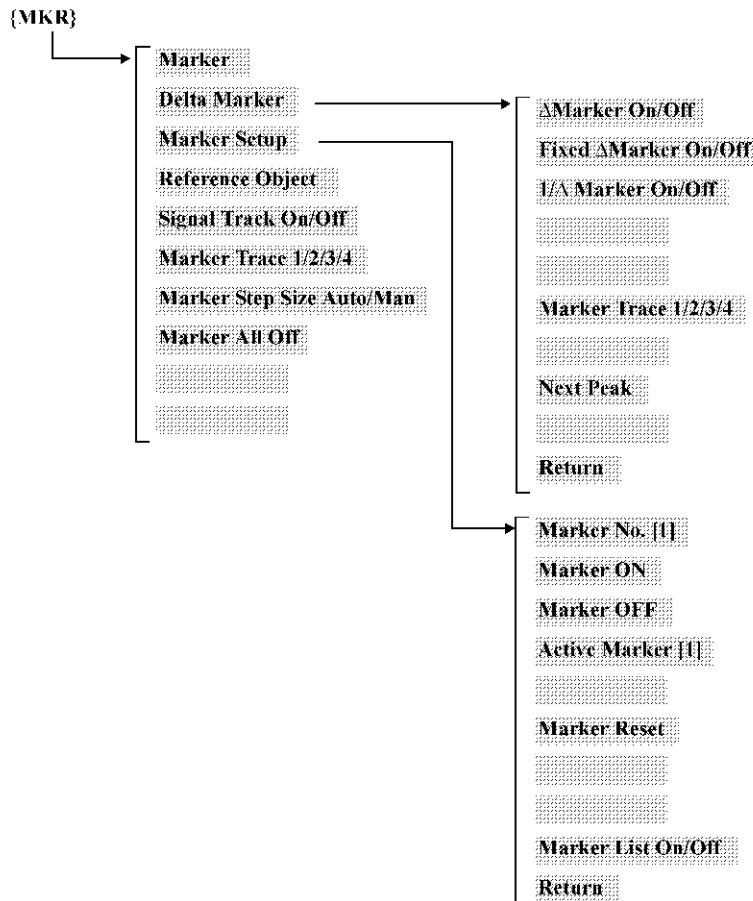
[X Posi] Specifies the center position (when frequency span is used) or start position (when zero span is used) of the horizontal axis in the target range.

5.3.7 {SEARCH}

[X Width]	Specifies the search range width whose center position is specified by the value set by [X Posi] (when frequency span is used) or the search range width whose start position is specified by the value set by [X Posi] (when zero span is used).
[Y]	When the check box is checked, setting of the target range of the vertical axis specified by [Y Top] and [Y Bottom] is enabled.When the check box is not checked, the whole vertical axis in the waveform screen becomes the targeted search area.
[Y Top]	Sets the upper limit of the targeted area of the vertical axis.
[Y Bottom]	Sets the lower limit of the targeted area of the vertical axis.
[Couple to F(T)]	Specifies the display mode of the window indicating the search area.

ON: The window indicating the set search position and range moves in line with the center frequency and span. The values of [Limit Posi] and [Limit Width] are not recalculated. The window position indicating the search range moves in line with the set frequency and span.

OFF: The values of [Limit Posi] and [Limit Width] are recalculated according to the set center frequency and span, and automatically reset so that the display position and width of the window in the waveform screen will always remain the same.

More 1/2	Displays the Search menu (1/2).

5.3.8 {MKR}

When you touch the {MKR} button, the Marker menu that enables marker setting is displayed.
The following shows the menu map:

{MKR}

Marker

Delta Marker ────────────► ΔMarker On/Off

Marker Setup ─────── Fixed ΔMarker On/Off

Reference Object 1/Δ Marker On/Off

Signal Track On/Off

Marker Trace 1/2/3/4

Marker Step Size Auto/Man Marker Trace 1/2/3/4

Marker All Off

Next Peak

Return

Marker No. [1]

Marker ON

Marker OFF

Active Marker [1]

Marker Reset

Marker List On/Off

Return

Marker	Activates setting of the frequency or time position of the active marker.
Delta Marker	Displays the Delta Marker menu.
ΔMarker On/Off	Switches On and Off the delta marker display function.

On: Displays the delta marker and normal marker in the same position. Displays the relative value (frequency and level) to the normal marker in the marker area.

Off: Deletes the display of the delta marker.

Fixed ΔMarker On/Off   Switches On and Off the fixed marker function.

On: Maintains the frequency and level of the delta marker.

Off: Cancels the fixed marker function.

5.3.8 {MKR}

1/Δ Marker On/Off	Switches On and Off the inverse number display function for the delta marker value.
	On: Displays a frequency value on the time axis and a time value on the frequency axis.
	Off: Cancels the inverse number display function.
Marker Trace 1/2/3/4	Specifies the trace where the marker sits. Every time you touch this key, the marker moves on the trace in the order of 1→2→3→4→1. The trace in the Blank condition when operating this key is skipped.
Next Peak	Moves the marker to the next highest peak from the current marker position in the targeted search range.
Return	Returns to the above layer menu.
Marker Setup	Displays the Marker Setup menu.
Marker No. |1|	Specifies a marker number. The initial value is |1|.
Marker ON	Displays the marker of the specified number, and displays the frequency and level of the marker position in the marker area.
Marker OFF	Deletes the marker of the specified number.
Active Marker |1|	Activates the marker of the specified number. The initial value is |1|.
Marker Reset	Deletes the multimarkers whose multimarker number is other than 1. Marker 1 is displayed at the center of the horizontal axis.
Marker List On/Off	Switches On and Off the display of the multimarker list.
	On: Displays a list of frequencies and levels in the order of marker numbers.
	Off: Deletes the display of the multimarker list.
Return	Returns to the above layer menu.
Reference Object	Displays the **|Reference Object|** dialog box.

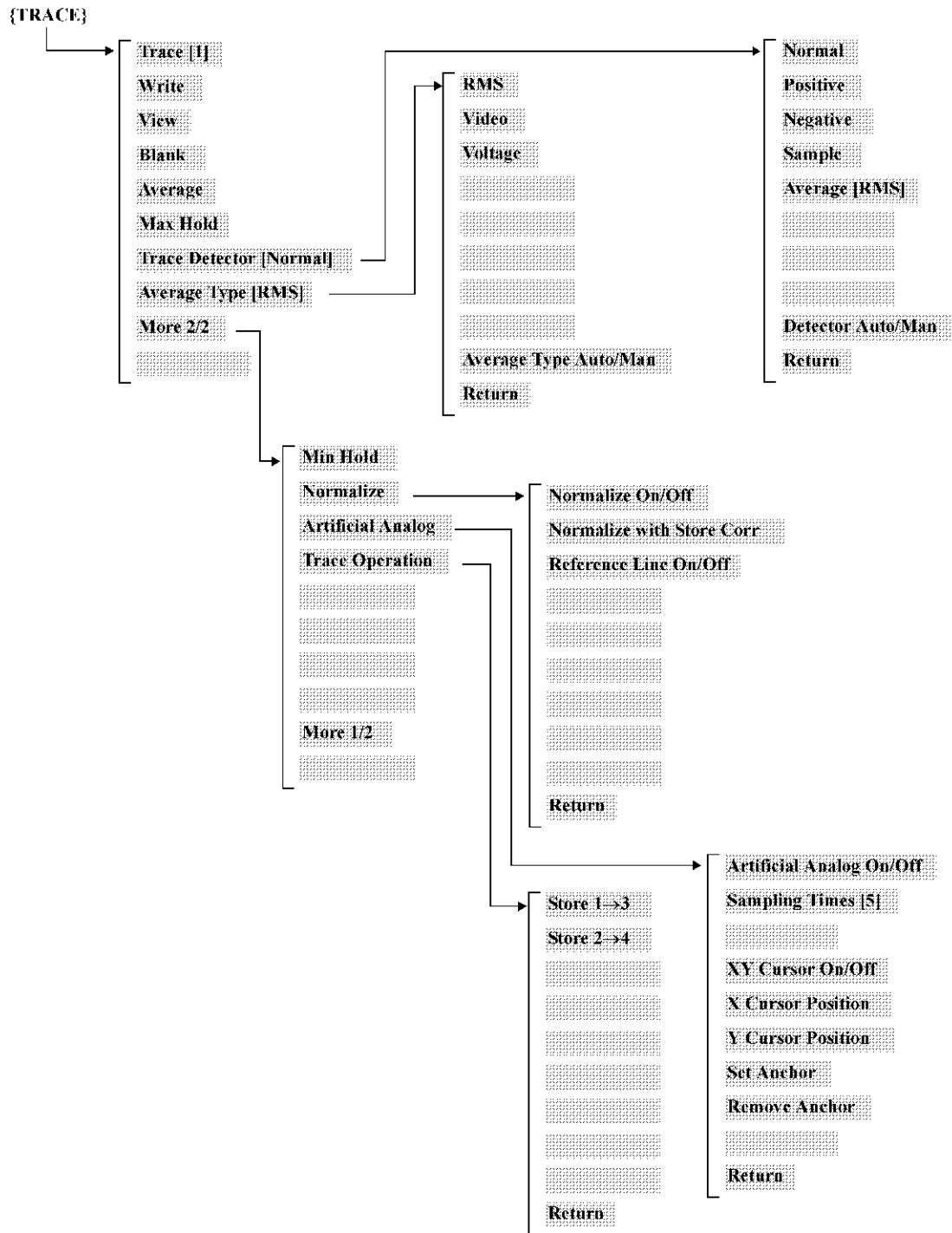|	
[Δ Marker]	Displays the relative value of the frequency (or time) and level of the normal marker, using the delta marker as a reference.

[Anchor]	Displays the relative value of the frequency (or time) and level of the normal marker, using the anchor as a reference.
[Limit Line 1]	Displays the relative value of each level of the normal marker, using limit line 1 as a reference.
[Limit Line 2]	Displays the relative value of each level of the normal marker, using limit line 2 as a reference.
[Disp Line]	Displays the relative value of the level of the normal marker, using the display line as a reference.
[Ref Line]	Displays the relative value of the level of the normal marker, using the reference line as a reference.
[Trace 1]	Displays the relative value of each level of the normal marker, using trace 1 as a reference.
[Trace 2]	Displays the relative value of each level of the normal marker, using trace 2 as a reference.
[Trace 3]	Displays the relative value of each level of the normal marker, using trace 3 as a reference.
[Trace 4]	Displays the relative value of each level of the normal marker, using trace 4 as a reference.
[Δ Marker (Other Screen)]	Displays the relative value of the frequency (or time) and level of the normal marker, using the delta marker on the other screen as a reference when two screens are displayed.
[No Reference]	Changes the display of the level value of the marker from the relative value to the absolute value, using no reference.

Signal Track On/Off   Switches On and Off the signal truck function.

On: Performs the peak search targeting the same peak each time a sweep is performed, and sets the frequency of the marker to the center frequency.
Signal of the same peak means that signal exists within +/-15 dB refer to the level when this function is switched on. If no signal exists in this range, tracking operation does not function. When a signal has returned to this range, tracking operation is restarted.

OFF: Cancels the signal truck function.

Marker Trace 1/2/3/4   Specifies the trace where the marker sits. Every time you touch this key, the marker moves on the trace in the order of 1→2→3→4→1. The trace in the Blank condition when operating this key is skipped.

Marker Step Size Auto/Man   Switches auto setting and manual setting of the step size for moving the marker by the step key.

Auto: Sets the marker step size to 1/10 of the frequency span.

Man: Sets the step size manually. Manual setting is automatically applied when a value specified by **Mkr →Mkr Step** or **ΔMarker →Mkr Step** is set to the step size.

Marker All Off   Deletes all markers displayed.

5.3.9 {TRACE}

When you touch the **{TRACE}** button, the Trace menu, which enables setting of the trace, is displayed. The following shows the menu map:

{TRACE}

- Trace [1]
- Write
- View
- Blank
- Average
- Max Hold
- Trace Detector [Normal]
  - Normal
  - Positive
  - Negative
  - Sample
  - Average [RMS]
  - Detector Auto/Man
  - Return
- Average Type [RMS]
  - RMS
  - Video
  - Voltage
  - Average Type Auto/Man
  - Return
- More 2/2
  - Min Hold
  - Normalize
    - Normalize On/Off
    - Normalize with Store Corr
    - Reference Line On/Off
    - Return
  - Artificial Analog
    - Artificial Analog On/Off
    - Sampling Times [5]
    - XY Cursor On/Off
    - X Cursor Position
    - Y Cursor Position
    - Set Anchor
    - Remove Anchor
    - Return
  - Trace Operation
    - Store 1→3
    - Store 2→4
    - Return
  - More 1/2

Trace [1]	Selects the trace to be the target of operation.
Write	Updates the trace data each time a sweep is performed.
View	Displays the trace data stored in the memory.
Blank	The trace is not displayed.
Average	Activates setting of the average count and displays the average value of each trace point by trace.
Max Hold	Activates setting of the max hold count and displays the maximum value of each trace point by trace.
Trace Detector [Normal]	Displays the Trace Detector menu used for the target trace.
Normal	Sets the normal detection mode to automatically detect whether the peak is positive or negative at each trace point.
Positive	Sets the positive peak detection mode.
Negative	Sets the negative peak detection mode.
Sample	Sets the sample detector mode.
Average [RMS]	Sets the average detector mode. There are three types of average detection: RMS (power average), Video (Trace average), and Voltage (voltage average). The averaging method to be used can be selected by the **Average Type [RMS]** menu.
Detector Auto/Man	Switches auto setting and manual setting of the detection mode.
	Auto: Automatically sets the optimum detection mode for measurement based on the trace mode.
	Man: Sets the detection mode manually.
Return	Returns to the above layer menu.
Average Type [RMS]	Displays the Average Type menu.
RMS	Performs averaging by power (W) and draws waveforms.
Video	Performs averaging by display data.
Voltage	Performs averaging by voltage and draws waveforms.
Average Type Auto/Man	Switches auto setting and manual setting of average type selection.
	Auto: Selects an appropriate averaging method for waveform averaging according to the type (Log/Linear) of the vertical axis scale. **Log scale: RMS** Linear scale: Voltage
	Man: Sets the averaging method manually.
Return	Returns to the above layer menu.
More 2/2	Displays the Trace menu (2/2).

5.3.9 {TRACE}

Min Hold	Activates setting of the minimum hold count and displays the minimum value of each trace point by trace.
Normalize	Displays the Normalize menu.
Normalize On/Off	Switches On and Off the normalize function.
	On: Performs level correction using the normalize data for measurement.
	Off: Cancels the normalize function.
Normalize with Store Corr	Acquires the normalize data and turns on the normalize function. When acquiring the normalize data, the waveform data displayed on the screen at that time is used.
Reference Line On/Off	Activates setting of the reference line used to specify the reference level for the normalize function.
Return	Returns to the above layer menu.
Artificial Analog	Displays the Artificial menu.
Artificial Analog On/Off	Switches On and Off the quasi analog display function.
	On: Displays the tone of the trace by using the quasi analog display function. Because the waveform data of up to 32 traces is accumulated on the screen, the opening condition of the waveform can be observed.
	Off: Cancels the quasi analog display function.
Sampling Times [5]	Activates the sampling count in the vertical axis by quasi analog trace. The initial value is [5].
XY Cursor On/Off	Switches On and Off the XY cursor function.
	On: Displays the XY cursors.
	Off: Deletes the XY cursors.
X Cursor Position	Activates the X cursor.
Y Cursor Position	Activates the Y cursor.
Set Anchor	Displays an anchor at the intersection point of the XY cursors. The display values of the XY cursors are the relative values between the anchor and the intersection point of the XY cursors.
Remove Anchor	Deletes the anchor.
Return	Returns to the above layer menu.
Trace Operation	Displays the Trace menu.
Store 1→3	Copies the waveform data of the trace 1 to the waveform data area of the trace 3, and sets the trace 3 to the View condition.
Store 2→4	Copies the waveform data of the trace 2 to the waveform data area of the trace 4, and sets the trace 4 to the View condition.
Return	Returns to the above layer menu.
More 1/2	Displays the Trace menu (1/2).

5.3.10 {MENU2>>}

When you touch {MENU2>>}, {MENU 1>>} is displayed.

5.3.11 {POWER}

When you touch the {POWER} button, the menu concerning Power measurement is displayed.
The following shows the menu map:

{POWER}

5.3.11 {POWER}

(a) ───

(b) ───────────────────────────────────────→

(c) ───────→

(d) ───────→

(e) ───────→

Auto Level Set

Ref Power Setup

Offset Setup

Average Times On/Off

Average Mode Cont/Rep

Parameters Def/Man

Parameters Define→Default

Spectrum Emission Mask Off

Return

CCDF RBW

Meas Sample

Trace Write On/Off

Gaussian On/Off

X Scale Max

CCDF Gate On/Off

CCDF Off

Return

Window Setup

Power Ratio On/Off

Average Times On/Off

Average Mode Cont/Rep

Parameters Def/Man

Parameters Define→Default

Multi Average Power Off

Return

(a)

(b)

Table No 1/2/3

Edit Table

Show Result

Parameters Def/Man

Parameters Define→Default

Spurious Emission Off

Return

Carrier Band Width

\Nyquist Filter Setup

Ref Power Chan/Peak

Return

Insert

Delete

Sort

Init

Return

Window No. [1]

Window ON

Window OFF

Active Window [1]

Window Position

Window Width

Couple to Power On/Off

Window Reset

Return

Auto Level Set

Ref/Offs Setup

\Nyquist Filter Setup

Average Times On/Off

Average Mode Cont/Rep

Noise Corr On/Off

Parameters Def/Man

Parameters Define→Default

Multi Carrier ACP Off

Return

Previous Result

Next Result

Return

Table No 1/2/3

Insert

Delete

Init

Return

Average Power
Measures and displays the average power in the target range (full measurement span or measuring window). Sets the averaging count for average power measurement. In average power measurement, the resolution bandwidth (RBW) is set to be wider than the amplitude fluctuation bandwidth. (the resolution bandwidth is more than three times wider than the occupied bandwidth) The average power can be obtained by the following equation. The trace point in the horizontal axis is set to 1001.

$$P_{AVG} = 10\log \left[\sum_{n=X1}^{X2} (10^{\frac{P(n)}{10}}) \times \frac{1}{1001} \right]$$

P_{AVG}: Denotes the average power to be calculated

P(n): Denotes the data (dBm) for each trace point

X1: 1

X2: 1001

Window On/Off
Switches On and Off the measuring window display.

On: Displays the measuring window in the screen.

Off: Closes the measuring window.

Window Position
Activates setting of the position of the measuring window.

Window Width
Activates setting of the width of the measuring window.

Average Times On/Off
Switches On and Off the averaging function.

On: Sets the average number of times and measures the average power.

Off: Cancels the averaging function.

Average Mode Cont/Rep
Switches the continuous calculation setting and the repeat calculation setting of the average mode.

Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.

Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning.

Parameters Def/Man
Switches the set mode of setting parameters for measurement.

Def: Starts measurement in the auto setting mode.
The setting parameters stored by the
Parameters Define→Default menu are automatically set.

Man: Starts measurement without changing the settings before measurement.

Parameters Define→Default
Stores the current setting parameters as the setting parameters for average power measurement.

5.3.11 {POWER}

Average Power Off	Terminates average power measurement.
Return	Returns to the above layer menu.
Channel Power	Activates the measuring window and displays the Channel Power menu. The channel power can be obtained by using the following equation.

$$P_{CH} = 10\log \left[\sum_{n=X1}^{X2} (10^{\frac{P(n)}{10}}) \times \frac{1}{PBW} \times \frac{Window\ Width}{(X2-X1)} \right]$$

P_{CH}: Channel power to be obtained

$P_{(n)}$: The power level (dBm) of each data point

SPAN: Span setting value

PBW: Noise power bandwidth

X1: Trace point at the window's start

X2: Trace point at the window's end

Window On/Off	Switches On and Off the measuring window display.

On: Displays the measuring window in the screen.

Off: Closes the measuring window.

Window Position	Activates setting of the position of the measuring window.
Window Width	Activates setting of the width of the measuring window.
Average Times On/Off	Switches On and Off the averaging function.

On: Sets the average number of times in the channel power measurement and measures the average channel power.

Off: Cancels the averaging function.

Average Mode Cont/Rep	Switches the continuous calculation setting and the repeat calculation setting of the average mode.

Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.

Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning.

Parameters Def/Man	Switches the set mode of setting parameters for measurement.

Def: Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define→Default** menu are automatically set.

Man: Starts measurement without changing the settings before measurement.

Parameters Define→Default	Stores the current setting parameters as the setting parameters for measurement.
Channel Power Off	Closes the window and terminates channel power measurement.
Return	Returns to the above layer menu.
OBW	Displays the OBW menu. Two screens are displayed. The upper screen displays the trace and the lower screen displays the occupied bandwidth measurement conditions and data.
OBW	Sets the ratio of the occupied bandwidth power to the total power in percentage terms. The initial value is |99%|.

Average Times On/Off   Switches On and Off the averaging function.

On: Sets the averaging count and performs averaging of the occupied bandwidth power.

Off: Cancels the averaging function.

Average Mode Cont/Rep   Switches the continuous calculation setting and the repeat calculation setting of the average mode.

Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.

Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning.

Parameters Def/Man   Switches the set mode of setting parameters for measurement.

Def: Starts measurement in the auto setting mode. The setting parameters stored by the
Parameters Define→Default menu are automatically set.

Man: Starts measurement without changing the settings before measurement.

Parameters Define→Default	Stores the current setting parameters as the setting parameters for measurement.
OBW Off	Terminates occupied bandwidth measurement.
Return	Returns to the above layer menu.
ACP	Displays the ACP menu.
Auto Level Set	Sets the reference level and ATT to the optimum value in accordance with the signal to be measured. When the key is pressed, Auto Level Set is executed.

MEMO: The modulation signal model which is used in Auto Level Set of ACP sets the input ATT to the optimum value assuming that one carrier of W-CDMA is input.

5.3.11 {POWER}

CS/BS Setup   Displays the CS/BS menu and [CS/BS Setup] dialog box at the same time.
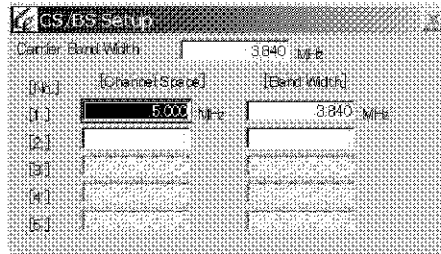
[Carrier Band Width]   Sets the measurement bandwidth for measuring channel power as the reference power.

[Channel Space]   Sets the Offset frequency from the carrier frequency indicating the adjacent channel measuring position.

[Band Width]   Sets the measurement bandwidth for measuring adjacent channel leakage power.

Insert   Inserts a line describing the adjacent channel measurement condition at the current cursor position. The data in the line that existed in the position before insertion is copied to each setting value as new line data.

Delete   Deletes the measurement condition at the current cursor position.

Sort   Sorts the data input into the dialog box in the order of frequency.

Init   Initializes all data in the table currently being edited.

Return   Returns to the above layer menu.

√Nyquist Filter Setup   Displays the [√Nyquist Filter Setup] dialog box.
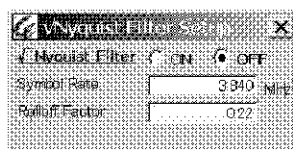
[√Nyquist Filter]   Switches On and Off the √Nyquist filter function.

       ON: Activates the √Nyquist filter.

       OFF: Cancels the √Nyquist filter.

[Symbol Rate]   Sets the inverse number of the symbol rate (frequency).

[Rolloff Factor]   Sets the rolloff factor.

Average Times On/Off   Switches On and Off the averaging function.

       On: Sets the average number of times in the ACP measurement and measures the average adjacent channel leakage power.

       Off: Cancels the averaging function.

Average Mode Cont/Rep   Switches the continuous calculation setting and the repeat calculation setting of the average mode.

| | Cont: | Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached. |

| | Rep: | Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning. |

Noise Corr On/Off Performs a correction equivalent to the internal noise level of this instrument, and switches On and Off the measurement dynamic range expansion function.

| | On: | Turns on the noise correction function. Every time the measurement parameter changes, measures the internal noise level of this instrument and reflects the noise correction value in the measured value. |

| | Off: | Turns off the noise correction function. |

Parameters Def/Man Switches the set mode of setting parameters for measurement.

| | Def: | Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define→Default** menu are automatically set. |

| | Man: | Starts measurement without changing the settings before measurement. |

Parameters Define→Default Stores the current setting parameters as the setting parameters for ACP measurement.

ACP Off Terminates the ACP measurement function.

Return Returns to the above layer menu.

Multi Carrier ACP Displays the Multi Carrier menu and performs multi carrier ACP measurement.

Auto Level Set Sets the reference level and ATT to the optimum value in accordance with the signal to be measured. When the key is pressed, Auto Level Set is executed.

MEMO: The modulation signal model which is used in Auto Level Set of Multi-Carrier ACP sets the input ATT to the optimum value assuming that three or four carriers of W-CDMA are input. When two carriers are input, the optimum value can be set by changing the ATT from -10 dB to -5 dB after executing Auto Level Set.

Ref/Offs Setup Displays the [Ref/Offs Setup] dialog box. In this dialog box, the offset frequency and bandwidth of the reference carrier of up to 10 carriers (Abs Meas1/2) and the frequency and bandwidth of up to 6 waves (Rel Meas) in the frequency domain to be measured by ACP measurement can be set. Set the Offset frequency from the center frequency set before measurement. The frequency to be measured by ACP measurement sets the Offset frequency from the reference carrier frequency. The center frequency (Carrier Freq), which is a reference in Multi-Carrier ACP, can be adjusted.

5.3.11 {POWER}
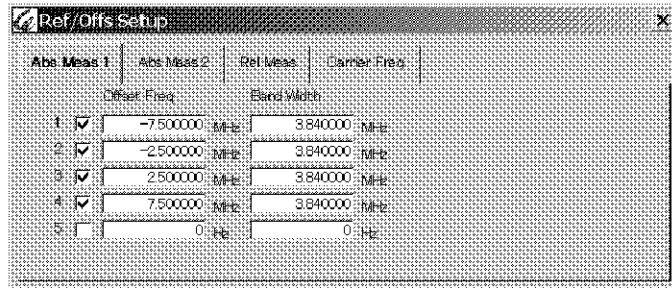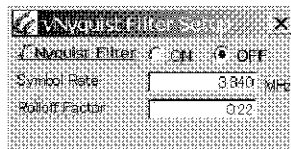
| √Nyquist Filter Setup | Displays the |√Nyquist Filter Setup| dialog box. |

| |√Nyquist Filter| | Switches On and Off the √Nyquist filter function. |
	ON: Activates the √Nyquist filter.
	OFF: Cancels the √Nyquist filter.
[Symbol Rate]	Sets the inverse number of the symbol rate (frequency).
[Rolloff Factor]	Sets the rolloff factor.
Average Times On/Off	Switches On and Off the averaging function.
	On: Sets the average number of times in the multi carrier ACP measurement and measures the average adjacent channel leakage power.
	Off: Cancels the averaging function.
Average Mode Cont/Rep	Switches the continuous calculation setting and the repeat calculation setting of the average mode.
	Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.
	Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning.
Noise Corr On/Off	Performs a correction equivalent to the internal noise level of this instrument, and switches On and Off the measurement dynamic range expansion function.
	On: Turns on the noise correction function. Every time the measurement parameter changes, measures the internal noise level of this instrument and reflects the noise correction value in the measured value.
	Off: Turns off the noise correction function.
Parameters Def/Man	Switches the set mode of setting parameters for measurement.

<table>
<tbody>
<tr><td></td><td>Def:</td><td>Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define→Default** menu are automatically set.</td></tr>
<tr><td></td><td>Man:</td><td>Starts measurement without changing the settings before measurement.</td></tr>
</tbody>
</table>

Parameters Define→Default   Stores the current setting parameters as the setting parameters for multi carrier ACP measurement.

Multi Carrier ACP Off   Terminates multi carrier ACP measurement.

Return   Returns to the above layer menu.

Spurious Emission   Displays the Spurious menu.Two screens are displayed. The upper screen displays the trace and the lower screen displays the spurious measurement result screen.

Table No 1/2/3   Switches setting sequence table number 1, 2, and 3 for spurious measurement.

1:   Sets the table number 1.

2:   Sets the table number 2.

3:   Sets the table number 3.

Edit Table   Displays the Edit Table menu.
The [Edit Table] dialog box for editing the setting sequence table of the selected numbers at the same time are displayed. You can set the start and stop frequency for spurious measurement frequency range and, RBW, VBW, sweep time, reference level, attenuator, preamp on/off, and judgment level value for measurement by these dialog box.

Table No 1/2/3   Switches setting sequence table number 1, 2,and 3 for spurious measurement.

1:   Sets the table number 1.

2:   Sets the table number 2.

3:   Sets the table number 3.

Insert	Inserts a vertical row as the spurious measurement condition setting area at the current cursor position. The data contained in the row that existed in the position before insertion is copied to each setting value as new row data.
Delete	Deletes a measurement condition area vertical row at the current cursor position.
Init	Initializes all data in the table currently being edited.
Return	Returns to the above layer menu.
Show Result	Displays the Show Result menu. The measurement result is displayed on the entire screen.
Previous Result	Displays the previous screen.
Next Result	Displays the next screen.
Return	Returns to the above layer menu.
Parameters Def/Man	Switches the set mode of setting parameters for measurement.

Def: Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define →Default** menu are automatically set.

Man: Starts measurement without changing the settings before measurement.

Parameters Define→Default	Stores the current setting parameters as the setting parameters for spurious measurement.
Spurious Emission Off	Returns to the single-screen display and terminates the spurious measurement function.
Return	Returns to the above layer menu.
Spectrum Emission Mask	Displays the Spectrum menu.
Auto Level Set	Sets the reference level and ATT to the optimum value in accordance with the signal to be measured. When the key is pressed, Auto Level Set is executed.

MEMO: *The modulation signal model, which is used in Auto Level Set of Spectrum Emission Mask, sets the input ATT to the optimum value assuming that one carrier of W-CDMA is input. The optimum value can be set by changing the ATT from 0dB to +5 dB for two carriers input and +10 dB for three or four carriers input after executing Auto Level Set.*

Ref Power Setup	Displays the Ref Power menu. This menu is used to set reference power calculation parameters.
Carrier Band Width	Activates setting of the power conversion bandwidth for carrier signals.

√Nyquist Filter Setup Displays the [√Nyquist Filter Setup] dialog box.

[√Nyquist Filter] Switches On and Off the √Nyquist filter function.

ON: Activates the √Nyquist filter.

OFF: Cancels the √Nyquist filter.

|Symbol Rate| Sets the inverse number of the symbol rate (frequency).

[Rolloff Factor] Sets the rolloff factor.

Ref Power Chan/Peak Switches calculation modes between the Channel mode and the Peak Power mode.

Chan: Calculates the carrier power according to the setting of **Ref Power Setup** and sets the calculated power value to the reference power for mask measurement.

Peak: Sets the Peak power value of the waveform to the reference power for mask measurement.

Return Returns to the above layer menu.

Offset Setup Displays the Offset Setup menu and |Offset Setup| dialog box for Offset data setting at the same time.
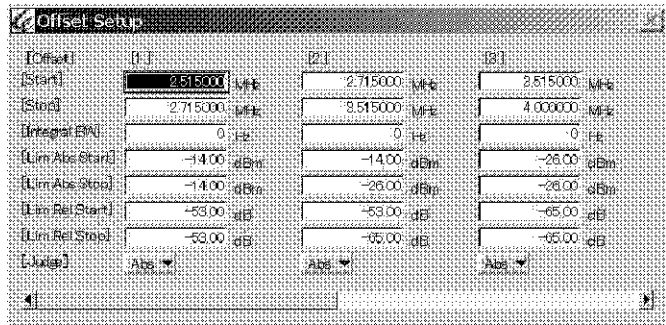
|Start| Enter the offset frequency from the center frequency for the start frequency in the emission mask judgment area.

|Stop| Enter the offset frequency from the center frequency for the stop frequency in the emission mask judgment area.

|Integral BW| Sets the power integral bandwidth at each frequency point.

[Limit Abs Start] Enter the mask value (absolute value) at the start frequency point.

[Limit Abs Stop] Enter the mask value (absolute value) at the stop frequency point. The mask value from the start frequency point to the stop frequency point is calculated by linear interpolation between the start value and stop value.

|Limit Rel Start| Enter the mask value (relative value) at the start frequency point. The mask value is used for comparison with the offset value from the measured reference power.

[Limit Rel Stop]	Enter the mask value (relative value) at the stop frequency point. The mask value from the start frequency point to the stop frequency point is calculated by linear interpolation between the start value and stop value.
[Judge]	Specifies how to make comparisons with the input mask values (absolute values and relative values) when judging the mask.

Abs:	Compares the mask values set as Limit Abs Start/Stop values with the waveform. The judgment is Pass when the waveform is equal to or under the mask values.
Rel:	Compares the mask values set as Limit Rel Start/Stop values with the waveform. The judgment is Pass when the waveform is equal to or under the mask values.
A&R:	Compares both the Limit Abs Start/Stop values and the Limit Rel Start/Stop values with the waveform. When the conditions of both are met, Pass is displayed.
A|R:	Compares both the Limit Abs Start/Stop values and the Limit Rel Start/Stop values with the waveform. When either one of the conditions is met, Pass is displayed.

Insert	Inserts the same value as the cursor position in the dialog box.
Delete	Deletes the row where the cursor is positioned in the dialog box.
Sort	Sorts the data input into the dialog box in the order of frequency.
Init	Deletes all data in the set dialog box.
Return	Closes the dialog box and returns to the above layer menu.
Average Times On/Off	Switches On and Off the averaging function.

On:	Sets the average number of times the spectrum emission mask measurement is performed and performs average measurement.
Off:	Cancels the averaging function.

Average Mode Cont/Rep	Switches the continuous calculation setting and the repeat calculation setting of the average mode.

Cont:	Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.
Rep:	Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the averaging count is reset to 1 and averaging is restarted from the beginning.

Parameters Def/Man	Switches the set mode of setting parameters for measurement.

Def:	Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define→Default** menu are automatically set.
Man:	Starts measurement without changing the settings before measurement.

Parameters Define->Default	Stores the current setting parameters as the setting parameters for spectrum emission mask measurement.
Spectrum Emission Mask Off	Terminates spectrum emission mask measurement.
Return	Returns to the above layer menu.
CCDF	Displays the CCDF menu. The screen is switched to the CCDF measurement screen.
CCDF RBW	Sets RBW. RBW can be set to 100 kHz to 20 MHz (1, 2, 3, and 5 sequence).

> *MEMO:* *When the wideband demodulator option is installed, the CCDF RBW can be set to 50 MHz.*
> *The analysis frequency range is from 200 MHz to 6 GHz and the built-in preamplifier can be used in the range from 200 MHz to 6 GHz.*

Meas Sample	Sets the number of measurement samples.
Trace Write On/Off	Switches the reference waveform display on and off.
	On: Displays the currently displayed waveform as the reference waveform.
	Off: Hides the reference waveform.
Gaussian On/Off	Switches the ideal Gaussian noise waveform display on and off.
	On: Displays the ideal Gaussian noise waveform.
	Off: Hides the ideal Gaussian noise waveform.
X Scale Max	Sets the horizontal axis maximum value of the waveform display.
CCDF Gate On/Off	Switches the gate function of the CCDF measurement on and off.
	On: Sets a threshold level and perform the CCDF measurement in the period where the input signal is higher than the specified threshold level.
	Off: Sets the gate function of the CCDF measurement to off.
CCDF Off	Quits the CCDF measurement.
Return	Returns to the previous menu.
Measurement Off	Sets the measurement function to Off.
More 2/2	Displays the Power menu (2/2).
Multi Average Power	Displays the Multi-Average Power menu. Displays the average power measured from each displayed window.
Window Setup	Displays the Window Setup menu.
Window No. [1]	Specifies a window number. The initial value is [1].
Window ON	Displays the window of the specified number.
Window OFF	Closes the window of the specified number.

5.3.11 {POWER}

Active Window [1]	Activates the window of the specified number. The initial value is [1].
Window Position	Activates the settings of the position of the active window.
Window Width	Activates the settings of the width of the active window.
Couple to Power	Displays the window coupled to the average power (Trace).
	On: Couples the window to the average power.
	Off: Does not couple the window to the average power.
Window Reset	Closes all windows except for window 1. Window 1 is displayed at the far left. At this time the window width is automatically set to one tenth of the sweep time.
Return	Returns to the previous menu.
Power Ratio On/Off	Switches On and Off the Power Ratio measurement.
	On: Calculates the level difference between the average power in the active window and the average powers in other displayed windows and displays the result.
	Off: Cancels the Power Ratio measurement.
Average Times On/Off	Switches On and Off the averaging function.
	On: Sets the number of times averaging is performed and measures the average power in the window.
	Off: Cancels the averaging function.
Average Mode Cont/Rep	Switches the averaging mode between the continuous calculation mode and the repeat calculation mode.
	Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used for calculation after the averaging count is reached.
	Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the averaging count is reached, the current averaging count is reset to 1 and the averaging process is repeated from the beginning.
Parameters Def/Man	Switches the set mode of setting parameters for measurement.
	Def: Starts the measurement in the mode in which setting parameters saved in the **Parameters Define→Default** menu were automatically set.
	Man: Starts the measurement by using the previously-set parameters.
Parameters Define→Default	Stores the currently-set parameters as measurement parameters.
Multi Average Power Off	Quits the Multi-Average Power measurement.
Return	Returns to the previous menu.
Measurement Off	Sets the measurement function to Off.
More 1/2	Displays the Power menu (1/2).

5.3.12　{MEAS}

When you touch the {MEAS} button, the menu concerning general measurement is displayed.
The following shows the menu map:

{MEAS}

- Counter ─────────────────────────────────────→ Average Times On/Off
- Noise/Hz ──────────────────────────→ Noise/X Hz
- X dB Down ──────────→ X dB Down Level
- %AM Meas On/Off ──── X dB Down → dBm/Hz
- X dB Left → dBμV/√Hz
- Harmonics ──── X dB Right → dBc/Hz
- IM Meas ──── Peak X dB Down
- Disp Mode REL/A,I,/A,R → Fixed Mkr Peak
- Measurement Off → Cont Down On/Off → Counter Off
- Noise/Hz Off → Return
- Reference Marker On/Off → Return
- Return

- FUND Frequency On/Off
- Harmonics Number
- Harmonics Off
- Return

- Order
- Limit Setup
- Pass/Fail Judgement On/Off
- Parameters Def/Man
- Parameters Define→Default
- IM Meas Off
- Return

5.3.12 {MEAS}

Counter	Displays the Counter menu and turns on the frequency counter function.
Average Times On/Off	Switches On and Off the averaging function.
	On: Sets the average number of times the counter is processed.
	Off: Cancels the averaging function.
Counter Off	Turns off the frequency counter function.
Return	Returns to the above layer menu.
Noise/Hz	Displays the Noise/Hz menu and starts Noise/Hz measurement.
Noise/X Hz	Activates setting of the noise measurement bandwidth. The initial value is [1Hz].
dBm/Hz	Sets the vertical axis unit to dBm and the marker unit to dBm/Hz. As the detector mode, Average is automatically selected.
dBμV/√Hz	Sets the vertical axis unit to dBμV and the marker unit to dBμV/√Hz. As the detector mode, Average is automatically selected.
dBc/Hz	Sets the delta marker unit to dBc/Hz. The marker fixing function is set to ON. As the detector mode, Average is automatically selected.
Fixed Marker Peak	Moves a delta marker to the maximum peak of the trace currently being displayed and fixes it to that position.
Noise/Hz Off	Terminates the noise measurement function.
Return	Returns to the above layer menu.
X dB Down	Displays the X dB Down menu.
X dB Down Level	X dB Down Level:Activates the lower level setting.
X dB Down	Based on the Mode setting, displays a normal marker and a delta marker in the position lower than the current position by X dB.
X dB Left	Displays a normal marker in the position lower than the current position on the left by X dB.
X dB Right	Displays a normal marker in the position lower than the current position on the right by X dB.
Peak X dB Down	Searches the maximum peak in the targeted search range, and displays a normal marker and a delta marker in the position lower than the current position by X dB.
Disp Mode REL/A.L/A.R	Sets the marker data display method.
	REL: Displays a normal marker on the right and a delta marker on the left.
	A.L: Displays the marker on the left in absolute value.
	A.R: Displays the marker on the right in absolute value.

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5.3.12 {MEAS}

Cont Down On/Off	Switches On and Off the continuous X dB down function.
	On: Performs Peak X dB down repeatedly each time a sweep is performed.
	Off: Cancels the continuous X dB down function.
Reference Marker On/Off	Switches On and Off the reference marker function.
	On: Displays a reference marker in the reference position of X dB Down.
	Off: Deletes the reference marker.
Return	Returns to the above layer menu.
%AM Meas On/Off	Obtains the AM modulation factor using the peak search and displays the result of operation in percentage terms.
	On: Performs AM modulation measurement.
	Off: Terminates AM modulation measurement.
Harmonics	Displays the Harmonics menu. Two screens are displayed. The upper screen displays the trace and the lower screen displays the harmonic measurement data.
FUND Frequency On/Off	Switches On and Off the frequency setting function of the fundamental wave.
	On: Activates setting of the fundamental frequency.
	Off: Sets the current center frequency to the fundamental frequency.
Harmonics Number	Activates setting of the harmonic order to be measured.
Harmonics Off	Terminates the harmonic measurement function and displays the full screen.
Return	Returns to the above layer menu.
IM Meas	Displays the IM Meas menu. Two screens are displayed. The upper screen displays the trace and the lower screen displays the intermodulation distortion measurement data.
Order	Sets the measurement order. The allowed orders are 3, 5, 7, and 9.
Limit Setup	Displays the **[Limit Setup]** dialog box.
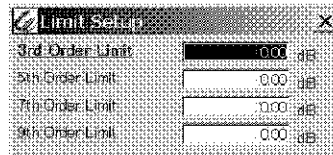
[3rd Order Limit]	Sets the limit value of the 3rd order distortion signal.
[5th Order Limit]	Sets the limit value of the 5th order distortion signal.
[7th Order Limit]	Sets the limit value of the 7th order distortion signal.
[9th Order Limit]	Sets the limit value of the 9th order distortion signal.

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5.3.12 {MEAS}

Pass/Fail Judgement On/Off   Switches On and Off Pass/Fail judgment performed by comparison with the limit value set in the |Limit Setup| dialog box.

On: Performs Pass/Fail judgment. If the measurement result is larger than the set limit value, a Fail judgment is made.

Off: Pass/Fail judgment is not performed.

Parameters Def/Man   Switches the set mode of setting parameters for measurement.

Def: Starts measurement in the auto setting mode. The setting parameters stored by the **Parameters Define→Default** menu are automatically set.

Man: Starts measurement without changing the settings before measurement.

Parameters Define→Default   Stores the current setting parameters as the setting parameters for intermodulation distortion measurement.

IM Meas Off   Terminates the intermodulation distortion measurement function.

Return   Returns to the above layer menu.

Measurement Off   Sets the measurement function to Off.

5.3.13   {PASS/FAIL}

When you touch the {PASS/FAIL} button, the menu concerning Pass/Fail is displayed.
The following shows the menu map:

{PASS/FAIL}

Limit Line Setup	Line 1/2
Judgement On/Off	Insert Line
Limit Line 1 On/Off	Delete Line
Limit Line 2 On/Off	Sort
	Table Init
Limit Line Auto Adj	Copy Table 1 to 2
Edit Limit Line	Copy Table 2 to 1
	Return
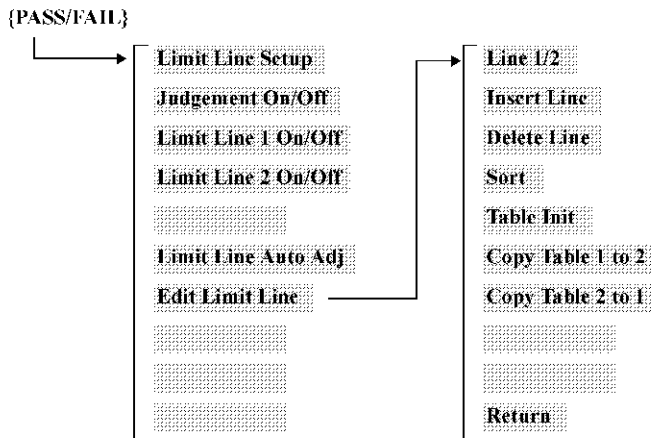
Limit Line Setup

Displays the |Limit Line Setup| dialog box used for setting judgment conditions using limit lines.
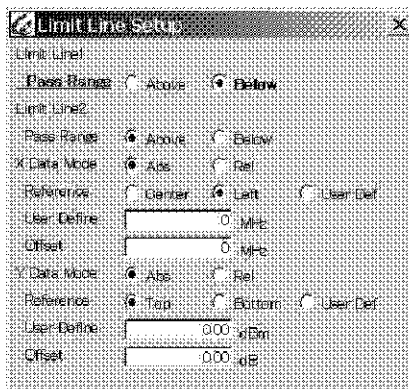
[Limit Line 1]

    [Pass Range]   Sets the judgment condition by limit line 1

        Above: Sets the range above limit line 1 as the range satisfying the Pass condition.

        Below: Sets the range below limit line 1 as the range satisfying the Pass condition.

|Limit Line 2|

    [Pass Range]   Sets the judgment condition by limit line 2

        Above: Sets the range above limit line 2 as the range satisfying the Pass condition.

        Below: Sets the range below limit line 2 as the range satisfying the Pass condition.

5.3.13 {PASS/FAIL}

[X Data Mode]	Sets the attributes of the horizontal axis (frequency or time) data of the limit line.

Abs: Sets the horizontal axis position based on the limit line set by **Limit Line Edit** as the absolute value. The position of the horizontal axis of the limit line moves according to the change in the frequency span and center frequency setting.

Rel: Sets the horizontal axis position based on the limit line set by **Limit Line Edit** as the relative value. The position of the horizontal axis of the limit line is fixed to the position defined by Reference, and is not affected by change in the frequency span or center frequency.

[Reference]	Displays the reference position.

Center: Sets the center point of the horizontal axis as the reference position.

Left: Sets the left-most point of the horizontal axis as the reference position.

User Def: Sets the reference position by User Define.

|User Define|	Sets the absolute frequency to be the reference position when **[User Def]** is selected for reference position setting.
|Offset|	Sets the offset frequency from the reference position.
[Y Data Mode]	Sets the attributes of the vertical axis (level) data of the limit line.

Abs: Sets the vertical axis position based on the limit line set by **Limit Line Edit** as the absolute value. The position of the vertical axis of the limit line moves according to the change in the level setting.

Rel: Sets the vertical axis position based on the limit line set by **Limit Line Edit** as the relative value. The position of the vertical axis of the limit line is fixed to the position defined by Reference, and is not affected by the change in the level setting.

[Reference]	Displays the reference position.

Top: Sets the top of the horizontal axis as the reference position.

Bottom: Sets the bottom of the horizontal axis as the reference position.

User Def: Sets the reference position by User Define.

|User Define|	Sets the absolute level to be the reference position when **|User Def|** is selected for reference position setting.
|Offset|	Sets the offset along the vertical axis direction against the limit line.

Judgement On/Off

Switches On and Off Pass/Fail judgment performed by comparison with limit lines 1 and 2.

On: Performs Pass/Fail judgment. If the value does not satisfy the condition set by the Limit Line Setup dialog, a Fail judgment is made.

Off: Pass/Fail judgment is not performed.

Limit Line 1 On/Off

Switches On and Off limit line 1.

On: Displays limit line 1.

Off: Deletes limit line 1.

Limit Line 2 On/Off

Switches On and Off limit line 2.

On: Displays limit line 2.

Off: Deletes limit line 2.

MEMO: A limit line is not displayed unless the data of at least two points for a limit line is entered with the [Limit Line] dialog box.

Limit Line Auto Adj

Searches the peak point of the waveform and sets the level value of the peak point to the **[User Define]** value in **[Y Data Mode]**. Moves the limit line according to the reference position. This function is available only when Y Data Mode is set to Rel.

Edit Limit Line

Displays the Edit menu and the **[Limit Line]** dialog box.
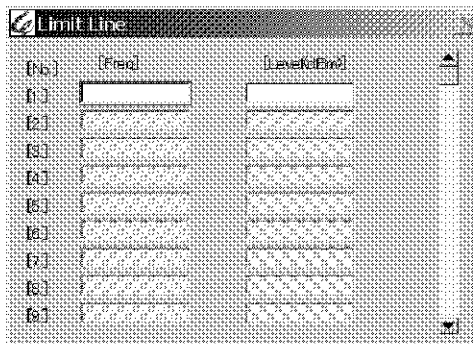
Line 1/2

Switches limit lines to be displayed in **[Limit Line]**.

Insert Line

Inserts the same value as the cursor position in the dialog box.

Delete Line

Deletes the line where the cursor is positioned in the dialog box.

Sort

Sorts the data input into the dialog box in the order of frequency.

Table Init

Deletes all data in the limit line setting dialog box.

Copy Table 1 to 2

Copies the data created for limit line 1 to limit line 2.

Copy Table 2 to 1

Copies the data created for limit line 2 to limit line 1.

Return

Closes the **[Limit Line]** dialog box, and returns to the above layer menu.

5.3.14 {DISPLAY}

When you touch the {DISPLAY} button, the Disp menu, which enables setting of the measuring window display, etc., is displayed.
The following shows the menu map:

{DISPLAY}

```
Display Line On/Off
Reference Line On/Off
XY Cursor ─────────────┐        Window On/Off
Meas Window ───────────┤        Window Position       XY Cursor On/Off
Zoom ──────────┐       │        Window Width          X Cursor Position
F/T ───────────┤       │                              Y Cursor Position
Split          │       │                              Set Anchor
Screen Reset   │       │                              Remove Anchor
More 2/2 ──┐   │       │        Window Sweep On/Off
           │   │       │                              Return
           │   │       │        Return
           │   │
           │   │                                      Zoom Position
           │   └──────────────> Zoom Position         Zoom Width
           └──> Annotations Setup
                                                       Screen Reset
                                Screen Reset           Return
                More 1/2        Return
```
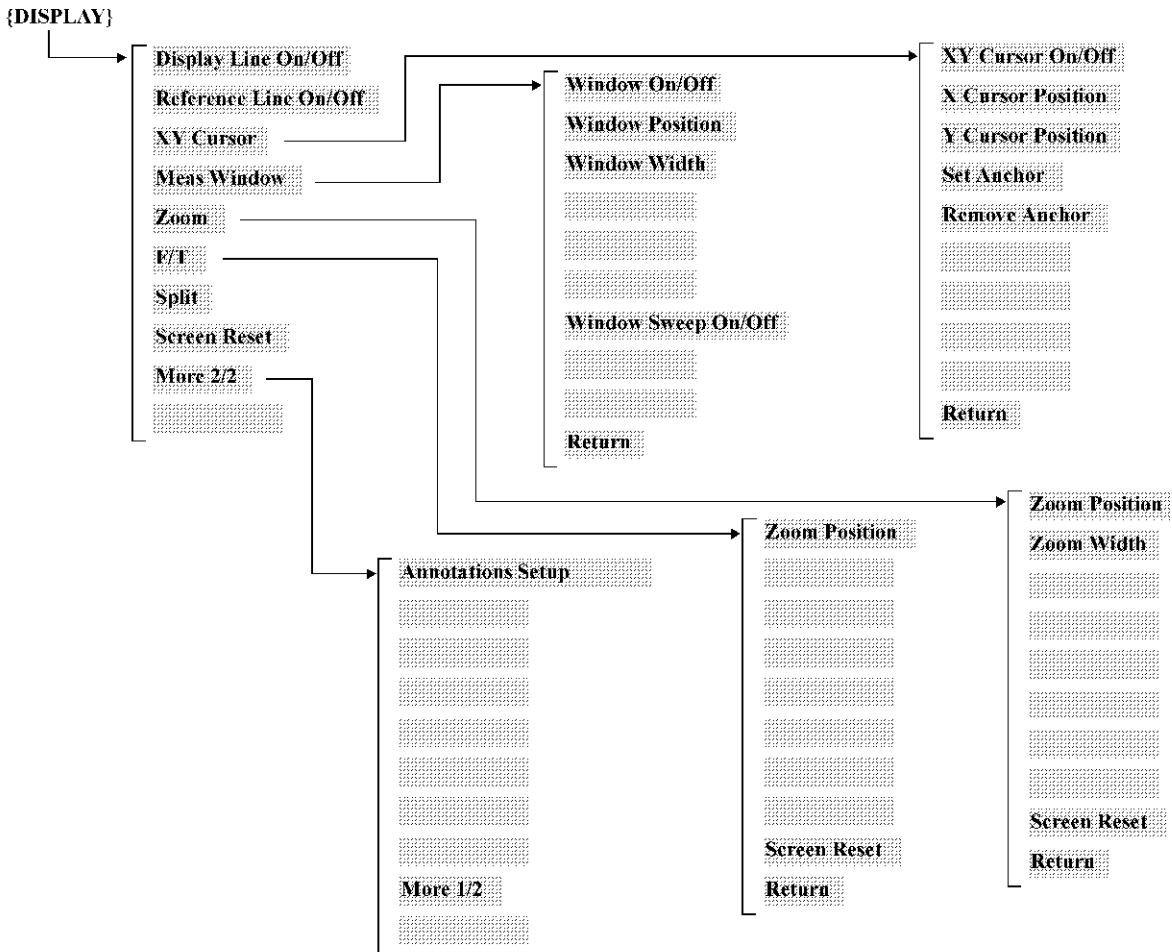
Display Line On/Off	Switches On and Off the display of the display line used as the reference line for trace level comparison.
	On: Activates the display line.
	Off: Deletes the display line.
Reference Line On/Off	Switches On and Off the display of the reference line, which will be the reference for the relative display of the level data.
	On: Displays the reference line. The reference line position can be changed here.
	Off: Deletes the reference line.
XY Cursor	Displays the XY Cursor menu.

XY Cursor On/Off	Switches On and Off the XY cursor function.
	On: Displays the XY cursors.
	Off: Deletes the XY cursors.
X Cursor Position	Activates the X cursor.
Y Cursor Position	Activates the Y cursor.
Set Anchor	Displays an anchor at the intersection point of the XY cursors. The display values of the XY cursors are the relative values between the anchor and the intersection point of the XY cursors.
Remove Anchor	Deletes the anchor.
Return	Returns to the above layer menu.
Meas Window	Displays the Meas Window menu.
Window On/Off	Switches On and Off the measuring window display.
	On: Displays the measuring window in the screen.
	Off: Closes the measuring window.
Window Position	Activates setting of the position of the measuring window.
Window Width	Activates setting of the width of the measuring window.
Window Sweep On/Off	Switches the window sweep function on and off.
	On: Performs the sweep within the range specified in the measuring window.
	Off: Performs the sweeps in entire range of the span.

MEMO: When the window sweep is on, the minimum width of the measuring window is frequency span/500. If the measuring window is not completely inside the measurement screen when the window sweep is on, the sweep is performed in the entire range of the span.

Return	Returns to the above layer menu.
Zoom	Displays the Zoom menu and displays two screens. The upper screen displays a waveform before zoom. The lower screen displays a zoomed waveform. The horizontal axis represents frequency (or time) both in the upper and lower screens.
Zoom Position	Activates setting of the center position to be zoomed.
Zoom Width	Activates setting of the zoom width.
Screen Reset	Displays only the upper screen and returns to the Disp menu.
Return	Returns to the above layer menu.
F/T	Displays the Zoom menu and displays two screens. The upper screen displays a waveform before zoom. The horizontal axis in the upper screen represents frequency, and the lower screen represents the time (zero span) in the zoomed position.

Zoom Position	Activates setting of the center position to be zoomed.
Screen Reset	Displays only the upper screen and returns to the Disp menu.
Return	Returns to the above layer menu.
Split	Sets the split-screen condition to display two screens (upper and lower). The two screens can be set individually.
Screen Reset	Returns to single-screen display (only the upper screen) from two-screen display.
More 2/2	Displays the Display menu (2/2).
Annotations Setup	Displays the [**Annotations Setup**] dialog box used to set on or off the annotation display that indicates the position and width of the measuring window.
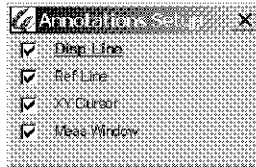
[Disp Line]	By checking the check box, the level position of Display Line when it is turned on is displayed. Deletes the display by unchecking the check box.
[Ref Line]	By checking the check box, the level position of Reference Line when it is turned on is displayed. Deletes the display by unchecking the check box.
[XY Cursor]	By checking the check box, the position of XY Cursor when it is turned on is displayed. Deletes the display by unchecking the check box.
|Meas Window|	By checking the check box, the position and width of the measuring window when it is turned on is displayed. Deletes the display by unchecking the check box.
More 1/2	Displays the Disp menu (1/2).

5.3.15 {MENU1>>}

When you touch {**MENU1>>**}, {**MENU2>>**} is displayed.

5.4 Tool Menu

This section describes the tool menu.
Functions of the tool menu are activated by touch screen operation.
The tool menu has the following functions:

Moves the active screen when multiple screens are displayed. After touching this menu, if you touch the area of the screen you want to activate, that screen is activated.

This menu is used to display a special window for touch screen operation. After touching this menu, you can display a window by simply touching the waveform screen. After touching this menu, if you specify two points (the two points specifying the window width) in the waveform screen area, the window is displayed at the specified position. Up to 10 windows can be displayed at one time.
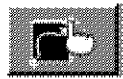
The window for touch screen operation is displayed by simply touching the waveform screen. After touching this menu, if you specify two points on opposing corners (the two points specifying the window width and height) in the waveform screen area, the measuring window is displayed at the specified position. Up to 10 windows can be displayed at one time.

Executes the peak search function in the active screen. When the window for touch screen operation is displayed, a marker is located on the maximum value of the waveform in the window. When the window is not displayed, a marker is located on the maximum value of the whole screen. This function is executed when this menu is pressed.

Executes the multimarker peak search function in the active window (surrounded by the thickest line) in the window for touch screen operation displayed on the active screen. The screen is zoomed out automatically and the multimarker list is displayed. This function is executed when this menu is pressed.
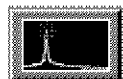
Turns off all marker displays and marker lists. This function is executed when this menu is pressed.
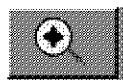
Executes the Zoom In function used to set the reference level and the frequency span or time on the active screen according to the area information specified in the window for touch screen operation. When the window for touch screen operation is not displayed and this menu is touched, the current frequency span centered on the center frequency decreases by 50%. This function is executed when this menu is touched.
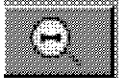
Executes the Zoom Out function to decrease the frequency span currently set to be within the touch screen window being displayed. When the window for touch screen operation is not displayed and this menu is touched, the current frequency span centered on the center frequency expands by 50%. This function is executed when this menu is touched.
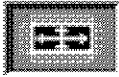
The reference level and center frequency are set by simply touching the upper, lower, left, or right part of the waveform screen area. After touching this menu, if you touch the upper or lower part of the waveform screen area, the set reference level value goes up or down according to the touched position. If you touch the left or right part, the set center frequency value goes up or down. The change in the setting varies depending on the setting condition at the time. However, it is equivalent to the change made to the value to be set at the time using the step key.

This function reacts only when the circled parts of the waveform drawing screen shown below are touched.
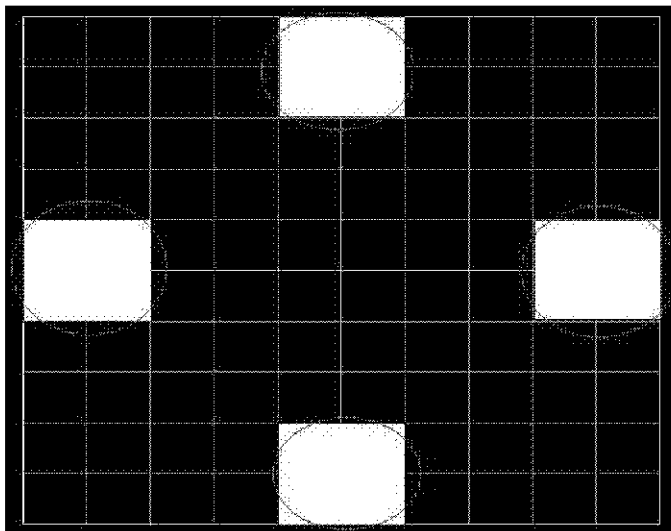
Figure 5-1　Function Active Area

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:
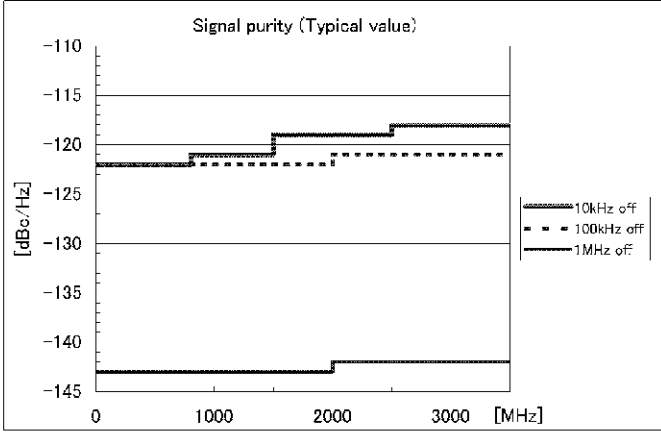
Specifications (spec.):   Indicate the performance guaranteed by the product. The specifications are determined in consideration of possible irregularities of quality among individual products, inaccurate measurements at the time of calibration, and performance changes due to environmental factors.

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   R3681 Performance Specifications

6.1.1   Frequency

Item	Specifications
Frequency range Spectrum analysis mode	20 Hz to 32 GHz
	<table><tr><td>Frequency band</td><td>Frequency band</td><td>Harmonic Mixing mode (N)</td></tr><tr><td>20 Hz to 3.5 GHz</td><td>0</td><td>1-</td></tr><tr><td>3.4 GHz to 7.5 GHz</td><td>1</td><td>1-</td></tr><tr><td>7.4 GHz to 15.4 GHz</td><td>2</td><td>2-</td></tr><tr><td>15.2 GHz to 32.0 GHz</td><td>3</td><td>4-</td></tr><tr><td colspan="3">Bands 1 to 3 use a built-in YIG tuning pre-selector.</td></tr></table>
Modulation analysis mode (When modulation analysis option is set)	20 MHz to 6 GHz
	<table><tr><td>Frequency band</td><td>Frequency band</td><td>Harmonic Mixing mode (N)</td></tr><tr><td>20 MHz to 3.5 GHz</td><td>0</td><td>1-</td></tr><tr><td>3.5 GHz to 6 GHz</td><td>1M</td><td>1-</td></tr><tr><td colspan="3">Band 1M bypasses the built-in YIG tuning pre-selector.</td></tr></table>
Built-in pre-amplifier (Band 0 only)	100 kHz to 3.5 GHz Gain 20 dB (typical value)
Input coupling	DC

Internal frequency reference stability
   Aging rate
   Temperature stability
 	
   Warm-up time (nominal value)
   Reference frequency error
	$\pm 5 \times 10^{-8}$/ day, $\pm 5 \times 10^{-7}$/ year
	$\pm 1 \times 10^{-7}$ (Frequency at 25°C is used as the reference in the range of 5 to 40°C)
	$\pm 5 \times 10^{-7}$/minute
	$\pm$ (Time elapsed from the latest factory calibration $\times$ aging rate + temperature stability)

Marker frequency counter
   Accuracy
   Resolution
	(S/N > 50 dB)
	$\pm$ (Marker frequency $\times$ Frequency reference error + Residual FM)
	0.01 Hz

Frequency reading accuracy	(Resolution bandwidth 1 Hz to 3 MHz) $\pm$ (Frequency reading $\times$ Frequency reference error + span $\times$ span accuracy + resolution bandwidth $\times$ 0.1 + residual FM)
Frequency stability Residual FM	(When internal reference frequency source is used) $\leq$ (3 Hz $\times$ N p-p)/100 ms

Frequency span
   Range
   Accuracy
	20 Hz to 32 GHz, 0 Hz (Zero span)
	$\pm$ 1% (200 Hz $\leq$ Span)
	$\pm$ 1 $\times$ N% (20 Hz $\leq$ Span < 200 Hz)

Item	Specifications
Signal purity (When internal reference frequency source is used)	At 800 MHz input | Offset	20°C to 30°C	5°C to 40°C
---	---	---
100 Hz	< -87 dBc/Hz	< -85 dBc/Hz
1 kHz	< -110 dBc/Hz	< -108 dBc/Hz
10 kHz	< -120 dBc/Hz	< -118 dBc/Hz
10 kHz (Typical value)	< -122 dBc/Hz	
100 kHz	< -120 dBc/Hz	< -120 dBc/Hz
100 kHz (Typical value)	< -123 dBc/Hz	
1 MHz	< -140 dBc/Hz	< -140 dBc/Hz
1 MHz (Typical value)	< -143 dBc/Hz	
10 MHz (Nominal value)	< -155 dBc/Hz	< -153 dBc/Hz	

At 800 MHz input

Offset	20°C to 30°C	5°C to 40°C
100 Hz	< -87 dBc/Hz	< -85 dBc/Hz
1 kHz	< -110 dBc/Hz	< -108 dBc/Hz
10 kHz	< -120 dBc/Hz	< -118 dBc/Hz
10 kHz (Typical value)	< -122 dBc/Hz	
100 kHz	< -120 dBc/Hz	< -120 dBc/Hz
100 kHz (Typical value)	< -123 dBc/Hz	
1 MHz	< -140 dBc/Hz	< -140 dBc/Hz
1 MHz (Typical value)	< -143 dBc/Hz	
10 MHz (Nominal value)	< -155 dBc/Hz	< -153 dBc/Hz

Signal purity (Typical value)

Item	Specifications

Resolution bandwidth (RBW)
  Range
  Accuracy
 	
  Selectivity (60 dB/ 3 dB)
	1 Hz to 10 MHz (1, 2, 3, 5 sequence)
	±3% : Resolution bandwidth 1 Hz to 500 kHz
	±7% : Resolution bandwidth 1 MHz to 3 MHz
	±12% : Resolution bandwidth 5 MHz
	±20% : Resolution bandwidth 10 MHz
	< 6:1 (5:1, typ.)

Video bandwidth (VBW) Range	1 Hz to 10 MHz (1, 2, 3, 5 sequence)

6.1.2　　Sweep

Item	Specifications
Sweep 　Sweep time setting range 　　Zero span 　　Span> 0 Hz 　Sweep time accuracy	 1 μs to 6000 s 10 ms to 2000 s ±2%
Sweep mode	Continuous, Single
Trigger function 　Trigger source 　Trigger delay setting range 　　Resolution	 Free Run, Video, IF, Line External 1 (TTL level), External 2 (0 to 5 V, resolution: 20 mV) 100 ns to 1 s 100 ns
Gated sweep 　Gate delay 　　Resolution 　Gate width 　　Resolution 　Trigger source	 0 s to 1 s 100 ns 50 μs to 1 s 100 ns Free Run, IF, External 1, External 2, Link

6.1.3　　Amplitude

Item	Specifications
Amplitude measurement range 　Preamplifier off 　Preamplifier on	 +30 dBm to displayed average noise level +20 dBm to displayed average noise level (band 0 only)
Maximum safe input level 　Average continuous power 　　Preamplifier off 　　Preamplifier on 　DC voltage	 +30 dBm (when input attenuator ≥ 10 dB) +13 dBm (when input attenuator ≥ 10 dB) 0 V (Do not apply DC power to signals.)
Input attenuator range	0 to 75 dB, 5 dB steps
Screen display range 　Log scale 　Linear scale	10 div. fixed 0.1 dB to 1 dB/div., 0.1 dB steps 1 dB to 20 dB/div., 1 dB steps 10%/div. of the reference level
Scale unit	dBm, dBmV, dBμV, dBμVemf, dBpW, W, V

Item	Specifications

Reference level set range
  Preamplifier off
    Log scale
    Linear scale
  Preamplifier on
    Log scale
    Linear scale
	
	-170 dBm to +60 dBm, 0.01 dB steps
	707.1 pV to 223.6 V, approx. 1% steps
	
	-170 dBm to +30 dBm, 0.01 dB steps
	707.1 pV to 7.071 V, approx. 1% steps

Trace	A maximum of 4
Detector mode	Normal, Positive Peak, Negative Peak, Sample, RMS, Video Average, Voltage Average

6.1.4   Amplitude Accuracy

Item	Specifications

Calibration signal accuracy (50 MHz)
  Amplitude
  Accuracy
	
	-10 dBm
	± 0.2 dB (20°C to 30°C), ±0.3 dB (0°C to 40°C)

Frequency response
  Spectrum analysis mode
    Preamplifier off
 	
    Preamplifier on
	(After autocalibration, reference frequency 50 MHz, input attenuator 10 dB, after pre-selector peak adjustment)
	
	(see tables below)

Frequency	Operating temperature range		Intraband flatness
	20°C to 30°C	5°C to 40°C	
50 MHz to 2.5 GHz	< ±0.4 dB	< ±0.9 dB	-
20 Hz to 3.5 GHz	< ±1.0 dB	< ±1.5 dB	-
3.5 GHz to 7.5 GHz	< ±1.5 dB	< ±3.5 dB	< ±1.5 dB
7.5 GHz to 15.4 GHz	< ±2.0 dB	< ±4.0 dB	< ±2.0 dB
15.4 GHz to 32.0 GHz	< ±2.5 dB	< ±4.5 dB	< ±2.5 dB

Frequency	Operating temperature range	
	20°C to 30°C	5°C to 40°C
50 MHz to 2.5 GHz	< ±1.0 dB	< ±1.5 dB
100 kHz to 3.5 GHz	< ±2.0 dB	< ±2.5 dB

6.1.4 Amplitude Accuracy

Item	Specifications
Input attenuator switching error	(Attenuator: 10 dB reference) | Frequency range	Switching error
20 Hz to 8 GHz	< ±1.0 dB (5 dB to 50 dB) < ±1.4 dB (55 dB to 75 dB)
8 GHz to 12 GHz	< ± 1.3 dB (5 dB to 50 dB) < ±1.9 dB (55 dB to 75 dB)
12 GHz to 20 GHz	< ±1.4 dB (5 dB to 50 dB) < ±2.1 dB (55 dB to 75 dB)
20 GHz to 26.5 GHz	< ±1.8 dB (5 dB to 50 dB) < ±2.7 dB (55 dB to 75 dB)
26.5 GHz to 32 GHz	< ± 2.1 dB (5 dB to 50 dB) < ± 3.8 dB (55 dB to 65 dB)	
Scale display error	(Mixer level: -20 dBm reference, mixer level -10 dBm to -50 dBm, temperature range 20°C to 30°C) < ±0.13 dB
Resolution bandwidth switching uncertainty	(Resolution bandwidth: 100 kHz reference, after autocalibration, 10 dB/div. or less) < ±0.05 dB (1 Hz to 3 MHz) < ±0.3 dB (5 MHz to 10 MHz)
Coupling level accuracy	(After autocalibration, signal level -10 dBm to -50 dBm, pream- plifier off, input attenuator 10 dB, RBW 100 kHz, temperature range 20°C to 30°C) < ± (0.2 dB + frequency response + scale display error)

6.1.5   Dynamic Range

Item	Specifications
Displayed average noise level	(Input is terminated, input attenuator: 0 dB, RBW1 Hz, VBW1 Hz, detector: Sample, average more than 20 times, average type: Video, temperature range 20°C to 30°C. Add 2 dB in the temperature range 5°C to 40°C.)

Spectrum analysis mode
  Preamplifier off

Frequency	Specification	Typical value
100 Hz	< -96 dBm	-115 dBm
1 kHz	< -119 dBm	-130 dBm
10 kHz	< -129 dBm	-140 dBm
100 kHz	< -130 dBm	-143 dBm
1 MHz	< -140 dBm	-150 dBm
10 MHz to 1 GHz	< -156 dBm	-158 dBm
1 GHz to 2 GHz	< -154 dBm	-156 dBm
2 GHz to 2.5 GHz	< -152 dBm	-154 dBm
2.5 GHz to 3 GHz	< -150 dBm	-152 dBm
3 GHz to 3.5 GHz	< -148 dBm	-150 dBm
3.5 GHz to 7.5 GHz	< -146 dBm	-149 dBm
7.5 GHz to 15.4 GHz	< -146 dBm	-149 dBm
15.4 GHz to 26.5 GHz	< -141 dBm	-144 dBm
26.5 GHz to 32 GHz	< -140 dBm	-143 dBm

  Preamplifier on

Frequency	Specification	Typical value
100 kHz	< -136 dBm	155 dBm
1 MHz	< -146 dBm	-160 dBm
10 MHz to 1 GHz	< -162 dBm	-168 dBm
1 GHz to 2.5 GHz	< -160 dBm	-166 dBm
2.5 GHz to 3 GHz	< -158 dBm	-164 dBm
3 GHz to 3.5 GHz	< -156 dBm	-162 dBm

Item	Specifications
1 dB gain compression	(Separation: RBW × 15, 50 kHz min.)

Input frequency	Specification	Typical value
10 MHz to 200 MHz	> +2 dBm	+5 dBm
200 MHz to 3.5 GHz	> +7 dBm	+10 dBm
3.5 GHz to 7.5 GHz	> -5 dBm	-2 dBm
7.5 GHz to 32 GHz	> -3 dBm	+0 dBm

6.1.5 Dynamic Range

Item	Specifications
2nd order harmonic distortion	

Input frequency	Specification	Mixer level
10 MHz to 1.75 GHz	< -60 dBc	-20 dBm
> 1.75 GHz	< -90 dBc	-10 dBm

Item	Specifications
3rd order intermodulation distortion (TOI)	(Mixer level: -20 dBm, separation: 25 kHz)

Input frequency	Specification	Typical value
10 MHz to 200 MHz	> +12 dBm	+16 dBm
200 MHz to 500 MHz	> +16 dBm	+20 dBm
500 MHz to 1 GHz	> +20 dBm	+24 dBm
1 GHz to 2 GHz	> +21 dBm	+25 dBm
2 GHz to 3.5 GHz	> +22 dBm	+26 dBm
3.5 GHz to 7.5 GHz	> +5 dBm	+10 dBm
7.5 GHz to 32 GHz	> +8 dBm	+12 dBm

Item	Specifications
Image/multiple/out-band spurious	(Spectrum analysis mode)

Frequency	Specification
10 MHz to 15.4 GHz	< -70 dBc
15.4 GHz to 26.5 GHz	< -65 dBc
26.5 GHz to 32.0 GHz	< -60 dBc

Item	Specifications
Residual spurious	(Spectrum analysis mode, no input, input terminated, input attenuator: 0 dB)

	Frequency	Specification
Preamplifier on	1 MHz to 3.5 GHz	< -95 dBm
Preamplifier off	1 MHz to 3.5 GHz	< -90 dBm
	3.5 GHz to 32.0 GHz	< - 90 dBm

6.1.6　　　Input and Output

Item	Specifications
RF input 　Connector 　Impedance 　VSWR	 K type (m), front panel 50 Ω(nominal value) Input attenuator ≥ 10 dB, at the set frequency <1.5:1 (<3.5 GHz) (nominal value) <2.0:1 (>3.5 GHz) (nominal value)
Calibration signal output 　Connector 　Impedance 　Frequency	 BNC (f), front panel 50 Ω (nominal value) 50 MHz
Probe power source 　Connector 　Output voltage	 4-pin connector, front panel ± 15 V, 150 mA (nominal value)
1st LO output 　Connector	When external mixer option is used SMA (f), front panel
421.4 MHz IF input 　Connector	When external mixer option is used SMA (f), front panel
I/Q input 　Connector 　Impedance 　Maximum input amplitude	 BNC (f), front panel 50 Ω (nominal value), AC/DC coupled 1.0 Vp-p (DC component ±0.5V)
External trigger input 1 　Connector 　Impedance 　Trigger level	 BNC (f), rear panel 10 kΩ (nominal value), DC coupled TTL level
External trigger input 2 　Connector 　Impedance 　Trigger level	 BNC (f), rear panel 10 kΩ (nominal value), DC coupled 0 V to 5 V
Trigger output 　Connector 　Amplitude	 BNC (f), rear panel TTL level
Frequency reference input 　Connector 　Impedance 　Frequency 　Amplitude	 BNC (f), rear panel 50 Ω (nominal value) 5 MHz to 20 MHz 0 dBm ±5 dB
10 MHz frequency reference output 　Connector 　Impedance 　Frequency 　Amplitude	 BNC (f), rear panel 50 Ω (nominal value) 10 MHz 0 dBm ±5 dB

6.1.7 General Specifications

Item	Specifications

21.4 MHz IF output
   Connector
   Impedance
   Frequency
   Amplitude
	
	BNC (f), rear panel
	50 Ω (nominal value)
	21.4 MHz
	Mixer input level + 2 dB (typical value at 50 MHz)

I/O
   Keyboard
   Mouse
   USB
   GP-IB
   LAN port
   PRINTER port
   Signal for external indicator
	
	PS/2 101/106 keyboard, front panel
	PS/2 mouse, front panel
	Front panel
	IEEE-488.2 compatible, rear panel
	10Base-T, protocol used: TCP/IP, rear panel
	Conforms to IEEE-1284-1994, rear panel
	15-pin D-SUB connector (VGA), rear panel

6.1.7 General Specifications
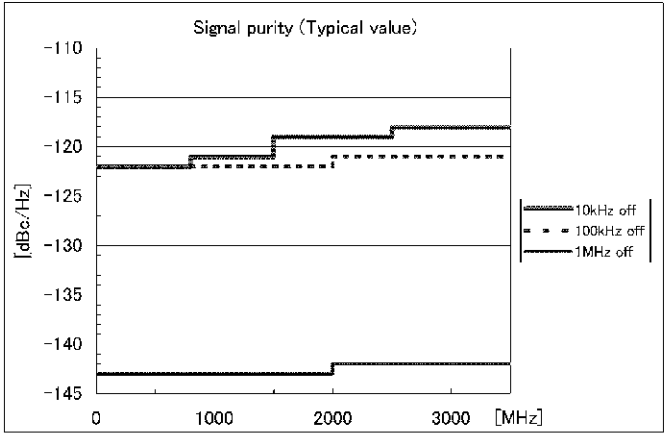
Item	Specifications
Operating environmental range	Ambient temperature: +5°C to +40°C Relative humidity: 80% or less (no condensation)
Storage environmental range	Ambient temperature: -20°C to +60°C Relative humidity: 80% or less (no condensation)
AC power input	AC100 V to 120 V, 50 Hz/60 Hz AC220 V to 240 V, 50 Hz/60 Hz (automatic switching between AC 100 V and AC 200 V sources)
Power consumption	500 VA or less Approx. 220 VA (except for options)
External dimensions	424 mm (W) × 266 mm (H) × 530 mm (D) (approx.)
Weight	Approx. 32 kg or less (except for options)

6.2 R3671 Performance Specifications

6.2.1 Frequency

Item	Specifications
Frequency range Spectrum analysis mode	20 Hz to 13 GHz

Frequency band	Frequency band	Harmonic Mixing mode (N)
20 Hz to 3.5 GHz	0	1-
3.4 GHz to 7.5 GHz	1	1-
7.4 GHz to 13 GHz	2	2-
Bands 1 to 2 use a built-in YIG tuning pre-selector.		

Item	Specifications
Modulation analysis mode (When modulation analysis option is set)	20 MHz to 6 GHz

Frequency band	Frequency band	Harmonic Mixing mode (N)
20 MHz to 3.5 GHz	0	1-
3.5 GHz to 6 GHz	1M	1-
Band 1M bypasses the built-in YIG tuning pre-selector.		

Item	Specifications
Built-in pre-amplifier (Band 0 only)	100 kHz to 3.5 GHz Gain 20 dB (typical value)
Input coupling	DC

Internal frequency reference stability
   Aging rate
   Temperature stability
 	
   Warm-up time (nominal value)
   Reference frequency error
	$\pm 5 \times 10^{-8}$/ day, $\pm 5 \times 10^{-7}$/ year
	$\pm 1 \times 10^{-7}$ (Frequency at 25°C is used as the reference in the range of 5 to 40°C)
	$\pm 5 \times 10^{-7}$/minute
	$\pm$ (Time elapsed from the latest factory calibration $\times$ aging rate + temperature stability)

Marker frequency counter
   Accuracy
   Resolution
	(S/N > 50 dB)
	$\pm$ (Marker frequency $\times$ Frequency reference error + Residual FM)
	0.01 Hz

Frequency reading accuracy	(Resolution bandwidth 1 Hz to 3 MHz) $\pm$ (Frequency reading $\times$ Frequency reference error + span $\times$ span accuracy + resolution bandwidth $\times$ 0.1 + residual FM)
Frequency stability Residual FM	(When internal reference frequency source is used) $\leq$ (3 Hz $\times$ N p-p)/100 ms

Frequency span
   Range
   Accuracy
	20 Hz to 13 GHz, 0 Hz (Zero span)
	$\pm$ 1% (200 Hz $\leq$ Span)
	$\pm$ 1 $\times$ N% (20 Hz $\leq$ Span < 200 Hz)

6.2.1 Frequency

Item	Specifications
Signal purity (When internal reference frequency source is used)	At 800 MHz input

At 800 MHz input table:

Offset	20°C to 30°C	5°C to 40°C
100 Hz	< -87 dBc/Hz	< -85 dBc/Hz
1 kHz	< -110 dBc/Hz	< -108 dBc/Hz
10 kHz	< -120 dBc/Hz	< -118 dBc/Hz
10 kHz (Typical value)	< -122 dBc/Hz	
100 kHz	< -120 dBc/Hz	< -120 dBc/Hz
100 kHz (Typical value)	< -123 dBc/Hz	
1 MHz	< -140 dBc/Hz	< -140 dBc/Hz
1 MHz (Typical value)	< -143 dBc/Hz	
10 MHz (Nominal value)	< -155 dBc/Hz	< -153 dBc/Hz

Signal purity (Typical value)

Item	Specifications
Resolution bandwidth (RBW) Range Accuracy	1 Hz to 10 MHz (1, 2, 3, 5 sequence) ±3% : Resolution bandwidth 1 Hz to 500 kHz ±7% : Resolution bandwidth 1 MHz to 3 MHz ±12% : Resolution bandwidth 5 MHz ±20% : Resolution bandwidth 10 MHz
Selectivity (60 dB/ 3 dB)	< 6:1 (5:1, typ.)
Video bandwidth (VBW) Range	1 Hz to 10 MHz (1, 2, 3, 5 sequence)

6.2.2   Sweep

Item	Specifications

Sweep
    Sweep time setting range
        Zero span
        Span> 0 Hz
    Sweep time accuracy
	
	1 μs to 6000 s
	10 ms to 2000 s
	±2%

Sweep mode	Continuous, Single

Trigger function
    Trigger source
 	
    Trigger delay setting range
        Resolution
	
	Free Run, Video, IF, Line
	External 1 (TTL level), External 2 (0 to 5 V, resolution: 20 mV)
	100 ns to 1 s
	100 ns

Gated sweep
    Gate delay
        Resolution
    Gate width
        Resolution
    Trigger source
	
	0 s to 1 s
	100 ns
	50 μs to 1 s
	100 ns
	Free Run, IF, External 1, External 2, Link

6.2.3   Amplitude

Item	Specifications

Amplitude measurement range
    Preamplifier off
    Preamplifier on
	
	+30 dBm to displayed average noise level
	+20 dBm to displayed average noise level (band 0 only)

Maximum safe input level
    Average continuous power
        Preamplifier off
        Preamplifier on
    DC voltage
	
	+30 dBm (when input attenuator ≥ 10 dB)
	+13 dBm (when input attenuator ≥ 10 dB)
	0 V (Do not apply DC power to signals.)

Input attenuator range	0 to 75 dB, 5 dB steps

Screen display range
    Log scale
 	
    Linear scale
	10 div. fixed
	0.1 dB to 1 dB/div., 0.1 dB steps
	1 dB to 20 dB/div., 1 dB steps
	10%/div. of the reference level

Scale unit	dBm, dBmV, dBμV, dBμVemf, dBpW, W, V

6.2.4 Amplitude Accuracy

Item	Specifications
Reference level set range Preamplifier off Log scale Linear scale Preamplifier on Log scale Linear scale	 -170 dBm to +60 dBm, 0.01 dB steps 707.1 pV to 223.6 V, approx. 1% steps -170 dBm to +30 dBm, 0.01 dB steps 707.1 pV to 7.071 V, approx. 1% steps
Trace	A maximum of 4
Detector mode	Normal, Positive Peak, Negative Peak, Sample, RMS, Video Average, Voltage Average

6.2.4   Amplitude Accuracy

Item	Specifications
Calibration signal accuracy (50 MHz) Amplitude Accuracy	 -10 dBm ± 0.2 dB (20°C to 30°C), ±0.3 dB (0°C to 40°C)
Frequency response Spectrum analysis mode Preamplifier off Preamplifier on	(After autocalibration, reference frequency 50 MHz, input attenuator 10 dB, after pre-selector peak adjustment) *(see tables below)*

(Preamplifier off)

Frequency	Operating temperature range		Intraband flatness
	20°C to 30°C	5°C to 40°C	
50 MHz to 2.5 GHz	< ±0.4 dB	< ±0.9 dB	-
20 Hz to 3.5 GHz	< ±1.0 dB	< ±1.5 dB	-
3.5 GHz to 7.5 GHz	< ±1.5 dB	< ±3.5 dB	< ±1.5 dB
7.5 GHz to 13 GHz	< ±2.0 dB	< ±4.0 dB	< ±2.0 dB

(Preamplifier on)

Frequency	Operating temperature range	
	20°C to 30°C	5°C to 40°C
50 MHz to 2.5 GHz	< ±1.0 dB	< ±1.5 dB
100 kHz to 3.5 GHz	< ±2.0 dB	< ±2.5 dB

Item	Specifications
Input attenuator switching error	(Attenuator: 10 dB reference)

Frequency range	Switching error
20 Hz to 8 GHz	< ±1.0 dB (5 dB to 50 dB) < ±1.4 dB (55 dB to 75 dB)
8 GHz to 12 GHz	< ± 1.3 dB (5 dB to 50 dB) < ±1.9 dB (55 dB to 75 dB)
12 GHz to 13 GHz	< ±1.4 dB (5 dB to 50 dB) < ±2.1 dB (55 dB to 75 dB)

Item	Specifications
Scale display error	(Mixer level: -20 dBm reference, mixer level -10 dBm to -50 dBm, temperature range 20°C to 30°C) < ±0.13 dB
Resolution bandwidth switching uncertainty	(Resolution bandwidth: 100 kHz reference, after autocalibration, 10 dB/div. or less) < ±0.05 dB (1 Hz to 3 MHz) < ±0.3 dB (5 MHz to 10 MHz)
Coupling level accuracy	(After autocalibration, signal level -10 dBm to -50 dBm, preamplifier off, input attenuator 10 dB, RBW 100 kHz, temperature range 20°C to 30°C) < ± (0.2 dB + frequency response + scale display error)

6.2.5 Dynamic Range

Item	Specifications
Displayed average noise level Spectrum analysis mode Preamplifier off	(Input is terminated, input attenuator: 0 dB, RBW1 Hz, VBW1 Hz, detector: Sample, average more than 20 times, average type: Video, temperature range 20°C to 30°C. Add 2 dB in the temperature range 5°C to 40°C.)

Frequency	Specification	Typical value
100 Hz	< -96 dBm	-115 dBm
1 kHz	< -119 dBm	-130 dBm
10 kHz	< -129 dBm	-140 dBm
100 kHz	< -130 dBm	-143 dBm
1 MHz	< -140 dBm	-150 dBm
10 MHz to 1 GHz	< -156 dBm	-158 dBm
1 GHz to 2 GHz	< -154 dBm	-156 dBm
2 GHz to 2.5 GHz	< -152 dBm	-154 dBm
2.5 GHz to 3 GHz	< -150 dBm	-152 dBm
3 GHz to 3.5 GHz	< -148 dBm	-150 dBm
3.5 GHz to 7.5 GHz	< -146 dBm	-149 dBm
7.5 GHz to 13 GHz	< -146 dBm	-149 dBm

Preamplifier on

Frequency	Specification	Typical value
100 kHz	< -136 dBm	155 dBm
1 MHz	< -146 dBm	-160 dBm
10 MHz to 1 GHz	< -162 dBm	-168 dBm
1 GHz to 2.5 GHz	< -160 dBm	-166 dBm
2.5 GHz to 3 GHz	< -158 dBm	-164 dBm
3 GHz to 3.5 GHz	< -156 dBm	-162 dBm

1 dB gain compression | (Separation: RBW × 15, 50 kHz min.)

Input frequency	Specification	Typical value
10 MHz to 200 MHz	> +2 dBm	+5 dBm
200 MHz to 3.5 GHz	> +7 dBm	+10 dBm
3.5 GHz to 7.5 GHz	> -5 dBm	-2 dBm
7.5 GHz to 13 GHz	> -3 dBm	+0 dBm

2nd order harmonic distortion

Input frequency	Specification	Mixer level
10 MHz to 1.75 GHz	< -60 dBc	-20 dBm
> 1.75 GHz	< -90 dBc	-10 dBm

Item	Specifications
3rd order intermodulation distortion (TOI)	(Mixer level: -20 dBm, separation: 25 kHz)
Image/multiple/out-band spurious	(Spectrum analysis mode)
Residual spurious	(Spectrum analysis mode, no input, input terminated, input attenuator: 0 dB)

For 3rd order intermodulation distortion (TOI):

Input frequency	Specification	Typical value
10 MHz to 200 MHz	> +12 dBm	+16 dBm
200 MHz to 500 MHz	> +16 dBm	+20 dBm
500 MHz to 1 GHz	> +20 dBm	+24 dBm
1 GHz to 2 GHz	> +21 dBm	+25 dBm
2 GHz to 3.5 GHz	> +22 dBm	+26 dBm
3.5 GHz to 7.5 GHz	> +5 dBm	+10 dBm
7.5 GHz to 13 GHz	> +8 dBm	+12 dBm

For Image/multiple/out-band spurious:

Frequency	Specification
10 MHz to 13 GHz	< -70 dBc

For Residual spurious:

	Frequency	Specification
Preamplifier on	1 MHz to 3.5 GHz	< -95 dBm
Preamplifier off	1 MHz to 3.5 GHz	< -90 dBm
	3.5 GHz to 13 GHz	< - 90 dBm

6.2.6 Input and Output

Item	Specifications

RF input
  Connector
  Impedance
  VSWR
	N type (f), front panel
	50 Ω(nominal value)
	Input attenuator ≥ 10 dB, at the set frequency
	<1.5:1 (<3.5 GHz) (nominal value)
	<2.0:1 (>3.5 GHz) (nominal value)

Calibration signal output
  Connector
  Impedance
  Frequency
	BNC (f), front panel
	50 Ω (nominal value)
	50 MHz

Probe power source
  Connector
  Output voltage
	4-pin connector, front panel
	± 15 V, 150 mA (nominal value)

1st LO output Connector	When external mixer option is used SMA (f), front panel

6.2.6 Input and Output

Item	Specifications
421.4 MHz IF input Connector	When external mixer option is used SMA (f), front panel

I/Q input
   Connector
   Impedance
   Maximum input amplitude
	
	BNC (f), front panel
	50 Ω (nominal value), AC/DC coupled
	1.0 Vp-p (DC component ±0.5V)

External trigger input 1
   Connector
   Impedance
   Trigger level
	
	BNC (f), rear panel
	10 kΩ (nominal value), DC coupled
	TTL level

External trigger input 2
   Connector
   Impedance
   Trigger level
	
	BNC (f), rear panel
	10 kΩ (nominal value), DC coupled
	0 V to 5 V

Trigger output
   Connector
   Amplitude
	
	BNC (f), rear panel
	TTL level

Frequency reference input
   Connector
   Impedance
   Frequency
   Amplitude
	
	BNC (f), rear panel
	50 Ω (nominal value)
	5 MHz to 20 MHz
	0 dBm ±5 dB

10 MHz frequency reference output
   Connector
   Impedance
   Frequency
   Amplitude
	
	BNC (f), rear panel
	50 Ω (nominal value)
	10 MHz
	0 dBm ±5 dB

21.4 MHz IF output
   Connector
   Impedance
   Frequency
   Amplitude
	
	BNC (f), rear panel
	50 Ω (nominal value)
	21.4 MHz
	Mixer input level + 2 dB (typical value at 50 MHz)

I/O
   Keyboard
   Mouse
   USB
   GP-IB
   LAN port
   PRINTER port
   Signal for external indicator
	
	PS/2 101/106 keyboard, front panel
	PS/2 mouse, front panel
	Front panel
	IEEE-488.2 compatible, rear panel
	10Base-T, protocol used: TCP/IP, rear panel
	Conforms to IEEE-1284-1994, rear panel
	15-pin D-SUB connector (VGA), rear panel

6.2.7   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)
AC power input	AC100 V to 120 V, 50 Hz/60 Hz AC220 V to 240 V, 50 Hz/60 Hz (automatic switching between AC 100 V and AC 200 V sources)
Power consumption	500 VA or less Approx. 220 VA (except for options)
External dimensions	424 mm (W) × 266 mm (H) × 530 mm (D) (approx.)
Weight	Approx. 32 kg or less (except for options)

6.3 Option

- OPTION 11 Wideband demodulator

Item	Specifications
Analysis frequency range Analysis resolution bandwidth (CCDF RBW) Dynamic Range (CCDF RBW: 50 MHz)	200 MHz to 6 GHz 50 MHz (Center frequency: 1 GHz, Reference level: +5 dBm, Input attenuator: Auto, Temperature range: 20°C to 30°C, and the 1-GHz and +5-dBm CW signal is input.) > 50 dB

- OPTION 22 High stability frequency reference source

Item	Specifications

Reference frequency stability
  Aging rate
  Temperature stability
  Warm-up time (nominal value)
 	
Frequency reference error
	$\pm 3 \times 10^{-10}$/day, $\pm 2 \times 10^{-8}$/year
	$\pm 5 \times 10^{-9}$ (5 to 40°C, frequency at 25°C used as the reference)
	$\pm 1 \times 10^{-8}$/ 30 min $\}$ (frequency at 25°C, 24 hours after power
	$\pm 5 \times 10^{-9}$/ 60 min $\}$ on used as reference)
	
	$\pm$ (Time elapsed after the latest factory calibration $\times$ aging rate + temperature stability)

6.4   External Dimension Diagram
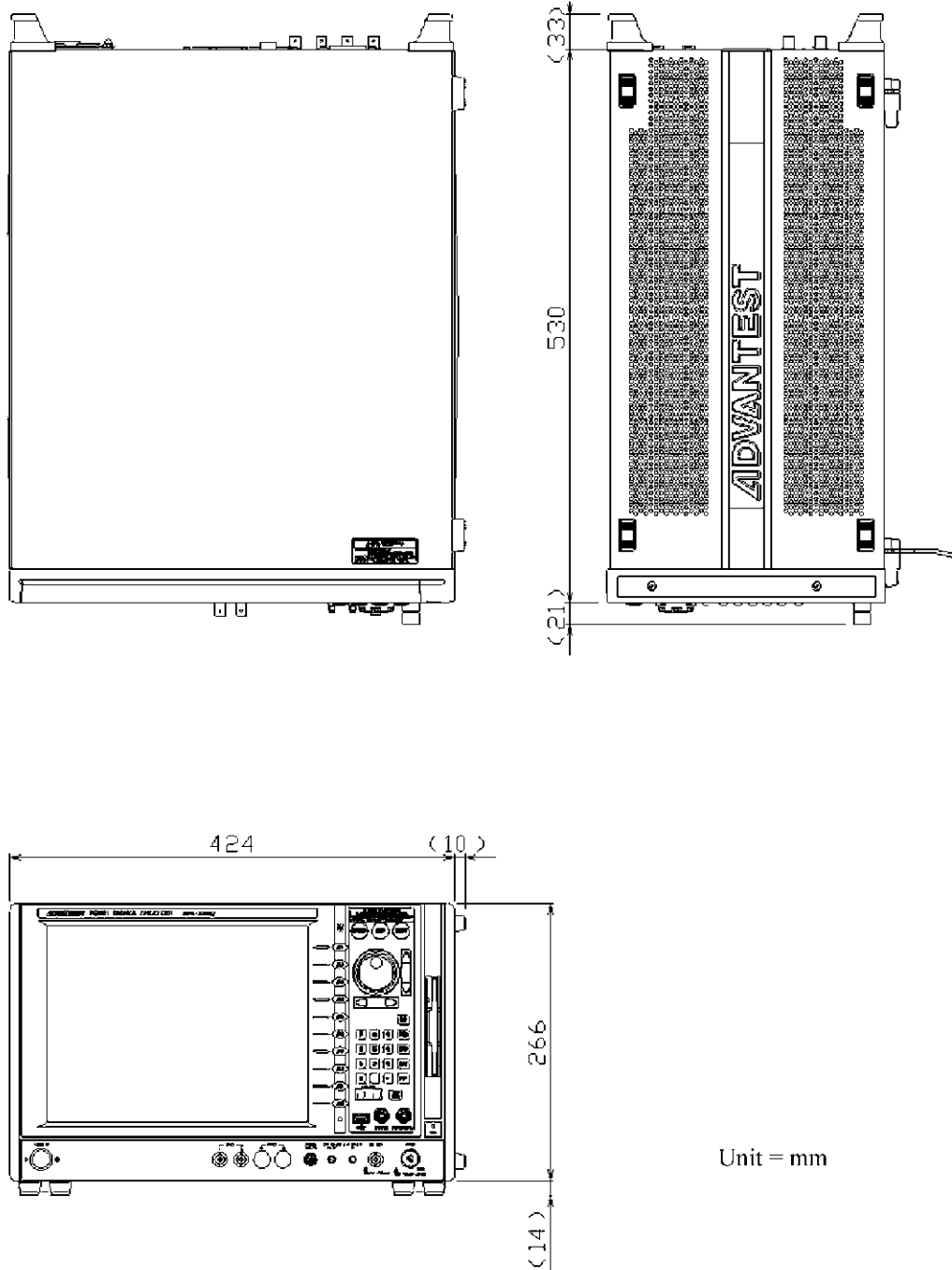
NOTE: *This drawing shows external dimensions of this instrument.*
The difference in products and options used can cause a change in the appearance of the instrument.

7. OPTIONS AND ACCESSORIES

This chapter introduces the separately sold options and measurement accessories that can be used with this instrument.

7.1 Options

Table 7-1   Options

Option	Explanation
OPT11	Wideband demodulator
OPT22	High stability frequency reference source
OPT50	3GPP modulation analysis software
OPT52	cdma2000 modulation analysis software
OPT54	cdma2000 1xEV-DO modulation analysis software
OPT56	GSM/EDGE modulation analysis software
OPT57	Bluetooth modulation analysis software
OPT59	IEEE802.11b/g modulation analysis software
OPT60	WiBro modulation analysis software WiBro (WiBro 16e) modulation analysis software
OPT64	Single-carrier general-purpose modulation analysis software
OPT68	OFDM modulation analysis software
OPT71	200M AWG module
OPT72	Digital signal generator module
OPT73	3GPP multi-carrier generator option
OPT74	Pulse modulator
OPT80	C/N measurement software
OPT83	AMP measurement software

7.2 Accessories

Table 7-2   Accessories

Accessory Name	Part Code	Code Compliance
Rack-mount set B	A02724	EIA standard
	A02725	JIS standard
Panel extension cable (3 m)	A112003	-

8. MAINTENANCE

This chapter describes the following matters related to the maintenance of this instrument in order to maintain its designed performance.

8.1 Cleaning

8.2 About Calibration

8.3 About Replacement of Limited-Life Parts

8.4 Method of Storing the Instrument

8.5 How to Move and Transport the Instrument

8.6 Notes for Requesting Repair, Replacement of Parts, and Periodic Calibration

8.7 System Recovery Procedure

8.8 List of Error Messages

8.9 Product Disposal and Recycle

8.1   Cleaning

This section describes how to clean this instrument and some matters to note.

WARNING: *Turn off the power breaker on the rear panel and extract the power cable from the wall socket to protect yourself from electric shock accidents.*
Never attempt to remove the cabinet cover to clean the inside of the instrument.

8.1.1   Cabinet Cleaning

Use the following procedure to clean the cabinet of this instrument.

Clean the cabinet surface with a soft dry cloth.
If the surface is not clean enough, try again with a cloth soaked in a weakened neutral detergent. Then wipe the surface with a soft dry cloth.

CAUTION: *Do not allow water to splash into the inside of the instrument.*
Do not use an organic solvent such as benzene, toluene, xylene, or acetone and the cleanser for cleaning. They can cause the paint on the cabinet to come off, deform, or degrade.

8.1.2 Cleaning the Touch Screen

Cleaning with a soft dry cloth is sufficient for ordinary use. If dirt remains on the touch screen, wipe the surface with a soft cloth soaked in ethanol.

CAUTION: *The screen surface may be scratched if you rub it powerfully.*
Handle the touch screen very carefully. It may be broken if it is exposed to strong physical shock because it contains glass.

8.1.3 Cleaning of Other Parts

Use appropriate caution to protect this instrument from dust.

WARNING: *Remove dust periodically from wall sockets and power connector plugs.*
Dust that is wet with humidity may cause tracking that could cause a fire.
The rear panel is equipped with an exhaust cooling fan and the side and the bottom panels have exhaust vents. Keep these vents clean for sufficient exhaustion. If dust piled on the vents causes exhaustion to become poor, the temperature inside will rise and the instrument will not work correctly.

8.2   About Calibration

Calibration should be performed periodically to prevent performance deterioration or to adjust chronological performance changes.
The recommended period of regular calibration is once a year.

Calibration is done at the factory site.
For more information, call a sales representative.

8.3   About Replacement of Limited-Life Parts

Table 8-1 lists the proper limited-life parts of this instrument.
The table also shows the number of operations for the expected life spans of each of these parts, to suggest a recommended time of replacement in terms of the number of times of operations. For replacement, call the Service Center (Advantest Customer Support (ACS)).

Note that the life span can become shorter than expected depending on the operation environment, frequency of use, and storage environment.

MEMO: The table shows the expected life spans or recommended time of replacement only for the user's reference. It does not guarantee the life of the components.

Table 8-1   Limited-Life Parts

Name	Life (Reference values provided by manufacturer)
Panel key switch	10^6 operations
LCD back light	50,000 hours
Rotary encoder	25×10^5 operations
Cooling fan	40,000 hours
Lithium battery cells for data backup	About 3 years
Input attenuator	10^6 operations
Mechanical relay, RF block	10^6 operations
Mechanical relay, IF block	10^5 operations

8.4 Method of Storing the Instrument

When you store this instrument, keep it in an environment that meets the following requirements.

- Reduced vibration
- Not dusty
- Protected from direct sunlight
- Ambient temperature range: -20 to +60°C
- Relative humidity: 30 to 85%

When you do not use the instrument for 90 days or more, store it in an appropriate moisture-proof bag with desiccant.

8.5 How to Move and Transport the Instrument

8.5.1 Moving

CAUTION:	*This instrument is a weighty item. Sufficient care is needed for moving or transporting it from one place to another. Use the following procedures to protect yourself from accidents.* *Use a cart with sufficient strength.* *When you hand-carry the instrument, be sure to work with an assistant.*

8.5.2 Transportation

For transportation, use the packing materials used for the shipping of this instrument. If you use other materials, double-pack the instrument using the following procedure.

1. Install the protection cover of the touch screen display on this instrument.

2. Cover the instrument with a protective plastic sheet. (Put desiccant inside for protection from moisture.)

3. Prepare an inner carton case.
   The panels of the case must be 5 mm or more thick. The inner dimensions must be 10 cm or more larger than the physical size of this instrument because cushioning materials are placed inside.
   Place the instrument so that it is covered with cushioning or plastic foam material on all sides. (The cushioning material must be 4 cm or more thick.)

4. Seal the carton case with an industrial stapler or packing tape.

5. Prepare an outer carton case.
   The panels of the case must be 5 mm or more thick. The dimensions must be 10 cm or more larger than the inner case on all sides. Place cushioning material 4 cm or more thick inside the outer case and put the inner case prepared in steps 3 and 4 therein.

6. Stuff the cushioning material in the space between the inner and outer cases and seal the outer case. Fasten the outer case with packing strings.

8.6 Notes for Requesting Repair, Replacement of Parts, and Periodic Calibration

8.6.1 Work Request

Attach a tag indicating the following data to this instrument when you send it to a sales representative.

- Your company name and address
- Name of the person in charge
- Serial number (on the rear panel)
- What work to request (repair or periodic calibration)

8.6.2 Destination and Phone Number for Contact

Call Advantest Instrument Call Center: ICC.

8.7   System Recovery Procedure

This instrument adopts Microsoft Windows XP Embedded and Windows application programs for measurement functions.
The system files required for the operation of this instrument are stored in the built-in system drive.
If a system file is destroyed during operation of this instrument for any reason, the instrument may not operate normally.

In such a case, you can recover the built-in system drive to the factory-set state by using the System Recovery Disk attached to this instrument as an accessory.

IMPORTANT: The contents of the built-in system drive are lost by recovery operation. In other words, the settings of networks or printers made after you purchased the instrument are lost.
Recovery of this instrument is impossible in the case of damage of disk partition information or disks.
Call a sales representative for repair.

Recovery procedure

1.   Make sure that the power of this instrument is turned off.
When the instrument is operating, press the $\boxed{\textbf{POWER}}$ switch on the front panel to terminate the operation of this instrument.

2.   Insert the floppy disk with "System Recovery Disk" on the label into the disk drive.

3.   Press the $\boxed{\textbf{POWER}}$ switch on the front panel to turn on power.
The recovery software is read from the system recovery disk and a dialog box is displayed.

4.   Select [Continue] with the data knob for system recovery. Press the $\boxed{\textbf{ENT}}$ button on the front panel.

5.   System recovery begins. System recovery takes about 5 minutes to complete.

6.   The Reboot dialog box shown in Figure 8-1 is displayed on completion of system recovery.
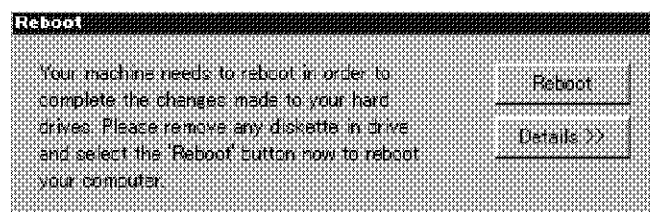
Figure 8-1   Reboot Dialog Box

7. Press the eject button on the floppy disk drive and extract the system recovery disk.

CAUTION: *Do not press the eject button on the floppy disk drive while the access lamp on the drive is on. If you do, the floppy disk drive or floppy disk may be broken.*

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8. Select **[Reboot]** with the data knob and press the $\boxed{\text{ENT}}$ button on the front panel.
    The system restarts and the final processing is performed. It takes about 7 minutes to complete.
    Although restarting occurs several times during this period, it does not mean any error has occurred.

9. After completion of the final processing, the firmware of this instrument operates.

8.8 List of Error Messages

This section describes the error messages displayed on this instrument.
The list contains the following items of information.

- Error number

- Message text

- Cause of the error and action to take

Error number	Message text	Description
-232	Invalid data format.	The file format is illegal. Check the file storing format and file extension.
-257	Bad File name.	The file name is illegal. Change the file name.
-330	Self-test failed.	An error occurred in the self-test at power-on. A description of the error can be checked in a dialog box, opening it by touching [Special...], and then [Self Test] on the menu bar. After checking the description, contact a sales representative.
-1250	No such file or directory.	The specified file or directory does not exist. Check the file name or directory name.
-1251	Permission denied.	File operation is forbidden. Check the drive, file, or directory.
-1252	Not enough space on the disk.	Not enough space is available. Delete unnecessary files.
-1253	File read/write error.	A file I/O error occurred.
-1254	No item is selected.	No item is selected.
-1255	Invalid data format.	The setting information file format of the Standard is incorrect.
-1256	Standard is not selected.	The Standard is not selected. Execute after selecting a Standard.
-1257	Standard is selected.	The Standard is selected. Execute after setting the Standard selection to OFF.
-1300	Device is not ready.	A disk is not inserted.
-1310	Unlock 200MHz PLL.	The 200 MHz PLL circuit used in the system is unlocked. Check external reference input setting.
-1311	Unlock Sweep PLL.	The Sweep PLL circuit used in the system is unlocked. Contact a sales representative for repair.
-1312	Unlock Sampler PLL.	The Sampler PLL circuit used in the system is unlocked. Contact a sales representative for repair.

Error number	Message text	Description
-1313	Unlock YTO PLL.	The YTO PLL circuit used in the circuit is unlocked. Contact a sales representative for repair.
-1400	There is no data in the effective state.	Exclusive GPIB error. The data requested to be read out is uncertain. After performing proper measurement, read out data.
-1500	Option required.	The associated option function is required.
-1510	Invalid Frequency-Correction Data1. Please contact a service engineer.	The internal frequency correction data is invalid. Contact a sales representative for repair.
-1511	Invalid Frequency-Correction Data2. Please contact a service engineer.	The internal frequency correction data is invalid. Contact a sales representative for repair.
-2200	Span is set 0 Hz. Please change span.	The frequency span is set to zero span. Change the span.
-2201	Span is not set 0 Hz. Please change to zero span.	The frequency span is not set to zero span. Set the frequency span to zero span.
-2202	Scale is Linear mode. Please select dB/div scale. [LEVEL → dB/div]	The vertical axis is set to linear scale. Select the dB/div scale.
-2204	ΔMarker is not active. Please activate ΔMarker. [MKR → Delta Marker]	The Δmarker is not turned on. Turn on the Δmarker.
-2205	Blank mode is selected. Please change to Write mode. [Trace → Write]	Cannot be executed because Blank mode is set. Change the mode to Write.
-2206	No peak is detected.	The peak is not found.
-2207	Marker Frequency is base-band.	The pre-selector tuning cannot be executed because the marker is in the base-band frequency range.
-2208	Not available. Trigger source is Free Run or Line.	Cannot be executed because the trigger source is set to Free Run or Line.
-2209	Gated sweep setup mode. Please select the same Gate source.	Gated sweep setting mode. Cannot select the trigger, which does not meet the gated sweep trigger condition.
-2210	Trace Normalize is active. Turn Trace Normalize off.	Normalize function is being executed. Turn off normalize function.
-2211	Display line is not active.	Cannot be selected because Display line is turned off.
-2212	Reference line is not active.	Cannot be selected because Reference line is turned off.
-2213	Limit Line1 is not active.	Cannot be selected because Limit Line 1 is turned off.
-2214	Limit Line2 is not active.	Cannot be selected because Limit Line 2 is turned off.
-2215	Anchor is not active.	Cannot be selected because the anchor of XY cursor is turned off.

8.8 List of Error Messages

Error number	Message text	Description
-2216	Invalid data mode. Set to Relative mode.	Y Data Mode of Limit Line is invalid.
-2217	Not available in High Speed ADC mode.	Video trigger is not available in High Speed ADC mode. Video Set a trigger other than Video trigger.
-2218	Gated sweep is active. Turn Gated sweep off.	Cannot be executed because the gated sweep is set to on.
-2221	Trigger source incorrect. Set Trigger source to IF Power or Free Run.	The trigger source is set incorrectly. Set to IF Power or Free Run.
-2222	Not available. RBW is less than 1kHz.	Cannot be executed because RBW is less than 1 kHz.
-2223	Not available. Sweep time is less than 100µs.	Cannot be executed because the sweep time is less than 100 µs.
-2224	Not available. Gate source is Free Run.	Cannot be executed because the gate source is set to Free Run.
-2240	Parameter is out of range.	An invalid parameter is set for measurement.
-2241	Incorrect data. Set span to (1.0 + alpha) *Tf or more.	The root Nyquist filter is set to a value that cannot be measured. Change the setting to a value that meets the following requirement. Frequency span > (1.0+Rolloff Factor) × Symbol Rate
-2242	Frequency table contains no data.	The function cannot be executed because data is not contained in the table.
-2243	Editor is active. Please quit the editor first.	Cannot be executed in the Editor mode. Terminate the editor mode.
-2244	Incorrect data. Set span to Carrier Band Width or more.	The carrier bandwidth is set to a value that cannot be measured. Change the setting to a value that meets the following requirement: Frequency span > Carrier bandwidth
-2245	Not available. Spurious is ON.	Cannot be executed because Spurious measurement mode is on.
-2246	Not available. CCDF is ON.	Cannot be executed in the CCDF measurement mode.
-2248	Not available. IF Monitor is ON.	Cannot be executed in the IF signal monitor mode.
-2249	Not available. Center Frequency is larger than 7.5GHz.	RBW cannot be set to 50 MHz because a center frequency of more than 7.5 GHz is set.
-2281	Not available in Single-screen mode.	Cannot be executed in the single-screen mode.
-2282	Not available in Zoom(F/F) mode.	Cannot be executed in Zoom (F/F) mode.
-2283	Not available in Zoom(T/T) mode.	Cannot be executed in Zoom (T/T) mode.

Error number	Message text	Description
-2284	Not available in F/T mode.	Cannot be executed in Zoom (F/T) mode.
-2286	Not available in Gated sweep setup mode.	Cannot be executed in the gated-sweep setting mode.
-2287	Not available in Multi-screen mode.	Cannot be executed in the multi-screen mode.
-2289	Please select Zoom or F/T mode.	Cannot be executed because Zoom (F/F, T/T) or F/T mode is not on. Select Zoom or F/T mode.
-2500	Cal data is not enough. Please execute Cal All	CAL data is insufficient. Execute Cal All.
-2501	Internal CAL Level (-10[dBm]) out of range	Calibration failed.
-2502	Internal CAL Level (-30[dBm]) out of range	Calibration failed.
-2503	External CAL Level out of range	Calibration failed.
-2504	ATT 0dB out of range	Calibration failed.
-2509	ATT 5dB out of range	Calibration failed.
-2518	ATT 15dB out of range	Calibration failed.
-2523	ATT 20dB out of range	Calibration failed.
-2528	ATT 25dB out of range	Calibration failed.
-2533	ATT 30dB out of range	Calibration failed.
-2534	ATT 35dB out of range	Calibration failed.
-2535	ATT 40dB out of range	Calibration failed.
-2536	ATT 45dB out of range	Calibration failed.
-2537	ATT 50dB out of range	Calibration failed.
-2539	ATT 55dB out of range	Calibration failed.
-2540	ATT 60dB out of range	Calibration failed.
-2541	ATT 65dB out of range	Calibration failed.
-2542	ATT 70dB out of range	Calibration failed.
-2543	ATT 75dB out of range	Calibration failed.
-2544	IF Input Level out of range	Calibration failed.
-2545	IF Gain Amp out of range	Calibration failed.
-2546	2nd Wide BPF Level out of range	Calibration failed.
-2547	Preamp Level out of range	Calibration failed.
-2548	x2 Path Clock Skew out of range	Calibration failed.
-2549	x4 Path Clock Skew out of range	Calibration failed.
-2550	x6 Path Clock Skew out of range	Calibration failed.

8.8 List of Error Messages

Error number	Message text	Description
-2551	x8 Path Clock Skew out of range	Calibration failed.
-2552	x12 Path Clock Skew out of range	Calibration failed.
-2553	x16 Path Clock Skew out of range	Calibration failed.
-2555	Prefilter Wide CF1 CAL Error	Calibration failed.
-2556	Prefilter Wide CF2 CAL Error	Calibration failed.
-2557	Prefilter Wide Tank1 CAL Error	Calibration failed.
-2558	Prefilter Wide Tank2 CAL Error	Calibration failed.
-2559	Prefilter RBW 1MHz Bandwidth Error	Calibration failed.
-2560	Prefilter RBW 500kHz Bandwidth Error	Calibration failed.
-2561	Prefilter RBW 300kHz Bandwidth Error	Calibration failed.
-2562	Prefilter RBW 200kHz Bandwidth Error	Calibration failed.
-2563	Prefilter Middle CF CAL Error	Calibration failed.
-2564	Prefilter Middle Tank CAL Error	Calibration failed.
-2565	Prefilter Middle Symmetry CAL Error	Calibration failed.
-2566	Prefilter RBW 100kHz Bandwidth Error	Calibration failed.
-2567	Prefilter RBW 50kHz Bandwidth Error	Calibration failed.
-2568	Prefilter Narrow CF CAL Error	Calibration failed.
-2569	Prefilter Narrow Tank CAL Error	Calibration failed.
-2570	Prefilter Narrow Symmetry CAL Error	Calibration failed.
-2571	Prefilter RBW 30Hz Bandwidth Error	Calibration failed.
-2572	Prefilter RBW 20Hz Bandwidth Error	Calibration failed.

Error number	Message text	Description
-2573	Prefilter RBW 10Hz Bandwidth Error	Calibration failed.
-2574	Prefilter RBW 5kHz Bandwidth Error	Calibration failed.
-2575	Prefilter RBW 3kHz Bandwidth Error	Calibration failed.
-2576	Prefilter RBW 2kHz Bandwidth Error	Calibration failed.
-2577	Prefilter RBW 1kHz Bandwidth Error	Calibration failed.
-2578	Prefilter RBW 500Hz Bandwidth Error	Calibration failed.
-2579	Prefilter RBW 300Hz Bandwidth Error	Calibration failed.
-2580	Prefilter RBW 200Hz Bandwidth Error	Calibration failed.
-2581	Prefilter RBW 100Hz Bandwidth Error	Calibration failed.
-2582	Prefilter RBW 50Hz Bandwidth Error	Calibration failed.
-2583	Prefilter RBW 30Hz Bandwidth Error	Calibration failed.
-2584	Prefilter RBW 20Hz Bandwidth Error	Calibration failed.
-2585	Prefilter RBW 10Hz Bandwidth Error	Calibration failed.
-2590	Wideband Demodulator Ranging Amp Off out of range	Calibration failed.
-2591	Wideband Demodulator Ranging Amp On out of range	Calibration failed.
-5300	Option 11 Cal Error	Automatic adjustment of the wideband demodulator has failed.

8.9   Product Disposal and Recycle

This product should be disposed of according to the regulations and laws that are established in your country and municipality.

Before this product is disposed of, separately collect components shown in the table below to prevent the spread of substances, which may be harmful to the global environment, humans, and ecology.

Substance/Component	Used/ Not used	Location	Unit	Component
Polychlorinated biphenyls (PCB) containing capacitors	Not used	-	-	-
Mercury containing components	Used	Main frame	LCD monitor	Fluorescent tube
Batteries	Used	Main frame	BLK-030857X02	Lithium-ion battery
Printed circuit boards	Used	Main frame	Panel, Controller	Printed circuit board
			Power supply	Printed circuit board
			Board, Slot	Printed circuit board
Toner cartridges	Not used	-	-	-
Plastic containing brominated flame retardants	Used	Main frame	BEB-030571 BEB-031113 BEB-031114 BEB-031235 BEB-031812 BEC-029787 BEC-029788 BEC-030549 BEC-030550 BEC-031374 BEG-029154 BEK-029784 BGK-030548 BLB-027808 BLB-027809 BLB-027810 BLB-027811 BLB-029378 BLB-029657X02 BLB-030111 BLB-030151 BLB-031115 BLB-031116 BLC-027690 BLC-029789 BLC-030142 BLC-030547 BLF-027807 BLF-029156 BLF-030112	Packages used for tantalum capacitors, diodes, transistors, and ICs (memory, Logic, PMOS, and analog)

Substance/Component	Used/ Not used	Location	Unit	Component
Plastic containing brominated flame retardants			BLG-027689 BLG-029155 BLK-027921 BLK-029132 BLK-029783 BLK-029785 BLK-029790 BLK-029791 BLK-029792 BLK-029793 BLK-029794 BLK-030106 BLK-030857X02 BLK-031454 BLR-029193X02 Cases	
Asbestos waste and components which contain asbestos	Not used	-	-	-
Cathode ray tubes	Not used	-	-	-
Chlorofluorocarbons (CFC), Hydrochlorofluorocarbons (HCFC), Hydrofluorocarbons (HFC) or Hydrocarbons (HC)	Not used	-	-	-
Gas discharge lamps	Used	Main frame	LCD monitor	Fluorescent tube
Liquid crystal displays of a surface greater than 100 square centimeters	Used	Main frame	Monitor	Liquid crystal displays
External electric cables	Used	Main frame		Power cable
				Signal cable
		Touch panel		Signal cable
Components containing refractory ceramic fibers	Not used	-	-	-
Components containing radioactive substances	Not used	-	-	-
Electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume)	Not used	-	-	-
Cadmium and Cadmium compounds	Used	Main frame	Electronic components	Electric and electronic components (Connectors) Mechanical parts
Hexavalent Chromium compounds	Used	Main frame	Electronic components	Electric and electronic components (Connectors) Mechanical parts
Azo colorant	Used	Main frame		Electronic components

8.9 Product Disposal and Recycle

Substance/Component	Used/ Not used	Location	Unit	Component
Antimony and Antimony compounds	Used	Main frame		Electronic components
Beryllium and Beryllium compounds	Used	Main frame		Electric and electronic components (Connectors) Mechanical parts
Arsenic and Arsenic compounds	Used	Main frame	Electronic components	GaAs IC
Bismuth and Bismuth compounds	Used	Main frame		Electronic components
Nickel and Nickel compounds	Used	Main frame		Electric and electronic components (Connectors) Mechanical parts
Polyvinyl chloride (PVC)	Used	Main frame		Electric and electronic components (Connectors) Mechanical parts
Phthalate	Used	Main frame		Electric and electronic components (Connectors) Mechanical parts
Lead and Lead compounds	Used	Main frame (Board)	BEB-030571 BEB-031113 BEB-031114 BEB-031235 BEB-031812 BEC-029787 BEC-029788 BEC-030549 BEC-030550 BEC-031374 BEG-029154 BEK-029784 BGK-030548 BLB-027808 BLB-027809 BLB-027810 BLB-027811 BLB-029378 BLB-029657X02 BLB-030111 BLB-030151 BLB-031115 BLB-031116 BLC-027690 BLC-029789 BLC-030142 BLC-030547 BLF-027807 BLF-029156 BLF-030112	Electronic components mounted on the printed circuit board and lead solder used for mounting.

Substance/Component	Used/ Not used	Location	Unit	Component
Lead and Lead compounds	Used	Main frame (Board)	BLG-027689 BLG-029155 BLK-027921 BLK-029132 BLK-029783 BLK-029785 BLK-029790 BLK-029791 BLK-029792 BLK-029793 BLK-029794 BLK-030106 BLK-030857X02 BLK-031454 BLR-029193X02 BPJ-033488 BPG-033489 BPF-033527	Electronic components mounted on the printed circuit board and lead solder used for mounting.

APPENDIX

A.1 Setting Time and Time Zone

The default settings of time and time zone for this instrument are set to Japan time.
Therefore, if you use this instrument outside Japan, it is necessary to set the time and time zone.
Otherwise, the time stamp for files will be incorrect.

This section describes procedures for setting the time and time zone.

Procedures

1. Touch |System| on the menu bar and select [Date and Time...].
   The [Date and Time Properties] dialog box will be displayed.

2. Touch the [Time Zone] tab on the opened [Date and Time Properties] dialog box.

3. Select the area in which this instrument will be used from the drop down list box for the time zone.
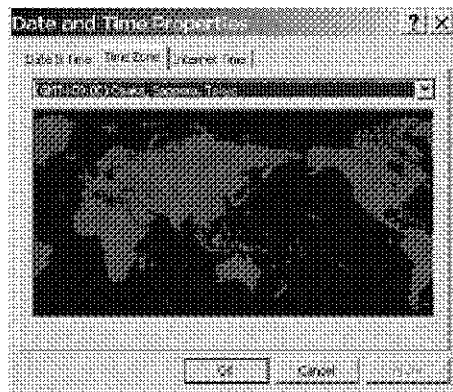
4. Touch the [Date & Time] tab on the opened [Date and Time Properties] dialog box.
   The dialog box for adjusting the date and time will be displayed. Set the date and time.

A.1 Setting Time and Time Zone
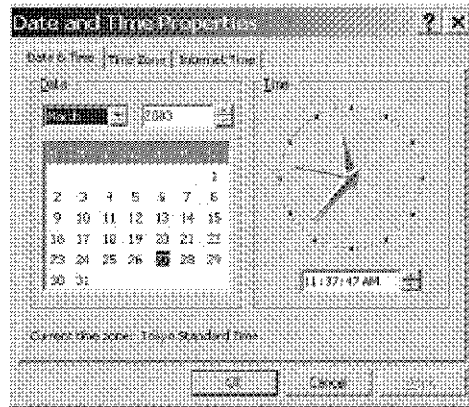
5. Touch the **[OK]** button and close the dialog box.

A.2 Installing the Printer Driver

This section describes the procedures for installing the printer driver.

Obtaining a printer driver

The printer driver used in this instrument is a printer driver for Windows XP.
Use a printer driver for Windows XP attached to the printer or obtain one from the
website of the printer manufacturer.

IMPORTANT:

- *Before starting installation of the printer driver, press the* $\boxed{\text{STOP}}$ *button on the front panel to hold measurement.*
- *Use a printer driver for Windows XP.*

Installing the Printer Driver

Install the printer driver in accordance with the installation procedures attached to the
printer.
If the driver is provided with a CD-ROM, install it using the CD-ROM drive of an
external PC through a network.

This instrument does not support Standard TCP/IP Port.

Setting the printer

Perform the setting for the printer from the **[Printers and Faxes]** window that is dis-
played by selecting **[Printers Setup...]** of **[System]** on the menu bar.

Uninstalling the Printer Driver

The printer driver is installed using the system area of this instrument. Therefore, the
printer driver cannot be installed in certain cases, depending on the remaining system
area for this installation. In such cases, it is necessary to perform new installation after
uninstalling printer drivers that are not used, in accordance with the following proce-
dures.

1. Select **[Printers Setup...]** of **[System]** and open the **[Printers and Faxes]** win-
    dow.
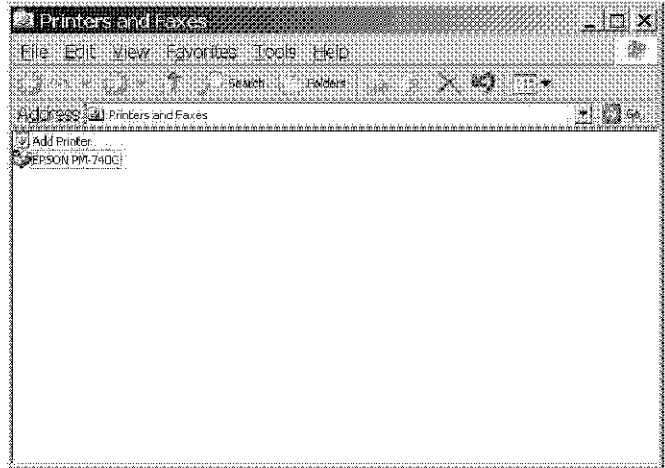
2. From the window, select the printer drivers to be uninstalled and touch |File|. Select [Delete] and touch the [Yes] button of the displayed dialog to delete the drivers from the driver list.

3. If you touch the [File] menu on the |Printers and Faxes| window and select [Server Properties], the |Printers Server Properties| dialog box shown below will be displayed.
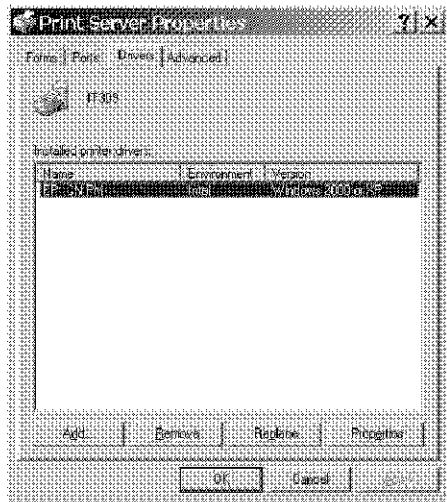
4. Touch the [Drivers] tag in the [Printers Server Properties] dialog box to display the printer driver installed on this instrument. From the displayed printer drivers, select the ones to be uninstalled by touching them and then touch the [Remove] button. After that, touch the |Yes| button in accordance with the instruction to complete the procedures to uninstall drivers.

A.3 Setting up the Network

If you connect this instrument with a network, you can share files and folders with computers in the network. This section describes each component in the network setting dialog box.

IMPORTANT: *Before starting procedures for network setting, press the STOP button on the front panel to hold measurement.*

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1. Touch [System] on the menu bar and select [Network Setup...]. The [Network Setting] dialog box will be displayed.
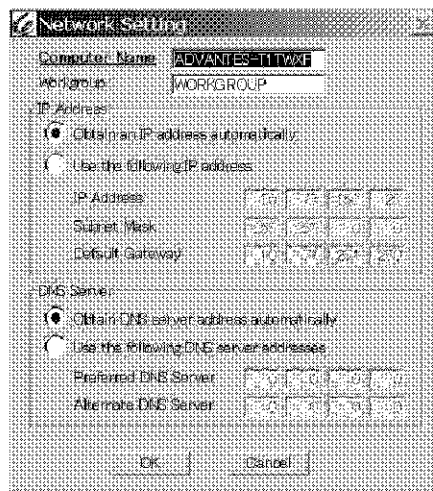
[Computer Name]	The computer name of this instrument will be displayed. If you change this item, the change becomes effective only after restarting the computer.
[Workgroup]	The Windows workgroup name will be displayed. If you change this item, the change becomes effective only after restarting the computer.

[IP Address]

    [Obtain an IP address automatically]
        Select this command for obtaining the IP address from the DHCP server.

    [Use the following IP address] Select this command for specifying the IP address manually.

[IP Address]	The current setting is displayed immediately after the IP address dialog box is displayed.
[Subnet Mask]	The current setting is displayed immediately after the subnet mask dialog box is displayed.
[Default Gateway]	The current setting is displayed immediately after the Default Gateway dialog box is displayed.

[DNS Server]

    [Obtain DNS server address automatically]
        Select this command for obtaining DNS server information from the DHCP server.

[Use the following DNS server address]
Select this command for setting the DNS server manually.

[Preferred DNS Server]
The current setting is displayed immediately after the preferred DNS server address dialog box is displayed.

[Alternate DNS Server]
The current setting is displayed immediately after the alternative DNS server address dialog box is displayed.

A.4 Setting the Guest Account

It is necessary to set the Guest Account in order to access this instrument from a remote PC through a network and share files.

Because the Guest Account is disabled in default status, perform this setting before sharing files.

This section describes each component in the Guest Account setting dialog.

1. Touch **[System]** on the menu bar and select **[Guest Account...]**.
   The **[Guest Account]** setting dialog will be displayed.
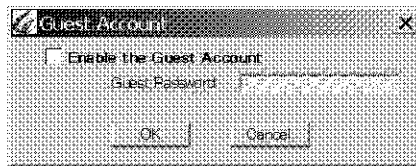
[Enable the Guest Account]	f you check this box, the Guest Account will be enabled. You can enter **[Guest Password]** only when this box is checked.
[Guest Password]	This text box is used for entering the Guest Account password. The password is not displayed. If you press the **[OK]** button with this box empty, setting will be performed without a password.

A.5 Setting up File Sharing

For referring to a file through the network, perform setting for file sharing from Explorer. When accessing a product through the network, enable the Guest Account.
For information on setting the Guest Account, refer to APPENDIX A.4 Setting the Guest Account.

This section describes the procedures for setting for file sharing.

Procedures

1. Touch |System| on the menu bar and select |Explorer|.
   Explorer will be displayed.

2. Select from Explorer the folder for which setting for sharing will be made.

3. Touch |File| on the menu bar of Explorer and select [Sharing and Security...|.
   The [Shared Documents Properties] dialog box will be displayed.
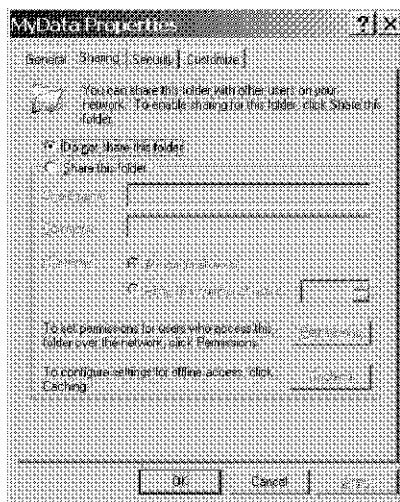
4. Select [Share this folder] and enter the share name into [Share name].
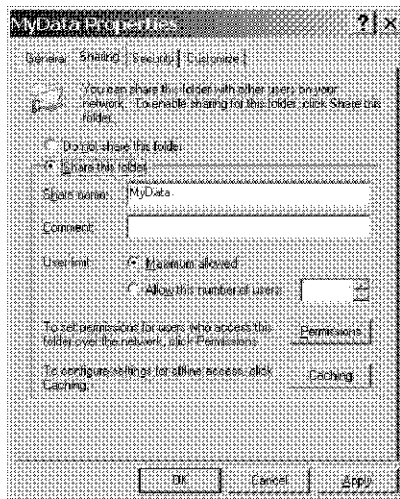
If you want to write from an external PC, perform the following setting.

5. Touch the **[Permissions]** button.
The **[Permissions for Documents]** dialog box will be displayed.
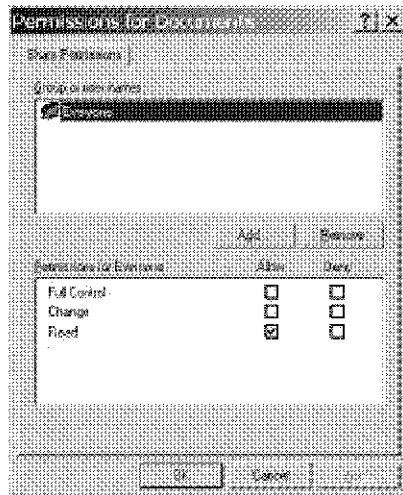
6. Select the |**Full Control**| check box for setting for sharing of |**Everyone**|.
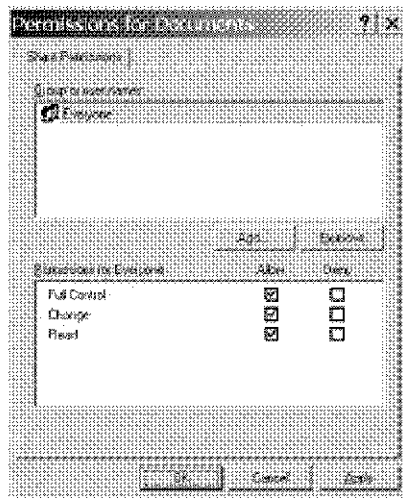
7. Press the **[OK]** buttons of all displayed dialog boxes to close the dialog boxes.

A.6 Initial Setting List

This section describes the default preset parameter setting list.

Function	Parameter	Initial set value	
		R3681	R3671
{FREQ}	Center Freq setting	16 GHz	6.5 GHz
	Start Freq setting	0 Hz	0 Hz
	Stop Freq setting	32 GHz	13 GHz
	Freq Offset setting	0 Hz	0 Hz
	Freq Offset On/Off	Off	Off
	CF Step Size setting (Manual)	3.2 GHz	1.3 GHz
	CF Step Size (Auto/Manual)	Auto	Auto
	Presele Manual Tune setting	0	0
	Channel Number setting	1	1
{SPAN}	Span setting	32 GHz	13 GHz
	Last Span setting	32 GHz	13 GHz
{LEVEL}	Ref Level setting	5.0 dBm	5.0 dBm
	LOG/LIN selection	LOG	LOG
	dB/div setting	10 dB/div	10 dB/div
	Unit setting	dBm	dBm
	ATT (Auto/Manual)	Auto	Auto
	ATT setting (Manual)	10 dB	10 dB
	Min ATT setting	10 dB	10 dB
	Min ATT On/Off	On	On
	Preamp On/Off	Off	Off
	Ref Offset setting	0.00 dB	0.00 dB
	Ref Offset On/Off	Off	Off
	Correction Factor On/Off	Off	Off
{BW}	RBW setting (Manual)	3 MHz	3 MHz
	RBW (Auto/Manual)	Auto	Auto
	VBW setting (Manual)	3 MHz	3 MHz
	VBW (Auto/Manual)	Auto	Auto
	VBW/RBW ratio	1	1
	VBW/RBW ratio (Auto/Manual)	Auto	Auto
	SPAN/RBW ratio	100	100
	SPAN/RBW ratio (Auto/Manual)	Auto	Auto
	PLL Band Width	Auto	Auto
	ADC Dither On/Off	Off	Off
{SWEEP}	Sweep Time setting (Manual)	480 ms	195 ms
	Sweep Time (Auto/Manual)	Auto	Auto
	Trigger Source Free Run/IF Power/Video/Ext1/Ext2/Line/Link	Free Run	Free Run
	Trigger Slope +/-	+	+
	Video Level setting	0 dBm	0 dBm

Function	Parameter	Initial set value	
		R3681	R3671
	Ext2 Level setting	2.5 V	2.5 V
	IF Power Level setting	50%	50%
	Trigger Delay setting	0.0 ms	0.0 ms
	IF Monitor On/Off	Off	Off
{SWEEP} Gated Sweep	Gated Sweep On/Off	Off	Off
	Gate Source FreeRun/IF Power/Ext1/Ext2/Link	Free Run	Free Run
	Gate Slope +/-	+	+
	Ext2 Level setting	2.5 V	2.5 V
	IF Power Level setting	50%	50%
	Gate Delay	0 sec	0 sec
	Gate Width	1 ms	1 ms
	Gate Width(Auto/Manual)	Auto	Auto
{SEARCH}	Peak Search Condition		
	X Range Mode All/Inner/Outer	All	All
	X Range Limit Position setting	16 GHz (freq)	6.5 GHz
	X Range Limit Width setting	6.4 GHz (freq)	2.6 GHz
	Couple to Freq(Time) ON/OFF	OFF	OFF
	Y Range Mode All/Disp Line/Limit Line	All	All
	Y Range Display Line Above/Below	Above	Above
	Y Range Limit Line 1 Above/Below	Above	Above
	Y Range Limit Line 2 Above/Below	Above	Above
	Peak ΔY setting	10 dB	10 dB
	Continuous Peak On/Off	Off	Off
	Multi Inner Limit Setup		
	Mkr X Range Inner Limit ON/OFF	OFF	OFF
	Mkr X Range Position setting	16 GHz	6.5 GHz
	Mkr X Range Width setting	6.4 GHz	2.6 GHz
	Mkr Y Range Inner Limit ON/OFF	OFF	OFF
	Mkr Y Range Top setting	1000 dBm	1000 dBm
	Mkr Y Range Bottom setting	-1000 dBm	-1000 dBm
	Couple to Freq(Time) ON/OFF	OFF	OFF
	Marker List On/Off	Off	Off
{MKR}	Marker Function ON/OFF	OFF	OFF
	ΔMarker On/Off	Off	Off
	FixedΔMarker On/Off	Off	Off
	1ΔMarker On/Off	Off	Off
	Marker No.	1	1
	Active Marker	1	1
	Reference Object	No Reference	No Reference
	Signal Track On/Off	Off	Off
	Marker Trace 1/2/3/4	1	1

A.6 Initial Setting List

Function	Parameter	Initial set value	
		R3681	R3671
	Marker Step Size setting (Manual)	3.2 GHz (freq) 1 ms (time)	1.3 GHz (freq) 1 ms (time)
	Marker Step Size (Auto/Manual)	Auto	Auto
{TRACE}	Trace setting	Write	Write
	Active Trace setting	1	1
	Trace Detector Normal/Positive/Negative/Sample/Average	Normal	Normal
	Detector (Auto/Manual)	Auto	Auto
	Average Type RMS/Video/Voltage	RMS	RMS
	Average Type (Auto/Manual)	Auto	Auto
	Normalize Correction On/Off	Off	Off
	Artificial Analog On/Off	Off	Off
	Analog Sampling Times setting	5	5
{POWER} Channel Power	Channel Power Window On/Off	On	On
	Channel Power Window Position setting	Center frequency	Center frequency
	Channel Power Window Width setting	6.4 GHz	6.4 GHz
	Average Times setting	100	100
	Average Times On/Off	On	On
	Avg Mode Cont/Rep	Continuous	Continuous
	Parameters Default/Manual	Manual	Manual
{POWER} Average Power	Average Power Window On/Off	Off	Off
	Average Power Window Position setting	Center frequency	Center frequency
	Average Power Window Width setting	6.4 GHz	6.4 GHz
	Average Times setting	100	100
	Average Times On/Off	On	On
	Avg Mode Cont/Rep	Continuous	Continuous
	Parameters Default/Manual	Manual	Manual
{POWER} OBW	OBW % setting	99%	99%
	Average Times setting	5	5
	Average Times On/Off	Off	Off
	Avg Mode Cont/Rep	Repeat	Repeat
	Parameters Default/Manual	Manual	Manual
{POWER} ACP	Average Times setting	5	5
	Average Times On/Off	Off	Off
	Avg Mode Cont/Rep	Repeat	Repeat
	Carrier Band Width setting	3.84 MHz	3.84 MHz
	Channel Space & Band Width Data In	CS:5 MHz/ BS:3.84 MHz	CS:5 MHz/ BS:3.84 MHz
	√Nyquist filter ON/OFF	OFF	OFF
	Symbol Rate setting	3.84 MHz	3.84 MHz

Function	Parameter	Initial set value	
		R3681	R3671
	Rolloff factor setting	0.22	0.22
	Parameters Default/Manual	Manual	Manual
	Noise Correction On/Off	Off	Off
{POWER} Multi Carrier ACP	Symbol Rate setting	3.84 MHz	3.84 MHz
	Rolloff Factor setting	0.22	0.22
	√Nyquist filer ON/OFF	OFF	OFF
	Average Times setting	5	5
	Average Times On/Off	Off	Off
	Average Mode Cont/Rep	Repeat	Repeat
	Parameter Setup Default/Manual	Manual	Manual
	Noise Correction On/Off	Off	Off
	Carrier Freq Adjustment setting	0 Hz	0 Hz
	Carrier Freq Adjustment On/Off	Off	Off
{POWER} Spurious Emission	Spurious Table No.	1	1
	Parameters Default/Manual	Manual	Manual
{POWER} Spectrum Emission Mask	Carrier Band Width setting	3.84 MHz	3.84 MHz
	√Nyquist filter ON/OFF	OFF	OFF
	Symbol Rate setting	3.84 MHz	3.84 MHz
	Rolloff factor setting	0.22	0.22
	Ref Power Chan/Peak	Channel	Channel
	Average Times setting	5	5
	Average Times On/Off	Off	Off
	Average Mode Cont/Rep	Continuous	Continuous
	Parameters Default/Manual	Manual	Manual
{POWER} CCDF	CCDF RBW setting	10 MHz	10 MHz
	Meas Sample setting	1 k	1 k
	Trace Write On/Off	Off	Off
	Gaussian On/Off	Off	Off
	X Scale Max	100 dB	100 dB
	CCDF Gate On/Off	Off	Off
{POWER} Multi Average Power	Window No.	1	1
	Window On/Off	On(Window1) Off(Window2 - 10)	On(Window1) Off(Window2 - 10)
	Window Position	0 ms	0 ms
	Window Width	1 ms	1 ms
	Active Window	1	1

A.6 Initial Setting List

Function	Parameter	Initial set value	
		R3681	R3671
	Couple to Power On/Off	Off	Off
	Power Ratio On/Off	Off	Off
	Average Times setting	100	100
	Average Times On/Off	Off	Off
	Average Mode Cont/Rep	Continuous	Continuous
	Parameters Default/Manual	Manual	Manual
{MEAS} Counter	Counter ON/OFF	OFF	OFF
	Counter Average Times setting	2	2
	Counter Average Times On/Off	Off	Off
{MEAS} X dB Down	X dB setting	3 dB	3 dB
	Disp Mode REL/A.L/A.R	REL	REL
	Cont Down On/Off	Off	Off
	Ref Marker On/Off	Off	Off
{MEAS} Noise/Hz	Noise/Hz ON/OFF	OFF	OFF
	Noise/Hz x Hz setting	1 Hz	1 Hz
	Noise/Hz Mode dBm/dBμV/dBc	dBm/Hz	dBm/Hz
{MEAS} %AM	%AM Measure On/Off	Off	Off
{MEAS} Harmonics	FUND Frequency setting	100 MHz	100 MHz
	FUND Frequency On/Off	Off	Off
	Harmonics Number setting	2	2
{MEAS} IM Meas	Order setting	3	3
	Limit Setup setting	0 dB	0 dB
	Pass/Fail Judgment On/Off	On	On
	Parameters Default/Manual	Manual	Manual
{PASS/FAIL}	Judgment On/Off	On	On
	Limit Line 1 On/Off	Off	Off
	Limit Line 2 On/Off	Off	Off
	Limit Line 1 Pass Range Above/Below	Below	Below
	Limit Line 2 Pass Range Above/Below	Above	Above
	X Data Mode Abs/Rel	ABS	ABS
	X Data Reference Center/Left/User Def	Left	Left
	X Data User Define setting	0 Hz (freq) 0 sec (time)	0 Hz (freq) 0 sec (time)
	X Data Offset setting	0 Hz (freq) 0 sec (time)	0 Hz (freq) 0 sec (time)
	Y Data Mode Abs/Rel	Abs	Abs
	Y Data Reference Top/Bottom/User Define	Top	Top

Function	Parameter	Initial set value	
		R3681	R3671
	Y Data User Define setting	0 dBm	0 dBm
	Y Data Offset setting	0 dB	0 dB
{DISPLAY}	Display Line On/Off	Off	Off
	Display Line setting	-50 dBm	-50 dBm
	Reference Line On/Off	Off	Off
	Reference Line setting	-50 dBm	-50 dBm
	XY Cursor On/Off	Off	Off
	Cursor Position X setting	16 GHz (freq)	6.5 GHz
	Cursor Position Y setting	-50 dBm	-50 dBm
	Anchor On/Off	Off	Off
	Meas Window On/Off	Off	Off
	Window Position setting	16 GHz	6.5 GHz
	Window Width setting	6.4 GHz	2.6 GHz
	Window Sweep On/Off	Off	Off
	Zoom F/F, Zoom T/T, F/T, OFF	OFF	OFF
	Zoom F/F(F/T) Position setting	16 GHz	6.5 GHz
	Zoom F/F(F/T) Width setting	32 GHz	13 GHz
	Zoom T/T Delay setting	0 s	0 s
	Zoom T/T Width setting	2 ms	2 ms
	Split ON/OFF	OFF	OFF
	Active Screen setting	1	1
	Annotations Setup		
	Disp Line ON/OFF	ON	ON
	Ref Line ON/OFF	ON	ON
	XY Cursor ON/OFF	ON	ON
	Meas Window ON/OFF	ON	ON
[GPIB Address...]	GPIB address of this instrument	8	8
[Freq Reference...]	Manual Mode ON/OFF	OFF	OFF
	Ext. Reference	10 MHz	10 MHz
[Display...]	Date Format YMD/MDY/DMY	YMD	YMD
	Date ON/OFF	ON	ON
	Title setting	NULL	NULL
[Save Item...]	Setup ON/OFF	ON	ON
	Trace ON/OFF	OFF	OFF
	Normalize Correction ON/OFF	OFF	OFF
	Limit Line ON/OFF	OFF	OFF
	Correction Factor ON/OFF	OFF	OFF
	Spectrum Emission Mask ON/OFF	OFF	OFF
	Spurious ON/OFF	OFF	OFF

A.7 Operation Principle

This section describes a root Nyquist filter to be used for input saturation and ACP measurement based on the operation principle of this instrument.

A.7.1 Input Saturation

When a large level signal is applied to this instrument, measurement errors may become larger, depending on the attenuator setting. Input saturation may be suspected as a cause of this. This section describes input saturation.

*   Cause of Input Saturation

    A block diagram of the input section of this instrument is shown in Figure A-1. The signal entering from the input connector is input into the mixer through the attenuator.
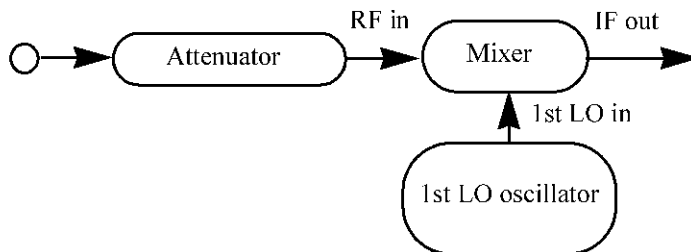
Figure A-1   Block Diagram of the Input Section

Under normal conditions, the input level and output level of the mixer are proportionate to each other. If the input level of the mixer becomes larger, however, the mixer is saturated and the output level of the mixer becomes disproportionate to the input level.
This is input saturation, which hinders correct measurement (see Figure A-2).
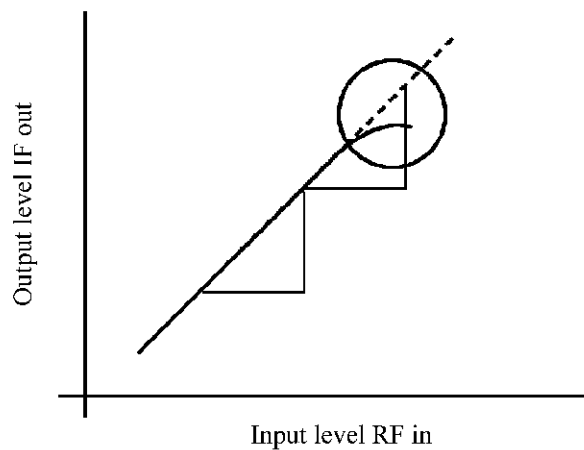
Figure A-2   Relation Between Input and Output of the Mixer

- Countermeasures against input saturation

  If input saturation occurs, set the most suitable attenuator value to lower the mixer input level.

***IMPORTANT:** If the attenuator setting is too large, the necessary signal becomes smaller and analysis becomes impossible. Contrarily, if the attenuator setting is too small, it may cause damage to the internal mixer circuit.*

Usually, automatic setting to an appropriate value is performed for continuous wave (CW) input signal if you set the attenuator to auto and the peak of the signal at or below the reference level.

In the case of measurement of input signal with a wide modulation bandwidth in which the resolution bandwidth (RBW) is narrower than the modulation bandwidth, the indication level becomes smaller. Therefore, it must be set to the optimum value manually.

- Method to confirm the optimum value

  1. Obtain a rough set value for the attenuator with the following formula.
     The maximum input level of the mixer is -5 dBm.

     Input attenuator set value (dB) ≥ Input level (dBm) + 10 dB

  2. Watching the screen, decrease the setting for the attenuator by one step. If the peak value on the screen does not change, there is no input saturation. You can continue measurement.
     If there is any change, increase the setting for the attenuator to eliminate the change.

A.7.2 Root Nyquist Filter

In this instrument, a correction equivalent to the passage of input signal in the root Nyquist filter can be made in adjacent channel leak power measurement.

In calculating the power for each channel by integrating the trace data, multiply by the coefficient of the root Nyquist filter at the corresponding frequency (H(n)).

$$P''_U = \sum_{n=a}^{b} 10^{\left(\frac{P(n)}{10}\right)} \times H(n)$$

$$a = f_{Uch} - \frac{(1+\alpha)}{2T}, \quad b = f_{Uch} + \frac{(1+\alpha)}{2T}$$

$$P''_L = \sum_{n=a}^{b} 10^{\left(\frac{P(n)}{10}\right)} \times H(n)$$

$$a = f_{Lch} - \frac{(1+\alpha)}{2T}, \quad b = f_{Lch} + \frac{(1+\alpha)}{2T}$$

The coefficient of the root Nyquist filter (H(n)) is calculated from the symbol rate (T) and the rolloff factor (α) using the following formula.

$$|H(n)| = \begin{cases} 1 & 0 \le |f| \le (1-\alpha)/2T \\ \cos[(T/4\alpha)(2\pi|f| - \pi(1-\alpha)/T)] & (1-\alpha)/2T \le |f| \le (1+\alpha)/2T \\ 0 & (1+\alpha)/2T \le |f| \end{cases}$$

A.7.2 Operation Principle

Characteristics of the root Nyquist filter are shown below.
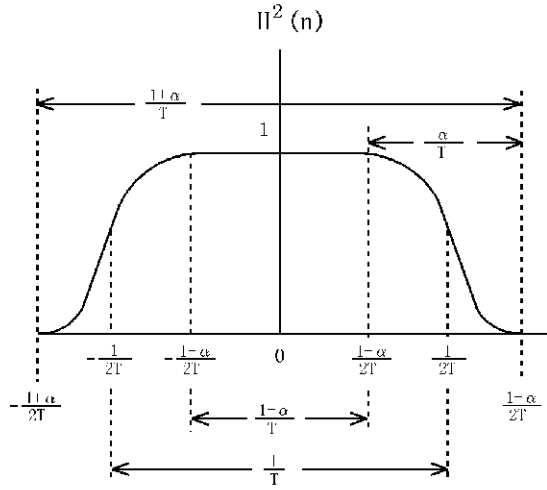
Figure A-3   Characteristics of the Root Nyquist Filter

A.8 Glossary

Average Noise Level

This sensitivity represents spectrum analyzer's capability of detecting the smallest signal and is directly related with noises generated from a spectrum analyzer itself. The sensitivity, however, varies depends on the resolution bandwidth used. In general, the maximum input sensitivity of a spectrum analyzer is expressed as average noise level when the instrument is used with its minimum resolution bandwidth.

Bandwidth Accuracy

The bandwidth accuracy of the resolution bandwidth filter is expressed by the deviation from the nominal value of the 3 dB lowered point. This deficiency has almost no effect when measuring normal signals at a continuous level, but it should be taken into consideration when measuring the level of a noise signal.

Bandwidth Selectivity

The bandpass filter normally attenuates using a Gaussian distribution instead of the so-called rectangular characteristic. Consequently, if two adjacent signals of different sizes are mixed, the smaller signal hides at the tail of the larger signal (Figure A-4).

Therefore, the bandwidth at a certain attenuation range (60 dB) should also be defined. The ratio between the 3 dB width and 60 dB width is expressed as the bandwidth selectivity (BW60 dB/BW3 dB).

(a) Separation of signal at different levels   (b) IF filter selectivity
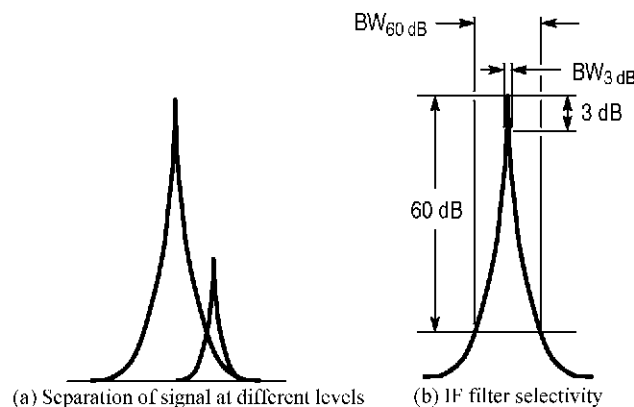
Figure A-4   Bandwidth Selectivity

Bandwidth Switching Uncertainty

Several resolution bandwidth filters are used to obtain an optimal resolution in signal spectrum analysis according to the scan width. When switching from one resolution bandwidth filter to another while measuring one signal, an error is generated for the differences in loss. This error is defined as the bandwidth switching uncertainty.
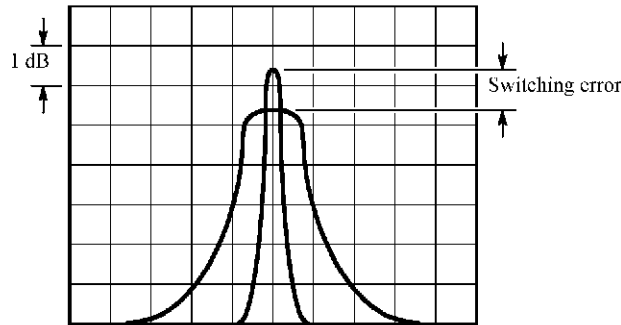
Figure A-5   Bandwidth Switching Uncertainty

Frequency Response

This term represents amplitude characteristics (frequency characteristics) for a given frequency. In the spectrum analyzer, frequency response means the frequency characteristics (flatness) of the input attenuator and mixer for the input frequency, and is given in $\pm \Delta dB$.

Gain Compression

If the input signal is greater than a certain value, the correct value is not displayed on the screen, and the input signal appears as if it were compressed. This phenomenon is called gain compression, and it reflects an error in the linearity of the input signal range. Normally, the gain compression for a spectrum analyzer is specified as the input signal level that produces a 1 dB error from a perfect linear response.

IF Gain Uncertainty

The uppermost scale on the screen is the reference used to read the absolute level of an input signal on the spectrum analyzer. The level set for this uppermost scale is referred to as the reference level.
The reference level is set using the **Ref Level** key and displayed in dBm or dBμ. The absolute accuracy of this display is determined by the IF gain uncertainty assuming the input attenuator is at a constant level.
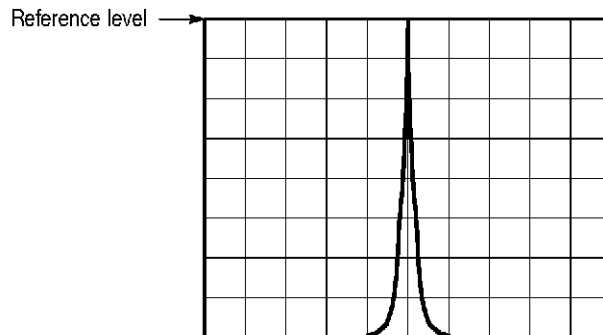
Figure A-6   IF Gain Uncertainty

Maximum Input Level

This is the maximum level allowed for the input circuit of the spectrum analyzer. The level can be modified by the input attenuator.

Noise Sidebands

Spectrum analyzer efficiency is reduced by noise generated in the local oscillator and phase lock loop of the analyzer. This noise will appear in the vicinity of the spectrum on the screen.
To compensate for this, the sideband of the analyzer is defined so that signals out of the sideband can be analyzed in a certain range. This range is called the noise sideband.
The spectrum analyzer's noise sideband characteristics are shown in the following example.

Example   Suppose the noise level measured in the resolution bandwidth of 1 kHz is -70 dB at 20 kHz apart from the carrier. The noise level is normally expressed by the energy contained in the 1 Hz bandwidth (Figure A-7 (b)). With a bandwidth of 1 Hz, the following applies: Since the value is -70 dB when the bandwidth is 1 kHz, the signals within the 1 Hz bandwidth will be lower than this by about 10 log 1 Hz/1 kHz [dB], or about 30 dB; consequently, it is expressed as -100 dB/Hz at 20 kHz apart from the carrier when the resolution bandwidth is 1 kHz.
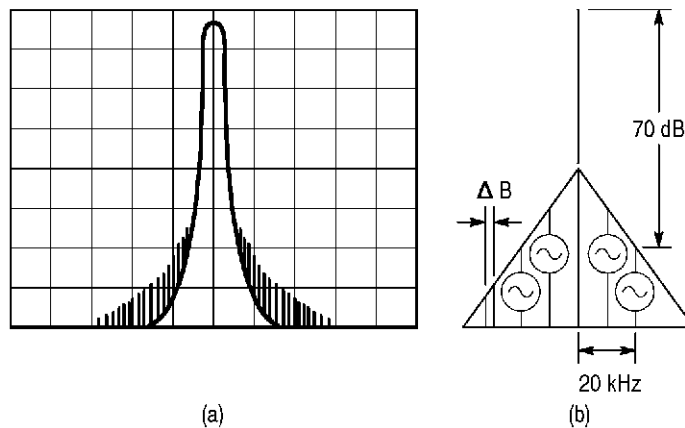
Figure A-7   Noise Sidebands

Occupied Bandwidth

When information is transmitted through radio waves, the extension of the frequency spectrum is caused along with the modulation. The occupied bandwidth is defined as the width of frequency spectrum that occupies 99% of all averaged electric power (see Figure A-8).
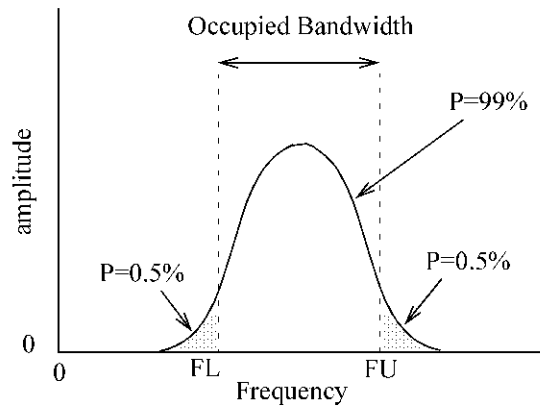
Figure A-8   Occupied Bandwidth

Residual FM

The short-term frequency stability of the local oscillators built in the spectrum analyzer is expressed as residual FM. The frequency width fluctuating per unit time is expressed as p-p. This also determines the measurement limit value when measuring the residual FM of a signal.

Residual Response

Residual response is a measure of how much (in the input level calculation) the spurious signal generated by the spectrum analyzer is suppressed. Residual response is generated by leaks of signals such as local oscillation output in the spectrum analyzer. This should be taken into consideration when analyzing a low-level input signal.

Resolution Bandwidth

The spectrum analyzer uses the bandpass filter (BPF) to analyze the frequency components contained in the input signal. The 3dB bandwidth of the BPF is called the resolution bandwidth (See Figure A-9 (a) below). BPF characteristics should be set according to the sweep width and the sweep speed used for the trace. This spectrum analyzer sets the optimal value for the sweep width. In general, smaller bandwidths improve resolution so the resolution of the spectrum analyzer should be expressed using the narrowest resolution bandwidth (See Figure A-9 (b) below).
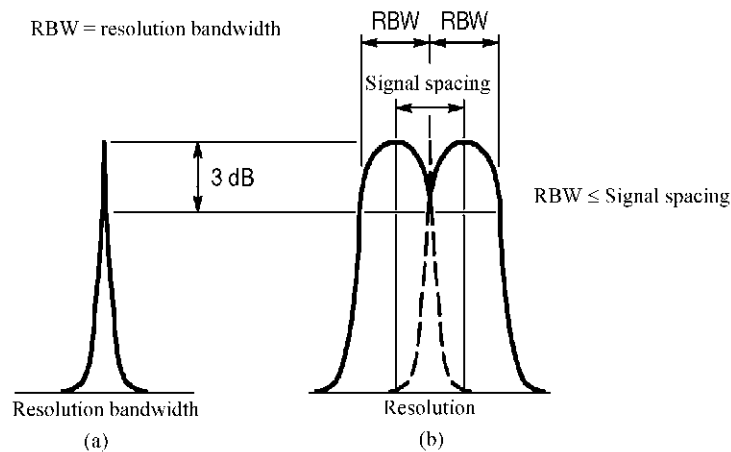
Figure A-9   Resolution Bandwidth

Spurious Response

Spurious signals are signals that cause distortion to an ideal signal, and are classified according to their characteristics.

Second harmonic distortion:

This is the distortion caused by the non-linearity of a spectrum analyzer (especially generated in the mixer) when an ideal, undistorted signal is input to the spectrum analyzer. This performance determines spectrum analyzer's capability of measuring harmonic distortion (see Figure A-10).

Third order distortion:

This is the distortion caused by the non-linearity of a spectrum analyzer when two signals with different frequencies f1 and f2 are input, thus outputting two signals: one signal with frequency 2f1-f2; and another signal with frequency 2f2-fi. The amplitude of these signals depends on the input levels at the mixer (see Figure A-10). The maximum value is specified.

Image/Multiple/Extra-band responses:

In addition to the two types of spurious signals described above, there is a third type called "non-harmonic spurious" that is generated by the spectrum analyzer with a frequency proper to each spectrum analyzer. There are three types of responses in the non-harmonic spurious: the image, multiple and extra-band responses.
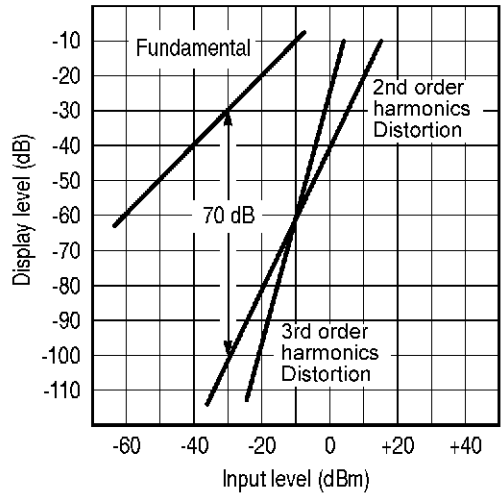
Figure A-10   Spurious Response

VSWR (Voltage Standing Wave Ratio)

This shows the state of impedance matching when a spectrum analyzer is connected to a voltage source whose output impedance is ideal and nominal. The VSWR is expressed as the ratio of the maximum value to minimum value of a standing wave which consists of traveling and reflected waves. The VSWR is another expression of the reflection coefficient or return loss.

Referring to Figure A-11, The signal at the receiving end E1 is the same as the signal at the transmitting end (E_0, or the spectrum analyzer input section) if the impedance of the receiving end is matched to that of the transmitting end.
The reflection coefficient is expressed in the formula shown below when the reflected wave E_R exists due to a mismatch between the impedances.

Reflection coefficient m = Reflected wave E_R / Traveling wave E_0

The Return loss is expressed in the formula shown below.

Return loss $= 20 \log E_R / E_0$ [dB] VSWR
$\quad\quad\quad = (E_0 + E_R) / (E_0 - E_R)$

The relationship of VSWR with the reflection coefficient is as follows.

VSWR $= (1 + | m |) / (1 - | m |)$

The range of VSWR is between 1 and ∞ the nearer to 1 this value is, the better the state of impedance matching is.

Signal to be measured   Spectrum analyzer

Sender E_0 E_1 Receiver

Traveling wave   Reflected wave
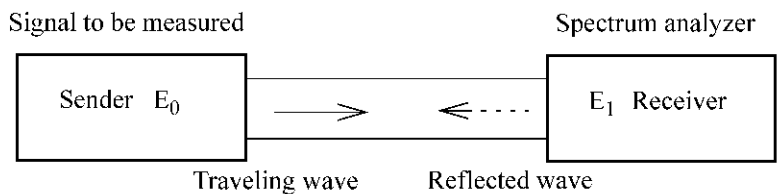
Figure A-11   VSWR

Zero Span

The spectrum analyzer sweeps at any frequency along the horizontal axis as the time axis but will not sweep in zero span mode.

A.9 dB Conversion Formula

1. Definitions

$$0dBV = 1Vrms \qquad YdBV = 20log\frac{XV}{1V}$$

$$0dBm = 1mW \qquad YdBm = 10log\frac{XmW}{1mW}$$

$$0dB\mu V = 1\mu Vrms \qquad YdB\mu V = 20log\frac{X\mu V}{1\mu V}$$

$$0dBpw = 1pW \qquad YdBpw = 10log\frac{XpW}{1pW}$$

2. Conversion formulas

   If R = 50 Ω: If R = 75 Ω:

   dBV ≅ (dBm - 13dB)   dBV ≅ (dBm - 11dB)

   dBμV ≅ (dBm + 107dB)   dBμV ≅ (dBm + 109dB)

   dBμVemf ≅ (dBm + 113dB)   dBμVemf ≅ (dBm + 115dB)

   dBpw ≅ (dBm + 90dB)   dBpw ≅ (dBm + 90dB)

3. Examples

   Converting 1mV into dBμV: $20log\frac{1mV}{1\mu V} = 20log\ 10^3 = 60dB\mu V$

   Converting 0dBm into dBμV: $\begin{cases} 0dBm + 107dB = 107dB\mu V(R = 50\Omega) \\ 0dBm + 109dB = 109dB\mu V(R = 75\Omega) \end{cases}$

   Converting 60dBμV into dBm: $\begin{cases} 60dB\mu V - 107dB = -47dBm(R = 50\Omega) \\ 60dB\mu V - 109dB = -49dBm(R = 75\Omega) \end{cases}$

   Converting 10V/m into dBμV/m: $20log\frac{10V/m}{1\mu V/m} = 140dB\mu V/m$

4. Relationship between dBm and Watt

+50dBm	+40dBm	+30dBm	+20dBm	+10dBm	+0dBm	-10dBm	-20dBm	-30dBm
100W	10W	1W	100mW	10mW	1mW	0.1mW	0.01mW	0.001mW

A.10 Standard Information File Format

When the standard's setting is saved by using the [**Save STD Data...**], the file shown in Figure A-12 is created.

If the file is loaded by using the [**Load STD Data...**] after the file data is edited, the parameters can be set as the default value of the standard. This standard Information file is created in CSV format.

Figure A-12   Standard Information file

The file consists of the previous header portion, which includes the early several rows, and the following parameter portion.

1. Header

This portion includes all the rows from the beginning of the file to the 8th row. Don't change this portion, because the standard's parameters are unrelated.

Row number	String shown in Figure A-12	Description
1	[ASCII]	Shows the strings in ASCII format.
2	[R3681]	Shows the product series name of the main unit when the file was created by using the **[Save STD Data...]**.
3	[test]	Shows the strings, which are indicated in the Memo area, when the file is selected by using the **[Load STD Data...]**.
4	[User Data]	Shows the strings which are indicated in the Information area, when the file is selected by using the **[Load STD Data...]**.
5	[1934]	The load cannot be executed if the value is deleted.
6	3GPP	Shows the standard's name. The user file, which is created or renewed when the **[Load STD Data...]** is executed, belongs to the category of this standard and is named "Standard name_User.csv".
7	UpLink	Shows the state of the standard, when the file was created by using the **[Save STD Data...]**. Changing the row has no effect.
8	2003/11/7	The memo. Any characters can be written.

2. Parameters

This portion includes the rows from the 9th row to the end of the file. These rows describe the relation to the default value of the standard. The parameter portion consists of the function name row and the parameter rows.

This portion is described in the following order: the function name (single row) → the parameters (multiple rows) → .... The description of the parameter rows, which are next to the function name row, shows the default values of the function.

The rows from the 10th to the 19th rows are the parameters of the Average Power function, and the rows from 22nd to 28th rows are the parameters of the ACP function in Figure A-12.

A.10.1 Function of Standard Measurement and String

The function, which can set the default values in the standard measurement, and the string of the function name are below.

Function name	String
OBW	[OBW]
ACP	[ACP]
Multi Carrier ACP	[Multi Carrier ACP]
Spurious Emission	[Spurious Emission]
Spectrum Emission Mask	[Spectrum Emission Mask]
Channel Power	[Channel Power]
Average Power	[Average Power]
Channel	[Channel]
Multi Average Power	[Multi Average Power]

A.10.2 Parameters of Standard Measurement

The table of the parameters in the Standard Information file and the setting values when the parameters are omitted is below.

The parameters which can be set in all measurement functions

Parameter name	Label	Parameter	Initial value
Span	: FREQ : SPAN	Real value	1 GHz
RBW	: BAND : RES	Real value	3 MHz
RBW Auto/Manual	: BAND : RES : AUTO	ON or OFF	Manual
VBW	: BAND : VID	Real value	3 MHz
VBW Auto/Manual	: BAND : VID : AUTO	ON or OFF	Manual
Sweep Time	: SWE : TIME	Real value	10 ms
Sweep Time Auto/Manual	: SWE : TIME : AUTO	ON or OFF	Manual
Trace Write / View / Blank / Average / MaxHold / MinHold	: DISP : TRAC : MODE<1~4>	WRIT / VIEW / BLAN / AVER / MAXH / MINH	Write(1), Blank(2~4)
Detector	: DET : TRAC : FUNC<1~4>	NORM / POS / NEG / SAMP / AVER	Auto value of each function
Detector Auto/Manual	: DET : TRAC : FUNC : AUTO<1~4>	ON or OFF	Manual
Average Type RMS / Video / Average	: AVER : TYPE	RMS or VID or AVER	RMS
Average Type Auto / Manual	: AVER : TYPE : AUTO	ON or OFF	Manual

A.10.2 Standard Information File Format

Parameter name	Label	Parameter	Initial value
Gated Sweep On/Off	: SWE : GATE	ON or OFF	OFF
Gate Source	: SWE : GATE : SOUR	IMM / IF / EXT1 / EXT2 / LINK	IMM
Gate Width	: SWE : GATE : WIDT	Real value	50 μs
Gate Width Auto/Manual	: SWE : GATE : WIDT : AUTO	ON or OFF	Manual
Gate Delay	: SWE : GATE : DEL	Real value	0 s
Gate Trigger Level (IF Power)	: SWE : GATE : LEV : IF	Real value	50%
Gate Trigger Level (Ext2)	: SWE : GATE : LEV : EXT	Real value	2.5 V
Gate Slope +/-	: SWE : GATE : SLOP	POS/NEG	+
Trigger Source	: TRIG : SOUR	IMM / IF / VID / EXT1 / EXT2 / LINE / LINK	IMM
Trigger Level (IF Power)	: TRIG : LEV : IF	Real value	50%
Trigger Level (Video)	: TRIG : LEV : VID	Real value	0 dBm
Trigger Level (Ext2)	: TRIG : LEV : EXT	Real value	2.5 V
Trigger Slope +/-	: TRIG : SLOP	POS / NEG	+
Trigger Delay	: TRIG : DEL	Real value	0 s

OBW Parameter

Parameter name	Label	Parameter	Initial value
OBW Percent	: OBW : PERC	Real value	99.8%
Average On/Off	: OBW : AVER	ON or OFF	OFF
Average Count	: OBW : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: OBW : AVER : MODE	CONT or REP	Repeat

ACP Parameter

Parameter name	Label	Parameter	Initial value
Average On/Off	: ACP : AVER	ON or OFF	OFF
Average Count	: ACP : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: ACP : AVER : MODE	CONT or REP	Repeat
Carrier Band Width	: ACP : CBW	Real value	3.84 MHz
Channel Space & Band Width	: ACP : CSBW : DATA	Real value, Real value	All initialization
√Nyquist Filter On/Off	: ACP : RNYQ	ON or OFF	OFF
Symbol Rate	: ACP : RNYQ : SRAT	Real value	3.84 MHz
Rolloff Factor	: ACP : RNYQ : RFAC	Real value	0.22
Noise Correction On/Off	: ACP : NCOR	ON or OFF	OFF

Average Power Parameter

Parameter name	Label	Parameter	Initial value
Average On/Off	: APOW : AVER	ON or OFF	OFF
Average Count	: APOW : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: APOW : AVER : MODE	CONT or REP	Cont
Window On/Off	: APOW : WIND	ON or OFF	ON
Window Position	: APOW : WIND : POS	Real value	0 Hz
Window Width	: APOW : WIND : WIDT	Real value	1 GHz

Channel Power Parameter

Parameter name	Label	Parameter	Initial value
Average On/Off	: CPOW : AVER	ON or OFF	OFF
Average Count	: CPOW : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: CPOW : AVER : MODE	CONT or REP	Cont
Window On/Off	: CPOW : WIND	ON or OFF	ON
Window Position	: CPOW : WIND : POS	Real value	0 Hz
Window Width	: CPOW : WIND : WIDT	Real value	1 GHz

A.10.2 Standard Information File Format

Multi Carrier ACP Parameter

Parameter name	Label	Parameter	Initial value
Average On/Off	: MCAC : AVER	ON or OFF	OFF
Average Count	: MCAC : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: MCAC : AVER : MODE	CONT or REP	Repeat
√Nyquist Filter On/Off	: MCAC : RNYQ	ON or OFF	OFF
Symbol Rate	: MCAC : RNYQ : SRAT	Real value	3.84 MHz
Rolloff Factor	: MCAC : RNYQ : RFAC	Real value	0.22
Offset Setup On/Off	: MCAC : PAR : STAT<1~16>	ON or OFF	OFF
Offset Freq	: MCAC : PAR : FREQ<1~16>	Real value	0 Hz
Band Width	: MCAC : PAR : BWID<1~16>	Real value	0 Hz
Reference No.	: MCAC : PAR : REF<11~16>	Integer	1
Limit	: MCAC : PAR : LIM<11~16>	Real value	0 dB
Noise Corr On/Off	: MCAC : NCOR	ON or OFF	OFF
Carrier Freq Adjustment On/Off	: MCAC : CARR : ADJ : STAT	ON or OFF	ON
Carrier Freq Adjustment	: MCAC : CARR : ADJ	Real value	0 Hz

Spurious Parameter

Parameter name	Label	Parameter	Initial value
Table 1/2/3	: SPUR : DATA : ACT	Real value	---
Table Data In (1~3)	: SPUR : DATA<1~3>	(*1)	All initialization

Spectrum Emission Mask Parameter

Parameter name	Label	Parameter	Initial value
Carrier Band Width	: SEM : CBW	Real value	3.84 MHz
√Nyquist Filter On/Off	: SEM : RNYQ	ON or OFF	ON
Symbol Rate	: SEM : SRAT	Real value	3.84 MHz
Rolloff Factor	: SEM : RFAC	Real value	0.22
Offset Data In	: SEM : DATA	(*2)	All initialization
Average Times On/Off	: SEM : AVER	ON or OFF	OFF
Average Times	: SEM : AVER : COUN	Integer	5
Average Mode Cont/Repeat	: SEM : AVER : MODE	CONT or REP	Cont
Reference Power Chan/Peak	: SEM : RPOW : MODE	CHAN or PEAK	Channel

Channel Parameter

Parameter name	Label	Parameter	Initial value
Table Enable/Disable	: CHAN : STAT<1~9>	ON or OFF	OFF
Channel Number Min	: CHAN : MIN<1~9>	Integer	---
Channel Number Max	: CHAN : MAX<1~9>	Integer	---
Channel Space	: CHAN : SPAC<1~9>	Real value	---
Channel Offset	: CHAN : OFFS<1~9>	Integer	---
Channel Base Freq	: CHAN : BASE<1~9>	Real value	---

Multi Average Power Parameter

Parameter name	Label	Parameter	Initial value
Window On/Off	: MAP : WIND<1~10>	ON or OFF	1:ON 2-10:OFF
Window Position	: MAP : WIND : POS<1~10>	Real Value	Time on the left side of the screen
Window Width	: MAP : WIND : WIDT<1~10>	Real Value	Sweep time/10
Active Window	: MAP : WIND : ACT	1-10	1
Couple to Power	: MAP : WIND : COUP	ON or OFF	OFF
Power Ratio On/Off	: MAP : PRAT	ON or OFF	OFF
Average On/Off	: MAP : AVER	ON or OFF	OFF
Average Count	: MAP : AVER : COUN	Integer	100
Average Mode Cont/Repeat	: MAP : AVER : MODE	CONT or REP	Cont

A.10.2 Standard Information File Format

(*1) The following 13 parameters are included in the Spurious Table Data In.
Real value (start freq), Real value (stop freq), ON or OFF(RBW Auto), Real value (RBW), ON Or OFF(VBW Auto), Real value (VBW), ON or OFF(SWP Auto), Real value (SWP), Real value (Ref Level), ON or OFF(ATT Auto), Real value (ATT), ON or OFF(Preamp), Real value (Limit)

(*2) The following 8 parameters are included in the Spectrum Emission Mask Offset Data In. Each parameter is written in the column from B to I.
Real value (Start), Real value (Stop), Real value (IBW), Real value (Limit Abs Start), Real value (Limit Abs Stop), Real value (Limit Rel Start), Real value (Limit Rel Stop), ABS or REL or AAR or AOR

ALPHABETICAL INDEX

[Numerics]

[A]

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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.

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