ADVANTEST

ADVANTEST CORPORATION

R3477 Series
User's Guide

MANUAL NUMBER FOE-8440194C00

Applicable Model
R3477

First printing January 20, 2005
Printed in Japan

Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

  Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

  Symbols of those warning labels are shown below together with their meaning.

  DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

  WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

  CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

  Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

  - Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
  - When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
  - When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
  - Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
  - Connect the power cable to a power outlet that is connected to a protected ground terminal. Grounding will be defeated if you use an extension cord which does not include a protected ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.
  - Do not place anything on the product and do not apply excessive pressure to the product. Also, do not place flower pots or other containers containing liquid such as chemicals near this

product.

- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

 : ATTENTION - Refer to manual.

 : Protective ground (earth) terminal.

 : DANGER - High voltage.

 : CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.
Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.
Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

Each product may use parts with limited life.
For more information, refer to the section in this document where the parts with limited life are described.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD display	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years
Memory backup battery	5 years

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
  Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.

- Store and operate the products under the following environmental conditions.
  An area with no sudden temperature changes.
  An area away from shock or vibrations.
  An area free from moisture, dirt, or dust.
  An area away from magnets or an instrument which generates a magnetic field.

- Make back-ups of important data.
  The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **Precautions when Disposing of this Instrument**

When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other
Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- Altitude of up to 2000 m

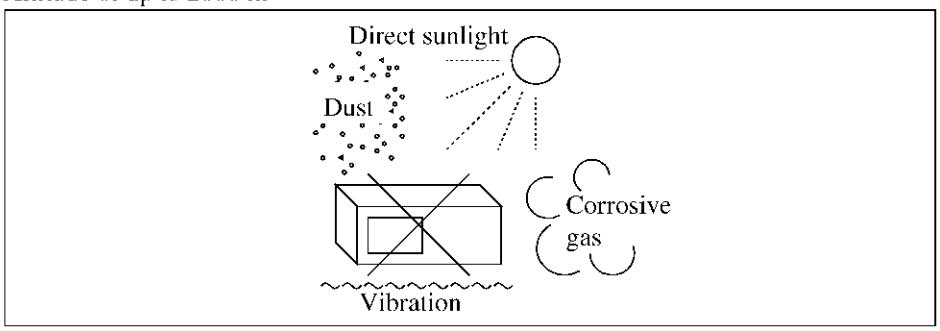


Figure-1 Environmental Conditions

- Operating position

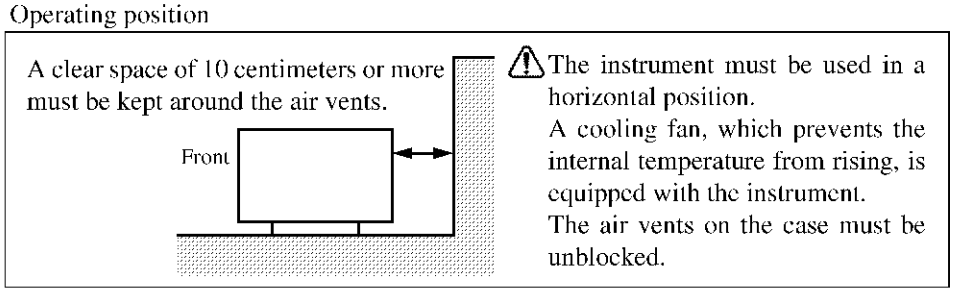


Figure-2 Operating Position

- Storage position

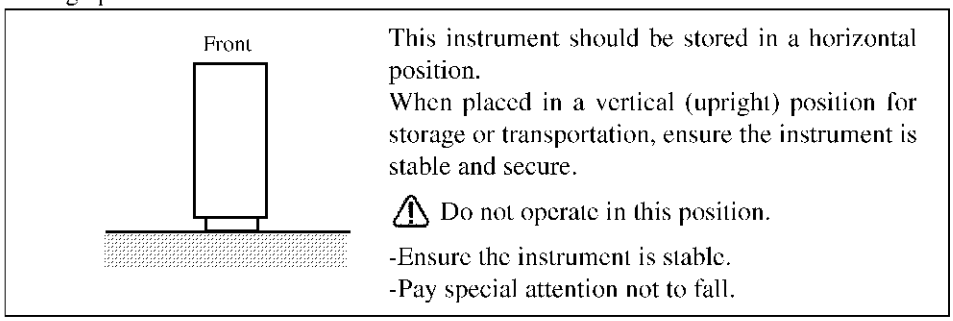


Figure-3 Storage Position

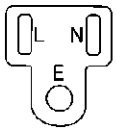
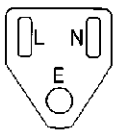
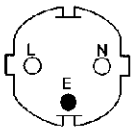
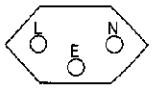
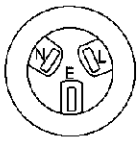
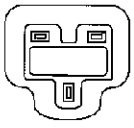
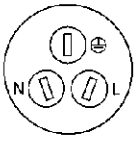
- The classification of the transient over-voltage, which exists typically in the main power supply, and the pollution degree is defined by IEC61010-1 and described below.

  Impulse withstand voltage (over-voltage) category II defined by IEC60364-4-443

  Pollution Degree 2

Types of Power Cable

Replace any references to the power cable type, according to the following table, with the appropriate power cable type for your country.

Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
	CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: The Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V at 6 A Gray 2 m (6 ft)	Straight: A01404 (Option 96) Angled: A01414
	SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
	SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
	BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417
	CCC:China	250 V at 10 A Black 2 m (6 ft)	Straight: A114009 (Option 94) Angled: A114109

Certificate of Conformity

CE

This is to certify, that

Signal Analyzer

R3477 Series

instrument, type, designation

complies with the provisions of the EMC Directive 89/336/EEC (All of these factors are revised by 91/263/EEC,92/31/EEC,93/68/EEC) in accordance with EN61326
and Low Voltage Directive 73/23/EEC (All of these factors are revised by 93/68/EEC) in accordance with EN61010.

ADVANTEST Corp.

Tokyo, Japan

ROHDE&SCHWARZ

Europe GmbH
Munich, Germany

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. INTRODUCTION

This chapter describes the contents of this manual and the product overview of the R3477 series Signal Analyzer to help you get the most out of this manual.

1.1 Contents of This Manual

This manual can be used by novices or experienced users of this instrument. You may read through this manual from Chapter 1 to learn more about this instrument or you may refer to the table of contents, which is found at the beginning of each chapter and directly jump to the section that you need.

The contents of each chapter are as follows:

CHAPTER 1. INTRODUCTION	This chapter describes the contents of this manual and the product overview.
CHAPTER 2. PRECAUTIONS WHEN USING THE R3477	This chapter describes precautions when using this instrument. Read this chapter before using this instrument.
CHAPTER 3. SETUP	This chapter describes how to setup this instrument. After setting up this instrument in an appropriate location, turn on the power and check that this instrument starts correctly.
CHAPTER 4. QUICK START	This chapter describes the functions of each part of the panel and the screen of this instrument. You can learn how to operate this instrument from the operations and simple examples.
CHAPTER 5. MENU MAP, FUNCTIONAL EXPLANATION	This chapter describes the menu structure and functions of soft keys.
CHAPTER 6. REMOTE CONTROL	This chapter describes program examples and the table of commands used when operating this instrument by remote.
CHAPTER 7. SPECIFICATIONS	This chapter describes the specifications of this instrument.
CHAPTER 8. OPTIONS AND ACCESSORIES	This chapter describes options and accessories which are sold separately.
CHAPTER 9. MAINTENANCE	This chapter describes how to care for this instrument such as cleaning, calibration, and storage to maintain the high performance and smooth functioning of this instrument. Also this chapter describes how to identify problems and the relevant procedures to follow.

APPENDIX	This chapter describes the following information: • Principles of measurement • Technical terms used in this manual • How to set up the network • How to install the printer driver • How to set up file sharing

1.2 Product Overview

The R3477 Signal Analyzer corresponds to the next generation of digital wireless communication. This instrument provides the performance, which corresponds to the needs for a broader signal range, a wider dynamic range, and a multi-carrier architecture, and corresponds to the various wireless communication systems by adding the signal analysis software option.

The main features of this instrument are as follows:

- Various signals can be analyzed by adding the modulation analysis software option.
- Wide frequency measurement range: 9 kHz to 13.5 GHz
- Extremely low noise level: -158 dBm (typical value @ 10 MHz to 1 GHz)
- Low distortion: TOI +26 dBm (typical value @ 2 GHz to 3.3 GHz)
- Broad modulation analysis bandwidth: >20 MHz
- Built-in attenuator in 5 dB steps

1.3 Other Manuals Related to This Instrument

The following manuals are available for this instrument:

- User's Guide (Part Code: {ER3477-U}, This manual)

  This manual describes, in addition to how to use the R3477 series Signal Analyzer, the following information: setup, basic operations, applied measurements, function descriptions, controlling by remote, specifications, and maintenance.

- Performance Test Guide (Part Code: {ER3477-T}, English)

  This manual describes information, which is required to check the performance of the R3477 series Signal Analyzer, such as performance test procedures and specifications.

1.4 Conventions of Notation Used in This Document

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

Hard keys
"Hard keys" are hardware keys which are on the panel.

Sample	Indicates a hard key labeled "Sample." Example: **FREQ**, **LEVEL**

Touch-screen system menus

[Sample]	Indicates a touch-screen menu, tab, button or dialog box that is labeled "Sample" and that is selected or executed when touched. Example: **[Normal]** tab, **[Option]** button

Touch-screen soft menu bar

Sample	Indicates a touch-screen soft menu bar labeled "Sample." Example: **Center** key, **Ref Level** key

Sequential key operation

FREQ, **Center**	Indicates that you need to touch the **FREQ** key and then touch the **Center** key.

Toggle key operation

ΔMarker On/Off (On)	Indicates that you need to touch the **ΔMarker On/Off** key to turn on the ΔMarker.

1.5 Trademarks and Registered Trademarks

- Microsoft® and Windows® are trademarks or registered trademarks of Microsoft Corporation in the United States and other countries.
- Other product and company names referenced herein are trademarks or registered trademarks of their respective owners.

2. PRECAUTIONS WHEN USING THE R3477

This chapter describes precautions when using this instrument. Read this chapter before using this instrument.

2.1 If a Fault Occurs

If any smoke, smell, or noise emanates from this instrument, turn off the MAIN POWER switch, remove the power cable from the AC power connector, and then contact an Advantest sales representative immediately.

2.2 Removing the Case

The case of this instrument should only be opened by Advantest service engineers.

WARNING: ***This instrument contains high-voltage and high temperature parts which may cause electrical shocks or burns.***

2.3 Power Fuse

This instrument is protected from overcurrent by a power fuse. If the power fuse blows, there may be some problems in this instrument. Contact Advantest and request a sales representative to repair this instrument.

The power fuse is placed in a fuse holder which is located on the rear panel.

The power fuse can be checked or replaced according to the following procedure:

WARNING: ***Use the same rating and same type power fuse to prevent a fire.***

---

1. Press the **POWER** switch on the front panel to turn off the power supply if the instrument operates.
2. Set the MAIN POWER switch to OFF and remove the power cable from the AC power connector.
3. Remove the fuse holder located on the rear panel by using a flathead screwdriver.
4. Check or replace the power fuse and put the fuse holder back in.

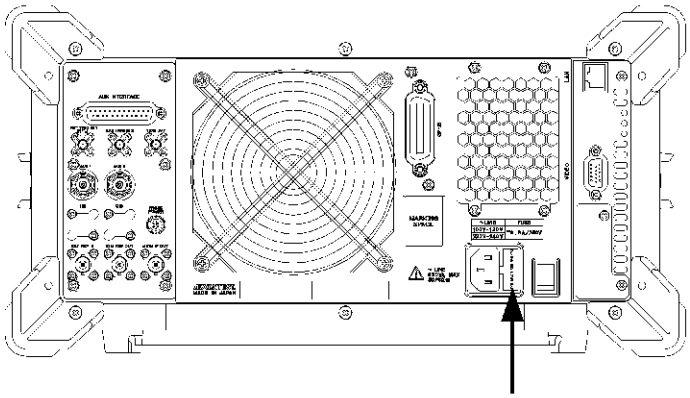


Figure 2-1 Fuse Holder Location

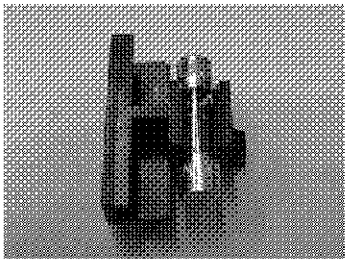


Figure 2-2 Fuse Holder

2.4 Built-in Flash Memory

Because flash memory is included in this instrument, be careful of the following:

- Do not turn off the power when the access lamp lights.
  Data which is being accessed may be damaged.

NOTE: ***Advantest is not responsible for any consequences if any unusual circumstances cause an abnormality to occur in the built-in flash memory and the stored data is erased or corrupted.***

2.5 Handling the Touch Screen

Because the touch screen is included in this instrument, be careful of the following:

- Avoid giving strong impact or excessive force to the screen.
  The glass screen may become damaged.
- Using a hard-pointed material such as a mechanical pencil or a ballpoint may damage the screen.

2.6 To Avoid Disrupting the Software Environment

This instrument includes Microsoft Windows XP Embedded.

Because the functions of this instrument depend on the Windows environment, do not alter the Windows environment in any way other than described in this manual.

This instrument is not a data processor. Only perform the operations which are described in this manual.

1. Non-permitted actions:
   - Installing other application programs
   - Changing or deleting items in the control panel (except for those procedures described in "A.2 Installing the Printer Driver" and "A.3 Setting up the Network" in this manual)
   - Opening or changing existing files in C drive
   - Starting or operating other application programs during measurement
   - Upgrading the Windows operating system
   - If this instrument operates incorrectly after an application is installed, the Windows operating system must be reinstalled. Contact Advantest and request a sales representative to reinstall the system.
2. Computer viruses

   Depending on how the operating environment is used, the system may become infected by a computer virus.

   To prevent any infections, we recommend the following counter measures:
   - Checking for viruses before loading a file or inserting any media from an outside source.
   - Make sure that all networks have been checked for viruses before connecting.

   Steps to take if this instrument becomes infected by a computer virus
   - We recommend that the system be reinstalled. Contact Advantest and request a sales representative to reinstall the system.

2.7 Note on Transportation

When carrying this instrument, be careful of the following:

- If using this instrument on a cart, secure both this instrument and the cart with a belt.

2.8 Electromagnetic Interference

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

Electromagnetic interference from this instrument may be prevented by the following precautions.

- Changing the direction of the antenna of the television or radio.
- Placing this instrument on the other side of the television or radio.
- Placing this instrument away from the television or radio.
- Using a different power source for the television or radio, and this instrument.

2.9 Note when Turning on the Power

When turning on the power, do not connect a DUT to this instrument.

2.10 Restrictions Imposed when Using Windows XP

END-USER LICENSE AGREEMENT

- You have acquired a device ("INSTRUMENT") that includes software licensed by [ADVANTEST] from Microsoft Licensing Inc. or its affiliates ("MS"). Those installed software products of MS origin, as well as associated media, printed materials, and "online" or electronic documentation ("SOFTWARE") are protected by international intellectual property laws and treaties. The SOFTWARE is licensed, not sold. All rights reserved.
- IF YOU DO NOT AGREE TO THIS END USER LICENSE AGREEMENT ("EULA"), DO NOT USE THE INSTRUMENT OR COPY THE SOFTWARE. INSTEAD, PROMPTLY CONTACT *[ADVANTEST]* FOR INSTRUCTIONS ON RETURN OF THE UNUSED INSTRUMENT(S) FOR A REFUND. **ANY USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO USE ON THE INSTRUMENT, WILL CONSTITUTE YOUR AGREEMENT TO THIS EULA (OR RATIFICATION OF ANY PREVIOUS CONSENT).**
- **GRANT OF SOFTWARE LICENSE.** This EULA grants you the following license:
  - You may use the SOFTWARE only on the INSTRUMENT.
  - **NOT FAULT TOLERANT.** THE SOFTWARE IS NOT FAULT TOLERANT. *[ADVANTEST]* HAS INDEPENDENTLY DETERMINED HOW TO USE THE SOFTWARE IN THE INSTRUMENT, AND MS HAS RELIED UPON *[ADVANTEST]* TO CONDUCT SUFFICIENT TESTING TO DETERMINE THAT THE SOFTWARE IS SUITABLE FOR SUCH USE.
  - NO WARRANTIES FOR THE SOFTWARE. **THE SOFTWARE is provided "AS IS" and with all faults. THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCURACY, AND EFFORT (INCLUDING LACK OF NEGLIGENCE) IS WITH YOU. ALSO, THERE IS NO WARRANTY AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE SOFTWARE OR AGAINST INFRINGEMENT.** IF YOU HAVE RECEIVED ANY WARRANTIES REGARDING THE INSTRUMENT OR THE SOFTWARE, THOSE WARRANTIES DO NOT ORIGINATE FROM, AND ARE NOT BINDING ON, MS.
  - No Liability for Certain Damages. **EXCEPT AS PROHIBITED BY LAW, MS SHALL HAVE NO LIABILITY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES ARISING FROM OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE SOFTWARE. THIS LIMITATION SHALL APPLY EVEN IF ANY REMEDY FAILS OF ITS ESSENTIAL PURPOSE. IN NO EVENT SHALL MS BE LIABLE FOR ANY AMOUNT IN EXCESS OF U.S. TWO HUNDRED FIFTY DOLLARS (U.S.$250.00).**
  - **Limitations on Reverse Engineering, Decompilation, and Disassembly.** You may not reverse engineer, decompile, or disassemble the SOFTWARE, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.
  - **SOFTWARE TRANSFER ALLOWED BUT WITH RESTRICTIONS.** You may permanently transfer rights under this EULA only as part of a permanent sale or transfer of the INSTRUMENT, and only if the recipient agrees to this EULA. If the SOFTWARE is an upgrade, any transfer must also include all prior versions of the SOFTWARE.
  - **EXPORT RESTRICTIONS.** You acknowledge that SOFTWARE is of US-origin. You agree to comply with all applicable international and national laws that apply to the SOFTWARE, including the U.S. Export Administration Regulations, as well as end-user, end-use and country destination restrictions issued by U.S. and other governments. For additional information on exporting the SOFTWARE, see http://www.microsoft.com/exporting/.

- **Installation and Use.** The SOFTWARE may not be used by more than two (2) processors at any one time on the INSTRUMENT. You may permit a maximum of ten (10) computers or other electronic devices (each a "Client") to connect to the INSTRUMENT to utilize the services of the SOFTWARE solely for file and print services, internet information services, and remote access (including connection sharing and telephony services). The ten (10) connection maximum includes any indirect connections made through "multiplexing" or other software or hardware which pools or aggregates connections. Except as otherwise permitted in the NetMeeting/Remote Assistance/Remote Desktop Features terms below, you may not use a Client to use, access, display or run the SOFTWARE, the SOFTWARE's user interface or other executable software residing on the INSTRUMENT.
- If you use the INSTRUMENT to access or utilize the services or functionality of Microsoft Windows Server products (such as Microsoft Windows NT Server 4.0 (all editions) or Microsoft Windows 2000 Server (all editions)), or use the INSTRUMENT to permit workstation or computing devices to access or utilize the services or functionality of Microsoft Windows Server products, you may be required to obtain a Client Access License for the INSTRUMENT and/or each such workstation or computing device. Please refer to the end user license agreement for your Microsoft Windows Server product for additional information.
- **Restricted Uses.** The SOFTWARE is not designed or intended for use or resale in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, or other devices or systems in which a malfunction of the SOFTWARE would result in foreseeable risk of injury or death to the operator of the device or system, or to others.
- **Restricted Functionality.** You are licensed to use the SOFTWARE to provide only the limited functionality (specific tasks or processes) for which the INSTRUMENT has been designed and marketed by

[*ADVANTEST*]. This license specifically prohibits any other use of the software programs or functions, or inclusion of additional software programs or functions, on the INSTRUMENT.

- **Security Updates.** Content providers are using the digital rights management technology ("Microsoft DRM") contained in this SOFTWARE to protect the integrity of their content ("Secure Content") so that their intellectual property, including copyright, in such content is not misappropriated. Owners of such Secure Content ("Secure Content Owners") may, from time to time, request MS, Microsoft Corporation or their subsidiaries to provide security related updates to the Microsoft DRM components of the SOFTWARE ("Security Updates") that may affect your ability to copy, display and/or play Secure Content through Microsoft software or third party applications that utilize Microsoft DRM. You therefore agree that, if you elect to download a license from the Internet which enables your use of Secure Content, MS, Microsoft Corporation or their subsidiaries may, in conjunction with such license, also download onto your INSTRUMENT such Security Updates that a Secure Content Owner has requested that MS, Microsoft Corporation or their subsidiaries distribute. MS, Microsoft Corporation or their subsidiaries will not retrieve any personally identifiable information, or any other information, from your INSTRUMENT by downloading such Security Updates.
- **NetMeeting/Remote Assistance/Remote Desktop Features.** The SOFTWARE may contain NetMeeting, Remote Assistance, and Remote Desktop technologies that enable the SOFTWARE or other applications installed on the INSTRUMENT to be used remotely between two or more computing devices, even if the SOFTWARE or application is installed on only one INSTRUMENT. You may use NetMeeting, Remote Assistance, and Remote Desktop with all Microsoft products; provided however, use of these technologies with certain Microsoft products may require an additional license. For both Microsoft products and non-Microsoft products, you should consult the license agreement accompanying the applicable product or contact the applicable licensor to determine whether use of NetMeeting, Remote Assistance, or Remote Desktop is permitted without an additional license.
- **Consent to Use of Data.** You agree that MS, Microsoft Corporation and their affiliates may collect and use technical information gathered in any manner as part of product support services related to the SOFTWARE. MS, Microsoft Corporation and their affiliates may use this information solely to improve their products or to provide customized services or technologies to you. MS, Microsoft Corporation and their affiliates may disclose this information to others, but not in a form that personally identifies you.
- **Internet Gaming/Update Features.** If the SOFTWARE provides, and you choose to utilize, the Internet gaming or update features within the SOFTWARE, it is necessary to use certain computer system, hardware, and software information to implement the features. By using these features, you explicitly authorize MS, Microsoft Corporation and/or their designated agent to use this information solely to improve their products or to provide customized services or technologies to you. MS or Microsoft Corporation may disclose this information to others, but not in a form that personally identifies you.
- **Internet-Based Services Components.** The SOFTWARE may contain components that enable and facilitate the use of certain Internet-based services. You acknowledge and agree that MS, Microsoft Corporation or their affiliates may automatically check the version of the SOFTWARE and/or its components that you are utilizing and may provide upgrades or supplements to the SOFTWARE that may be automatically downloaded to your INSTRUMENT.
- **Links to Third Party Sites.** The SOFTWARE may provide you with the ability to link to third party sites through the use of the SOFTWARE. The third party sites are not under the control of MS, Microsoft Corporation or their affiliates. Neither MS nor Microsoft Corporation nor their affiliates are responsible for (i) the contents of any third party sites, any links contained in third party sites, or any changes or updates to third party sites, or (ii) webcasting or any other form of transmission received from any third party sites. If the SOFTWARE provides links to third party sites, those links are provided to you only as a convenience, and the inclusion of any link does not imply an endorsement of the third party site by MS, Microsoft Corporation or their affiliates.
- **Additional Software/Services.** The SOFTWARE may permit [*ADVANTEST*], MS, Microsoft Corporation or their affiliates to provide or make available to you SOFTWARE updates, supplements, add-on components, or Internet-based services components of the SOFTWARE after the date you obtain your initial copy of the SOFTWARE ("Supplemental Components").
- If [*ADVANTEST*] provides or makes available to you Supplemental Components and no other EULA terms are provided along with the Supplemental Components, then the terms of this EULA shall apply.
- If MS, Microsoft Corporation or their affiliates make available Supplemental Components, and no other EULA terms are provided, then the terms of this EULA shall apply, except that the MS, Microsoft Corporation or affiliate entity providing the Supplemental Component(s) shall be the licensor of the Supplemental Component(s).

[*ADVANTEST*], MS, Microsoft Corporation and their affiliates reserve the right to discontinue any Internet-based services provided to you or made available to you through the use of the SOFTWARE.

This EULA does not grant you any rights to use the Windows Media Format Software Development Kit ("WMFSDK") components contained in the SOFTWARE to develop a software application that uses Windows Media technology. If you wish to use the WMFSDK to develop such an application, visit http://msdn.microsoft.com/workshop/imedia/windowsmedia/sdk/wmsdk.asp, accept a separate license for the WMFSDK, download the appropriate WMFSDK, and install it on your system.

3. SETUP

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

- 3.1 Inspection on Delivery
- 3.2 Installation Environment
- 3.3 Connection of Accessories
- 3.4 Power Supply
- 3.5 Checking Operations

3.1 Inspection on Delivery

After receiving the product, inspect the outside and the accessories according to the following procedure.

1. Check that the shipping container and the cushioning material are not damaged.

   IMPORTANT: ***If the shipping container or the cushioning material is damaged, keep them until the following inspections are complete.***

2. Check that the outside of the product is not damaged.

   WARNING: ***If any outside components of the product such as the cover, panel (front or rear), LCD display, power switch, or connector are damaged, do not turn on the power. You may receive an electrical shock.***

3. Check that the standard accessories listed in Table 3-1 are complete and they are not damaged.
   If any of the following occur, contact an Advantest sales representative.
   - The shipping container or the cushioning material is damaged, or signs of stress are found.
   - The outside of the product is damaged.
   - The standard accessories are incomplete or are damaged.
   - Defects are found in the operation check.

Table 3-1 Standard Accessories

Name	Model	Quantity	Remarks
Power cable	A01412	1	
Input cable (50 Ω)	A01037-0300	1	
Spare fuse	T6.3A/250V	1	
N (m)-BNC (f) adapter	JUG-201A/U	1	If the Option79 is included in this instrument, the quantity changes to two.
Ferrite core	MSFC8KEX	1	
R3477 Series User's Guide	ER3477-U	1	
R3477 Series Performance Test Guide	ER3477-T	1	

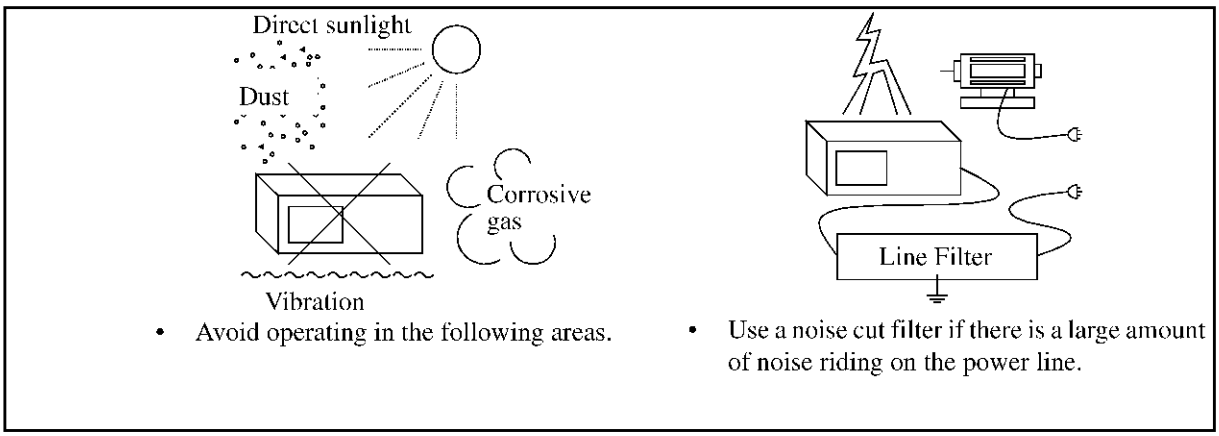
3.2 Installation Environment

This section describes the environment into which this instrument should be installed.

3.2.1 Operating Environment

Install this instrument in an environment in which the following conditions are satisfied.

- Ambient temperature: 0 °C to +50 °C (operating temperature)
  -20 °C to +60 °C (storage temperature)
- Relative humidity: 80 percent or less with 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 from the AC power line, it should be used in a low noise area.
  Use a noise cut filter if ambient noise is unavoidable.
- An area in which the airflow is not obstructed
  There is an exhaust-cooling fan on the rear panel and exhaust vents on both sides of this instrument. Do not block the fan and these vents. If there is insufficient exhaust, the internal temperature will rise and the instrument may operate incorrectly. Keep a space of 10 centimeters between the rear panel and the wall. Do not use this instrument on its side.



- Avoid operating in the following areas.
- Use a noise cut filter if there is a large amount of noise riding on the power line.

Figure 3-1 Operating Environment

- Operating position

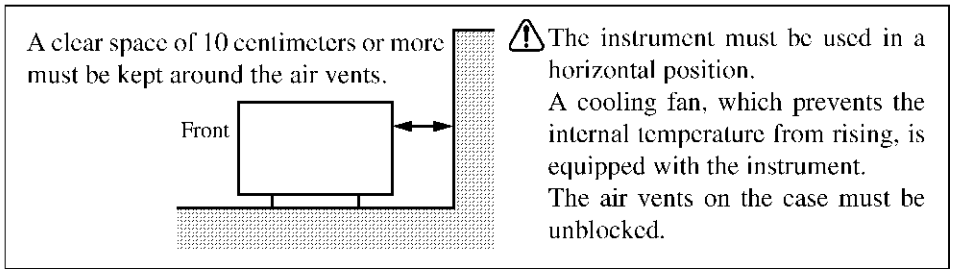


Figure 3-2 Operating Position

- Storage position

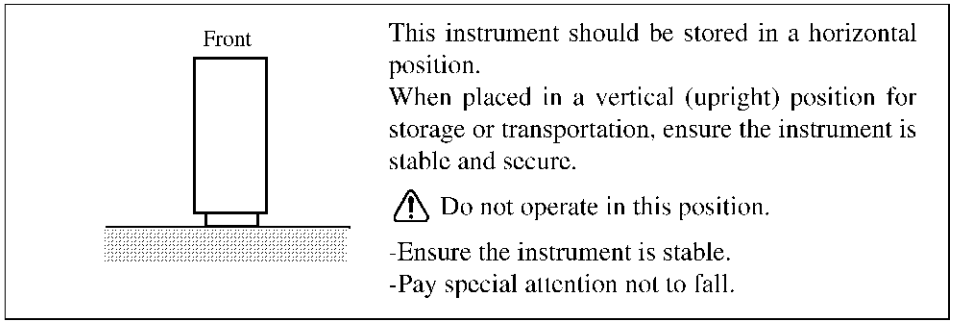


Figure 3-3 Storage Position

3.2.2 Protecting Against Electrostatic Discharge

To prevent semiconductors from being damaged by electrostatic discharge (ESD), the precautions shown below should be taken. We recommend combining two or more countermeasures to prevent damage from ESD.
(Static electricity can be generated easily by the movement of a person or the friction against insulation.)

Table 3-2 ESD Countermeasures

Human Body	Use a wrist strap (See Figure 3-4).
Work floor	Install a conductive mat, use conductive shoes, and connect to earth (See Figure 3-5).
Workbench	Install a conductive mat and connect to earth (See Figure 3-6).

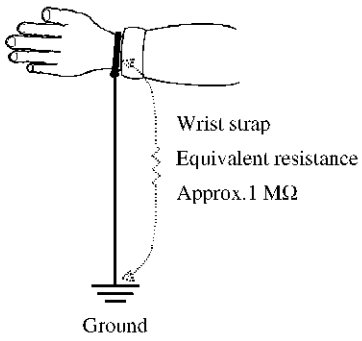


Figure 3-4 Countermeasures for Static Electricity from the Human Body

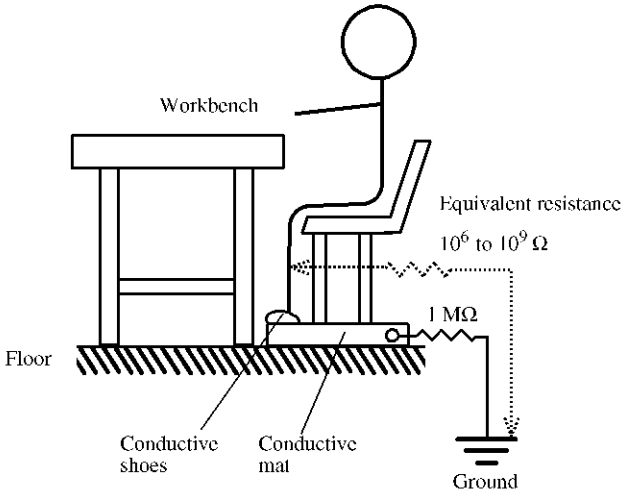


Figure 3-5 Countermeasures for Static Electricity from the Work Floor

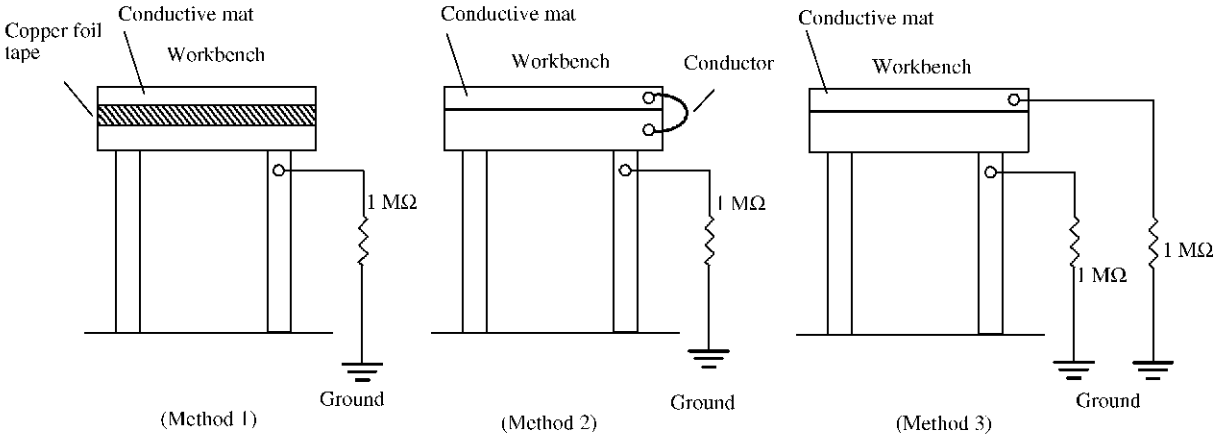


Figure 3-6 Countermeasures for Static Electricity from the Workbench

3.3 Connection of Accessories

This section describes how to connect the accessories required to operate this unit.

3.3.1 Caution when Connecting Peripherals

Use shielded cables when connecting peripherals.
Attach the included ferrite core (MSFC8KEX produced by Okaya Electric Industries Co., Ltd.) to the probe power cable as shown in Figure 3-7.

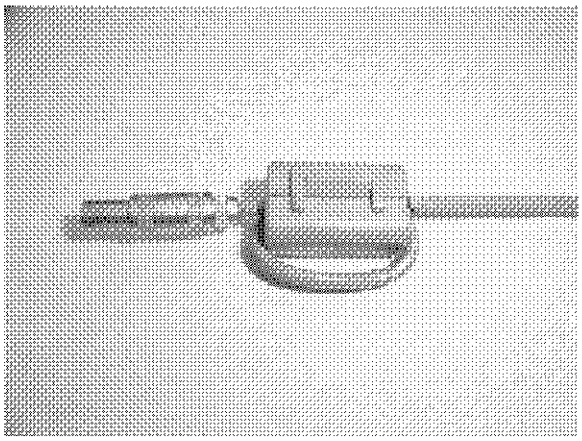


Figure 3-7 A ferrite core

3.4 Power Supply

This section describes power requirements and how to connect the power cable.

3.4.1 Power Requirements

The power requirements of this instrument are shown in Table 3-3. Check that the power supply, which satisfies the conditions shown in Table 3-3, is supplied to this instrument.

Table 3-3 Power Requirements

	100 V AC	200 V AC	Remarks
Input voltage range	90 V-132 V	198 V-250 V	Automatically switches the input voltage between 100 V AC and 200 V AC.
Frequency range	47 Hz-63 Hz		
Power consumption	360 VA or less		

WARNING: ***Make sure the power supply, which satisfies the power requirements, is supplied to this instrument. If the power requirements are not satisfied, this instrument may be damaged.***

3.4.2 Connecting the Power Cable

This instrument includes a three-core power cable with a grounding conductor. To prevent accidents caused by electric shocks, use the included power cable and securely connect to the ground through a three-pin power outlet.

1. Check that the included power cable is not damaged.

   WARNING: ***Never use a damaged power cable. You may receive an electrical shock.***

2. Connect the AC power connector on the rear panel of this instrument to a three-pin power outlet that has a protected ground terminal by using the included power cable (see Figure 3-8).

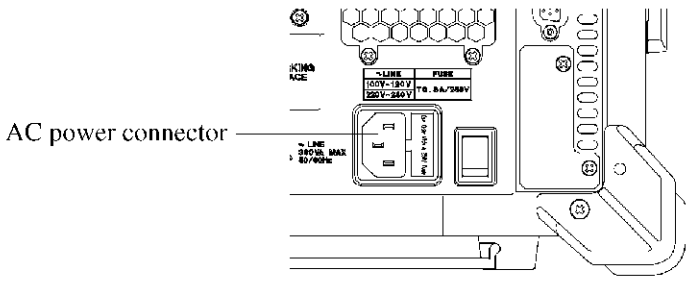


Figure 3-8 Connecting the Power Cable

WARNING:

1. ***Use a power cable that is suitable for the power supply voltage. Use a power cable that complies with safety standards of your country (Refer to "Safety Summary").***
2. ***To prevent any danger of electrical shock, connect the power cable to a three-pin power outlet that is connected to a protected ground terminal. The instrument will not be grounded if an extension cord, which does not include a protected ground terminal, is used.***

3.5 Checking Operations

This section describes how to check operations by using the auto-calibration function of this instrument. Check that this instrument operates correctly by following the procedure below.

Starting this instrument

1. Connect the power cable according to "3.4.2 Connecting the Power Cable."
2. Turn on the MAIN POWER switch on the rear panel.
   After turning on the MAIN POWER switch, wait for three seconds or more.
3. Press the **POWER** switch to turn on the instrument.

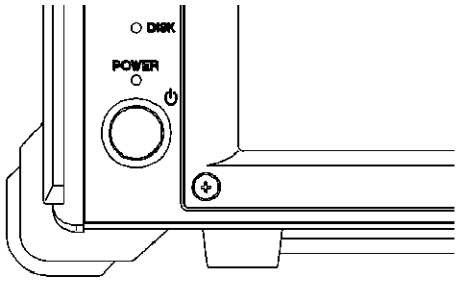


Figure 3-9 **POWER** switch

NOTE:

1. ***If the power supply of this instrument is abruptly disconnected, such as by pulling the power cable out of position, while the instrument is operating, Scandisk launches the next time this instrument starts because the internal flash memory may become damaged.***
2. *Scandisk*
   If the power of this instrument is turned off without being shut down, Scandisk launches automatically. Do not abort Scandisk while it is running. If Scandisk detects any faulty clusters, follow the displayed messages and take the appropriate action. The software in this instrument starts automatically after Scandisk is complete.

---

4. The power-on diagnostic program starts the self-diagnostic.
   The self-diagnostic takes approximately one minute to complete.
5. The initial screen shown in Figure 3-10 is displayed if no faults are detected in this instrument during the self-diagnostic.
   The initial screen display may differ from Figure 3-10 depending on the status of the settings when the power supply was last turned off.

MEMO: ***If any error message is displayed as a result of the self-diagnostic, refer to Chapter 9, "MAINTENANCE."***

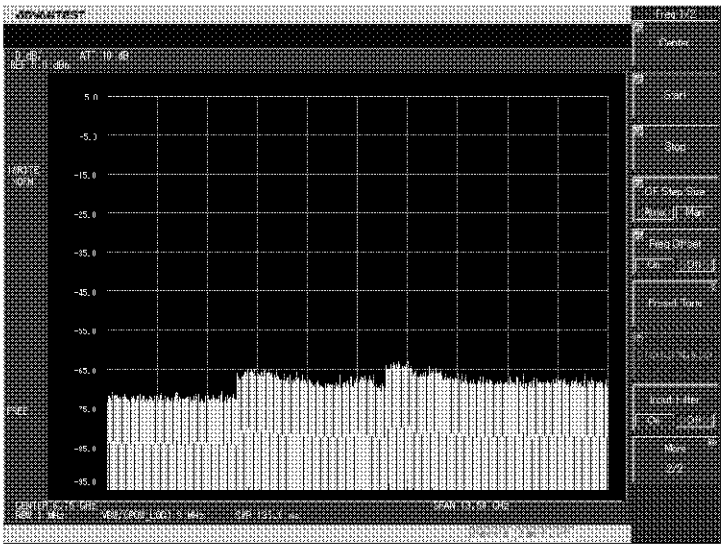


Figure 3-10 Initial Screen

Performing autocalibration

6. Connect as shown in Figure 3-11 by using included N(m)-BNC(f) adapter and input cable (A01037-0300).

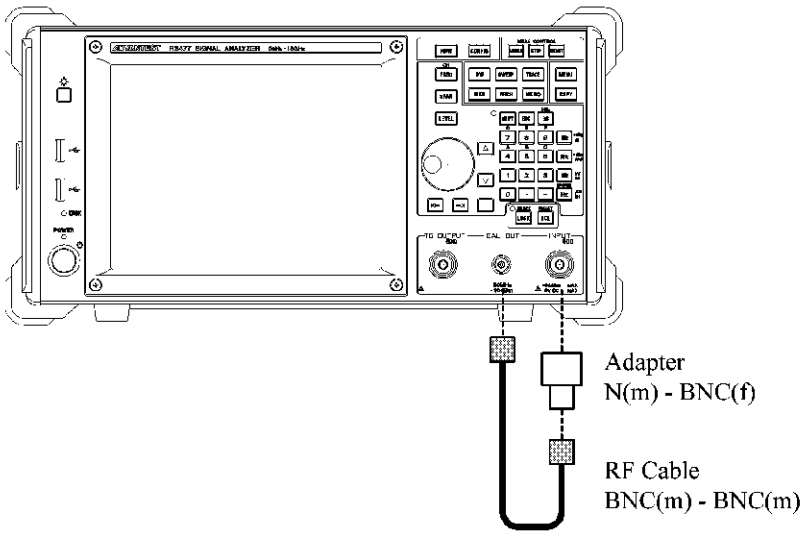


Figure 3-11 Autocalibration

IMPORTANT: ***Perform autocalibration after allowing a warm up time of at least 30 minutes. For more information on how to perform autocalibration, refer to section 4.3.1, "Autocalibration."***

7. Press the **MENU** key, select the **Cal** key from the soft menu, and select the **SA Cal** key form the soft menu.
8. Autocalibration starts.
   It takes approximately one minute to complete the autocalibration.
9. Check that no error message is displayed as a result of the autocalibration.

MEMO: ***If any error message is displayed as a result of the autocalibration, refer to Chapter 9, "MAINTENANCE."***

Turning off the power supply

10. Press the **POWER** switch.
    The system shuts down and the power of the instrument turns off automatically.

4. QUICK START

This chapter describes the functions of each part on the panels and screen, and describes the basic operations of this instrument by using measurement examples.

4.1 Panel and Screen Descriptions

This section describes the names and functions of each part on the front panel, screen, and rear panel.

4.1.1 Names and Functions of Each Part on the Front Panel

This section describes the names and functions of each part on the front panel.

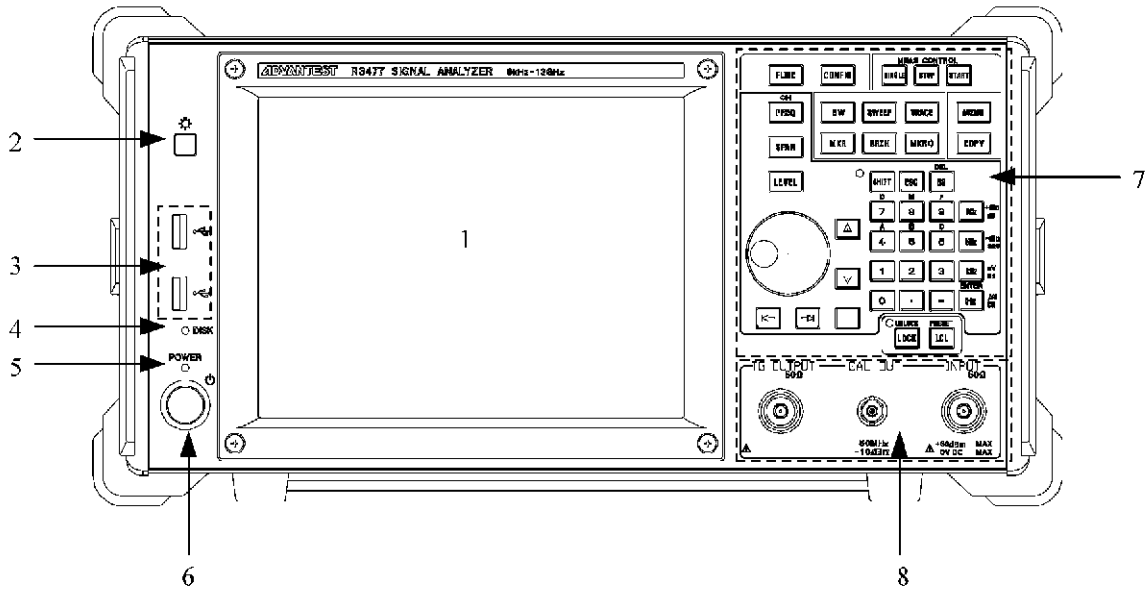


Figure 4-1 Front Panel

1. Touch Screen Display — Displays measurement data, setting conditions, and other information. Setting conditions can be changed by the touch screen function.
2. Backlight Key — Turns on or off the backlight of the display.
3. I/F Connector — Enables a USB device to be connected.
4. Access Lamp — Lights while the internal flash memory is accessed.
5. Power Lamp — Lights while the power is turned on.
6. POWER Switch — Switches the power ON and OFF. When the power is switched to OFF, the power turns off after the system has terminated.

7. Entry Key Block — The keys in this block are used to change settings.

8. Input and Output Connector Block — The input and output connectors in this block are used for measurements.

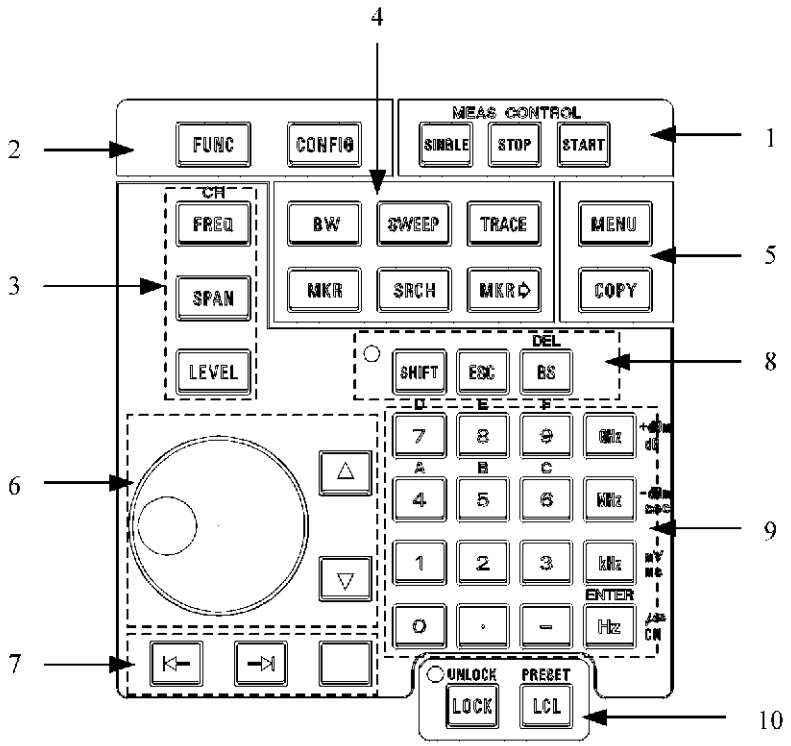


Figure 4-2 Entry Key Block

1. Measurement Control Key — Controls the measurement.
   - SINGLE: Performs the measurement once.
   - STOP: Interrupts the continuous measurement.
   - START: Starts the continuous measurement.

2. FUNC Key — Displays the measurement function menu in the soft menu bar.
   CONFIG Key — Selects a communication standard.

3. FREQ Key — Sets the center frequency.
   SPAN Key — Sets the frequency span.
   LEVEL Key — Sets the reference level.

4. BW Key — Sets the resolution bandwidth and video bandwidth.
   SWEEP Key — Sets the sweep time.
   TRACE Key — Set the trace mode and trace detector.
   MKR Key — Displays the marker.
   SRCH Key — Searches for a peak on a trace.
   MKR→ Key — Sets the values of the marker to that of another function.

5.	MENU Key	Displays menus for saving and loading data, setting the GPIB and printer, and calibration in the soft menu bar.
	COPY Key	Outputs a hard copy of the screen display. The output destination (file or printer) of the data displayed on the screen and other settings related to the file and printer are set in **MENU** → **System** → **Copy Config** .
6.	Data Knob, Step Key	Data knob and step key
7.	Tab Key	Tab key
	Space Key	Space key
8.	SHIFT Key	Shift key
	ESC Key	Escape key
	BS Key	Backspace key
	DEL Key (SHIFT→BS)	Delete key
9.	Keypad	Enters numeric values. GHz: Sets one of the following units: GHz, +dBm, and dB. MHz: Sets one of the following units: MHz, -dBm, and sec. kHz: Sets one of the following units: kHz, mV, and msec. Hz: Sets either of the following units: Hz and µs. The entered values are determined by pressing one of these unit keys.
10.	LCL Key	Cancels the remote status of this instrument.
	PRESET Key (SHIFT→LCL)	Initializes this instrument.
	LOCK Key	The key input is locked by pressing this key for a few seconds. The LED lights while the key input is locked.
	UNLOCK Key (SHIFT→LOCK)	The key input locking is canceled by pressing the SHIFT key and this key for a few seconds.

IMPORTANT: ***If the data knob is turned continuously at high speed, the numeric value entry may not increment or decrement uniformly.***

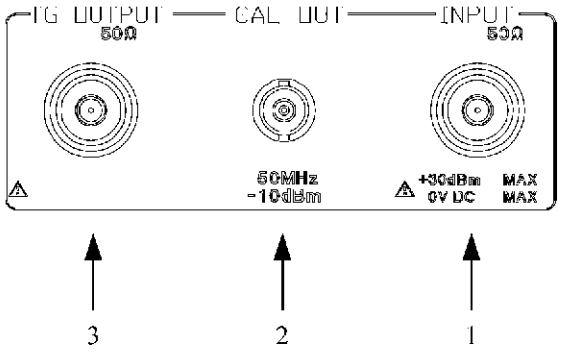


Figure 4-3 Input and Output Connectors Block

1. INPUT Connector — Inputs the signal to be measured.

NOTE: ***Do not apply an RF power or DC voltage that exceeds the limited value to the INPUT connector. The input attenuator and mixer may be damaged.***

2. CAL OUT Connector — Outputs the calibration signal.

3. TG OUTPUT Connector — Not used (Used when option is included.)

NOTE: ***The TG OUTPUT connector must be used only to output signals. To prevent this instrument from becoming damaged, do not apply an external DC voltage, AC voltage, or static electricity to the TG OUTPUT connector.***

4.1.2 Names and Functions of Each Part on the Screen

This section describes the names and functions of each part of the screen of this instrument.

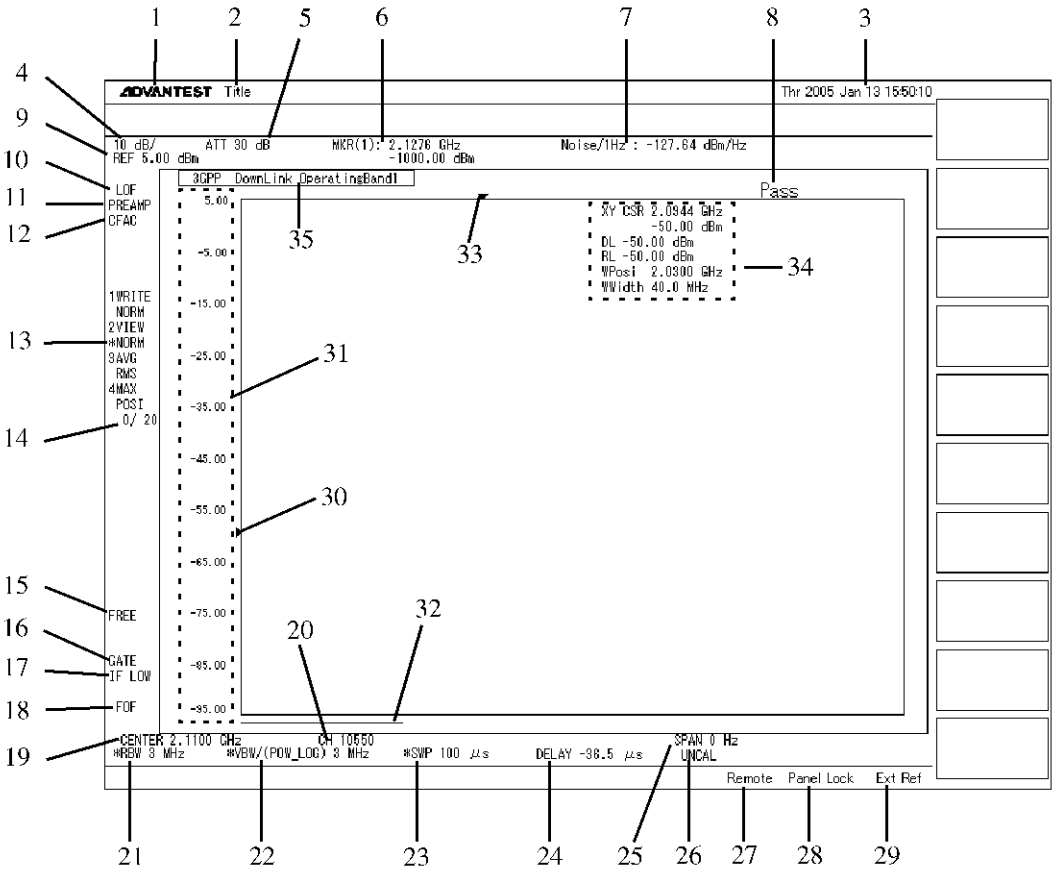


Figure 4-4 Screen Display

1. ADVANTEST Logo — Displays the ADVANTEST logo.
2. User's Title — Describes the contents of the measurement data.
3. Date — Displays the current date and time.
4. Amplitude Scale in Log Mode or Linear Mode
   Displays the amplitude scale setting in log mode.
5. RF Attenuator — Displays the attenuator setting value.
   Displays "*" before ATT if the attenuator is set in the manual mode.
6. Marker Area — Displays the marker frequency (time) and level.
7. Measurement Function Area — Displays the results of the Noise/Hz, frequency counter, and %AM measurement.
8. Pass/Fail Judgment — Displays the results of the Pass/Fail judgment that uses the limit line.

9. Reference Level	Displays the reference level setting value.
10. Level Offset	Displays LOF while the reference level offset is set to On.
11. Preamp/Input filter	Displays PREAMP when the preamplifier is set to On. Displays FLTER when the input filter is set to On.
12. Correction Factor	Displays CFAC while the correction factor is set to On.
13. Trace and Trace Detector	Displays the selected trace mode and trace detector mode.
14. Averaging Count	Displays the set and current number of times averaging is performed.
15. Trigger Source	Displays the selected trigger source.
16. Gated Sweep	Displayed when gated sweep is set to On.
17. IF shift	Displays IF LOW when the IF shift is set to Low and displays IF HI when it is set to High.
18. Frequency Offset	Displays FOF while the frequency offset is set to On.
19. Center Frequency or Start Frequency	Displays the center frequency or start frequency.
20. Channel number	Displays the channel number when the center frequency is set by using a channel number.
21. Resolution Bandwidth (RBW)	Displays the resolution bandwidth setting value. Displays "*" before RBW if the resolution bandwidth is set in the manual mode.
22. Video Bandwidth (VBW)	Displays the video bandwidth setting value. Displays "*" before VBW if the video bandwidth is set in the manual mode. Displays (POW_LOG) after VBW when the level of the signal, which is entered into the video filter, is expressed as a logarithmic power value. Displays (VOLT) after VBW when the level of the signal, which is entered into the video filter, is expressed as a voltage.
23. Sweep Time	Displays the sweep time setting value. Displays "*" before SWP if the sweep time is set in the manual mode.
24. Trigger Delay Time	Displays the trigger delay time or pre-trigger time.
25. Frequency Span or Stop Frequency	Displays the frequency span or stop frequency.
26. UNCAL Message	Displays UNCAL if the manual settings are inappropriate.
27. Remote	Displays "Remote" while GPIB is in remote state.
28. Panel Lock	Displays "Panel Lock" while the panel keys are locked.
29. External Reference Signal	Displays "Ext Ref" while the external reference signal is input. Displays "*" before Ext Ref if the external reference is set in the manual mode.
30. Trigger Position	Displays the video trigger position or Ext2 trigger position.

31.	Level Scale	Displays the level scale.
32.	Sweep Indicator	Displays the sweep position when the sweep time is set to two seconds or longer.
33.	Trigger Delay Position	Displays "◁" when the trigger delay is set or display "V" when the pre-trigger is set.
34.	Display Function Area	Displays the cursor, display line, reference line, and the values in the measurement window.

4.1.3 Names and Functions of Each Part on the Rear Panel

This section describes the names and functions of each part on the rear panel.

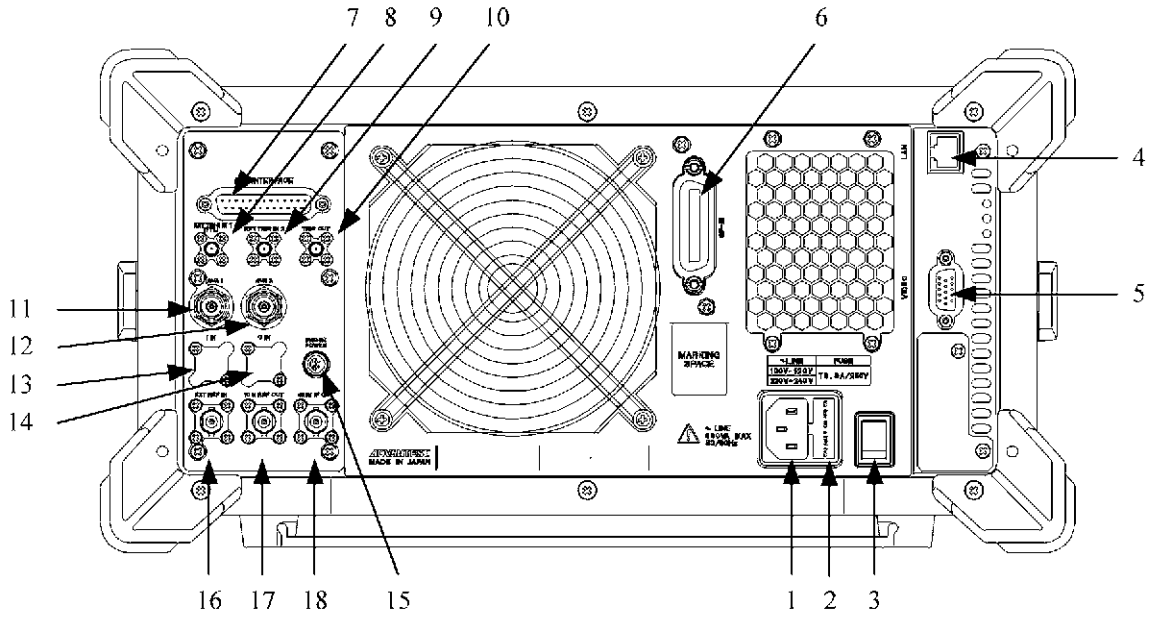


Figure 4-5 Rear Panel

1.	AC Power Connector	Connects this instrument to the AC power supply by using the included power cable.
2.	Fuse Holder	Includes a fuse for protecting against over current.
3.	MAIN POWER Switch	Turns on or off the power.
4.	LAN Connector	10BaseT LAN connector
5.	VIDEO Connector	Connects to an external VGA monitor.
6.	GP-IB Connector	Connects to the external controller when the remote-control is used through the GPIB interface.
7.	AUX INTERFACE Connector	Not used
8.	EXT TRIG IN 1 (TTL) Connector	Inputs the external trigger signal (TTL level).

9.	EXT TRIG IN 2 Connector	Inputs the external trigger signal (Variable level).
10.	TRIG OUT Connector	Outputs the signal (TTL level) synchronized with a trigger signal.
11.	AUX 1 Connector	Not used
12.	AUX 2 Connector	Not used
13.	I IN Connector	Not used
14.	Q IN Connector	Not used
15.	PROBE POWER Connector	The connector used for the probe power (±15 V output).
16.	EXT REF IN Connector	Inputs the external reference signal.
17.	10M REF OUT Connector	Outputs the 10-MHz reference signal.
18.	421M IF OUT Connector	Outputs the 2nd IF (421.4 MHz) signal.

4.2 Basic Operation

This section describes the menu operations, data entry, and usage of the basic measurement functions.

4.2.1 Menu Operation and Data Entry

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

1. Operation Menu

   Pressing a panel key displays its menu on the right of the screen. The side menu is selected by touching the screen.

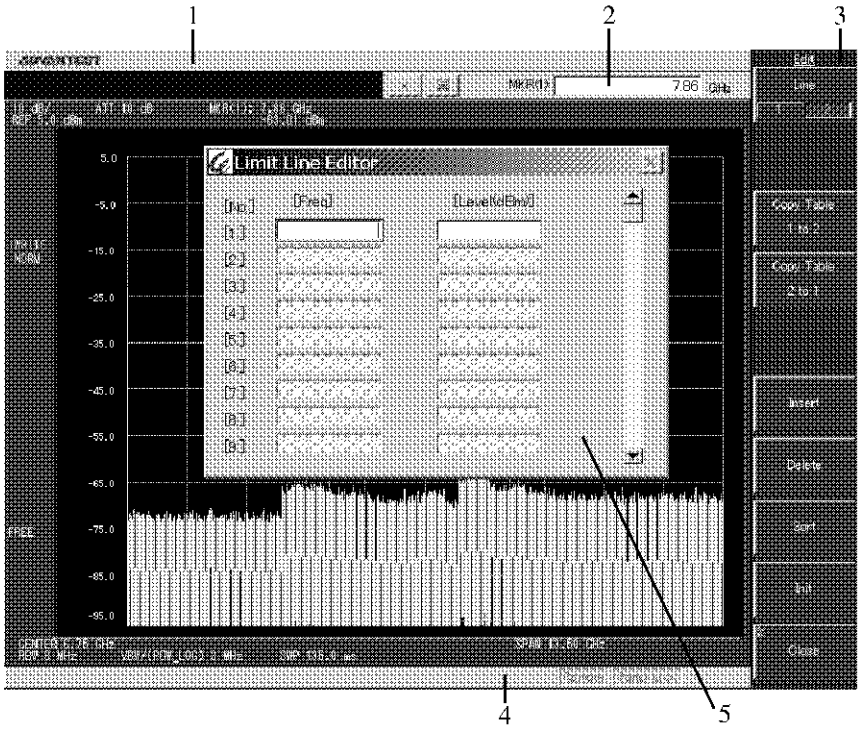


Figure 4-6 Operation Menu Description

1. User's Title Bar — Displays the screen title, date, and time which are entered.
2. Entry Box — The box into which numeric values are input. Displayed while numeric values can be entered.
3. Soft Menu Bar — A soft menu, which corresponds to each key, is displayed in this area when the [FUNC], [CONFIG], [MENU], [FREQ], [SPAN], [LEVEL], [BW], [SWEEP], [TRACE], [MKR], [SRCH], or [MKR→] key is pressed.
4. Status Bar — Displays the settings and operation status of this instrument.
5. Dialog Box — Displays the switches and buttons used for selecting items and the entry boxes for data entry related to each function.

2. Data Entry

   If a set value is displayed in the entry box, it can be changed by using the keypad, step key, or data knob.

   - Data entry by using the key pad

     Data can be entered by using the number keys, decimal point key, BK SP (back space) key, and minus (-) key. If numbers are incorrectly entered, use the BS to delete one character to the left. Enter the correct number. After entering data, press the unit key to complete the entry.

   IMPORTANT: ***If any other menu key is pressed before the unit key is pressed, any entered data becomes invalid.***

   - Data entry by using the step key

     Data can be entered by using the step key to increase or decrease the displayed number.

   - Data entry by using the data knob

     Data can be entered by using the data knob. The data knob is ideal for fine adjustments of entry data.

3. Displaying a dialog box

   Pressing certain soft menu keys displays a dialog box.
   To select items and enter numeric values in the dialog box, the following methods can be used:

   - Selecting items

     Use the Tab key.

   - Determining the setting

     Select the setting by using the data knob.

   - Selecting either ON or OFF in the check box (☑).

     Select by using the space key.

   - Entering numeric values

     Enter values by using the keypad and unit key.

   - Closing a dialog box

     Touch the **Close** menu on the soft menu bar to close the dialog box.
     Some dialog boxes close by clicking the close button (☒) in the upper right of the box.

4. SHIFT Function

   The SHIFT function is written on the panel key in blue.
   This instrument includes the following SHIFT functions.
   - PRESET
   - UNLOCK
   - DEL
   - A to F (Hexadecimal)

   To perform a SHIFT function, press **SHIFT** and then press each key.
   Pressing **SHIFT** turns on the LED, which is on the left of the key, and the shift mode is available.
   Press **SHIFT** again to cancel the shift mode.
   The LED turns off and the shift mode is unavailable.

4.3 Basic Measurement

This section uses the following measurement examples to describes basic measurement procedures which will allow the user to become familiar with the operation of this instrument.

4.3.1 Auto Calibration
4.3.2 Displaying Spectrum and Operating Markers
4.3.3 Frequency Measurement by Using the Frequency Counter
4.3.4 How to Cancel the UNCAL Message

4.3.1 Auto Calibration

This section describes how to use the built-in auto calibration function to perform the measurement with an accuracy that is guaranteed in this instrument.

This instrument uses the following two types of built-in auto calibrations:

- **[SA Cal]**

  When performing this calibration, CAL OUT and INPUT on the front panel should be connected each other.

  The time required for calibration: approximately one minute

- **[SA Cal without ATT]**

  Because this calibration uses only the internal Cal signal, connection between CAL OUT and INPUT is not required.

  The time required for calibration: approximately one minute

This section describes how to use **[SA Cal]**.

IMPORTANT: Perform auto calibration after allowing a warm up time of 30 minutes or more.

[Required equipment]

R3477 series signal analyzer
Conversion adapter: N (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

[Turning on the power supply]

1. Verify that the MAIN POWER switch on the rear panel is set to OFF.
2. Connect the included power cable to the AC power connector on the rear panel.

   CAUTION: To prevent damage, do not supply a voltage and frequency, which exceed the specified range, to this instrument.

3. Connect the power cable to an electrical outlet.

4. Turn on the MAIN POWER switch on the rear panel.
   After turning on the MAIN POWER switch, wait for three seconds or more.

5. Turn on the power switch on the front panel. After the self-test is complete, the startup screen is displayed.

MEMO: The display may be different depending on the state of the instrument when the power was last turned off.

[Initialization]

Initialize the settings of this instrument.

6. Press **SHIFT** and **LCL** (PRESET).
   Initial setting conditions are loaded.

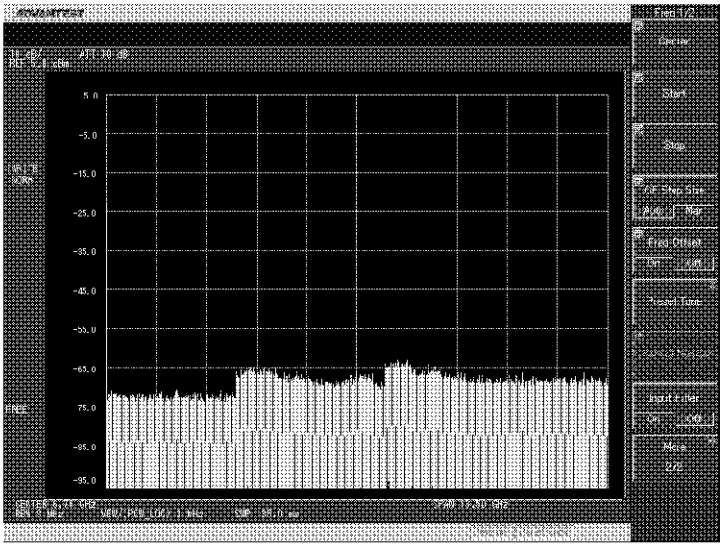


Figure 4-7 Initial Setting Screen

[Connecting the input signal]

Connect the calibration signal.

7. Attach the N(m)-BNC(f) adapter to the INPUT connector on the front panel. Connect the included input cable to the CAL OUT connector on the front panel and the N(m)-BNC(f) adapter.

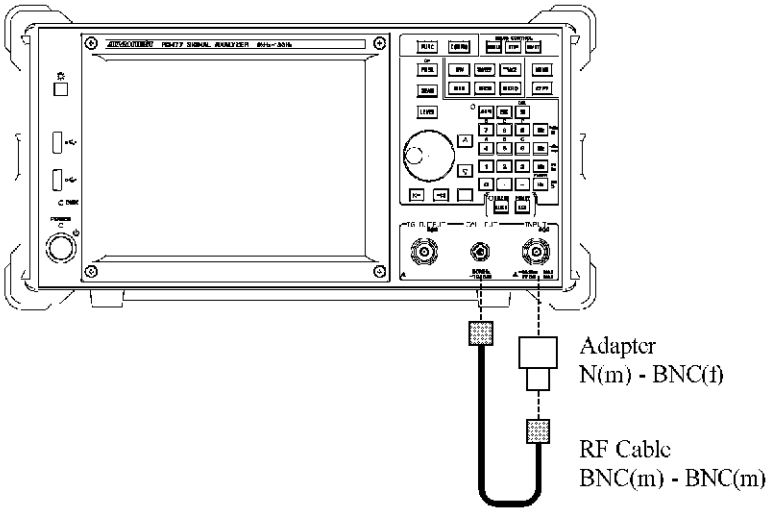


Figure 4-8 Connecting the CAL Signal

8. Press **MENU**, **Cal**, and **SA Cal**.
9. SA Cal starts.
   SA Cal terminates in one minute.

4.3.2 Displaying Spectrum and Operating Markers

This section describes how to display spectrums and use markers by using the CAL signal of this instrument.

For operating markers, the frequency differences between the points, which are 3 dB and 60 dB below from the peak of the CAL signal, and the peak point of the CAL signal are measured by using the delta marker.

[Required equipment]

R3477 series signal analyzer
Conversion adapter: N (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

[Turning on the power supply]

IMPORTANT: ***Use this instrument within the specified temperature range to perform accurate measurements. Perform calibration after allowing a warm up time of 30 minutes or more.***

---

1. Verify that the MAIN POWER switch on the rear panel is set to OFF.
2. Connect the included power cable to the AC power connector on the rear panel.

CAUTION: ***To prevent damage, do not supply a voltage and frequency, which exceed the specified range, to this instrument.***

---

3. Connect the power cable to an electrical outlet.
4. Turn on the MAIN POWER switch on the rear panel.
   After turning on the MAIN POWER switch, wait for three seconds or more.
5. Turn on the power switch on the front panel. After the self-test is complete, the startup screen is displayed.

MEMO: ***The display may be different depending on the state of the instrument when the power was last turned off.***

[Initialization]

Initialize the settings of this instrument.

6. Press **SHIFT** and **LCL** (PRESET).
   Initial setting conditions are loaded.

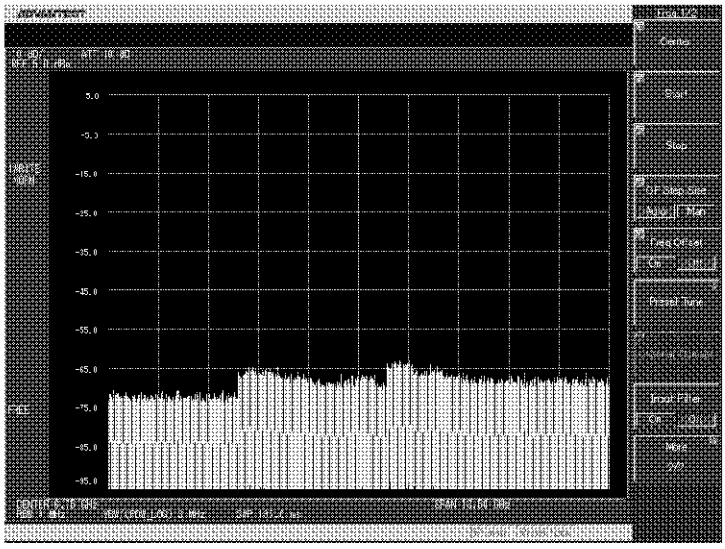


Figure 4-9 Initial Setting Screen

[Connecting the input signal]

Connect the calibration signal.

7. Attach the N(m)-BNC(f) adapter to the INPUT connector on the front panel. Connect the included input cable to the CAL OUT connector on the front panel and the N(m)-BNC(f) adapter.

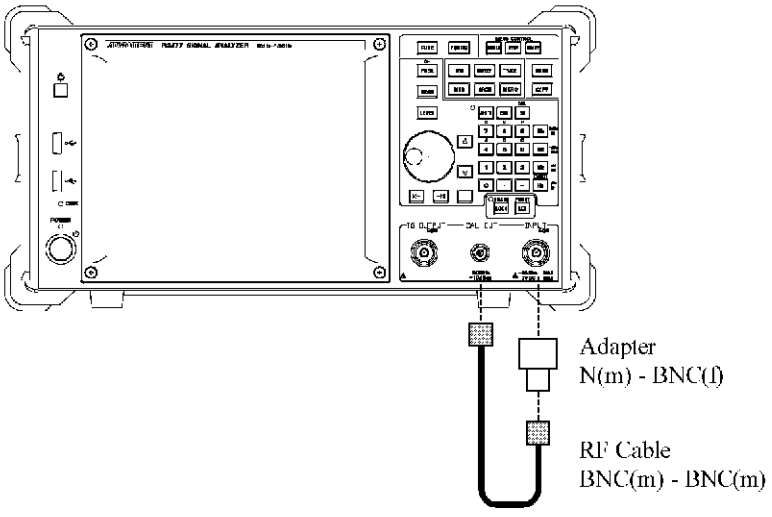


Figure 4-10 Connecting the CAL Signal

[Setting the calibration signal output]

Set the calibration signal output.

8. Press **MENU**, **Cal**, and **Cal Signal On/Off** (On).
   The calibration signal is output.

[Setting the measurement conditions]

Set the measurement conditions to observe the input signal more easily.

9. Press the **FREQ** key.
   The current center frequency is displayed in the entry box, and it can be changed.

10. Press **5**, **0**, and **MHz**.
    The center frequency is set to 50 MHz.

11. Press **SPAN**, **2**, and **MHz**.
    The frequency span is set to 2 MHz.

12. Press **BW**, **RBW Auto/Man** (Man), **1**, **0**, **0**, and **kHz**.
    The resolution bandwidth is set to 100 kHz.

13. Press **LEVEL**, **1**, **0**, and **MHz** (-dBm).
    The reference level is set to -10 dBm.

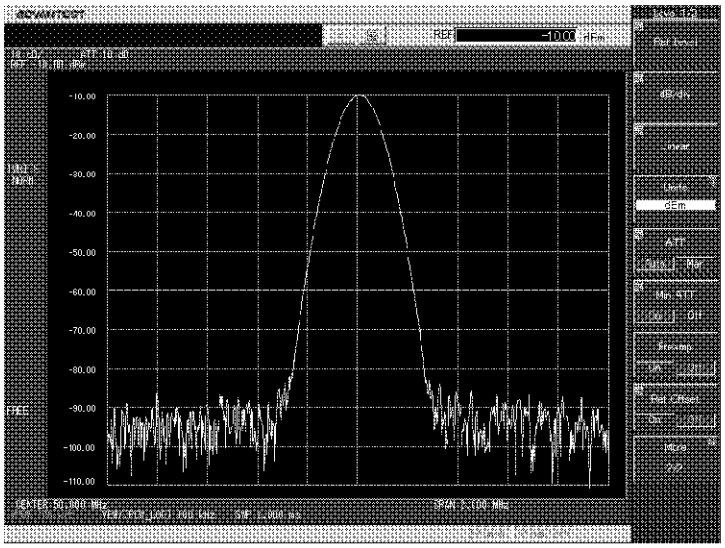


Figure 4-11 Completing the Setting of the Measurement Conditions

[Displaying a marker]

14. Press the **SRCH** key.

    The normal marker is displayed on the peak and the frequency (approximately 50 MHz) and level (approximately -10 dBm) of the marker are displayed in the marker area.

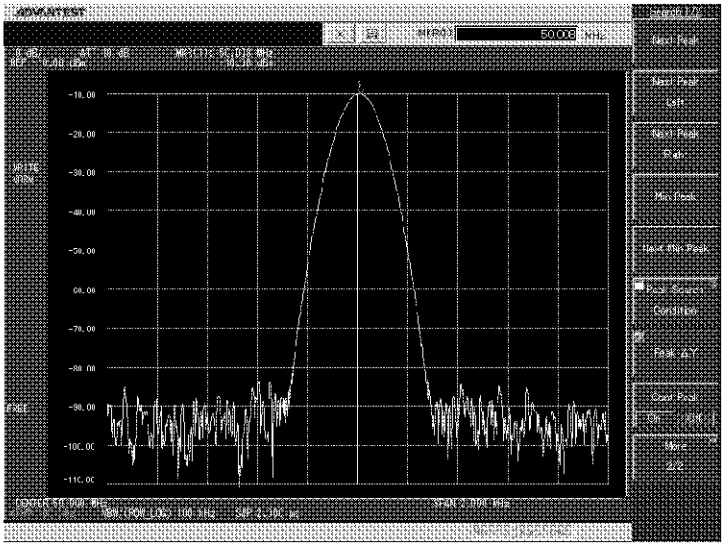


Figure 4-12 Displaying the Peak Search

[Displaying a delta marker]

15. Press **MKR** and **Delta Marker**.

    The Delta Marker menu is displayed. The delta marker is displayed and the frequency difference and level difference (relative value) between the normal marker and delta marker are displayed in the marker area.

16. Move the marker to the -3 dB level point by using the data knob while watching the level display in the marker area. (If an accurate value cannot be set depending on the restriction of the data knob resolution, set the closest value.)
    The frequency difference (relative value) between the peak and -3 dB down point is displayed in the marker area.

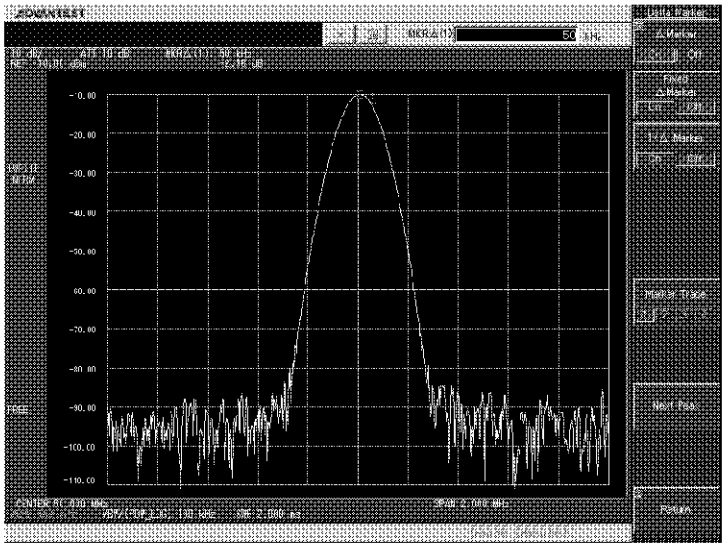


Figure 4-13 Frequency Difference between the Peak and -3 dB Down Level

17. Move the marker to the -60 dB level point by using the data knob. The frequency difference between the peak and -60 dB down point is displayed in the marker area.

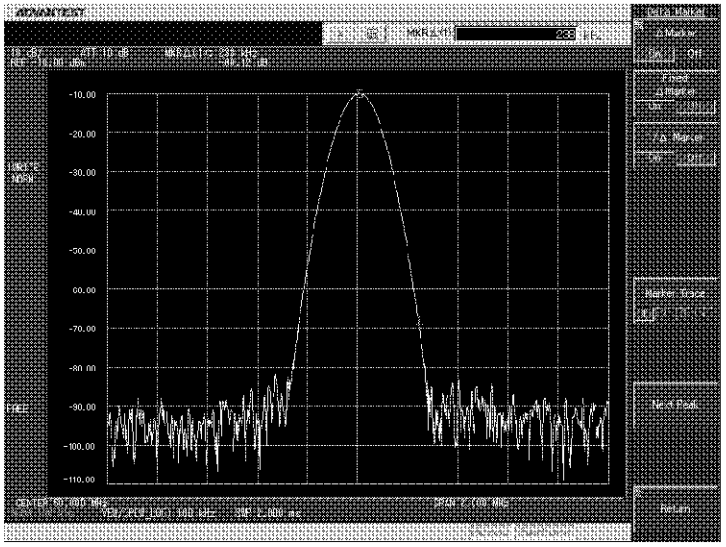


Figure 4-14 Frequency Difference between the Peak and -60 dB Down Level

4.3.3 Frequency Measurement by Using the Frequency Counter

This section describes how to use the frequency counter by using the CAL signal of this instrument.

The frequency counter function accurately measures the signal, on which the marker is placed, not the marker frequency.

The level value indicates the level on the marker point. The resolution of the counter is 0.01 Hz.

[Required instruments]

R3477 series signal analyzer
Conversion adapter: N (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

RESTRICTION:Unless the signal satisfies the condition of S/N>50 dB, no measurements can be performed accurately.

[Turning on the power supply]

1. Turn on the power of this instrument.

[Initialization]

Initialize the settings of this instrument.

2. Press **SHIFT** and **LCL** (PRESET).
   Initial setting conditions are loaded.

[Connecting the input signal]

3. Connect the calibration signal.

[Setting the calibration signal output]

Set the calibration signal output.

4. Press **MENU**, **Cal**, and **Cal Signal On/Off** (On).
   The calibration signal is output.

[Setting the measurement conditions]

Set the measurement conditions to measure the input signal more easily.

5. Press **FREQ**, **5**, **0**, and **MHz**.
   The center frequency is set to 50 MHz.

6. Press **SPAN**, **5**, **0**, and **MHz**.
   The frequency span is set to 50 MHz.

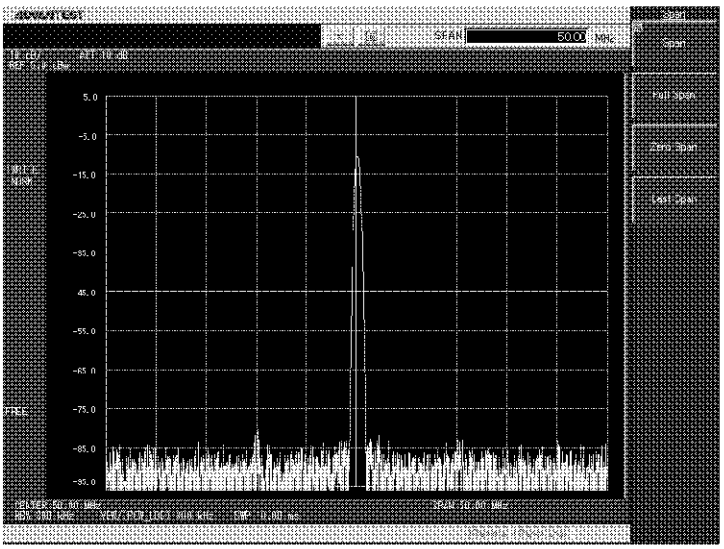


Figure 4-15 Setting Measurement Conditions

[Frequency measurement by using the frequency counter]

Measure the frequency by using the frequency counter function.

7. Press the **FUNC** key.
   The Function menu is displayed.

8. Press **Meas** and **Counter**.
   The frequency measurement by using the frequency counter starts.

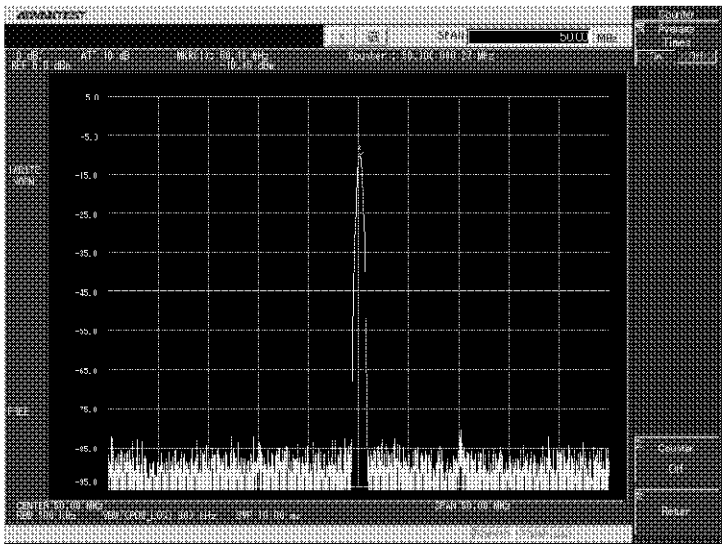


Figure 4-16 Frequency Measurement by Using the Frequency Counter

4.3.4 How to Cancel the UNCAL Message

The setting among the resolution bandwidth (RBW), video bandwidth (VBW), frequency span (Span), and sweep time (Sweep Time) affect each other.

If the combination of these settings in the manual setting is inappropriate, the UNCAL message is displayed in the frequency area. If the UNCAL message is displayed, the measurement level accuracy cannot be guaranteed.

Change the following settings to cancel the UNCAL message.

- Expand the resolution bandwidth (RBW).
- Expand the video bandwidth (VBW).
- Slow the sweep time (Sweep Time).
- If RBW or VBW cannot be changed, narrow the frequency span (Span).

IMPORTANT: Accurate measurement data cannot be acquired while the UNCAL message is displayed.

This section describes how to cancel the UNCAL message, which was generated because of the fast sweep time, by changing the RBW setting.

[Required instruments]

R3477 series signal analyzer
Conversion adapter: N (m)-BNC (f)
Input cable: BNC (m)-BNC (m)

[Connecting the instruments]

1. Connect the instruments as shown in Figure 4-17.

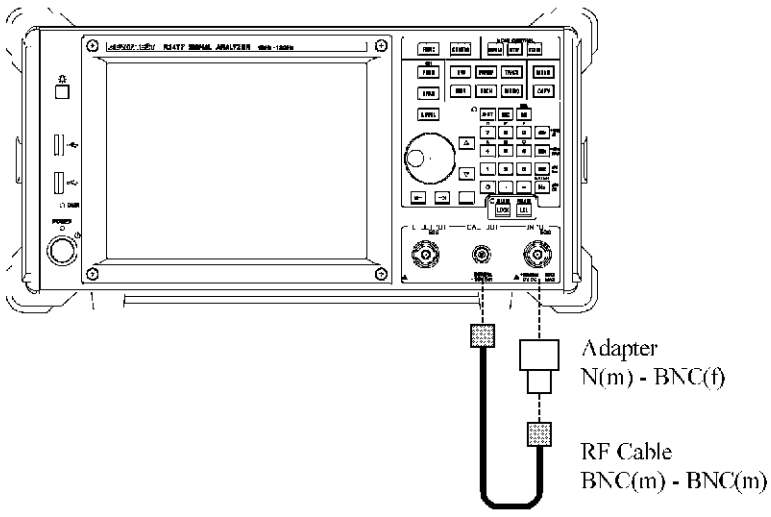


Figure 4-17 Connecting the Instruments

[Turning on the power supply]

2. Turn on the power of this instrument.

[Initialization]

Initialize the settings of this instrument.

3. Press **SHIFT** and **LCL** (PRESET).
   Initial setting conditions are loaded.

[Setting the measurement conditions]

Set the measurement conditions to observe the input signal more easily.

4. Press **FREQ**, **Center**, **5**, **0**, and **MHz**.
   The center frequency is set to 50 MHz.

5. Press **SPAN**, **2**, and **kHz**.
   The frequency span is set to 2 kHz.

6. Press **SWEEP**, **Sweep Time Auto/Man** (Man), **5**, **0**, **0**, and **kHz** (ms).
   The sweep time is set to 500 msec and the UNCAL message is displayed.
   The sweep time setting of 500 msec is too fast for the set conditions.

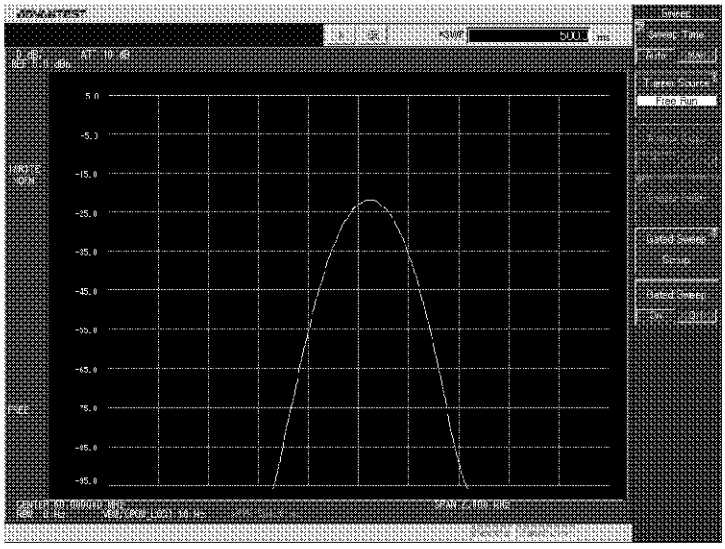


Figure 4-18 Displaying the UNCAL Message

[How to cancel the UNCAL message]

7. Press **BW**, **RBW Auto/Man** (Man), **1**, **0**, **0**, and **Hz**.
   Setting the RBW to 100 Hz cancels the UNCAL message because the sweep time of 500 msec meets the set conditions.

5. MENU MAP, FUNCTIONAL EXPLANATION

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

MEMO:

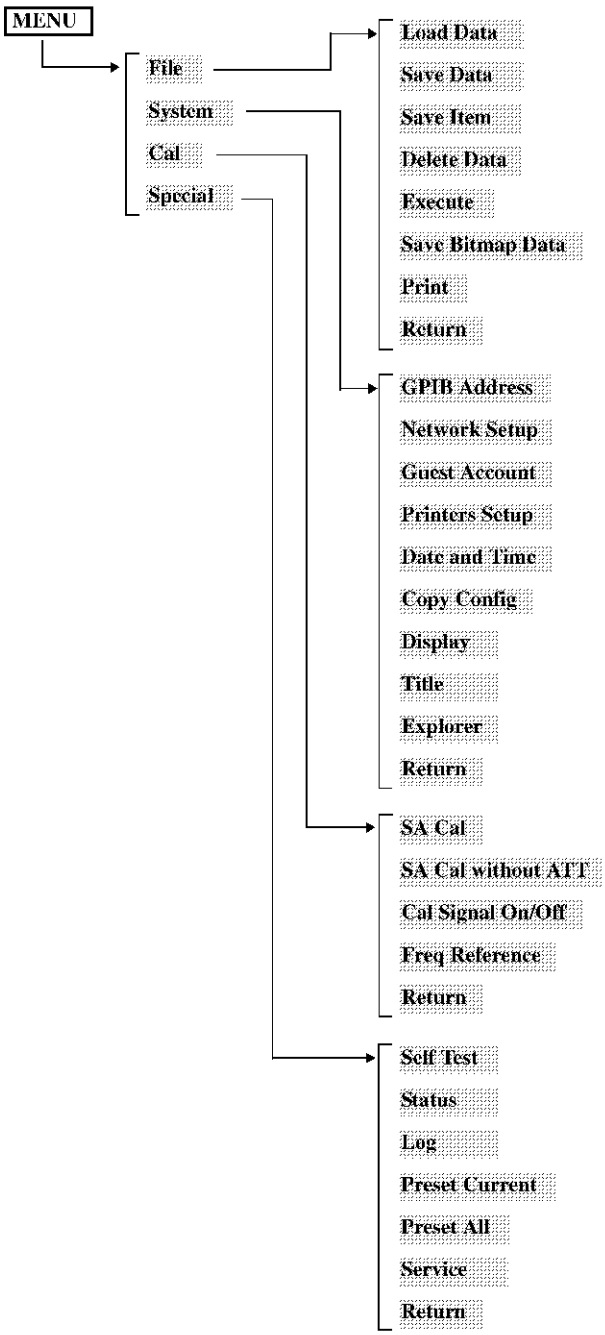
- *|.....| Used to enclose a menu name, key name, item name in the dialog box, button name, or the name of selected items in lists and menus.*
- *Shows a soft key on the soft menu bar.*

5.1 Menu Index

5.2 Function Description

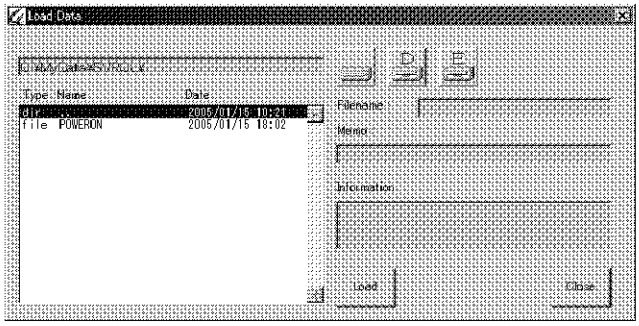
This section describes each function.

5.2.1 MENU



File Displays the File menu. Executes save/recall and print commands, and starts the application software.

Load Data Loads the saved setting conditions of this instrument.
When **Load Data** is selected, the following dialog box is displayed. The setting conditions are loaded by selecting the file name and executing **[Load]**.



Displays the standard directory information in the file list.

Displays the contents of the D drive, which is connected to the USB, in the file list.

Displays the contents of the E drive, which is connected to the USB, in the file list.

[Filename] Used to enter the file name to be loaded.

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

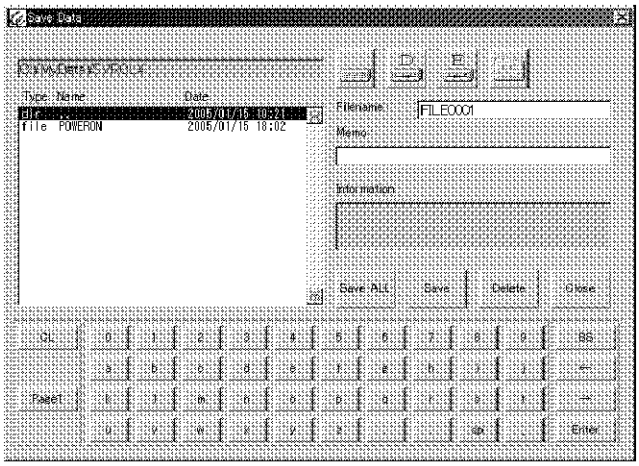
[Memo] Displays any additional information on the selected file.

[Information] Displays the selected file information.

[Load] Loads a file.

[Close] Closes the dialog box.

Save Data Saves the setting condition of this instrument in a file.
When **Save Data** is selected, the following dialog box is displayed.

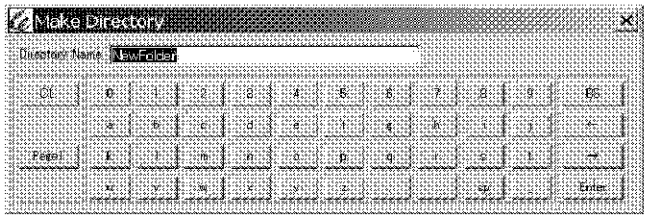


Displays the standard directory information in the file list.

Displays the contents of the D drive, which is connected to the USB, in the file list.

Displays the contents of the E drive, which is connected to the USB, in the file list.

Adds a folder to the directory being displayed. 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] Used to enter a space.

[Page1/2] Changes the input character type. 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] Used to enter the name of the file to be saved.

[Memo] Used to enter the memo information on the file.

[Information] Displays the selected file information.

[Save ALL] Saves all items regardless of the setting of Save Item.

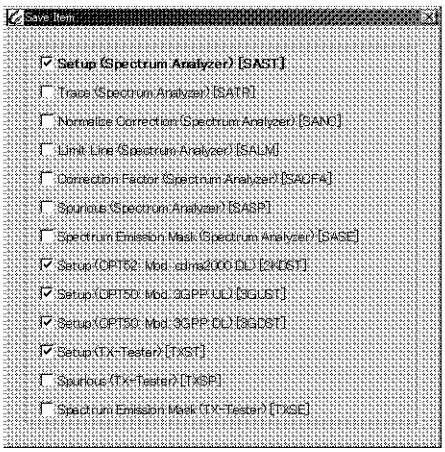
[Save] Used to select and save the items according to the setting of Save Item.

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

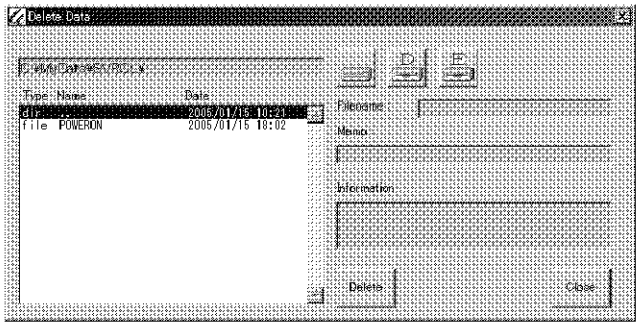
[Delete] Deletes the selected file.

[Close] Closes the dialog box.

Save Item Used to select the setting conditions and the type of data to be saved.
When **Save Item** is selected, the following dialog box is displayed.



Delete Data Deletes the file in which the setting conditions are saved.
When **Delete Data** is selected, the following dialog box is displayed.



Displays the standard directory information in the file list.

Displays the contents of the D drive, which is connected to the USB, in the file list.

Displays the contents of the E drive, which is connected to the USB, in the file list.

[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).***

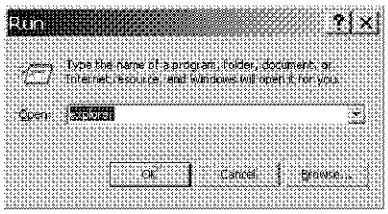
[Memo] Displays any additional information on the selected file.

[Information] Displays the selected file information.

[Delete] Deletes a file.

[Close] Closes the dialog box.

Execute Used to select and execute an executable file.
When **Execute** is selected, the following dialog box is displayed.



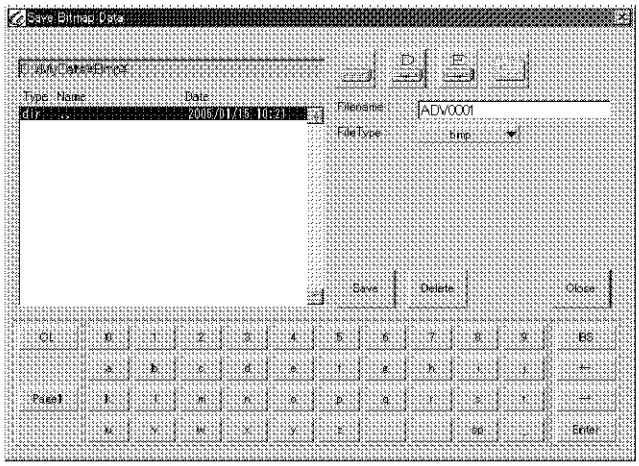
[Open] Used to enter the name of the executable file to be opened.

[OK] Executes the specified executable file.

[Cancel] Closes the dialog box.

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

Save Bitmap Data Saves the screen data of this instrument in a file.
When **Save Bitmap Data** is selected, the following dialog box is displayed.

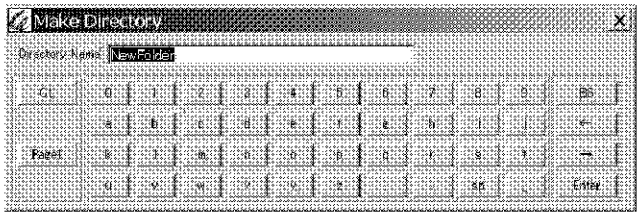


Displays the standard directory information in the file list.

Displays the contents of the D drive, which is connected to the USB, in the file list.

Displays the contents of the E drive, which is connected to the USB, 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] Used to enter a space.

[Page1/2] Changes the input character type. 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] Used to enter the name of the file to be saved.

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

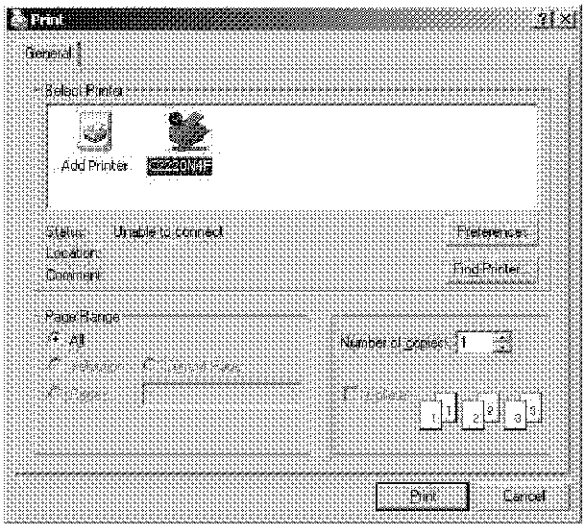
[File Type] Specifies the type of file to save. There are two file types available: the bit map file (bmp) format and the portable network graphics (png) format.

[Save] Saves the file.

[Delete] Deletes the selected file.

[Close] Closes the dialog box.

Print Outputs the screen data of this instrument to a printer.
When **Print** is selected, the following dialog box is displayed. The following example shows the state in which the printer driver is installed.

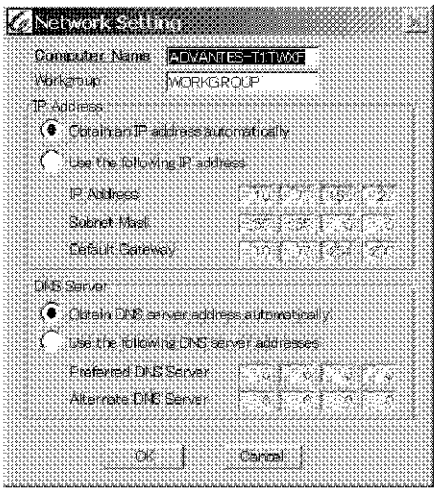


Return Returns to the previous menu.

System Sets the system functions such as the GPIB address, network setting, and addition of printer drivers.

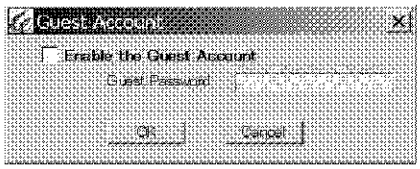
GPIB Address Sets the GPIB address of this instrument.

Network Setup Sets the LAN network information of this instrument.
When **Network Setup** is selected, the following dialog box is displayed. For more information on each setting item, refer to "Appendix A.3 Network Setting."



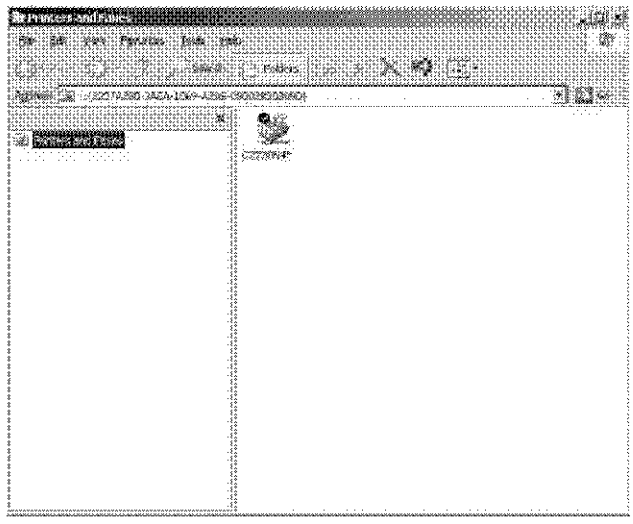
Guest Account Sets the Guest account.

When **Guest Account** is selected, the following dialog box is displayed. To refer to files in this instrument from a remote PC, the Guest Account must be set. For more information on the Guest Account settings, refer to "Appendix A.4 Guest Account Setting."



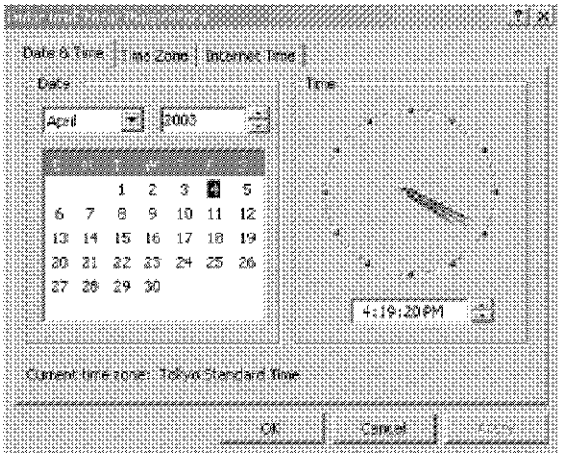
Printers Setup Installs the printer driver.

When **Printers Setup** is selected, the following dialog box is displayed. The following example shows the state in which the printer driver is installed.



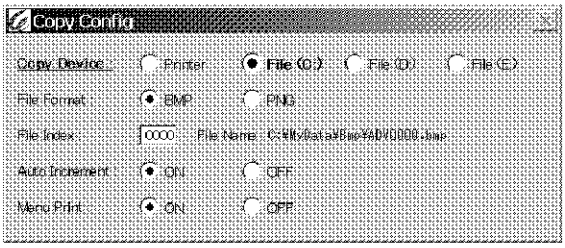
Date and Time

Sets the date, time and time zone of this instrument.
When **Date and Time** is selected, the following dialog box is displayed.



Copy Config

Sets the output destination (file or printer) of data displayed on the screen when the [COPY] key is pressed.
If **Copy Config** is selected, the following dialog box is displayed.



[Copy Device] Selects the output destination of data displayed on the screen.

Printer: Outputs data displayed on the screen to the printer that is specified in default setting.

File(C:): Saves a file in the C drive of this instrument.

File(D:): Saves a file in the D drive which is connected to the USB.

File(E:): Saves a file in the E drive which is connected to the USB.

[File Format] Selects the file format that is used when the data displayed on the screen is saved in a file.

BMP: Saves a file in BMP format.

PNG: Saves a file in PNG format.

[File Index] Specifies a file number to be saved.
The file is saved under a name which consists of "ADV" and the number that is specified in **[File Index]**.

[Auto Increment] Sets the function which automatically increments the file number.

ON: Increments the file number every time data displayed on the screen is saved.

OFF: Uses the file number which is specified in **[File Index]** when data displayed on the screen is saved in a file.

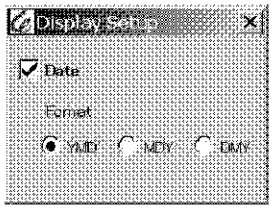
[Menu Print] Selects whether to include the soft menu in the output contents.

ON: Includes the soft menu in the output contents.

OFF: Does not include the soft menu in the output contents.

Close Closes the dialog box and returns to the previous menu.

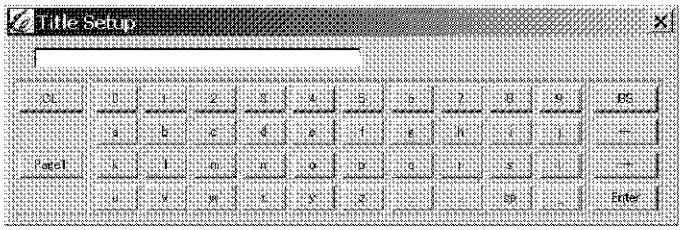
Display Sets the date display on the screen to ON or OFF and its display format.
When **Display** is selected, the following dialog box is displayed.



[Date] If a check mark is entered into the check box, the date is displayed on the screen. The display format can be selected from year/month/day, month/day/year, or day/month/year.

[Format] The format can be selected from YMD, MDY, or DMY.

Title Used to enter title characters on the screen of this instrument.
When **Title** is selected, the following dialog box is displayed.



[CL] Clears all characters in the input window.

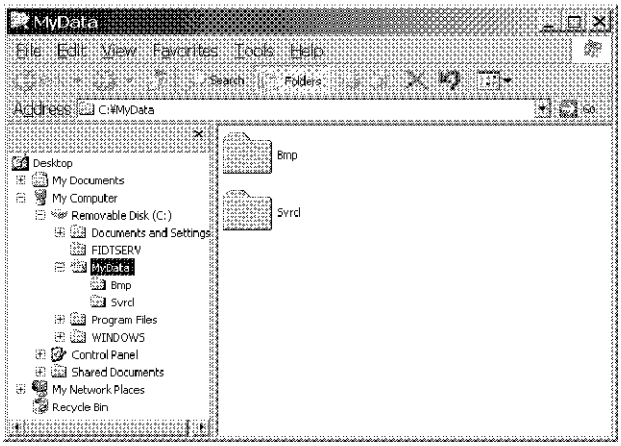
[BS] Deletes one character to the left of the cursor.

[sp] Used to enter a space.

[Page1/2] Changes the input character type. 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.

Explorer

Displays the following dialog box for managing files.



Return

Returns to the previous menu.

Cal

Displays the Cal menu. Cal is an abbreviation of the word "Calibration".

SA Cal

Executes the self-calibration function of this instrument. When performing self-calibration, the CAL OUT connector must be connected to the INPUT connector.

SA Cal without ATT

Executes the self-calibration function of this instrument. Because this calibration uses only the internal Cal signal, no connection to the external Cal signal is required.

Cal Signal On/Off

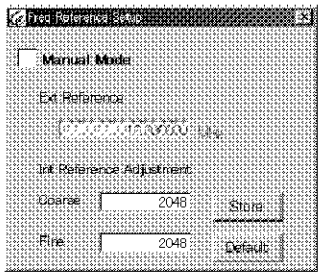
Used to select whether to output the calibration signal to the CAL OUT connector on the front panel.

Off: Does not output the calibration signal.
Even if this function is set to Off, the calibration signal is output while the self-calibration is performed.

On: Outputs the calibration signal.

Freq Reference

Used to select whether to use the internal or external frequency source as the reference, and finely adjust the frequency of the 10-MHz internal frequency reference source.
If Freq Reference is selected, the following dialog box is displayed.



[Manual Mode] Can be set only when the high stability frequency reference source option (OPT21, 22, or 23) is included.
If no option is installed, the check mark is cleared.
If the check mark is cleared, the frequency synchronization reference source mode is set to the internal/external reference signal auto-switching mode. If the auto-switching mode is set, the reference frequency is fixed to 10 MHz.
If the check mark is entered, the reference source mode for the frequency synchronization is set to the external reference. The external reference source whose frequency is specified in **[Ext Reference]** must be connected. If the external reference source is not connected, an error message, which indicates the phase is unlocked, is displayed.

[Ext Reference] Sets the frequency of the external reference source to a frequency between 5 MHz and 20 MHz.

[Int Reference Adjustment]
Adjusts the frequency of the internal reference frequency source.

[Coarse] Coarsely adjusts the frequency of the internal reference source. The setting range is between 0 and 4095.

[Fine] Finely adjusts the frequency of the internal reference source. The setting range is between 0 and 4095.

[Store] Saves the above value of **[Int Reference Adjustment]**, which is set to adjust the internal frequency reference source, to enable the adjustment value even when the power is turned off.

[Default] Discards the adjustment value saved by **[Store]** above, and set the adjustment value to the default setting.

Return Returns to the previous menu.

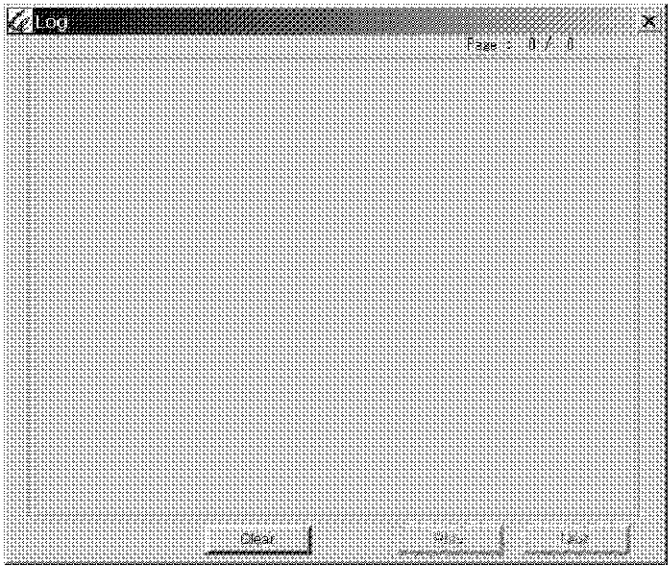
Special Displays the Special menu.

Self Test Displays the self-diagnostics dialog box for this instrument.

MEMO: The self-diagnostics function can be executed in the Spectrum Analyzer mode.

Status Displays the model name, serial number, software revision information, and option configuration of this instrument.

Log Displays the condition history of this instrument. When **Log** is selected, the following dialog box is displayed.



[Clear] Deletes the history.

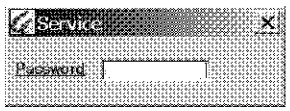
[Prev] Displays the previous history page.

[Next] Displays the next history page.

Preset Current Presets the currently active operation mode.

Preset All Presets all operation modes.

Service Displays the maintenance menu that only Advantest engineers are allowed to use.
When **Service** is selected, the following dialog box is displayed.



Return Returns to the previous menu.

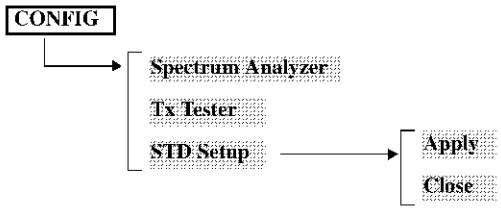
5.2.2 COPY

Pressing **COPY** outputs data on the screen to a file or a printer.

The output destination (file or printer) and other settings related to the file and printer are set in **MENU** → **System** → **Copy Config** .

No soft menu corresponds to this key.

5.2.3 CONFIG



Spectrum Analyzer Sets the Spectrum Analyzer mode.

Tx Tester Sets the Tx Tester mode.
This mode is enabled when the modulation analysis option is included.

STD Setup Used to select the standard to be measured.
When **STD Setup** is selected, the following dialog box is displayed:

[Type] Used to select a standard. When **[Type]** is set to OFF, the standard data is not used.

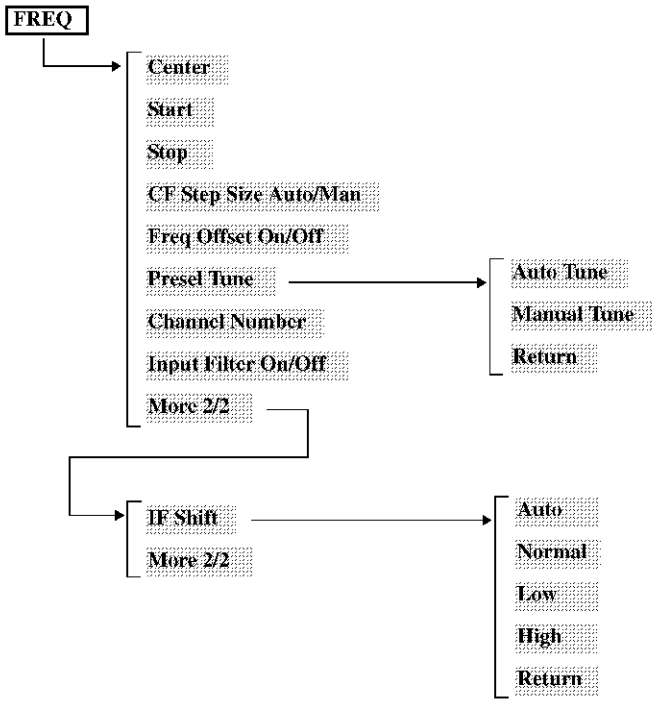
[Meas. Mode] Used to select Up Link, Down Link, and Band Class from the standard selected by **[Type]**.

Apply Applies the **[Type]** and **[Meas. Mode]** settings selected in the dialog box. The channel setting and the default value of the measurement function are set in accordance with the selected standard. Closes the dialog box and returns to the STD Setup menu.

Close Closes the dialog box without applying the changes and returns to the previous menu.

5.2.4 FREQ

When the **FREQ** key is pressed, the Freq menu is displayed and the center frequency can be set. The following shows the Frequency menu map.



Center — Sets the center frequency.
The frequency range is displayed by the center frequency and frequency span.

Start — Sets the start frequency. The frequency range is displayed by the start frequency and stop frequency.

Stop — Sets the stop frequency. The frequency range is displayed by the start frequency and stop frequency.

CF Step Size Auto/Man — Switches the step size between the auto and manual settings when the center frequency is changed by the step key.

- Auto: Sets the step size automatically to 1/10 of the span width.
- Man: Sets the step size manually.

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

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

Presel Tune — Displays the Presel Tune menu.

Auto Tune — Tunes the pre-selector automatically according to the peak frequency.

Manual Tune — Tunes the pre-selector manually.

Return — Returns to the previous menu.

Channel Number — Sets the center frequency by entering the channel number.

The channel number setting range and the relationship between the channel and frequency are determined according to the standard that is selected in **[CONFIG] → [STD Setup]**. If the standard selection is set to OFF, the channel number cannot be set.

Input Filter On/Off — Switches whether to use Input Filter.

This instrument includes the low pass filter, through which a signal of a frequency lower than 1.5 GHz is passed, and the high pass filter, through which a signal of frequency higher than 1.5 GHz is passed. When Input Filter is set to On, the filter is switched automatically according to the tuned frequency.

On: Uses Input Filter.

Off: Does not use Input Filter.

More 2/2 — Displays the Freq menu (2/2).

IF Shift — Used to select the 1st IF frequency setting in this instrument.

Auto — Sets the 1st IF frequency to the Normal frequency (4.4314 GHz) except for when measuring a Spurious Emissions, in which case set the 1st IF frequency to Low frequency (4.3914 GHz).

Normal — Set the 1st IF frequency to the Normal frequency (4.4314 GHz).

Low — Set the 1st IF frequency to the Low frequency (4.3914 GHz).

High — Set the 1st IF frequency to the High frequency (4.4514 GHz).

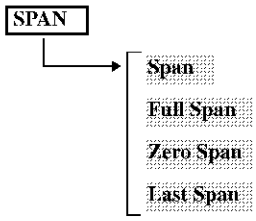
Return — Returns to the previous menu.

MEMO: If N times (N: integer of two or more) the input frequency is equal to the 1st IF frequency, the displayed noise level of this instrument may rise. In such a case, the rise of the noise level can be suppressed by setting the frequency to Low or High.
We recommend using the Auto setting usually.

More 1/2 — Displays the Freq menu (1/2).

5.2.5 SPAN

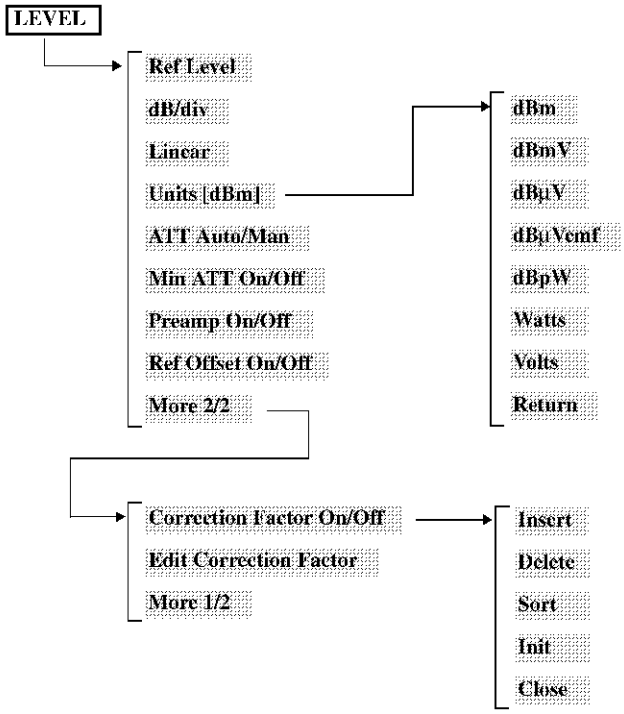
When the **SPAN** key is pressed, the Span menu is displayed and the frequency span can be set.
The following shows the Span menu map.



Span	Sets the frequency span. The frequency range is displayed by the center frequency and frequency span.
Full Span	Sets the frequency span to the full frequency range.
Zero Span	Sets the zero span mode at the center frequency.
Last Span	Returns the frequency span to the previous value.

5.2.6 LEVEL

When the LEVEL key is pressed, the Level menu is displayed and the amplitude can be set. The following shows the Level menu map.



Ref Level Sets the reference level.

dB/div Sets dB/div.
Displays waveform data on a log scale.

Linear Displays waveform data on a 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 dBµVemf.
- **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 previous menu.

ATT Auto/Man

Switches the attenuator function between the auto and manual settings.

Auto: Automatically sets the attenuator value according to the reference level.

Man: Sets the attenuator value manually.

Min ATT On/Off

Switches the Min ATT function On and Off.

On: Sets the minimum attenuator value and restricts the attenuator regardless of whether ATT is set to Auto or Manual.

Off: Cancels the Min ATT mode.

Preamp On/Off

Switches the high-sensitivity input function On and Off.

On: Turns On the built-in pre-amp with a gain of 20 dB or more. The pre-amp gain is corrected at each frequency and it does not need to be considered in level measurements.

Off: Turns Off the built-in pre-amp.

Ref Offset On/Off

Switches the reference level offset function On and Off.

On: The offset level can be set in the range of 0 to ±100.0 dB. The relationship among the displayed reference level, set reference level, and offset is as follows:

Displayed reference level = Set reference level + Offset

Off: Cancels the offset function.

More 2/2

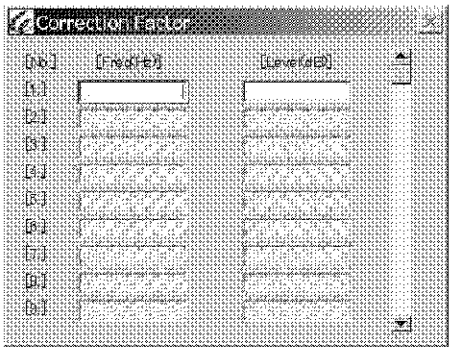
Displays the Level menu (2/2).

Correction Factor On/Off

Switches the level correction function On and Off.

Edit Correction Factor

Displays the Edit menu and the following **[Correction Factor]** dialog box.



Insert

Inserts the line that has the same values as the line of the cursor position in the dialog box.

Delete

Deletes the line from the cursor position in the dialog box.

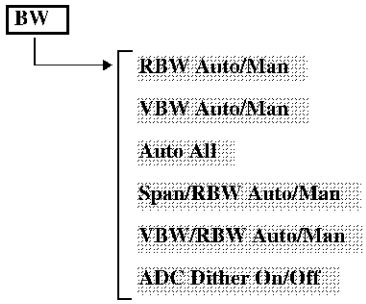
Sort

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

Init	Deletes all data in the dialog box.
Close	Closes the dialog box and returns to the previous menu.
More 1/2	Displays the Level menu (1/2).

5.2.7 BW

When the BW key is pressed, the BW menu, which is used to change the resolution bandwidth (RBW) and video bandwidth (VBW), is displayed. The resolution bandwidth can be set only when the manual setting is enabled.
The following shows the BW menu map.



RBW Auto/Man

Switches the RBW between the auto and manual settings.

Auto: Automatically sets the optimum RBW according to the frequency span.

Man: Sets the RBW manually.

VBW Auto/Man

Switches the VBW between the auto and manual settings.

Auto: Automatically sets the optimum VBW according to the RBW.

Man: Sets the VBW manually.

Auto All

Automatically sets the RBW, VBW and sweep time according to the frequency span.

Span/RBW Auto/Man

Switches the RBW versus frequency span function between the auto and manual settings. This setting is enabled only when the RBW is set to AUTO.

Auto: The ratio of frequency span to RBW is fixed to 1/100.

Man: The ratio of RBW to frequency span can be changed.

VBW/RBW Auto/Man

Switches the VBW versus RBW function between the auto and manual settings. This setting is enabled only when the VBW is set to AUTO.

Auto: The ratio of VBW to RBW is fixed to 1.

Man: The ratio of VBW to RBW can be changed.

ADC Dither On/Off

Switches the ADC Dither function On and Off.

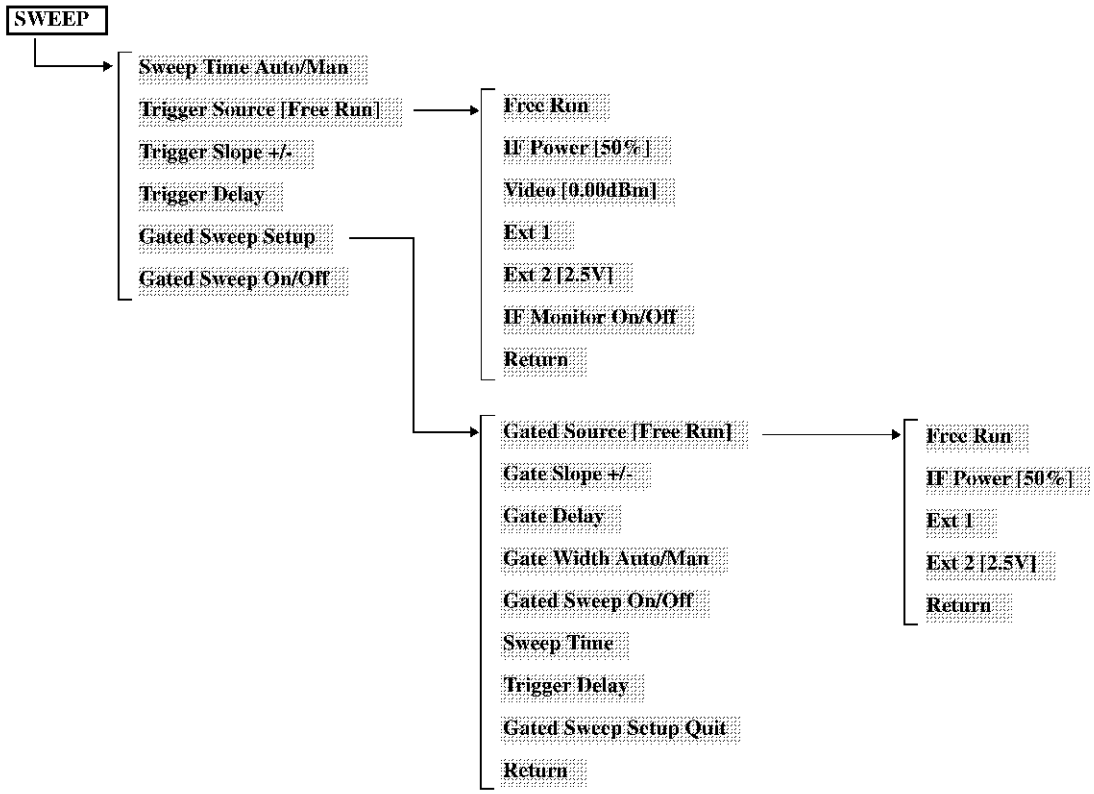
On: Enables ADC Dither.

Off: Cancels ADC Dither.

MEMO: ***When the ADC Dither is set to On, the ADC linearity of a low level signal improves and the internally-occurred intermodulation distortion is reduced. When measuring the intermodulation distortion, set ADC Dither to On. On the other hand, the ADC Dither adversely affects the displayed average noise level. When performing measurements by lowering the displayed average noise level, set the ADC Dither to Off.***

5.2.8 SWEEP

When the **SWEEP** key is pressed, the Sweep menu is displayed and the sweep conditions can be set. The following shows the Sweep menu map.



Sweep Time Auto/Man — Switches the sweep mode between the auto and manual settings.

Auto: Automatically sets the sweep time according to the span.

Man: Sets the sweep time manually.

Trigger Source [Free Run] — Displays the Trigger Source menu.

Free Run — Repeats the sweep automatically.

IF Power [50%] — Synchronizes the sweep with the IF signal and then starts the sweep.

Video [0.00dBm] — Synchronizes the sweep with the video signal and then starts the sweep.

Ext 1 — Synchronizes the sweep with the external trigger signal (EXT1 terminal) and then starts the sweep.

Ext 2 [2.5V] — Synchronizes the sweep with the external trigger signal (EXT2 terminal) and then starts the sweep.

IF Monitor On/Off Switches the IF signal monitor display function On and Off.

On: Turns On the IF signal monitor display function.

Off: Turns Off the IF signal monitor display function.

Return Returns to the previous menu.

Trigger Slope +/- Switches the trigger slope polarity between plus and minus. This setting is enabled only when the video trigger, external trigger, or IF trigger is used.

+: Starts the sweep at the rising edge of a trigger.

-: Starts the sweep at the falling edge of a trigger.

Trigger Delay Sets the delay time from a trigger point. This setting is enabled when the trigger condition se to the video trigger, external trigger, or IF trigger in the zero span mode.

Gated Sweep Setup Displays the Gated Sweep Setup 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.

Gated Source [Free Run] Displays the Gated Source menu.

Free Run Repeats the sweep automatically.

IF Power [50%] Synchronizes the sweep with the IF signal and then starts the sweep.

Ext 1 Synchronizes the sweep with the external trigger signal (EXT1 terminal) and then starts the sweep.

Ext 2 [2.5V] Synchronizes the sweep with the external trigger signal (EXT2 terminal) and then starts the sweep.

Return Returns to the previous menu.

Gate Slope +/- Switches the trigger slope polarity between plus and minus. This setting is enabled when the external trigger or IF trigger is used.

+: Starts the sweep at the rising edge of a trigger.

-: Starts the sweep at the falling edge of a trigger.

Gate Delay Sets the delay time from a trigger point. This value is used as the gate position when the gated sweep is performed.

Gate Width Auto/Man Switches the gate signal mode between the auto and manual settings when the gated sweep is performed.

Auto: Adjusts the gate width automatically according to the width of the rectangular part of the gate signal source. The gate width is automatically adjusted according to the width of the ON period of the signal.

Man: Sets the sweep time manually. 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 mode.

Sweep Time Sets the sweep time in the lower screen.

Trigger Delay Sets the delay time from a trigger point. This setting is enabled only when the zero span is set.

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

Return Returns to the previous menu.

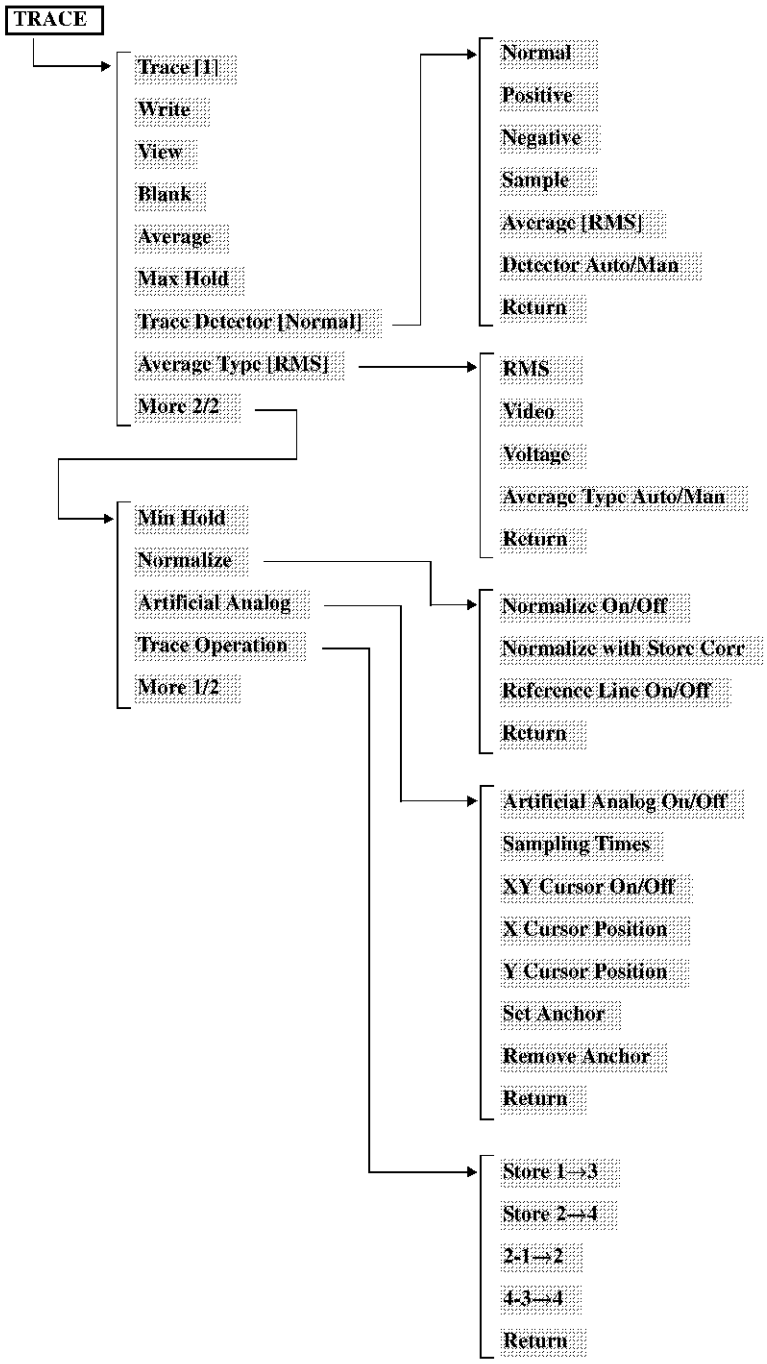
Gated Sweep On/Off Switches the gated sweep On and Off.

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

Off: Cancels the gated sweep mode.

5.2.9 TRACE

When the **TRACE** key is pressed, the Trace menu is displayed and the trace can be set. The following shows the Trace menu map.



Trace [1] Used to select a trace.

Write Refreshes the trace data in each sweep.

View Displays the trace data stored in the memory.

Blank Hides the trace.

Average Sets the number of times averaging is performed and displays the average value of each trace point by trace.

Max Hold Sets the Max Hold count and displays the maximum value of each trace point by trace.

Trace Detector [Normal] Displays the Trace Detector menu used in the trace.

Normal Sets the normal detection mode in which whether the peak is positive or negative at each trace point is automatically detected.

Positive Sets the positive peak detection mode.

Negative Sets the negative peak detection mode.

Sample Sets the sample detection mode.

Average [RMS] Sets the average detection mode. There are three types of average detection: RMS (power average), Video (Trace average), and Voltage (voltage average). The averaging method can be selected from the Average Type menu.

Detector Auto/Man Switches the detection mode between the auto and manual settings.

Auto: Automatically sets the optimum detection mode for measurement based on the trace mode.

Man: Sets the detection mode manually.

Return Returns to the previous menu.

Average Type [RMS] Displays the Average Type menu.

RMS Performs the Averaging function on the power (W) and draws waveforms.

Video Performs the Averaging function on the screen data.

Voltage Performs the Averaging function on the voltage and draws waveforms.

Average Type Auto/Man Switches the average type selection between the auto and manual settings.

Auto: Used to select an appropriate method for averaging waveforms according to the type of the vertical axis scale (Log or Linear).

For a Log scale, the RMS method is used
For a Linear scale, the Voltage method is used

Man: Sets the averaging method manually.

Return Returns to the previous menu.

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

Min Hold Sets the Min Hold count and displays the minimum value of each trace point by trace.

Normalize Displays the Normalize menu.

Normalize On/Off Switches the Normalize function On and Off.

On: Performs the level correction by using the normalization data and measurement.

Off: Cancels the Normalize function.

Normalize with Store Corr Acquires the normalization data and turns on the Normalize function. The waveform data displayed on the screen at that time is acquired as the normalization data.

Reference Line On/Off Sets the reference line used to specify the reference level for the Normalize function.

Return Returns to the previous menu.

Artificial Analog Displays the Artificial menu and sets the artificial analog display function to On.

Artificial Analog On/Off Switches the artificial analog display function On and Off.

On: Displays the tone of the trace by using the artificial analog display function. Because waveform data of up to 32 traces is accumulated on the screen, the opening condition of the waveform can be observed.

Off: Cancels the artificial analog display function.

Sampling Times Sets the sampling count for the vertical axis in the artificial analog display.

XY Cursor On/Off Switches the XY cursor function On and Off.

On: Displays the X and Y cursors.

Off: Hides the X and Y cursors.

X Cursor Position Sets the X cursor position.

Y Cursor Position Sets the Y cursor position.

Set Anchor Displays an anchor at the intersection of the X and Y cursors. The display values of the X and Y cursors are the relative values to the anchor.

Remove Anchor Hides the anchor.

Return Returns to the previous menu.

Trace Operation Displays the Trace menu.

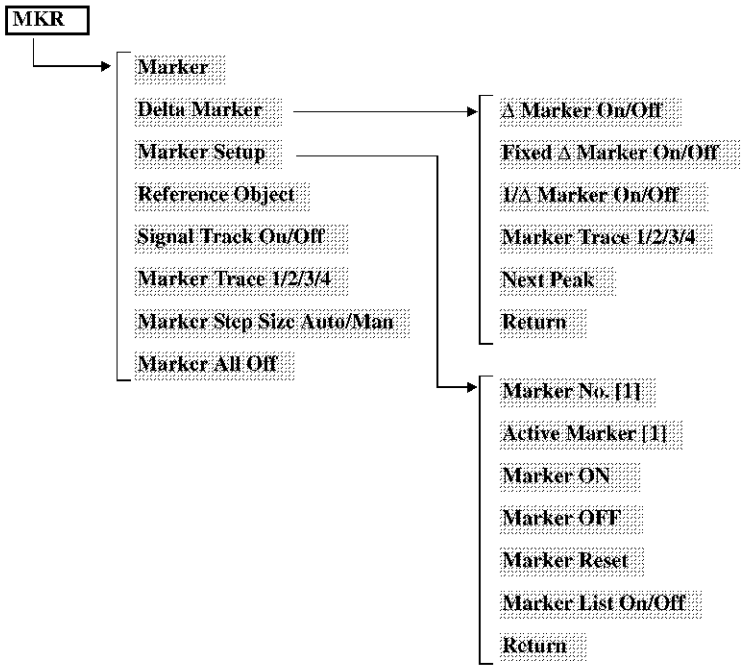
Store 1→3 Copies the waveform data of Trace 1 into the waveform data area of Trace 3, and sets Trace 3 to the View condition.

Store 2→4 Copies the waveform data of Trace 2 into the waveform data area of Trace 4, and sets Trace 4 to the View condition.

2-1→2	The waveform data on Trace 1 is subtracted from the acquired waveform data on Trace 2 and the result is displayed on Trace 2.
4-3→4	The waveform data on Trace 3 is subtracted from the acquired waveform data on Trace 4 and the result is displayed on Trace 4.
Return	Returns to the previous menu.
More 1/2	Displays the Trace menu (1/2).

5.2.10 MKR

When the MKR key is pressed, the Marker menu is displayed and the marker can be set. The following shows the Marker menu map.



Marker — Sets the frequency or time position of the active marker.

Delta Marker — Displays the Delta Marker menu.

Δ Marker On/Off — Switches the delta marker display function On and Off.

- On: Displays a delta marker at the same position as a normal marker. The relative values of the frequency and level to the normal marker are displayed in the marker area.
- Off: Hides the delta marker.

Fixed Δ Marker On/Off — Switches the fixed marker function On and Off.

- On: Maintains the frequency and level of the delta marker.
- Off: Cancels the fixed marker function.

1/Δ Marker On/Off — Switches the inverse number display function for the delta marker value On and Off.

- 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 on which the marker is placed. Every time this key is touched, the marker cycles through the traces in ascending order. However, a trace that is in the Blank state is skipped.

Next Peak — Moves the marker to the next highest peak from the current marker position in the search range.

Return — Returns to the previous menu.

Marker Setup — Displays the Marker Setup menu.

Marker No. [1] — Specifies a marker number.

Active Marker [1] — Specifies an active marker number.

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 — Hides the marker of the specified number.

Marker Reset — Hides any markers except for multi-marker number 1.
Marker 1 is displayed at the center of the horizontal axis.

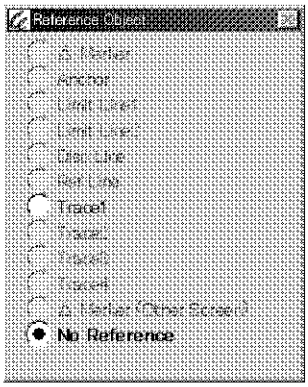
Marker List On/Off — Switches the display of the multi-marker list On and Off.

On: Displays the list of frequency and level in order of marker number.

Off: Hides the display of the multi-marker list.

Return — Returns to the previous 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 to the delta marker.

[Anchor] — Displays the relative value of the frequency (or time) and level of the normal marker to the anchor.

[Limit Line 1] — Displays the relative value of each level of the normal marker to Limit Line 1.

[Limit Line 2] — Displays the relative value of each level of the normal marker to Limit Line 2.

[Disp Line] — Displays the relative value of the level of the normal marker to the display line.

[Ref Line] — Displays the relative value of the level of the normal marker to the reference line.

[Trace 1] Displays the relative value of each level of the normal marker to Trace 1.

[Trace 2] Displays the relative value of each level of the normal marker to Trace 2.

[Trace 3] Displays the relative value of each level of the normal marker to Trace 3.

[Trace 4] Displays the relative value of each level of the normal marker to Trace 4.

[Δ Marker (Other Screen)] Displays the relative value of the frequency (or time) and level of the normal marker to the delta marker on the other screen when two screens are displayed.

[No Reference] Does not use the reference and changes the display of the level value of the marker from the relative value to the absolute value.

Close Closes the dialog box and returns to the previous menu.

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

On: Performs the peak search for the same peak in each sweep, and sets the marker frequency to the center frequency. The same peak means that a signal exists within ± 15 dB from the level when this function is turned on. If no signal exists in this range, the signal track function does not operate. When a signal re-enters this range, the signal track function restarts.

Off: Cancels the signal track function.

Marker Trace 1/2/3/4 Specifies the trace on which the marker is placed. Every time this key is touched, the marker cycles through the traces in ascending order. However, a trace that is in the Blank state is skipped.

Marker Step Size Auto/Man Switches the step size between auto and manual settings when the marker is moved by the step key.

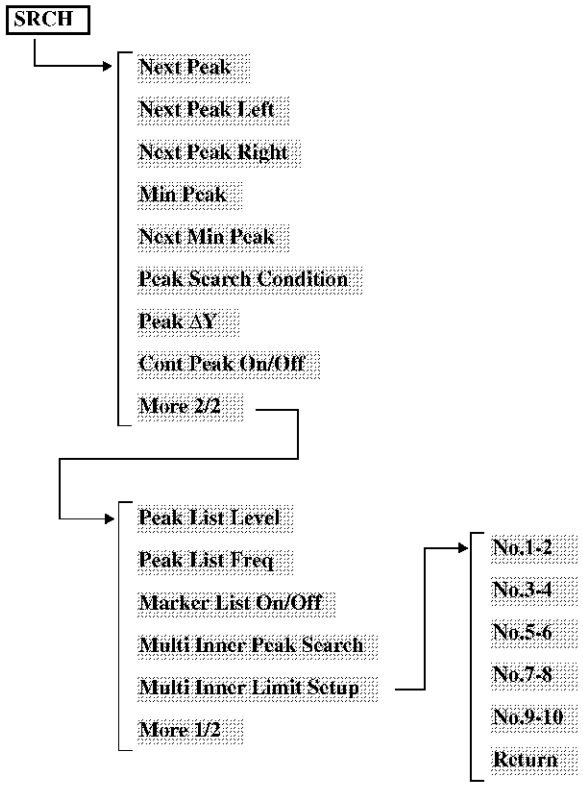
Auto: Sets the marker step size to 1/10 of the frequency span.

Man: Sets the step size manually. If a value specified by **Mkr→Mkr Step** or **ΔMarker→Mkr Step** is set to the step size, it is automatically set to Man.

Marker All Off Hides all displayed markers.

5.2.11 SRCH

When the **SRCH** key is pressed, the current marker moves to the peak of the trace and the Search menu is displayed.
The following shows the Search menu map.



Next Peak — Moves the marker to the next highest peak from the current marker position in the search range.

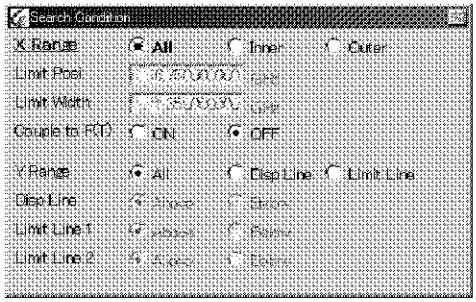
Next Peak Left — Moves the marker to the next peak on the left (at a lower frequency than the current marker position) in the search range.

Next Peak Right — Moves the marker to the next peak on the right (at a higher frequency than the current marker position) in the search range.

Min Peak — Moves the current marker to the lowest peak on the trace in the search range.

Next Min Peak — Moves the marker to the next lowest peak from the current marker position in the search range.

Peak Search Condition — Displays the **[Search Condition]** dialog box. Specifies the search range when the peak search function is performed by using the marker. The search range is specified over the waveform screen in the default setting.



[X Range] Specifies the search range on the horizontal axis in the waveform screen.

All: Sets the full range as the search range.

Inner: Sets the range specified by **[Limit Posi]** and **[Limit Width]** as the search range.

Outer: Sets the outside of the range specified by **[Limit Posi]** and **[Limit Width]** as the search range.

[Limit Posi] Sets the center position (for the frequency span setting) or start position (for the zero span setting) of the search range when Inner or Outer is specified in **[X Range]**.

[Limit Width] Sets the search width whose center position is set by **[Limit Posi]** (when setting the frequency span), or the search width whose start position is set by **[Limit Posi]** (when setting zero span) when Inner or Outer is specified in **[X Range]**.

[Couple to F(T)] Specifies the display mode of the window that shows the search range.

ON: The window, which shows the set search position and range, is coupled with the center frequency and span. The values of **[Limit Posi]** and **[Limit Width]** are not recalculated. The position of the window, which shows the search range, changes according to 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 are set automatically so that the window in the waveform screen always remains at the same position and width.

[Y Range] Specifies the search range of the vertical axis in the waveform screen.

All: Sets the full range as the search range.

Disp Line:
Displays a display line, and sets the range above or below the display line as the search range according to the condition specified in **[Disp Line]**.

Limit Line:
Sets the range above or below the displayed limit lines as the search range according to the conditions specified in **[Limit Line 1]** and **[Limit Line 2]**. When limit lines 1 and 2 are displayed, the search is performed according to both conditions set for limit lines 1 and 2.

[Disp Line] Specifies the range either above or below the display line as the search range.

Above: Sets the range above the display line as the search range.

Below: Sets 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: Sets the range above limit line 1 as the search range.

Below: Sets 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: Sets the range above limit line 2 as the search range.

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

Close Closes the dialog box and returns to the previous menu.

Peak ΔY Sets the level difference of the signal that is used to determine the peak point during the peak search. The set level difference is used as the threshold value for the peak point search.
This set value is used when Next Peak is performed and the multi-point peak search is performed by using the multi-marker.

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

On: Repeats the peak search in each sweep.

Off: Cancels the continuous peak search function.

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

Peak List Level Lists peak levels and peak frequencies in order of peak level.

Peak List Freq Lists peak levels and peak frequencies in order of frequency.

Marker List On/Off Switches the display of the multi-marker list On and Off.

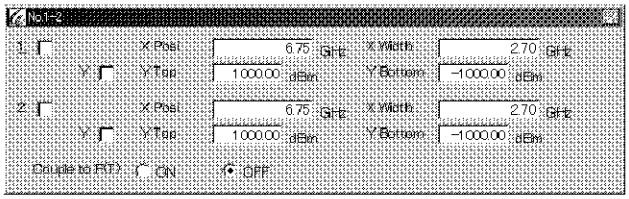
On: Displays the list of frequencies and levels in order of marker number.

Off: Hides the display of the multi-marker list.

Multi Inner Peak Search Performs the multi-inner peak search.
This function defines multiple areas and searches for the largest value in those areas. The areas must be specified by **Multi Inner Limit Setup** before performing this function.

Multi Inner Limit Setup Sets the search range when the multi-inner peak search function is performed. Up to 10 search ranges (No.1 to No.10) can be set.

No.1-2 Displays the dialog box in which search ranges No1 and No.2 are set.



[1] to [10] When a check mark is entered into the check box, the setting of the search range is enabled and the window is displayed in the corresponding area.

[X Posi] Sets the center position (when setting the frequency span) or start position (when setting the zero span) of the horizontal axis in the search range.

[X Width] Sets the search width whose center position (when setting the frequency span) or start position (when setting the zero span) is set in **[X Posi]**.

[Y] When a check mark is entered into the check box, the setting of the vertical search range set in **[Y Top]** and **[Y Bottom]** is enabled. If no check mark is entered into the check box, the whole vertical axis on the waveform screen is specified as the search range.

[Y Top] Sets the upper limit of the vertical search range.

[Y Bottom] Sets the lower limit of the vertical search range.

[Couple to F(T)] Specifies the display mode of the window that shows the search range.

ON: The window, which shows the set search position and range, is coupled with the center frequency and span. The values of **[Limit Posi]** and **[Limit Width]** are not recalculated. The position of the window, which shows the search range, changes according to 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 are set automatically so that the window in the waveform screen always remains the same display position and width.

Close Closes the dialog box and returns to the previous menu.

No.3-4 Displays the dialog box in which search ranges No3 and No.4 are set.

Close Closes the dialog box and returns to the previous menu.

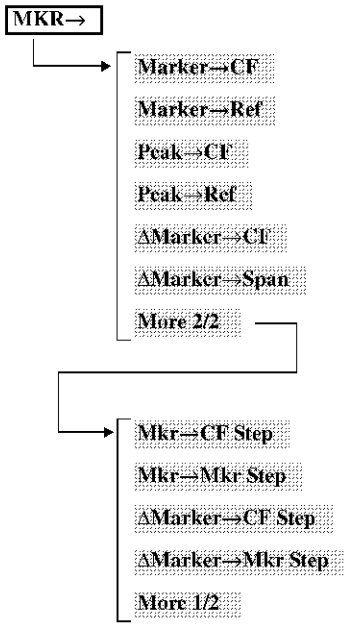
No.5-6 Displays the dialog box in which search ranges No5 and No.6 are set.

Close Closes the dialog box and returns to the previous menu.

No.7-8	Displays the dialog box in which search ranges No7 and No.8 are set.
Close	Closes the dialog box and returns to the previous menu.
No.9-10	Displays the dialog box in which search ranges No9 and No.10 are set.
Close	Closes the dialog box and returns to the previous menu.
Return	Returns to the previous menu.
More 1/2	Displays the Search menu (1/2).

5.2.12 MKR→

When the **MKR→** key is pressed, the MKR→ menu (1/2), in which the active marker data such as the frequency and level can be used as the data for other functions, is displayed.
The following shows the menu map.



Marker→CF — Sets the center frequency to the frequency of the active marker.

Marker→Ref — Sets the reference level to the level of the active marker.

Peak→CF — Displays the marker at the highest peak in the search range and sets the center frequency to the frequency of the marker.

Peak→Ref — Displays the marker at the highest peak in the search range and sets the reference level to the level of the marker.

ΔMarker→CF — Sets the center frequency to the difference between the frequencies of the delta marker and the normal marker.

ΔMarker→Span — Sets the frequency span to the difference between the frequencies of the delta marker and the normal marker.

More 2/2 — Displays the MKR→ menu (2/2).

Mkr→CF Step — Sets the step size of the center frequency to the frequency of the marker.

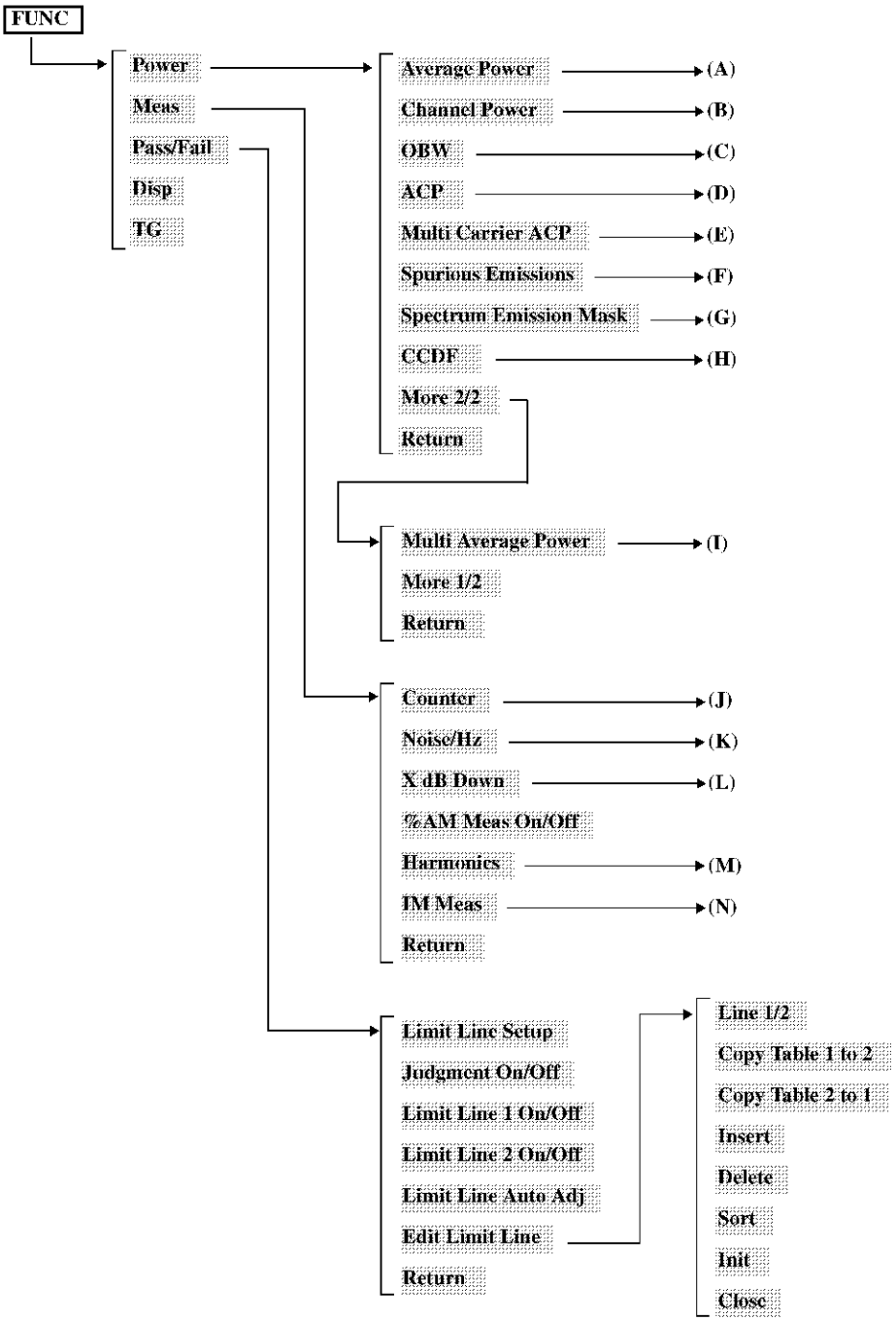
Mkr→Mkr Step — Sets the step size of the marker to the frequency of the marker.

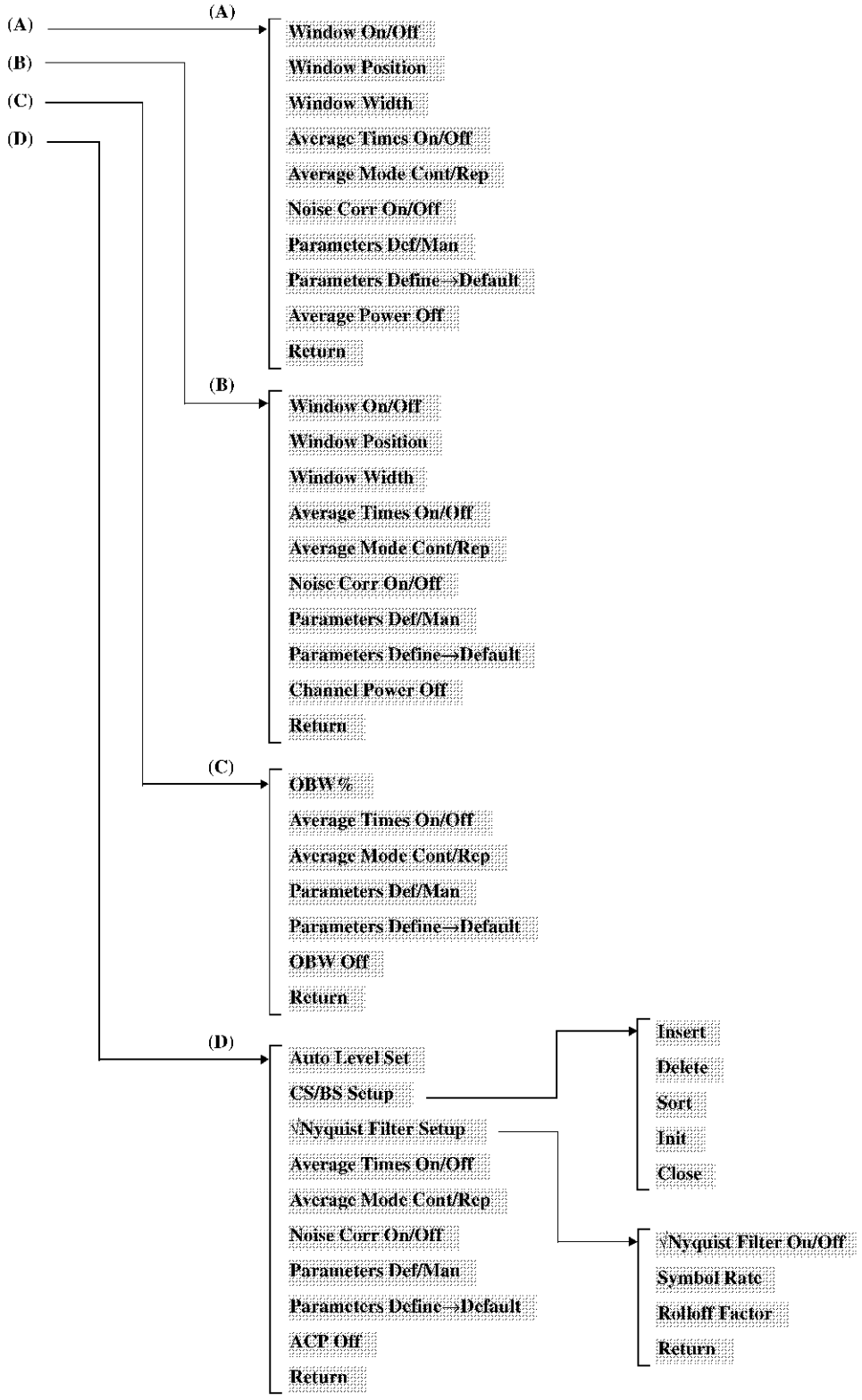
ΔMarker→CF Step — Sets the step size of the center frequency to the difference between the frequencies delta marker and the normal marker.

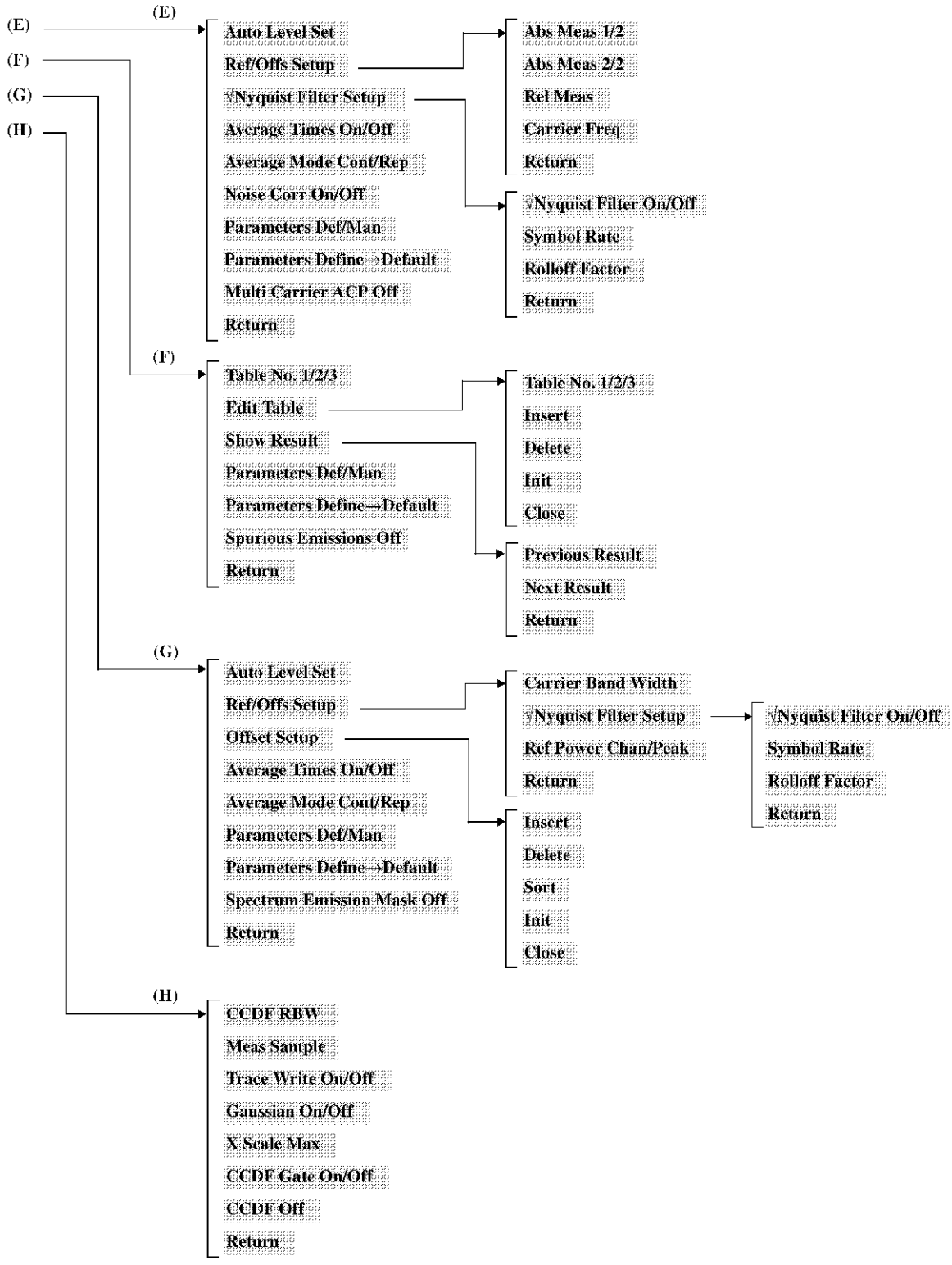
ΔMarker→Mkr Step	Sets the step size of the marker to the difference between the frequencies of the delta marker and the normal marker.
More 1/2	Displays the MKR→ menu (1/2).

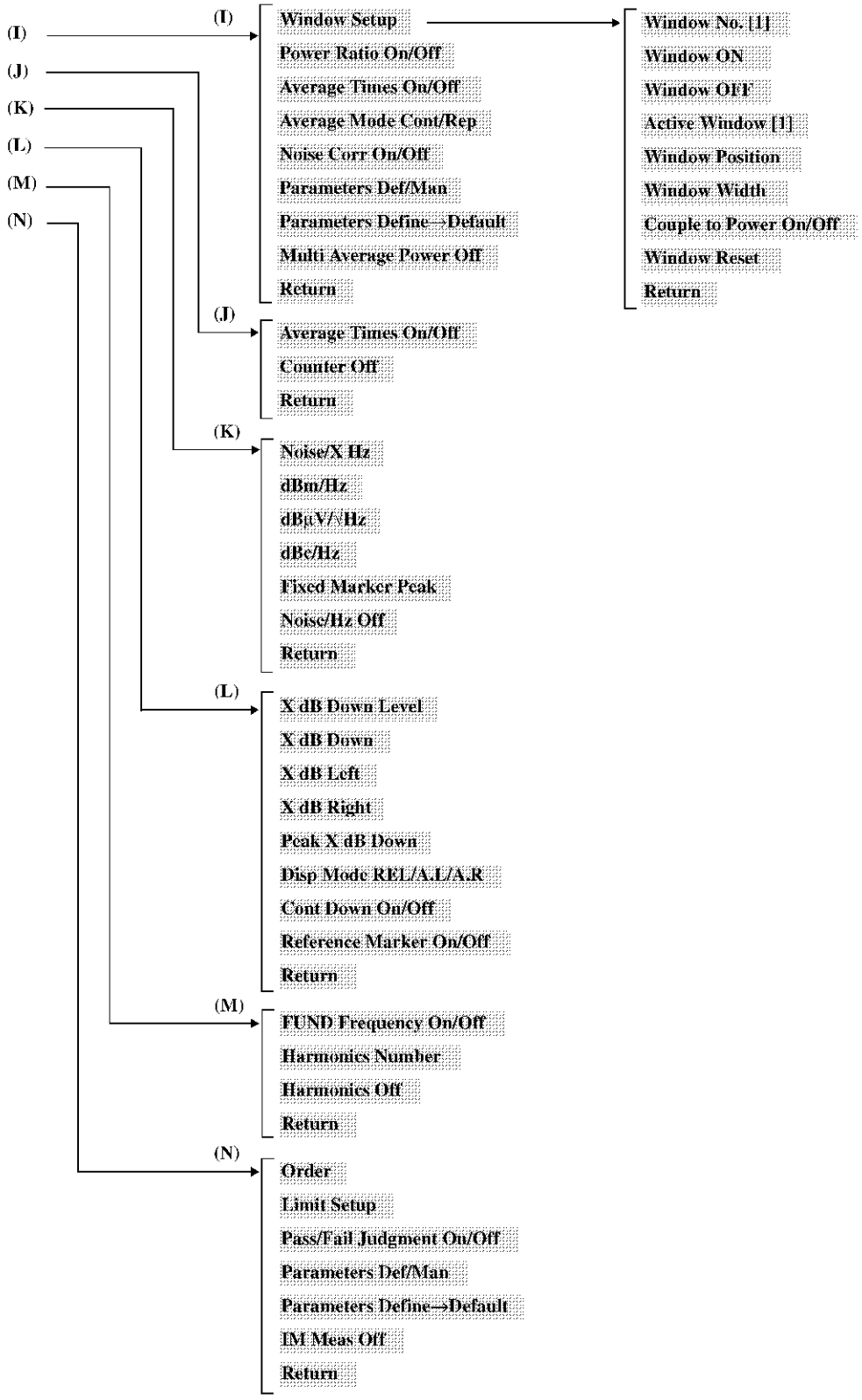
5.2.13 FUNC

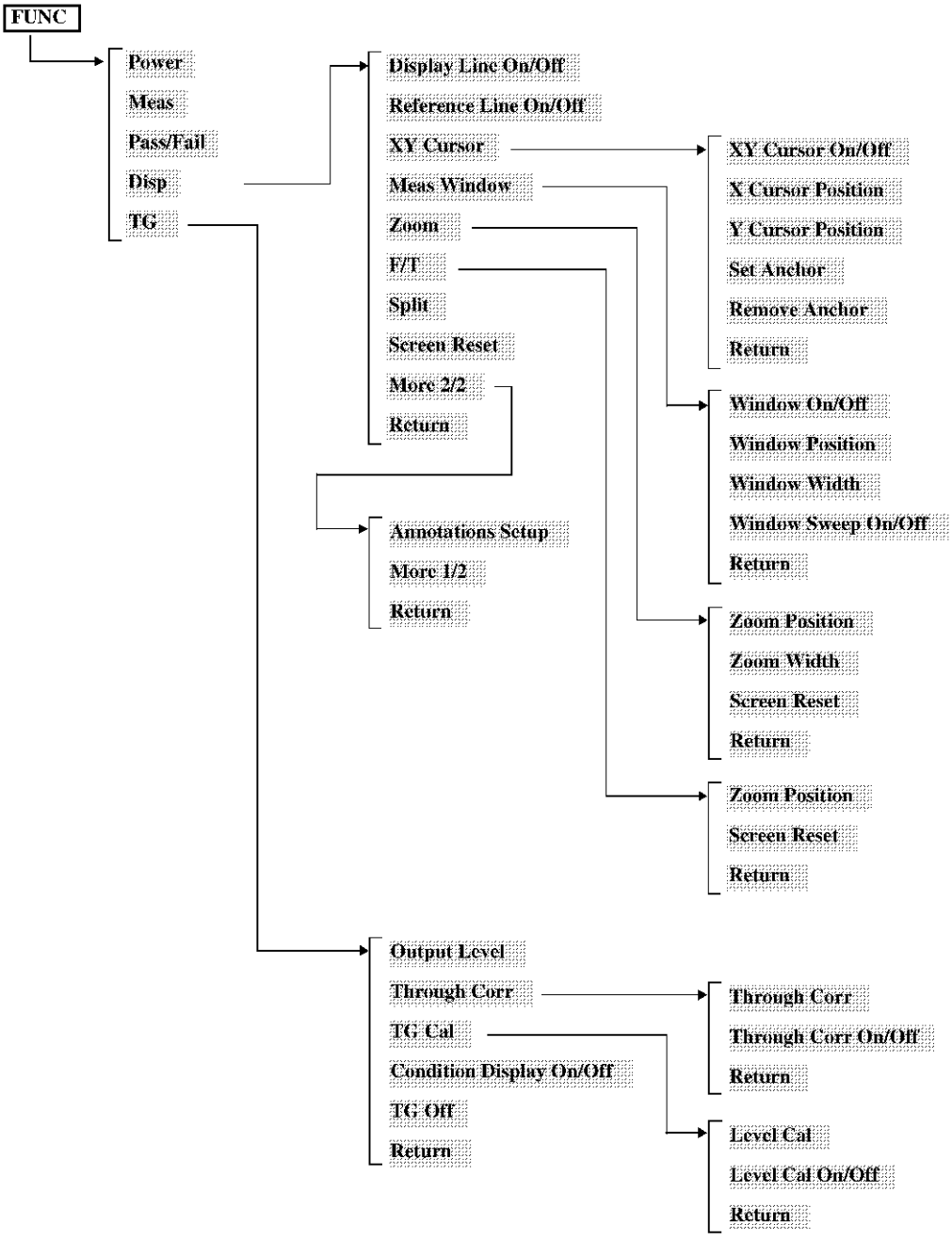
When the FUNC key is pressed, the Function menu is displayed.
The following shows the Function menu map.




(A)
(B)
(C)
(D)
(A)
Window On/Off
Window Position
Window Width
Average Times On/Off
Average Mode Cont/Rep
Noise Corr On/Off
Parameters Def/Man
Parameters Define→Default
Average Power Off
Return
(B)
Window On/Off
Window Position
Window Width
Average Times On/Off
Average Mode Cont/Rep
Noise Corr On/Off
Parameters Def/Man
Parameters Define→Default
Channel Power Off
Return
(C)
OBW%
Average Times On/Off
Average Mode Cont/Rep
Parameters Def/Man
Parameters Define→Default
OBW Off
Return
(D)
Auto Level Set
CS/BS Setup
√Nyquist Filter Setup
Average Times On/Off
Average Mode Cont/Rep
Noise Corr On/Off
Parameters Def/Man
Parameters Define→Default
ACP Off
Return
Insert
Delete
Sort
Init
Close
√Nyquist Filter On/Off
Symbol Rate
Rolloff Factor
Return


(E)
(F)
(G)
(H)
(E)
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
Abs Meas 1/2
Abs Meas 2/2
Rel Meas
Carrier Freq
Return
√Nyquist Filter On/Off
Symbol Rate
Rolloff Factor
Return
(F)
Table No. 1/2/3
Edit Table
Show Result
Parameters Def/Man
Parameters Define→Default
Spurious Emissions Off
Return
Table No. 1/2/3
Insert
Delete
Init
Close
Previous Result
Next Result
Return
(G)
Auto Level Set
Ref/Offs Setup
Offset Setup
Average Times On/Off
Average Mode Cont/Rep
Parameters Def/Man
Parameters Define→Default
Spectrum Emission Mask Off
Return
Carrier Band Width
√Nyquist Filter Setup
Ref Power Chan/Peak
Return
√Nyquist Filter On/Off
Symbol Rate
Rolloff Factor
Return
Insert
Delete
Sort
Init
Close
(H)
CCDF RBW
Meas Sample
Trace Write On/Off
Gaussian On/Off
X Scale Max
CCDF Gate On/Off
CCDF Off
Return


(I)
(J)
(K)
(L)
(M)
(N)
(I)
Window Setup
Power Ratio On/Off
Average Times On/Off
Average Mode Cont/Rep
Noise Corr On/Off
Parameters Def/Man
Parameters Define →Default
Multi Average Power Off
Return
Window No. [1]
Window ON
Window OFF
Active Window [1]
Window Position
Window Width
Couple to Power On/Off
Window Reset
Return
(J)
Average Times On/Off
Counter Off
Return
(K)
Noise/X Hz
dBm/Hz
dBμV/√Hz
dBc/Hz
Fixed Marker Peak
Noise/Hz Off
Return
(L)
X dB Down Level
X dB Down
X dB Left
X dB Right
Peak X dB Down
Disp Mode REL/A.L/A.R
Cont Down On/Off
Reference Marker On/Off
Return
(M)
FUND Frequency On/Off
Harmonics Number
Harmonics Off
Return
(N)
Order
Limit Setup
Pass/Fail Judgment On/Off
Parameters Def/Man
Parameters Define→Default
IM Meas Off
Return


FUNC
Power
Meas
Pass/Fail
Disp
TG
Display Line On/Off
Reference Line On/Off
XY Cursor
Meas Window
Zoom
F/T
Split
Screen Reset
More 2/2
Return
XY Cursor On/Off
X Cursor Position
Y Cursor Position
Set Anchor
Remove Anchor
Return
Window On/Off
Window Position
Window Width
Window Sweep On/Off
Return
Zoom Position
Zoom Width
Screen Reset
Return
Zoom Position
Screen Reset
Return
Annotations Setup
More 1/2
Return
Output Level
Through Corr
TG Cal
Condition Display On/Off
TG Off
Return
Through Corr
Through Corr On/Off
Return
Level Cal
Level Cal On/Off
Return

5.2.13.1 POWER

Power Displays the Power menu.

Average Power Measures and displays the average power in the range of the full measurement span or measuring window. Sets the number of times averaging is performed when measuring the average power. Sets the resolution bandwidth (RBW) widely than that of the amplitude fluctuation in the average power measurement. (The resolution bandwidth is more than three times wider than the occupied bandwidth.)
The average power can be obtained by using the following equation. The trace point in the horizontal axis is set to 1001.

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

P_{AVG}: Average power

$P_{(n)}$: Displayed data at each trace point (dBm)

X1: 1

X2: 1001

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

On: Displays the measuring window in the screen.

Off: Hides the measuring window.

Window Position Sets the measuring window position.

Window Width Sets the measuring window width.

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

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

Off: Cancels the averaging function.

Average Mode Cont/Rep
Average Mode Cont/RepSwitches the averaging mode between continuous calculation and repeat calculation.

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

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

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

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

Off: Turns off the noise correction function.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

Average Power Off Quits the average power measurement and returns to the Power menu.

Return Returns to the previous menu.

Channel Power Sets the measuring window and displays the Channel Power menu. The channel power can be obtained by using the following equation.

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

P_{CH}: Channel power

P(n): Displayed data at each trace point (dBm)

Window Width:
Window Width setting value

PBW: Noise power bandwidth

X1: Trace point at the window's left edge

X2: Trace point at the window's right edge

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

On: Displays the measuring window in the screen.

Off: Hides the measuring window.

Window Position Sets the measuring window position.

Window Width Sets the measuring window width.

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

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

Off: Cancels the averaging function.

Average Mode Cont/Rep
Switches the averaging mode between continuous calculation and repeat calculation.

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

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

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

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

Off: Turns off the noise correction function.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

Channel Power Off Hides the window, quits the channel power measurement, and returns to the Power menu.

Return Returns to the previous 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.

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

On: Sets the number of times averaging is performed and measures the average occupied bandwidth power.

Off: Cancels the averaging function.

Average Mode Cont/Rep
Switches the averaging mode between continuous calculation and

repeat calculation.

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

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

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

OBW Off Quits the occupied bandwidth measurement and returns to the Power menu.

Return Returns to the previous menu.

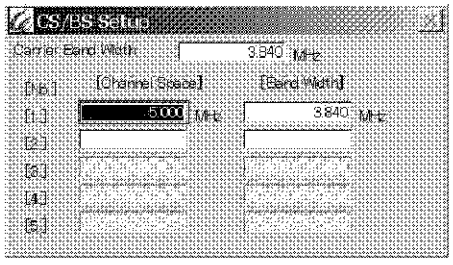
ACP Displays the ACP menu.

Auto Level Set Sets the reference level and ATT to their optimum values according to the signal to be measured. When the key is pressed, Auto Level Set is executed.

---

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

CS/BS Setup Displays the CS/BS menu and **[CS/BS Setup]** dialog box.



[Carrier Band Width]
Sets the measurement bandwidth in the channel power measurement used as the reference power.

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

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

Insert Inserts a line, on which to set an adjacent channel measurement condition, at the current cursor position. The data on the line that existed in the position before the new line was inserted is copied to each setting value as new line data.

Delete Deletes the measurement condition from the current cursor position.

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

Init Initializes all data in the table currently being edited.

Close Closes the dialog box and returns to the previous menu.

√Nyquist Filter Setup Displays the √Nyquist Filter Setup menu.

√Nyquist Filter On/Off
Switches the Nyquist filter function On and Off.

On: Sets a Nyquist filter.

Off: Cancels the Nyquist filter.

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

Rolloff Factor Sets the roll-off factor.

Return Returns to the previous menu.

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

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

Off: Cancels the averaging function.

Average Mode Cont/Rep
Switches the averaging mode between continuous calculation and repeat calculation.

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

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

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

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

Off: Turns off the noise correction function.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

ACP Off Quits the ACP measurement function and returns to the Power menu.

Return Returns to the previous menu.

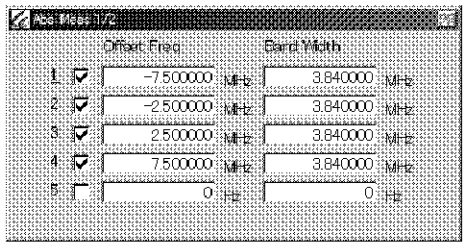
Multi Carrier ACP Displays the Multi Carrier menu and performs multi-carrier ACP measurement.

Auto Level Set Sets the reference level and ATT to their optimum values according to the signal to be measured. When the key is pressed, Auto Level Set is executed.

MEMO: ***Auto Level Set in Multi Carrier ACP sets the input ATT to its optimum value assuming that the modulation signal model is three or four carriers of W-CDMA. If the modulation signal includes two carriers, the ATT can be set to its optimum value by changing the attenuation between -10dB and -5dB after executing Auto Level Set.***

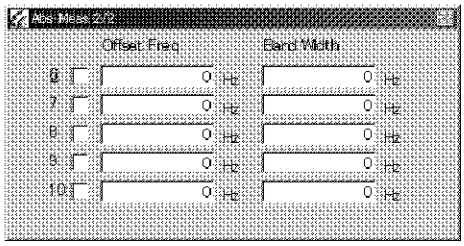
Ref/Offs Setup Displays the Ref/Offs Setup menu.

Abs Meas 1/2 Displays the **[Abs Meas 1/2]** dialog box. Sets the Offset frequency and bandwidth of the reference Carrier. Set the Offset frequency from the center frequency that is used before the measurement. Up to ten carriers can be set by combining **[Abs Meas 2/2]**.



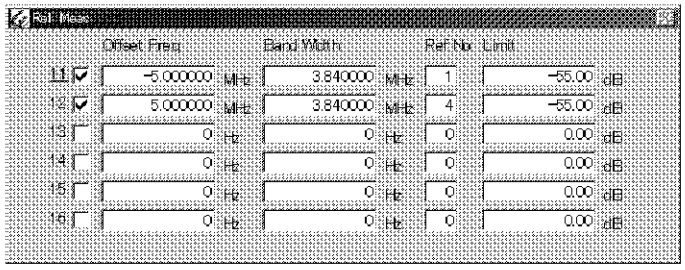
Close Closes the dialog box and returns to the previous menu.

Abs Meas 2/2 Displays the **[Abs Meas 2/2]** dialog box.



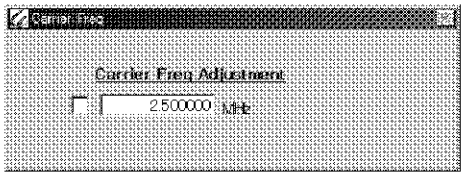
Close Closes the dialog box and returns to the previous menu.

Rel Meas Displays the **[Rel Meas]** dialog box. Up to six waves of frequencies and bandwidths in the frequency range, in which ACLR is measured, can be set. The frequency to be measured is set to the Offset frequency from the set reference carrier frequency.



Close Closes the dialog box and returns to the previous menu.

Carrier Freq Displays the **[Carrier Freq]** dialog box. The center frequency, which is used as the reference in Multi Carrier ACLR, can be adjusted.



Close Closes the dialog box and returns to the previous menu.

Return Returns to the previous menu.

√Nyquist Filter Setup Displays the √Nyquist Filter Setup menu.

√Nyquist Filter On/Off
Switches the Nyquist filter function On and Off.

On: Sets a Nyquist filter.

Off: Cancels the Nyquist filter.

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

Rolloff Factor Sets the roll-off factor.

Return Returns to the previous menu.

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

On: Sets the number of times averaging is performed 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 averaging mode between continuous calculation and repeat calculation.

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

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

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

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

Off: Turns off the noise correction function.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

Multi Carrier ACP Off
Quits the multi-carrier ACP measurement and returns to the Power menu.

Return Returns to the previous menu.

Spurious Emissions 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 Sets the setting sequence table number used for the spurious measurement to 1, 2, or 3.

1: Sets table number 1.

2: Sets table number 2.

3: Sets table number 3.

Edit Table Displays the Edit Table menu.
The **[Edit Table]** dialog box of the set table number is displayed. Parameters, which are used in the spurious measurement, such as start and stop frequencies, Input Filter On or Off, RBW, VBW, sweep time, reference level, attenuator, preamp ON or OFF, and judgment level value can be set in the dialog box.

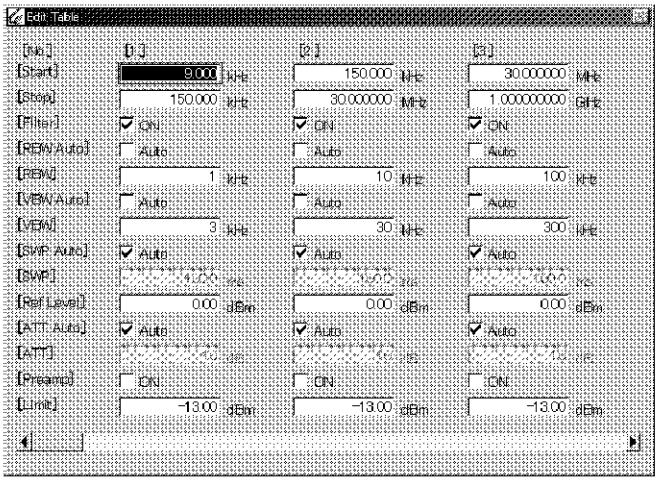


Table No. 1/2/3
Sets the setting sequence table number for the spurious measurement to 1, 2, or 3.

1: Sets table number 1.

2: Sets table number 2.

3: Sets table number 3.

Insert Inserts a column, in which spurious measurement conditions can be set, at the current cursor position. The data contained in the column that existed in the position before the column was inserted is copied to each setting value as new column data.

Delete Deletes a column of measurement conditions from the current cursor position.

Init Initializes all data in the table currently being edited.

Close Closes the dialog box and returns to the previous 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 Closes the measurement result screen and returns to the previous menu.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

Spurious Emissions Off
Quits the spurious measurement function and returns to the Power menu.

Return Returns to the previous menu.

Spectrum Emission Mask Displays the Spectrum menu.

Auto Level Set Sets the reference level and ATT to their optimum values according to the signal to be measured. When the key is pressed, Auto Level Set is executed.

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

Ref Power Setup Displays the Ref Power menu. This menu is used to set parameters for reference power calculation.

Carrier Band Width
Sets the power conversion bandwidth for carrier signals.

√Nyquist Filter Setup
Displays the √Nyquist Filter Setup menu.

√Nyquist Filter On/Off
Switches the Nyquist filter function On and Off.

On: Activates the Nyquist filter.

Off: Cancels the Nyquist filter.

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

Rolloff Factor
Sets the roll-off factor.

Return Returns to the previous menu.

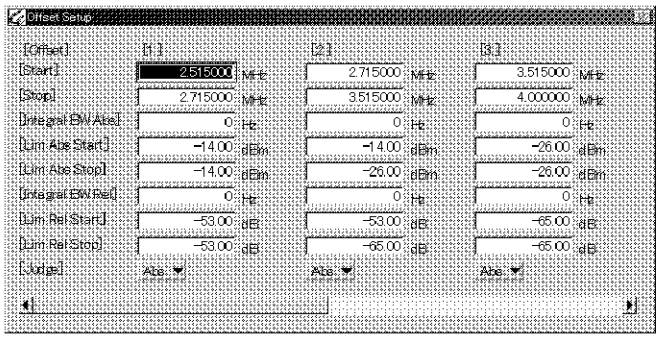
Ref Power Chan/Peak
Switches the calculation mode of the reference power between the Channel mode and the Peak Power mode.

Chan: Calculates the carrier power according to the setting in **Ref Power Setup** and sets the result as the reference power for mask measurement.

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

Return Returns to the previous menu.

Offset Setup Displays the Offset Setup menu and **[Offset Setup]** dialog box for the Offset data setting.



[Start] Used to enter the start frequency in the emission mask judgment area by using the offset frequency from the center frequency.

[Stop] Used to enter the stop frequency in the emission mask judgment area by using the offset frequency from the center frequency.

[Integral BW Abs]
Sets the power integral bandwidth at each frequency point in the absolute value measurement.

[Limit Abs Start]
Used to enter the mask value, which is set by an absolute value, at the start frequency.

[Limit Abs Stop]
Enter the mask value, which is set by an absolute value, at the stop frequency. The mask value between the start frequency and stop frequency is calculated by linear interpolation between the start value and stop value.

[Integral BW Rel]
Sets the power integral bandwidth at each frequency point in the relative value measurement.

[Limit Rel Start]
Used to enter the mask value, which is set by a relative value, at the start frequency. The mask value is used for comparison with the offset value from the measured reference power.

[Limit Rel Stop] Used to enter the mask value, which is set by a relative value, at the stop frequency. The mask value between the start frequency and stop frequency is calculated by linear interpolation between the start value and stop value.

[Judge] Specifies how to compare with the entered mask values, which are set by absolute and relative values, when the mask judgment is performed.

- Abs: Compares the waveform with the mask values set in Limit Abs Start/Stop. The Pass judgment is determined if the waveform is equal to or less than the mask values.
- Rel: Compares the waveform with the mask values set in Limit Rel Start/Stop. The Pass judgment is determined if the waveform is equal to or less than the mask values.
- A&R: Compares the waveform with values set in both Limit Abs Start/Stop and Limit Rel Start/Stop. If both conditions are met, Pass is displayed.
- A|R: Compares the waveform with values set in both Limit Abs Start/Stop and Limit Rel Start/Stop. If one of above mentioned conditions is met, Pass is displayed.

Insert Inserts a column that has the same values as the column of the cursor position in the dialog box.

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

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

Init Deletes all data in the dialog box.

Close Closes the dialog box and returns to the previous menu.

Average Times On/Off

Switches the averaging function On and Off.

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

Average Mode Cont/Rep

Switches the averaging mode between continuous calculation and repeat calculation.

- Cont: Sets the continuous calculation mode. In the continuous calculation mode, the moving-average method is used to calculate the result after the set averaging count is reached.
- Rep: Sets the repeat calculation mode. In the repeat calculation mode, when the set averaging count is reached, the current averaging count is reset to 1 and the averaging process is repeated from the beginning.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

Spectrum Emission Mask Off
Quits the spectrum emission mask measurement and returns to the Power menu.

Return Returns to the previous menu.

CCDF Displays the CCDF menu.
The screen is switched to the CCDF measurement screen.

CCDF RBW Sets RBW.
RBW can be set to a range of 100 kHz to 10 MHz (1, 3 sequence) and 20 MHz.

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 maximum value of the horizontal axis on the waveform display.

CCDF Gate On/Off Switches the gate function of the CCDF measurement On and Off.

On: Sets a threshold level and performs the CCDF measurement in the period where the input signal is higher than the specified threshold level.

Off: Cancels the gate function of the CCDF measurement.

CCDF Off Quits the CCDF measurement and returns to the Power menu.

Return Returns to the previous menu.

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

Return Returns to the previous menu.

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.

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 On/Off
Switches On and Off the function which 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 window1.
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.

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

On: Turns on the noise correction function. Every time the measurement parameter changes, the internal noise level of this instrument is measured and the noise correction value is reflected 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 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.

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

Return Returns to the previous menu.

5.2.13.2 MEAS

Meas — Displays the Meas menu.

Counter — Displays the Counter menu and turns on the frequency counter function.

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

On: Sets the number of times averaging is performed in the frequency counter function.

Off: Cancels the averaging function.

Counter Off — Turns off the frequency counter function and returns to the Meas menu.

Return — Returns to the previous menu.

Noise/Hz — Displays the Noise/Hz menu and starts the Noise/Hz measurement.

Noise/X Hz — Sets the noise measurement bandwidth.

dBm/Hz — Sets the vertical axis unit to dBm and sets the marker unit to dBm/Hz. Average is automatically selected as the detection mode.

dBμV/√Hz — Sets the vertical axis unit to dBμV and the marker unit to dBμV/√Hz. Average is automatically selected as the detection mode.

dBc/Hz — Sets the delta marker unit to dBc/Hz. The marker fixing function is set to ON. Average is automatically selected as the detection mode.

Fixed Marker Peak — Moves a delta marker to the largest peak on the trace which is currently displayed and fixes it to that position.

Noise/Hz Off — Quits the noise measurement function and returns to the Meas menu.

Return — Returns to the previous menu.

X dB Down — Displays the X dB Down menu.

X dB Down Level — Sets the attenuation.

X dB Down — According to the Mode setting, a normal marker and a delta marker X dB is displayed lower than the current position.

X dB Left — Displays a normal marker to the left of and X dB lower than the current position.

X dB Right — Displays a normal marker to the right of and X dB lower than the current position.

Peak X dB Down — Searches for the maximum peak in the search range, and displays a normal marker and a delta marker X dB lower than the current position.

Disp Mode REL/A.L/A.R
Sets how the marker data will be displayed.

REL: Displays a normal marker to the right and a delta marker to the left.

A.L: Displays the left marker as an absolute value.

A.R: Displays the right marker as an absolute value.

Cont Down On/Off Switches the continuous X dB down function On and Off.

On: Repeats Peak X dB down in every sweep.

Off: Cancels the continuous X dB down function.

Reference Marker On/Off
Switches the reference marker function On and Off.

On: Displays a reference marker at the reference position of X dB Down.

Off: Hides the reference marker.

Return Returns to the previous menu.

%AM Meas On/Off Acquires the AM modulation factor by using the peak search and displays the calculation result in percentage.

On: Performs the AM modulation measurement.

Off: Quits the 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 the fundamental frequency setting function On and Off.

On: Sets the fundamental frequency.

Off: Sets the fundamental frequency to the current center frequency.

Harmonics Number Sets the measuring harmonic order.

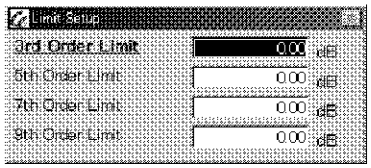
Harmonics Off Quits the harmonic measurement function and returns to the Meas menu. The entire screen is displayed.

Return Returns to the previous 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 measuring order. The third, fifth, seventh, and ninth orders can be set.

Limit Setup Displays the **[Limit Setup]** dialog box.



[3rd Order Limit]
Sets the limit value of the third-order distortion signal.

[5th Order Limit]
Sets the limit value of the fifth-order distortion signal.

[7th Order Limit]
Sets the limit value of the seventh-order distortion signal.

[9th Order Limit]
Sets the limit value of the ninth-order distortion signal.

Close Closes the dialog box and returns to the previous menu.

Pass/Fail Judgment On/Off
Switches the Pass/Fail judgment, which is determined by comparing with the limit value set in the **[Limit Setup]** dialog box, On and Off.

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

Off: Does not perform the Pass/Fail judgment.

Parameters Def/Man Sets the parameter setting mode used for measurement.

Def: Starts the measurement in the mode in which parameters that were saved in the **Parameters Define→Default** menu were automatically set.

Man: Starts the measurement by using the previous parameters.

Parameters Define→Default
Stores the current parameters as the parameters that are used for measurement.

IM Meas Off Quits the intermodulation distortion measurement function and returns to the Meas menu.

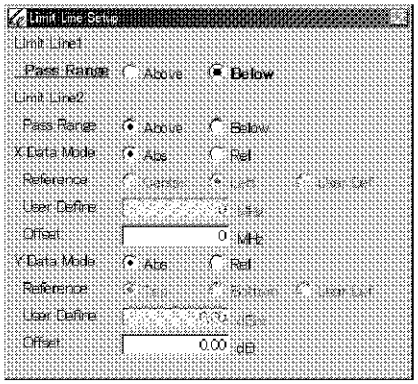
Return Returns to the previous menu.

Return Returns to the previous menu.

5.2.13.3 PASS/FAIL

Pass/Fail Displays the Pass/Fail menu.

Limit Line Setup Displays the **[Limit Line Setup]** dialog box used to set the judgment conditions that are set by limit lines.



[Limit Line 1]

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

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

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

[Limit Line 2]

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

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

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

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

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

Rel: Sets the horizontal axis position according to the relative value of the limit line set in **Limit Line Edit**. The horizontal axis position of the limit line is fixed to the position set in Reference and does not depend on changes in the frequency span and center frequency setting.

[Reference] Sets the reference position.

Center: Sets the reference position to the center of the horizontal axis.

Left: Sets the reference position to the leftmost point of the horizontal axis.

User Def: Sets the reference position in User Define.

[User Define] Sets the absolute frequency as the reference position when **[Reference]** is set to **[User Def]**.

[Offset] Sets the offset frequency from the reference position.

Close Closes the dialog box and returns to the previous menu.

[Y Data Mode] Sets the data attributes of the vertical axis (level) limit line.

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

Rel: Sets the vertical axis position according to the relative value of the limit line set in **Limit Line Edit**.
The position of the vertical axis of the limit line is fixed to the position set in Reference, and does not depend on a change in the level setting.

[Reference] Sets the reference position.

Top: Sets the reference position to the top of the vertical axis.

Bottom: Sets the reference position to the bottom of the vertical axis.

User Def: Sets the reference position in User Define.

[User Define] Sets the absolute level as the reference position when **[Reference]** is set to **[User Def]**.

[Offset] Sets the offset level from the limit line.

Close Closes the dialog box and returns to the previous menu.

Judgment On/Off Switches the Pass/Fail judgment compared with limit lines 1 and 2 On and Off.

On: Performs the Pass/Fail judgment. If the measurement result does not satisfy the conditions set in the Limit Line Setup dialog box, the device is judged as fail.

Off: Does not perform the Pass/Fail judgment.

Limit Line 1 On/Off Switches limit line 1 On and Off.

On: Displays limit line 1.

Off: Hides limit line 1.

Limit Line 2 On/Off Switches limit line 2 On and Off.

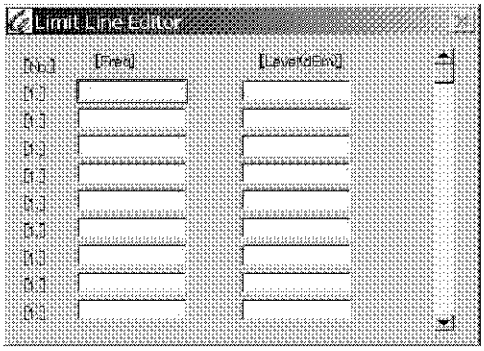
On: Displays limit line 2.

Off: Hides limit line 2.

MEMO: No limit line is displayed unless the limit line data of at least two points is entered in Limit Line Editor.

Limit Line Auto Adj Searches for 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 that is set above. This function is enabled only when Y Data Mode is set to Rel.

Edit Limit Line Displays the Edit menu and the **[Limit Line Editor]** dialog box.



Line 1/2 Sets the limit line to be displayed in **[Limit Line Editor]**.

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.

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

Delete Deletes the line from the cursor position in the dialog box.

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

Init Deletes all data in the limit line setting dialog box.

Close Closes the dialog box and returns to the previous menu.

Return Returns to the previous menu.

5.2.13.4 DISP

Disp Displays the Disp menu.

Display Line On/Off Switches the display of the display line, which is used as the reference line when the trace level is compared, On and Off.

On: Displays the display line.
The display line position can be changed.

Off: Hides the display line.

Reference Line On/Off Switches the display of the reference line, which is used as the reference for the relative display of the level data, On and Off.

On: Displays the reference line.
The reference line position can be changed.

Off: Hides the reference line.

XY Cursor Displays the XY Cursor menu.

XY Cursor On/Off Switches the XY cursor function On and Off.

On: Displays the X and Y cursors.

Off: Hides the X and Y cursors.

X Cursor Position Sets the X cursor position.

Y Cursor Position Sets the Y cursor position.

Set Anchor Displays an anchor at the intersection of the X and Y cursors. The display values of the X and Y cursors are the relative values to the anchor.

Remove Anchor Hides the anchor.

Return Returns to the previous menu.

Meas Window Displays the Meas Window menu.

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

On: Displays the measuring window in the screen.

Off: Hides the measuring window.

Window Position Sets the measuring window position.

Window Width Sets the measuring window width.

Window Sweep On/Off
Switches the window sweep On and Off

On: Performs the window sweep.

Off: Does not perform the window sweep.

Return Returns to the previous 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 is set to frequency (or time) in both the upper and lower screens.

- **Zoom Position** — Sets the center position to be zoomed.
- **Zoom Width** — Sets the zoom width.
- **Screen Reset** — Displays only the upper screen and returns to the Disp menu.
- **Return** — Returns to the previous menu.

F/T — Displays the Zoom menu and displays two screens. The upper screen displays a waveform before zoom. The horizontal axis is set to frequency in the upper screen and set to time (zero span) at the zoomed position in the lower screen.

- **Zoom Position** — Sets the center position to be zoomed.
- **Screen Reset** — Displays only the upper screen and returns to the Disp menu.
- **Return** — Returns to the previous menu.

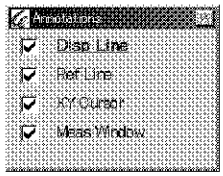
Split — Sets the upper and lower screens. Each screen can be set individually.

Screen Reset — Returns to the upper screen display from the two-screen display.

More 2/2 — Displays the Disp menu (2/2).

Return — Returns to the previous menu.

Annotations Setup — Displays the **[Annotations Setup]** dialog box used to set the annotation that displays the position and width of the measuring window to On or Off.



- **[Disp Line]** — Displays the level position of Display Line when Display Line is set to On and a check mark is entered in the check box. Hides the display by clearing the check mark from the check box.
- **[Ref Line]** — Displays the level position of Reference Line when Reference Line is set to On and a check mark is entered in the check box. Hides the display by clearing the check mark from the check box.
- **[XY Cursor]** — Displays the XY Cursor position when the XY Cursor is set to On and a check mark is entered in the check box. Hides the display by clearing the check mark from the check box.
- **[Meas Window]** — Displays the position and width of the measuring window when the measuring window is set to On and a check mark is entered in the check box. Hides the display by clearing the check mark from the check box.
- **Close** — Closes the dialog box and returns to the previous menu.

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

Return Returns to the previous menu.

5.2.13.5 TG

TG Turns on the Tracking Generator output and displays the TG menu that is used to set Tracking Generator.

MEMO: ***This function is enabled only when the Tracking Generator option is included.***

Output Level Sets the output level.

Through Corr Displays the Through Corr menu.

Through Corr Performs the normalization in a range of 100 kHz to 3.3 GHz and turns on the Through Correction function.
Connect the cable to TG OUTPUT and INPUT before performing the normalization.

MEMO: ***If the frequency setting is changed in a range of 100 kHz to 3.3 GHz, the measurement can be performed without normalization because the frequency characteristics are automatically corrected by the normalization data.***

Through Corr On/Off Switches the Through Correction function On and Off.

On: Performs the correction by using the Though Correction function.

Off: Cancels the Though Correction function.

MEMO: ***This function cannot be set to On before [Through Corr] is performed.***

Return Returns to the previous menu.

TG Cal Displays the TG Cal menu that is used to perform the calibration of the output level.

Level Cal Performs the level calibration of the Tracking Generator output.
Connect the cable to TG OUTPUT and INPUT before performing the calibration.

Level Cal On/Off Switches the level calibration function On and Off.

On: Corrects the output level by using the calibration factor that is acquired in Level Cal.

Off: Does not correct the output level by using the calibration factor.

MEMO: ***This function cannot be set to On before [Level Cal] is performed.***

Return Returns to the previous menu.

Condition Display On/Off Used to select whether to display the setting parameters of Tracking Generator.

On: Displays the setting parameters on the screen.

Off: Does not display the setting parameters on the screen.

TG Off Turns off the Tracking Generator output.

Return Returns to the previous menu.

6. REMOTE CONTROL

This chapter describes the overview, examples of controlling the instrument by remote, and the SCPI command.

6.1 Overview of Remote Control

This chapter describes the overview of the remote control system and SCPI commands.

6.1.1 Types of Remote Control Systems

The following two types of remote control systems can be configured, depending on the interface:

Interface	Overview
GPIB (Talker/Listener mode)	This system controls the R3477 Series and other devices connected from the external controller through GPIB. For more information, refer to section 6.1.2, "GPIB Remote Control System."
LAN	This system controls the R3477 Series and other devices connected from the external controller through LAN. For more information, refer to section 6.1.3, "LAN Remote Control System."

6.1.2 GPIB Remote Control System

The GPIB (General Purpose Interface Bus) that is compliant with IEEE standards 488.1-1978 and 488.2-1987 comes standard with this instrument so that remote control can be performed from the external controller.

The controlling method using the GPIB remote control function is explained below.

6.1.2.1 What is the GPIB?

The GPIB (General Purpose Interface Bus) is a high performance bus that integrates computers and measuring instruments.

Operation of the GPIB is defined by IEEE standard 488.1-1978. Since the GPIB has bus structure interfaces, a specific device can be specified by assigning a unique device address to each device. Up to 15 devices can be connected to one bus in parallel. A GPIB device is equipped with at least one of the following functions:

- Talker

  The device that is set to send data to the bus is called the "talker". On the GPIB bus, only one device acts as an active talker.

- Listener

  The device that is set to receive data on the bus is called the "listener". Two or more active listener devices can exist on a GPIB bus.

- Controller

  The device that specifies talkers and listeners is called the "controller". On a GPIB bus, only one device acts as an active controller. Of these controllers, the device that can control IFC and REN messages is expressly called the "system controller".

  Only one system controller is permitted on a GPIB bus. If there are two or more controllers on a bus, the system controller becomes the active controller at the time of system startup and the other devices with controller capability act as addressable devices.

  To set another controller to an active controller, use Take Control (TCT) interface messages. At this time, this controller becomes a non-active controller.

  The controller controls the entire system by sending interface or device messages to each measuring instrument. The roles of these messages are shown below.

  - Interface message: Controls the GPIB bus.
  - Device message: Controls the measuring instruments.

6.1.2.2 Setting up the GPIB

1. GPIB connection

   The standard GPIB connection is shown below. Fix the GPIB connector firmly with two screws such that they do not loosen during use.

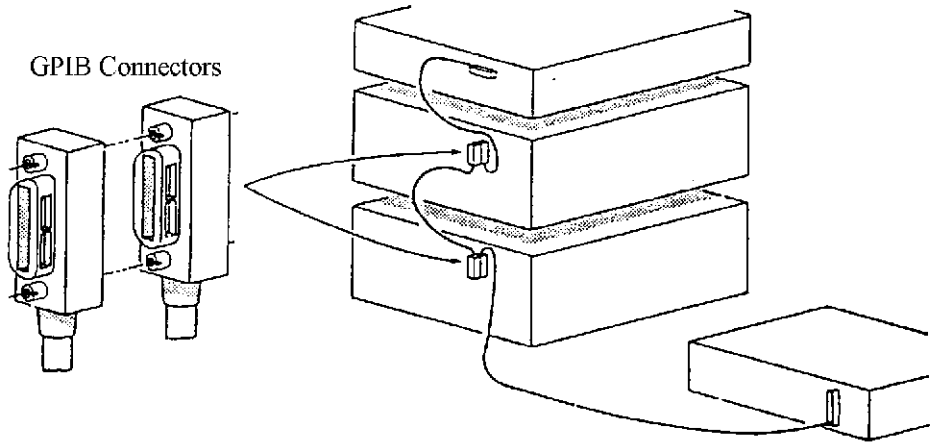


Figure 6-1 GPIB Connection

Note the following when using the GPIB interface:

- Connect the GPIB cable to the GP-IB 1 connector on the rear panel of this instrument.
- The total cable length of the GPIB cable used in one bus system is not longer than 2 m × {the number of connected devices (the GPIB controller is counted as one device)}.
  The total cable length should be 20 m or less.
- Up to 15 devices can be connected to one bus system.
- There is no restriction in the method of connecting cables. However, four or more GPIB connectors should not be stacked on one device. If four or more GPIB connectors are stacked, the joints of the connectors may be broken because excessive force is applied to them.

  For example, a system consisting of five devices can use cables of up to 10 m (2 m/device × 5 devices = 10 m) in total. Cable lengths can be allocated freely unless the total cable length exceeds the permitted maximum length. When 10 or more devices are to be connected, however, some devices should be connected with cables of 2 m or less so that the total cable length does not exceed 20 m.

2. GPIB address setting

   GPIB addresses should be set from the GPIB dialog box in the System menu.

6.1.2.3 GPIB Bus Functions

6.1.2.3.1 GPIB Interface Functions

Table 6-1 GPIB Interface Functions

Code	Description
SH1	Has the source handshake function
AH1	Has the accepter handshake function
T6	Basic talker function, serial polling function, listener-specified talker cancel function
TE0	No extended talker function
L4	Basic listener function, talker-specified listener cancel function
LE0	No extended listener function
SR1	Has service request function
RL1	Remote function, local function, local lockout function
PP0	No parallel polling function
DC1	Device clear function
DT1	Device trigger function
C1	System controller function
C2	IFC transmission, controller-in-charge function
C3	REN transmission function
C4	SRQ response function
C12	Interface message transmission function, pass control back function
E1	Using the open-collector bus driver

6.1.2.3.2 Responses to Interface Messages

The responses of this instrument to interface messages explained in this section are defined in IEEE standards 488.1-1987 and 488.2-1987.

For information on the method of sending interface messages to this instrument, refer to the operation manual of the controller used.

1. Interface clear (IFC)

   This message is directly sent to this instrument through a signal line.

   With this message, this instrument stops the operation of the GPIB bus. Though all input/output is stopped, the I/O buffer is not cleared (it is cleared by DCL). When this instrument is defined as an active controller, the control right of the GPIB bus is canceled and the system controller gets the control right.

2. Remote enable (REN)

   This message is directly sent to this instrument through a signal line.

   If this instrument is specified as a listener when this message is TRUE, it enters the remote state.

   This state continues until this instrument receives GTL, REN is changed to FALSE, or the LOCAL key is pressed.

   This instrument ignores all the received data when it is in the local state.

   When it is in the remote state, this instrument ignores all key entry except the LOCAL key.

   When it is in local lockout state (refer to "Local lockout (LLO)"), this instrument ignores all key entry.

3. Serial port enable (SPE)

   When receiving this message from outside, this instrument enters the serial polling mode.

   When this instrument specified as a talker in this mode, it sends status bytes instead of ordinary messages. This mode continues until this instrument receives a serial polling disable (SPD) message or an IFC message.

   When this instrument is sending a service request (SRQ) message to the controller, bit6 (RQS bit) of response data is set to 1 (TRUE). After transmission is completed, RQS bit is set to 0 (FALSE). A service request (SRQ) message is directly sent through a signal line.

4. Group execute trigger (GET)

   This message triggers this instrument. If the following conditions are met, this instrument starts measurement.

   - The trigger source is set to the GPIB bus.
   - This instrument is in trigger waiting state.

   GET performs the same operation as *TRG.

5. Device clear (DCL)

   When receiving DCL, this instrument performs the following operations:

   - Clearing the input and output buffers
   - Resetting the syntax analysis, execution control, and response data generation units
   - Canceling all the commands that impede the remote command to be executed next
   - Canceling the command that is temporarily stopped to wait for other parameters
   - Canceling *OPC and *OPC?

The following operations are not executed:

- Changing data set or stored in this instrument
- Interrupting the front panel operation
- Affecting or interrupting the operation of this instrument during execution
- Changing the status byte except MAV (MAV is set to 0 as the result of clearing the output buffer)

6. Selected device clear (SDC)

   Performs the same operation as DCL. However, SDC is executed only when this instrument is a listener.
   In other cases, it is ignored.

7. Go to local (GTL)

   This message sets this instrument to the local state. In the local state, all the front panel operations are enabled.

8. Local lockout (LLO)

   This message sets this instrument to the local lockout state. When this instrument enters the remote state in this state, all front panel operation is prohibited (In the ordinary remote state, the front panel operation can be performed with the LOCAL key).

   In this case, this instrument can be set to the local state by any of the following three methods:

   - Sending a GTL message to this instrument
   - Setting the REN message to FALSE (At this time, the local lockout state is also canceled)
   - Turning on the power again

   If this instrument receives this message when it is set to a talker, it is set to an active controller by path control. When receiving an IFC message, this instrument enters the addressable mode again.

6.1.3 LAN Remote Control System

The LAN (Local Area Network) interface that is compliant with IEEE standard 802.3 comes standard with this instrument so that remote control by socket communication between the external controller and this instrument can be performed.

The controlling method using the LAN remote control function is explained below.

6.1.3.1 Setting up LAN

1. LAN connection

   The standard LAN connection is shown below. To perform communication through LAN between an external controller and this instrument or other devices, connect them with the 10BASE-T LAN cable of the RJ45 connector. To directly connect this instrument and an external controller with a LAN cable, use a LAN cable (cross over cable) having connection as shown in Table 6-2. To connect this instrument and devices other than an external controller with a LAN, use an external device designed to connect devices having two or more LAN interfaces such as an Ethernet hub. The LAN cable used in this case is a LAN cable (straight cable) having connection as shown in Table 6-3.

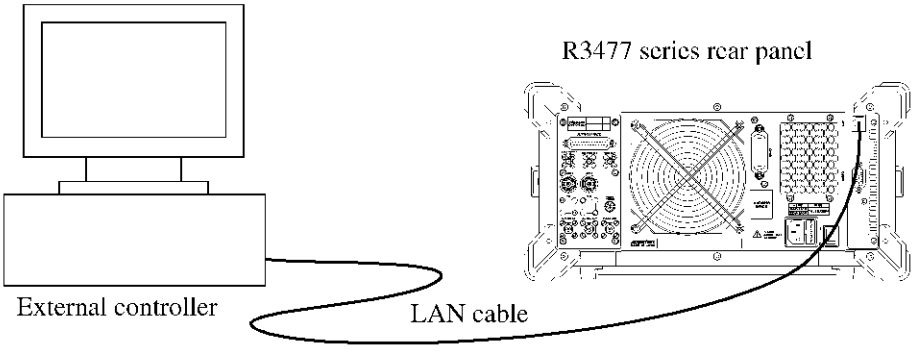


Figure 6-2 LAN Connection

Table 6-2 Connection of Cross-over Cables

Connector A side		Connector B side	
Signal name	RJ45 Pin number	RJ45 Pin number	Signal name
RX+	1	3	TX+
RX-	2	6	TX-
TX+	3	1	RX+
TX-	6	2	RX-
Not Used	4	4	Not Used
	5	5	
	6	6	
	7	7	
	8	8	

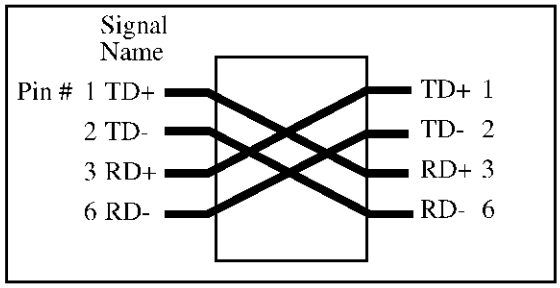


Figure 6-3 Connection of Cross-over Cables

Table 6-3 Connection of 10BASE-T Straight Cables

Signal name	RJ45 Pin number	Line color	Pair number
RX+	1	White/Orange	2
RX-	2	Orange	
TX+	3	White/Green	3
TX-	6	Green	
Not Used	4	Blue	1
	5	White/Blue	
	7	White/Brown	4
	8	Brown	

6.1.3.2 IP Address Setting

The IP address should be set from the network dialog box in the System menu.

6.1.3.3 Control from a Program

To control this instrument from a program of an external controller, a port number for socket communication is required. The port number "5025" is provided for socket communication for the remote control on the side of this instrument. To write a program for socket communication, a library for network connection with the TCP/IP protocol is required. The library differs depending on the environment, such as the OS of the external controller. In the Windows OS environment, for example, WinSock is provided.

Of the functions available in the GPIB remote control system, some functions specific to the GPIB bus, such as service request, cannot be used in the LAN remote control system.

6.1.4 Message Exchanging Protocol

This instrument receives program messages from the controller or other devices through the GPIB bus or LAN and generates response data. Program messages include commands, queries (which are commands that ask for response data) and data.

6.1.4.1 Buffers

This instrument has three buffers.

1. Input buffer

   A buffer for storing data temporarily to analyze commands.

   (1024-byte length)

   The input buffer can be cleared by the following two methods:

   - Power on
   - Executing DCL or SDC

2. Output buffer

   A buffer for storing data until data is read by the controller.

   (1024-byte length)

   The output buffer can be cleared by the following two methods:

   - Power on
   - Executing DCL or SDC

3. Error queue

   The error queue exists only in IEEE488.2-1987 command mode.

   This is a queue that stores error messages of remote commands, and its depth is 10.

   Each time an error occurs during analysis or execution of remote commands, messages are stacked in the queue.

   Messages can be read with the SYST:ERR command. Each time a message is read, it is deleted from the queue.

   The error queue can be cleared by the following two methods:

   - Power on
   - Executing *CLS

6.1.4.2 IEEE488.2-1987 Command Mode

The IEEE488.2-1987 command mode sends and receives messages in accordance with the message exchange protocol that is compliant with IEEE standard 488.2-1987.

When other controllers or devices receive messages from this instrument in this mode, the following items are especially important:

- Generating response data by receiving a query (Refer to "Parser").
- Generating data in the order queries are executed (Refer to "Generating response data").

1. Parser

   The parser receives command messages in the order they are received from the input buffer, executes syntax analysis, and determines what operations are to be executed by the commands received.

   It also traces the tree structure of commands when performing the syntax analysis of commands.

   For the next command analysis, it remembers the part of the tree structure from which analysis should be performed.

   This information is returned to the head of the tree structure when the parser is cleared.

   The parser can be cleared by the following four methods:

   - Power on
   - Receiving DCL or SDC
   - Receiving ":" next to ";"
   - Receiving the terminator or EOI

2. Generating response data

   When the parser executes a query, this instrument generates data on the output buffer as its response (that is, a query must be sent immediately before outputting data).

   It means that data is not cleared until the controller reads data generated by a query.

   Besides the controller reading data, there are two conditions in which data is cleared. In these conditions, a Query Error is generated.

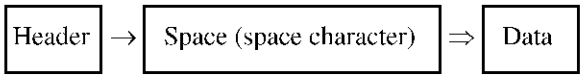
   - Unterminated condition : When the controller reads response data without terminating the query (with ASCII LF code or GPIB END message) or when the controller reads response data without sending a query.
   - Interrupted condition : When the controller receives the next program message before reading response data.

6.1.5 Command Syntax

This chapter describes the command syntax.

6.1.5.1 IEEE488.2-1987 Command Mode

The command syntax is defined in the following format:



MEMO: ***⇒ means repetition.***

1. Header

   The header has a layered structure consisting of two or more mnemonics delimited by colons (:). A mnemonic consisting of four or more characters has a "short form" of four (or three) characters (a non-abbreviated mnemonic is called a "long form"). Any combination of these forms is allowed.

   If a question mark (?) is attached immediately after a header, it becomes a query command.

2. Space (space character)

   A space of one or more characters is required. If any character except a space is used, an error will result.

3. Data

   When the command requires more than one data item, list these data items by delimiting them with commas (,).

   A space (space character) may be inserted before or after the comma (,).

   For more information on data type, refer to "6.1.5.2 Data Format."

4. Writing more than one command

   In IEEE488.2-1987 command mode, more than one command may be written on one line by delimiting them with semicolons (;).

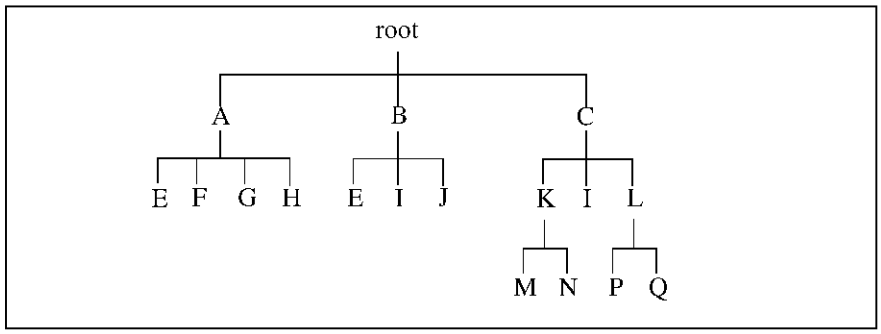
   When commands are written in this way, the system executes commands while moving the current path in the layered structure of the header.

5. Moving the current path

   The current path moves in accordance with the following rule:

   - When power is turned on: The current path is set to root.
   - Terminator: The current path is set to root.
   - Colon (:): If the colon (:) that moves the current path to one layer below in the command tree is the initial character, the colon (:) sets the current path to root.
   - Semicolon (;): The current path is not changed.
   - Common command: This command can be executed regardless of the current path. When an *RST command is executed, the current path is set to root (* See the following example).

Example: Assume the following header structure:



In the above structure, the current path moves in the following way:

1. :A:E;:B:E

   Since the colon (:) in the second command moves the current path to root, both A:E and B:E are correct commands.

2. :A:E<END>B:E

   Since <END> (terminator) moves the current path to root, both A:E and B:E are correct commands.

3. :A:E;F;G;H

   Since a semicolon (;) does not move the current path, :A:E;F;G;H results in the four commands A:E, A:F, A:G, and A:H.

4. :C:I;K:N;M

   Since a colon (:) moves the current path, K:N is seen from the layer of :C:.

   Therefore, K:N is equal to C:K:N. At the same time, the current path is changed to :C:K: because K:N contains a colon (:) and the last M is treated as C:K:M.

5. :A:E;*ESR 16

   Since the common command is independent of the current path, *ESR 16 is executed correctly.

6. :A:E;*ESR 16;F;G;H

   Since the common command does not change the current path, the third F is searched for from the current path :A: that is set in the first :A:E.

   Therefore, F, G, and H are equal to A:F, A:G, and A:H, respectively.

In the following examples, a syntax error will result.

1. :A:E;B:E

   A:E changes the current path to :A:.

   Therefore B:E is searched for from the layer of :A: but the mnemonic B cannot be found. As a result, an error will result.

2. :C:K:M;L:P

   :C:K:M changes the current path to :C:K:.

   Therefore L:P is searched for from :C:K: but the mnemonic L cannot be found. As a result, an error will result.

6.1.5.2 Data Format

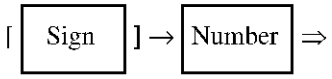
In IEEE488.2-1987 command mode, the data types shown in this section are used in data input/output.

1. Numeric data

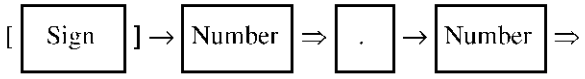
   There are three formats for numeric data as shown below. When entering numeric values for this instrument, any format may be used (the value is rounded depending on the data type entered).

   Depending on the command, a unit may be attached to the entered numeric value. For units, see Section (5), which is described later.

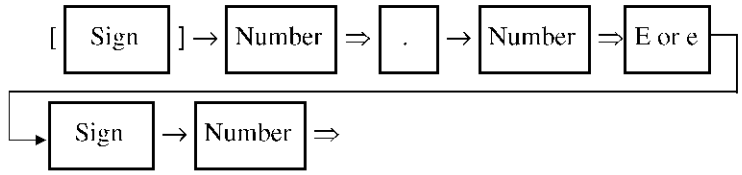
   - Integer type: NR1 format

   - Fixed point type: NR2 format

   - Floating point type: NR3 format

   MEMO: *⇒ means repetition.*
   The sign at the head may be omitted.

2. Character data

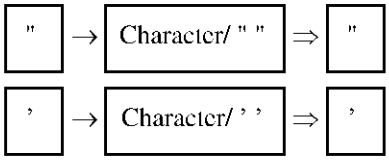
   The format of character data is shown below:

   MEMO: *⇒ means repetition.*

3. String data

   There are two formats for string data.

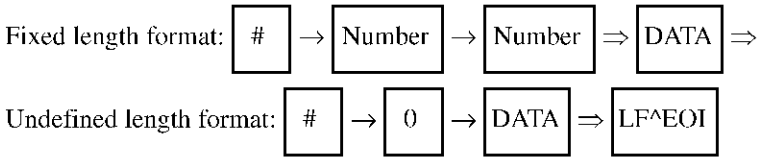
   In string data, ASCII 7bit code characters can be used.

   MEMO: *In string data starting with ", " should be represented as " ".*
   In string data starting with ', ' should be represented as ''.
   ⇒ means repetition.

If response data is string data, string data starting with " is always output.

4. Block data

There are two formats for block data. When entering data into this instrument, either format may be used.



MEMO: ***⇒ means repetition.***

In fixed length format, one character number following # indicates the number of digits for the subsequent bytes. 0 cannot be used (because it becomes the undefined length format).

Example: Block data #3128<data byte>

The number 3 following # indicates the number of digits of the subsequent string (128), and the number 128 represents the number of bytes of the subsequent <data byte>.

5. Unit

The unit is a suffix following the numeric value. For units, a suffix can be used as a prefix. Available suffixes and units are listed below:

Table 6-4 Available Units

Unit	Description
Hz*	Frequency unit
DB	Level unit (relative value)
DBM	Level unit (absolute value)
S	Time unit

Table 6-5 Available Suffixes

Suffixes	
1E18	EX
1E15	PE
1E12	T
1E9	G
1E6	MA
1E3	K
1E-3	M *
1E-6	U
1E-9	N
1E-12	P
1E-15	F
1E-18	A

*: If the unit is HZ, the suffix is 1E6 (equivalent to MA).

6.1.6 Status Bytes

This instrument has a layered status register structure that is compliant with IEEE standard 488.2-1987, and can send various statuses of the devices to the controller. This section describes the behavioral model of status bytes and allocation of events.

1. Status registers

   This instrument adopts the model of the status registers defined in IEEE standard 488.2-1987. The status registers consist of the condition register, event register, and enable register.

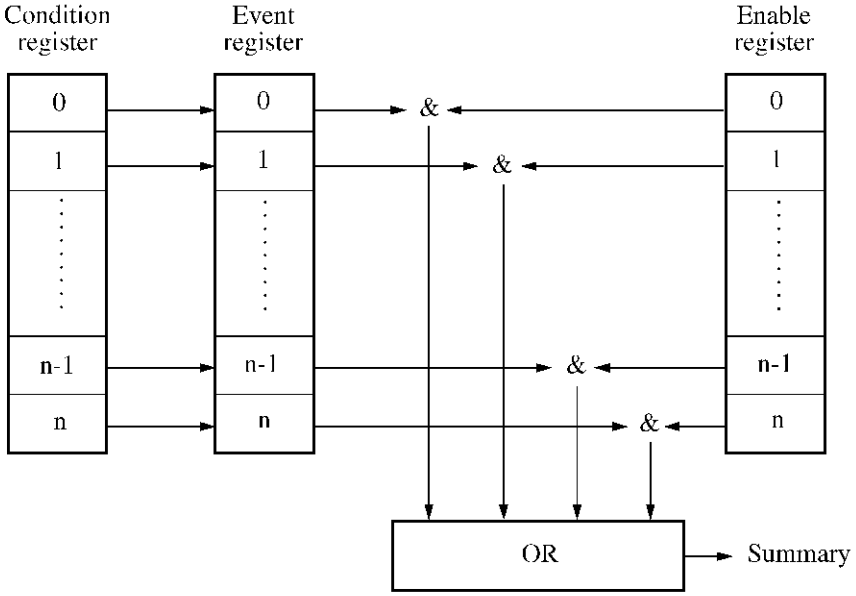


Figure 6-4 Status Register Configuration

a. Condition register

   The condition register is always monitoring the status of the device. That is, this register always retains the latest status of the device.

   However, the condition register cannot read and write data because it retains data as internal information.

b. Event register

   The event register latches and retains the status from the condition register (or retains change).

   Once this register is set, the setting value is kept until it is read by a query or cleared by *CLS.

   Data cannot be written to the event register.

c. Enable register

   The enable register specifies which bit in the event register is set as an effective status to generate a summary. The enable register is ANDed with the event register and the OR of the result is generated as a summary. The summary is written to the status byte register.

   Data can be written to the enable register.

This instrument has the following five types of status registers:

- Status byte register
- Standard event register
- Standard operation status register
- Questionable status register
- Measuring status register

The layout of the status registers in this instrument is shown in Figure 6-5.

The detail of the status registers is shown in Figure 6-6.

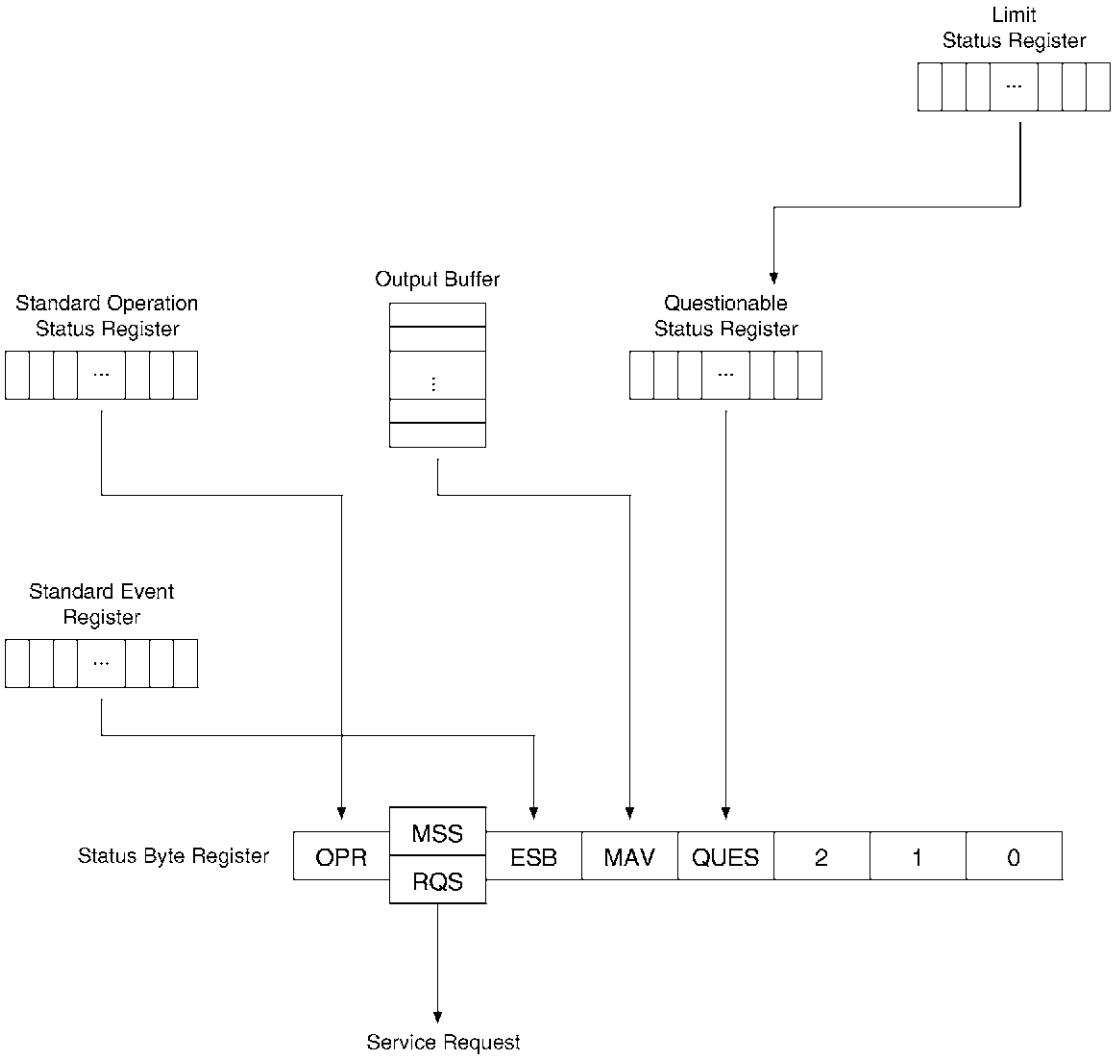


Figure 6-5 Status Register Layout

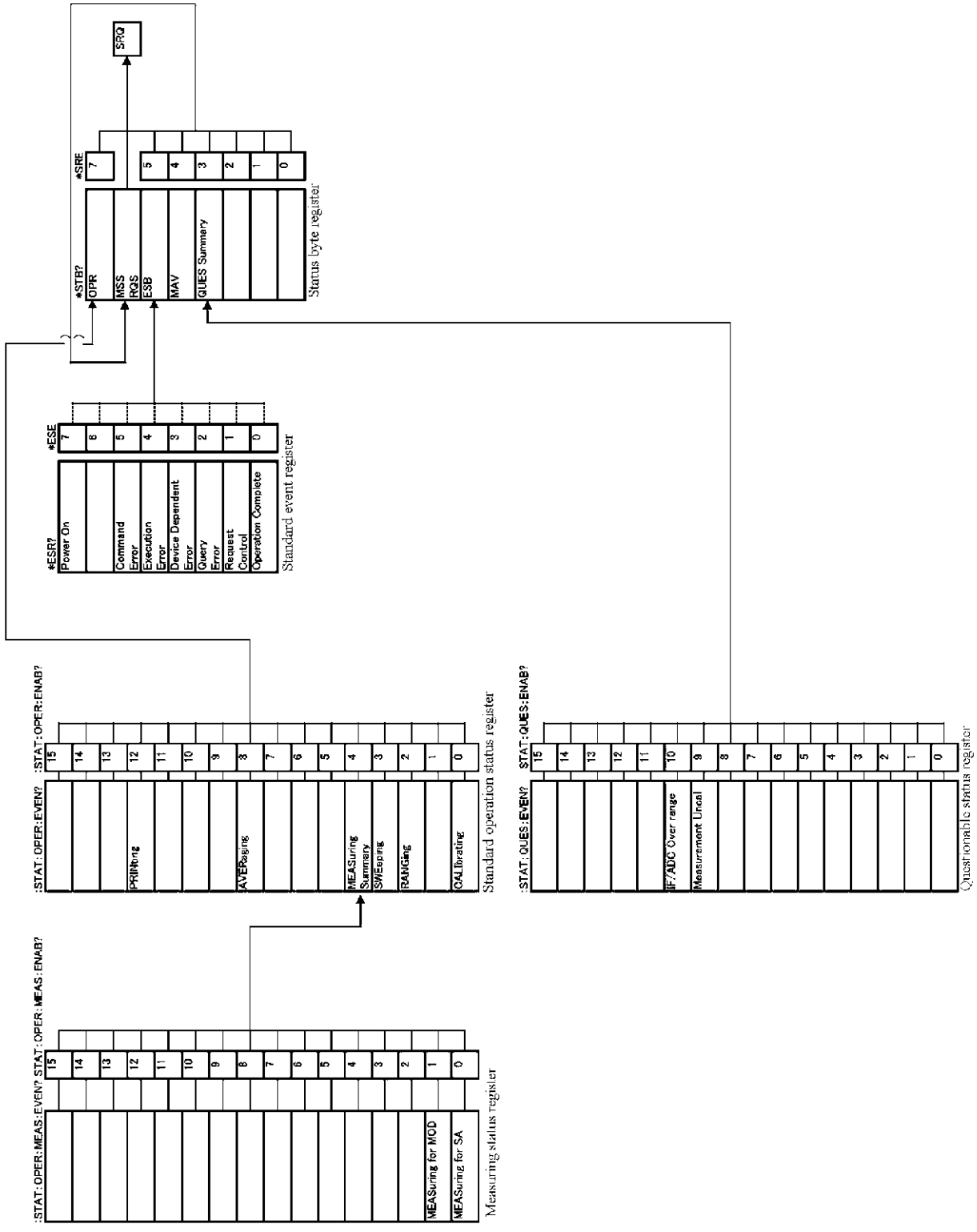


Figure 6-6 Status Register Detail

2. Event enable register

   Each event register has an enable register that determines which bit is to be enabled.

   - Service request enable register set
     *SRE
   - Standard event status enable register set
     *ESE
   - Operation status enable register set
     :STAT:OPER:ENAB

3. Standard operation status register

   Allocation in the standard operation status register is listed below:

Table 6-6 Allocation in the Standard Operation Status Register

bit	Function definition	Description
15	-	Always 0
14	-	Reserved
13	-	Always 0
12	-	Always 0
11 to 9	-	Always 0
8	AVERaging	Set to 1 when averaging is completed.
7 to 5	-	Always 0
4	MEASuring Summary	Set to 1 depending on the status of the measuring status register.
3	SWEeping	Set to 1 when sweep is completed.
2	RANGing	Set to 1 when Auto Level is completed.
1	-	Always 0
0	CALIbrating	Set to 1 when correction data acquisition is completed.

4. Status byte register

The status byte register summarizes the information from the status register.

The summary of this status byte register is sent to the controller as a service request. Therefore, the status byte register operates slightly differently than the status register structure.

This section describes the status byte register.

The structure of the status byte register is shown in Figure 6-7.

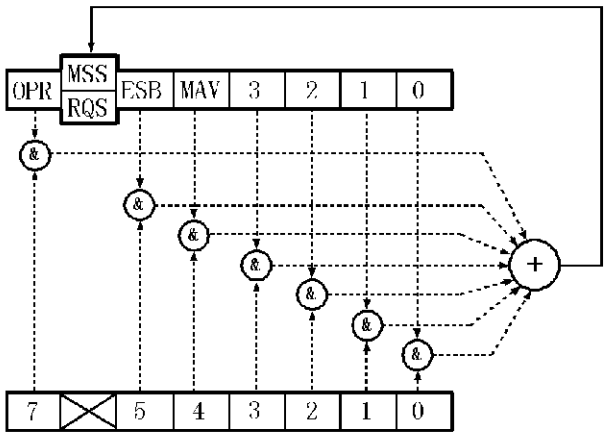


Figure 6-7 Structure of Status Byte Register

This status byte register follows the status register except for the following three points:

- The summary of the status byte register is written to bit6 of the status byte register.
- The bit6 of the enable register is always enabled and it cannot be changed.
- The bit6 (MSS) of the status byte register writes RQS of the service request.

This register responds to the serial polling from the controller. When responding to the serial polling, bit0 to bit5, bit7, and RQS of the status byte register are read, and then RQS is reset to 0. The other bits are not cleared until each factor is set to 0.

The status byte register, RQS, and MSS can be cleared by executing "*CLS". When they are cleared, the SRQ line is also set to FALSE.

The meaning of each bit in the status byte register is shown below:

Table 6-7 Meaning of Status Byte Register

bit	Function definition	Description
7	OPR	The OPR is the summary of the standard operation status register.
6	MSS	The RQS is set to TRUE when the MSS of the status byte register is set to 1, and the MSS is the summary bit of all of the status data structure. The MSS cannot be read in serial polling (but it is known that the MSS is 1 when RQS is 1). To read the MSS, use the common command *STB?. With *STB?, bit0 to bit5, bit7, and the MSS of the status byte register are read. In this case, the status byte register and the MSS are not cleared. The MSS is not set to 0 until all the unmasked factors in the status register structure are cleared.
5	ESB	The ESB is the summary of the standard event register.
4	MAV	The summary bit of the output buffer. It is set to 1 when there is output data in the output buffer and set to 0 after data is read.
3	QUES	The QUES is the summary of the questionable status register.
2 to 0		Always 0

5. Standard event register

   Allocation in the standard event register is listed below:

Table 6-8 Allocation in the Standard Event Register

bit	Function definition	Description
7	Power on	Set to 1 when power is turned on.
6	-	Always 0
5	Command Error	Set to 1 when the parser detects a syntax error.
4	Execution Error	Set to 1 when execution of an instruction received as a GPIB command fails for some reason (e.g., the parameter is out of range).
3	Device Dependent Error	Set to 1 when an error except Command Error, Execution Error, and Query Error occurs.
2	Query Error	Set to 1 when no data exists or data is lost when the controller tries to read data from this instrument.
1	Request Control	Set to 1 when this instrument is required to be an active controller.
0	Operation Complete	Set to 1 when there is no command that is being executed for this instrument after the *OPC command is received.

6. Measuring status register

Allocation in the measuring status register is listed below:

Table 6-9 Allocation in the Measuring Status Register

bit	Function definition	Description
15		Always 0
14		Reserved
13 to 3		Always 0
2		Reserved
1	MEASuring for MOD	Set to 1 when measurement in modulation is completed.
0	MEASuring for SA	Set to 1 when the measurement which includes other sequences is completed.

6.2 Measuring Procedure

This chapter describes the procedures for executing measurements with this instrument by remote control. The description is divided into the following sections and actual examples are shown:

6.2.1 Setting the Measuring Conditions

6.2.2 Executing a Measurement

6.2.3 Reading Measurement Data

6.2.1 Setting the Measuring Conditions

This section describes the setting of the measuring conditions.

6.2.1.1 Selecting the Measurement Mode

This instrument has two modes: the mode of analyzing the spectrum and the mode of analyzing the signal in the Base Band. Therefore, you must select the mode to be used in accordance with the purpose of measurement.

In this example, the spectrum analysis mode is set.

- Setting the spectrum analysis mode:
  :SYST:SEL SAN

6.2.1.2 Setting the Frequency

Set the center frequency, span frequency, and resolution bandwidth, etc. depending on the frequency of the signal to be measured in spectrum analysis mode. The following commands are used for the above settings:

- Setting the center frequency:
  :SENS:FREQ:CENT
- Setting the span frequency:
  :SENS:FREQ:SPAN
- Setting the resolution bandwidth (RBW):
  :SENS:BAND:RES
- Setting the video bandwidth (VBW):
  :SENS:BAND:VID

6.2.1.3 Setting the Level

Set the reference level and attenuator of this instrument, depending on the output level of the signal to be measured. The following commands are used for the above settings:

- Setting the reference level:
  :DISP:TRAC:Y:RLEV
- Setting the attenuator:
  :INP:ATT

6.2.1.4 Setting the Sweep Time

Set the sweep time during measurement. The following command is used for the above setting:

- Setting the sweep time:
  :SENS:SWE:TIME

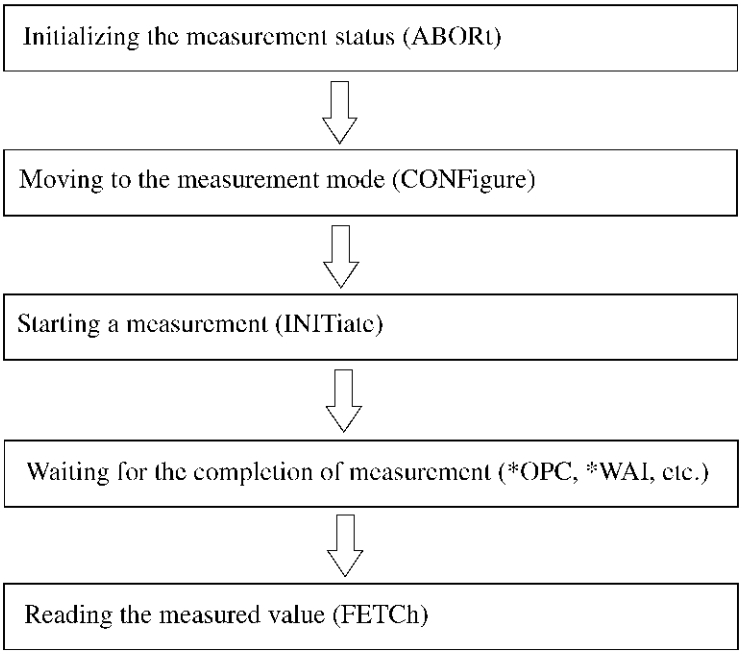
6.2.2 Executing a Measurement

This section describes the execution of measurement.

After the basic setting in spectrum analysis mode is completed, set the parameters associated with each measurement. After that, execute a measurement.

Measurement is usually performed by the following procedure:

- Ordinary measurement procedure:



By using the convenient command "MEASure," all of the above steps are executed automatically and the measurement result is returned, although a command is provided for each step.

6.2.2.1 Setting the Measurement Parameters, Selecting the Measuring Items, and Starting a Measurement

The explanation in this section assumes that the Power will be measured.
First, set the target frequency width of the Power measurement.

- Initializing the measurement status:
  :ABORt
- Setting the target frequency width of the power measurement:
  :SENS:CPOW:WIND:WIDT

Next, set the number of times of averaging the Power measurement operation.

- Setting the number of times of averaging operation in measurement:
  :SENS:CPOW:AVER:COUN

Finally, move to the measurement mode with the next commands and start measurement.

- Command for moving to the measurement mode:
  :CONF:CPOW
- Command for starting measurement:
  :INIT:IMM

6.2.2.2 Waiting for the Completion of Measurement

To wait for the completion of measurement, the following methods can be used:

- Polling the status register
- Using a Service Request (SRQ)
- Using the common commands *WAI, *OPC, and *OPC?
- Using READ of the SCPI command or the MEASure command

6.2.2.3 Polling the Status Register

In the method of using the polling of the status register, the external controller checks for the change of the status of this instrument by using a command of an appropriate status register.

This method is useful in the following cases:

- When the programming environment of the external controller to be used does not support the SRQ interrupt mechanism
- When a remote control through a LAN is used
- When you do not want to make a complicated setting for SRQ processing because you will write a program for a simple measurement

6.2.2.4 Using a Service Request (SRQ)

In the method of using an SRQ, an SRQ signal is sent from this instrument to the external controller in accordance with the detection condition preset by the external controller, and the external controller checks the state of this instrument in accordance with the SRQ signal.

This method is useful in the following cases:

- When the measurement time is restricted as a system
- When multiple measuring instruments must be monitored in addition to this instrument
- When the external controller must execute other processing during measurement wait time

6.2.2.5 Using the Common Commands

Of the common commands, the following commands can be used for measurement synchronization:

- *OPC

  When measurement is completed, the "Operation Complete" bit in the standard event status register is set.

- *OPC?

  As an ordinary query response instead of the bit information of the standard event status register, the number "1" is returned when measurement is completed.

- *WAI

  All the commands that were sent before sending the *WAI command are executed and the commands after the *WAI command are made to wait.

By using the characteristics of these commands, the completion of this instrument is detected from the external controller.

For more information on each common command, refer to "Command Reference."

6.2.2.6 Using the READ/MEASure Command

Besides the above methods, the measurement completion of this instrument can be detected by this instrument's response to a query for the READ/MEASure command sent by the external controller.

In this method, without accessing the status register, the point at which the response of the measurement result is returned from this instrument can be regarded as the completion of measurement.

- When the external controller to be used does not support the SRQ interrupt mechanism
- When a remote control through a LAN is used
- When there is relatively little restriction for the measurement time in the entire system and you want to execute a measurement and read the measurement result easily

6.2.3 Reading Measurement Data

This section describes the method of reading measurement data.

6.2.3.1 Types of Commands for Reading Measurement Data

After measurement in spectrum analysis mode is completed and the completion of measurement is detected, the external controller reads the measurement result data.
To read data from the external controller, a query command for reading the measurement result data is provided for each measurement function.

This instrument provides the following three commands for reading the measurement result:

- FETCh command
- READ command
- MEASure command

Since these three types of commands have the following features, an appropriate command can be used according to the purpose of use.

- FETCh command

  This command only reads the measurement result of the target.

- READ command

  The ABORt command and the measurement mode are not moved and a measurement is started by the INITiate command. After measurement is completed, internal operation by the above FETCh command is executed and the measurement result is read.

- MEASure command

  After being moved to the measurement mode by the ABORt and CONFigure commands, a measurement is started by the INITiate command. After measurement is completed, internal operation by the above FETCh command is executed and the measurement result is read.

6.2.3.2 Reading Measurement Data

This section shows the FETCh command for reading the result data of Power measurement as an example.

- Query command for reading the Channel Power measured value:

  :FETCh:CPOW?

In response to this reading query command, this instrument outputs the measurement result data in question to the output buffer. In this example, the Power value as the measurement result is set to the output buffer. The external controller can read the data in the output buffer through the GPIB or LAN interface by using a program.

6.3 Program Examples for Remote Control

This chapter describes program examples for remote control.

In the program examples in this chapter, Microsoft's Visual Basic is used. When writing a program in another language, change the description to the language used.

In the explanation of these programs, a GPIB board manufactured by National Instruments (NI) is assumed as the GPIB bus controller.

6.3.1 Basic Steps for GPIB Bus Control

This section describes step-by-step the operations required to control the GPIB bus from Visual Basic. For the initialization of variables which depend on Visual Basic and the definition of function routines, follow the notational conventions of Visual Basic programs.

6.3.1.1 Reading the GPIB Control Library for Visual Basic

To control an NI's GPIB board from a program written in Visual Basic, you must integrate two files - a VBIB-32.BAS file containing a GPIB communications interface for Visual Basic provided by NI, and a NIGLOBAL.BAS file that defines errors and timeout values - into the Project of Visual Basic.

6.3.1.1.1 Initializing the Controller

To communicate with this instrument through GPIB, you must first of all initialize the GPIB controller. An example of GPIB initialization is shown below:

```
Rem ----------------- Initialize GPIB Controller -----------------------------
Public Sub InitGPIB()

saaddress% = 8

Call ibfind ("GPIB0", boardID%)                    ' Open GPIB board
Call ibfind ("DEV1", analyzer%)                    ' Open SA analyzer port
Call ibpad( analyzer%, saaddress%)                 ' Set the SA's GPIB address

Call ibtmo( analyzer%, 12)                         ' Set timeout value to 3 sec

End Sub
```

6.3.1.1.2 Initializing this Instrument

The following program initializes this instrument before controlling the GPIB:

```
Rem ----------------- Initialize Spectrum Analyzer ----------------------------
Public Sub InitSA( )

Call ibwrt ( analyzer%, "*CLS" )                    ' Reset status register
Call ibwrt ( analyzer%, "*RST" )                    ' Reset this instrument

End Sub
```

6.3.1.1.3 Simple Setting Commands

The following program makes simple settings of this instrument:

```
Rem ----------------- Brief setting of Spectrum Analyzer ----------------------------
Public SUB SASetting( )

Call ibwrt( analyzer%, ":FREQ:CENT 1.9984GHZ" )     ' Set Center Freq. to 1.9984MHz
Call ibwrt( analyzer%, ":FREQ:SPAN 10MHZ" )         ' Set Freq. Span to 10MHz
Call ibwrt( analyzer%, ":DISP:TRAC:Y:RLEV  10DBM" ) ' Set Reference level 10dBm

End Sub
```

6.3.1.1.4 Reading the Setting Values

The following program reads the setting values of this instrument:

```
Rem ----------------- Read the setting value of Spectrum Analyzer ---------------
Public Sub ReadSASetting( )

CF$= Space$(32)                                     ' Prepare the text variable for read
Call ibwrt( analyzer%, ":FREQ:CENT?" )              ' Read request of center freq.
Call ibrd( analyzer%, CF$ )                         ' Read setting value
SP$= Space$(32)                                     ' Prepare the text variable for read
Call ibwrt( analyzer%, ":FREQ:SPAN?" )              ' Read request of span freq.
Call ibrd( analyzer%, SP$ )                         ' Read setting value

Rem -------------------- Display setting value ----------------------------------------
Call MsgBox ( "Center freq.: " & CF$ )
Call MsgBox ( "Span freq.: " & SP$ )

End Sub
```

6.3.1.1.5 Setting the Marker and Reading the Marker Value

The following program searches for the maximum level of the signal by using the marker and reads the level of the signal with the marker.

```
Rem ----------------- Read signal level using the marker function-------------------
Public Sub ReadMkrSignal( )

MKFreq$= Space$(32)                                  ' Prepare the text variable for read
MKLevel$= Space$(32)                                 ' Prepare the text variable for read
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON" )        ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )            ' Search peak point of signal
Call ibwrt( analyzer%, ":CALC:MARK:X?" )             ' Query the marker frequency
Call ibrd( analyzer%, MKFreq$ )                      ' Read it

Call ibwrt( analyzer%, ":CALC:MARK:Y?" )             ' Query the marker level
Call ibrd( analyzer%, MKLevel$ )                     ' Read it

Rem -------------------- Display the freq. and level of signal-------------------------
Call MsgBox ( "Marker freq.: " & MKFreq$ & " Level: " & MKLevel$ )

End Sub
```

6.3.1.1.6 Executing a Measurement and Reading the Measurement Result

This section shows some measurement execution examples and presents some examples of how to synchronize with this instrument for the execution of a measurement and reading of the measurement result after execution.

- Using the common commands for synchronization

  Of common commands, there are commands defined for synchronization during command execution (*WAI, *OPC?, *OPC). Examples using these commands are shown below:

Example 1: This example performs peak search of the marker after sweep, reads the result data, and displays it (using the *WAI command).

```
Rem -----------------Do search the peak point and get level data after sweeping---------
Public Sub GetPeakPoint1( )

Call ibwrt( analyzer%, ":INIT:CONT OFF" )            ' Set sweep mode to single sweep
Call ibwrt( analyzer%, ":INIT:ABOR" )                ' Stop sweeping
Call ibwrt( analyzer%, ":INIT:IMM" )                 ' Start sweeping
Call ibwrt( analyzer%, "*WAI" )                      ' Wait for end of sweep

MKLevel$= Space$(32)
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON" )        ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )            ' Search peak point of signal
Call ibwrt( analyzer%, ":CALC:MARK:Y?" )             ' Query the marker level
Call ibrd( analyzer%, MKLevel$ )                     ' Read it
Rem -------------------- Display setting value-----------------------------------------
Call MsgBox ( "Get Peak level after sweeping := " & MKLevel$ & "dBm" )

End Sub
```

Example 2: This example performs peak search of the marker after sweep, reads the result data, and displays it (using the *OPC? command).

```
Rem -----------------Do search the peak point and get level data after sweeping---------
Public Sub GetPeakPoint2( )

Call ibwrt( analyzer%, ":INIT:CONT OFF" )          ' Set sweep mode to single sweep
Call ibwrt( analyzer%, ":INIT:ABOR" )              ' Stop sweeping
Call ibwrt( analyzer%, "*CLS" )                    ' Clear status
Call ibwrt( analyzer%, ":INIT:IMM" )               ' Start sweeping

OPEND$ = Space$(3)
Do
  Call ibwrt( analyzer%, "*OPC?")                  ' Request Operation complete status
                                                   ' as sweep end info.
  Call ibrd( analyzer%, OPEND$)                    ' Read status
Loop until ( Int(Val(OPEND$) ) ) And 1 = 1

MKLevel$= Space$(32)
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON")       ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )          ' Search peak point of signal
Call ibwrt( analyzer%, ":CALC:MARK:Y?" )           ' Query the marker level
Call ibrd( analyzer%, MKLevel$ )                   ' Read it
Rem -------------------- Display setting value ----------------------------------------
Call MsgBox ( "Get Peak level after sweeping := " & MKLevel$ & "dBm" )

End Sub
```

Example 3: This example performs peak search of the marker after sweep, reads the result data, and displays it (using the *OPC command and taking the timing with SRQ).

```
Rem -----------------Do search the peak point and get level data after sweeping---------
Public Sub GetPeakPoint3( )

Call ibwrt( analyzer%, "*SRE 32" )                 ' Set SRQ for ESR to enable
Call ibwrt( analyzer%, "*ESE 1" )                  ' Set enable bit for OPC

Call ibwrt( analyzer%, ":INIT:CONT OFF" )          ' Set sweep mode to single sweep
Call ibwrt( analyzer%, ":INIT:ABOR")               ' Stop sweeping
Call ibwrt( analyzer%, "*CLS" )                    ' Clear status
Call ibwrt( analyzer%, "*OPC" )                    ' Send OPC for synchronization
Call ibwrt( analyzer%, ":INIT:IMM" )               ' Start sweeping

Call WaitSRQ( boardID%, res% )                     ' Wait for SRQ using driver's func.
Call ibrsp( analyzer%, stb% )                      ' Execute serial poll

MKLevel$= Space$(32)
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON")       ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )          ' Search peak point of signal
Call ibwrt( analyzer%, ":CALC:MARK:Y?" )           ' Query the marker level
Call ibrd( analyzer%, MKLevel$ )                   ' Read it
Rem -------------------- Display setting value ----------------------------------------
Call MsgBox ( "Get Peak level after sweeping := " & MKLevel$ & "dBm" )

End Sub
```

- Using the Measure command

  The Measure command contains the functions of command execution, synchronization, and reading so that the synchronization of measurement can be performed without detailed control. Since the time from the execution of measurement to synchronization and reading is treated as the timeout time on the GPIB driver in this case, it may be necessary to extend the timeout value of the GPIB bus. Note that the Measure command is not defined in all measurements.

After the parameters of a Carrier Power measurement are set, a measurement is executed and the result is read.

```
Rem -----------------Do search the peak point and get level data after sweeping---------
Public Sub GetPeakPoint4( )

Call ibtmo( analyzer%, 13)                          ' Set timeout value to 10sec

Call ibwrt( analyzer%, ":INIT:CONT OFF" )           ' Set sweep mode to single sweep
Call ibwrt( analyzer%, ":INIT:ABOR")                ' Stop sweeping

ResCarPow$ = Space$(32)
Call ibwrt( analyzer%, ":MEAS:CPOW?" )              ' Start carrier power measurement
Call ibrd ( analyzer%, ResCarPow$)                  ' Wait for receiving of meas. result

MKLevel$= Space$(32)
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON")        ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )           ' Search peak point of signal
Call ibwrt( analyzer%, ":CALC:MARK:Y?" )            ' Query the marker level
Call ibrd( analyzer%, MKLevel$ )                    ' Read it
Rem -------------------- Display setting value ----------------------------------------
Call MsgBox ( "Get Peak level after sweeping := " & MKLevel$ & "dBm" )

End Sub
```

6.3.1.1.7 Setting and Reading the Status Registers

For access to the status registers of this instrument, there are two types of commands.

One type consists of the commands defined in IEEE488.2 and the other consists of the commands for the registers extended by the SCPI.

IEEE488.2 Register Commands

Command	Function
*SRE	Sets the enable bit of the status byte register
*STB?	Reads the status byte register
*ESE	Sets the enable bit of the standard event register
*ESR?	Reads the standard event register

SCPI Extended Register Commands

Command	Function
:STATus:OPERation:ENABle	Sets the enable bit of the standard operation status register
:STATus:OPERation:EVENt?	Reads the standard operation status register
:STATus:QUEStionable:ENABle	Sets the enable bit of the questionable status register
:STATus:QUEStionable:EVENt?	Reads the questionable status register
:STATus:OPERation:MEASure:ENABle	Sets the enable bit of the measuring status register
:STATus:OPERation:MEASure:EVENt?	Reads the measuring status register

The following program clears the status registers and prepares for generating a service request, depending on the change of the status byte register.

```
Rem -----------------Prepare status registers condition for getting SQR signal----------
Public Sub PrepStatusReg( )

Call ibwrt( analyzer%, "*CLS" )                    ' Clear status registers
Call ibwrt( analyzer%, "*SRE 160")                 ' Enable service req. for ESB and
                                                   ' OPR bit
Call ibwrt( analyzer%, "*ESE 1")                   ' Set event enable for Operation
                                                   ' Complete of the ESR
Call ibwrt( analyzer%, ":STAT:OPER:ENAB 272" )     ' Set event enable for averaging end
                                                   ' and measurement end
Call ibwrt ( analyzer%, ":STAT:OPER:MEAS:ENAB 3")  ' Enable SA or Mod measurement
                                                   ' end event

End Sub
```

The following program checks the cause of the generation of a service request after it is generated.

```
Rem -----------------Read GPIB status register -----------------------
Public Sub ReadStatusReg( )

Stb$ = Space$(5)
Call ibwrt( analyzer%, "*STB?" )                   ' Read standard event reg.
Call ibrd( analyzer%, Stb$)

NumStb% = Int(Val(Stb$))
If (NumStb% And 32) > 0  then Call StanEventProcess ' Call standard event process
If ( NumStb% And 128) > 0 then Call OprEventProcess ' Call operation event process

End Sub

Rem ------------------ Check standard event bit ----------------------------------
Public Sub StanEventProcess( )

Ste$ = Space$(5)
Call ibwrt ( analyzer%, "*ESR?" )                  ' Read Standard event reg.
Call ibrd ( analyzer%, Ste$ )

NumSte% = Int(Val(Ste$))
If (NumSte% And 1) > 0  then Call MsgBox( "Operation complete" )

End Sub

Rem ------------------ Check standard event bit ----------------------------------
Public Sub OprEventProcess( )

Ope$ = Space$(7)
Call ibwrt ( analyzer%, ":STAT:OPER:EVEN?")        ' Read operation event reg.
Call ibrd ( analyzer%, OPE$)

NumOpe% = Int(Val(Ope$))
If (NumOpe% And 256) > 0 then Call MsgBox( "Averaging done" )
If (NumOpe% And 16) > 0 then Call MsgBox( "Some measurement has done" )

End Sub
```

6.3.1.1.8 Frequency Measurement Using the Frequency Counter

This section shows an example of making a high precision measurement of the signal frequency by using the marker counter function.

Measuring the frequency by using the marker counter function

```
Rem -----------------Read signal frequency using marker counter function -------------
Public Sub ReadPrecisionFreq( )

CounterFreq$ = Space(100)
Call ibwrt( analyzer%, ":INIT:CONT OFF" )           ' Set to single sweep mode
Call ibwrt( analyzer%, ":INIT:ABOR")                ' Stop sweeping
Call ibwrt( analyzer%, ":INIT:IMM" )                ' Start sweeping
Call ibwrt( analyzer%, "*WAI" )                     ' Wait for sweep end
Call ibwrt( analyzer%, ":CALC:MARK:FUNC ON")        ' Turn on the marker
Call ibwrt( analyzer%, ":CALC:MARK:MAX" )           ' Search peak point of signal

Call ibwrt( analyzer%, ":FCO:AVER:COUN 2" )         ' Set counter average times
Call ibwrt( analyzer%, ":FCO:AVER ON" )             ' Set counter average func. to ON
Call ibwrt( analyzer%, ":CALC:MARK:FCO ON" )        ' Freq. counter func. on
Call ibwrt( analyzer%, ":INIT:TS" )                 ' Start sweeping and
                                                    ' wait for sweep end and count end

Call ibwrt( analyzer%, ":CALC:MARK:FCO:FREQ?" )     ' Read out counter freq.
Call ibrd( analyzer%, CounterFreq$ )
Call MsgBox( "Marker counter freq. = " & CounterFreq$ )

End Sub
```

6.3.1.1.9 Channel Power Measurement

This section shows an example of measuring the power of the signal by using the Channel Power measurement function, which is a type of the power measurement functions.

Executing a Channel Power measurement and reading the result

```
Rem --------------Measure channel power ---------------------------------------------
Public Sub MeasChanPower( )

ChannelPow$ = Space(100)

Call ibwrt( analyzer%, ":FREQ:CENT 800MHZ" )        ' Set carrier freq.
Call ibwrt( analyzer%, ":FREQ:SPAN 5MHZ" )

Rem ----------------- Prepare for channel power measurement --------------------------
Call ibwrt( analyzer%, ":CPOW:DATA:MODE MAN" )      ' Set parameter mode to manual
Call ibwrt( analyzer%, ":CPOW:AVER:COUN 10" )       ' Set average times
Call ibwrt( analyzer%, ":CPOW:AVER ON")             ' Set average func. to ON
Call ibwrt( analyzer%, ":CPOW:AVER:MODE REP" )      ' Set meas mode to REPEAT
Call ibwrt( analyzer%, ":CPOW:WIND:POS  800MHZ" )   ' Set channel power window
Call ibwrt( analyzer%, ":CPOW:WIND:WIDT 1.288MHZ")

Call ibwrt( analyzer%, ":MEAS:CPOW?" )              ' Start measurement
Call ibrd( analyzer%,  ChannelPow$ )                ' Read out power

Call MsgBox( "Channel power  = " & ChannelPow$ & "dBm" )
```

```
Call ibwrt( analyzer%, ":CONF:NORM" )                ' Quit measurement
End Sub
```

6.3.1.1.10 ACP Measurement

This section shows an example of measuring the adjacent channel leakage power (ACP) of the signal by using the ACP measurement function, which is a type of the Power measurement functions.

Executing an ACP measurement and reading the result

```
Rem ----------------- Measure Adjacent Channel Power --------------------------
Public Sub MeasACP( )

ResultACP$ = Space(200)

Call ibwrt( analyzer%, ":FREQ:CENT 2GHZ" )           ' Set carrier freq.
Call ibwrt( analyzer%, ":FREQ:SPAN 25MHZ" )

Rem ----------------- Setting of Adjacent channel parameters -------------------
Call ibwrt( analyzer%, ":ACP:CSBW:DATA:DEL" )        ' Clear Channel Space param.
Call ibwrt( analyzer%, ":ACP:CBW 3.84MHZ" )          ' Set Channel Bandwidth
Call ibwrt( analyzer%, ":ACP:CSBW:DATA 5MHZ,3.84MHZ")' Set Adj. Channel param.
Call ibwrt( analyzer%, ":ACP:CSBW:DATA 10MHz,3.84MHZ")' Set Adj. Channel param.

Rem ----------------- Setting of Root Nyquist filter's parameters -------------
Call ibwrt( analyzer%, ":ACP:RNYQ:SRAT 3.84MHZ" )    ' Set Symbol rate of filter
Call ibwrt( analyzer%, ":ACP:RNYQ:RFAC 0.22" )       ' Set Roll off factor of filter
Call ibwrt( analyzer%, ":ACP:RNYQ ON" )              ' Set Nyq. Filter operation to on

Call ibwrt( analyzer%, ":ACP:AVER:COUN 10" )         ' Set average times
Call ibwrt( analyzer%, ":ACP:AVER ON" )              ' Set average func. to ON

Call ibwrt( analyzer%, ":MEAS:ACP?" )                ' Start measurement
Call ibrd( analyzer%,  ResultACP$ )                  ' Read out all meas. results of ACP

Call MsgBox( "ACP results : " & ResultACP$ )
Call ibwrt( analyzer%, ":CONF:NORM" )                ' Quit measurement
End Sub
```

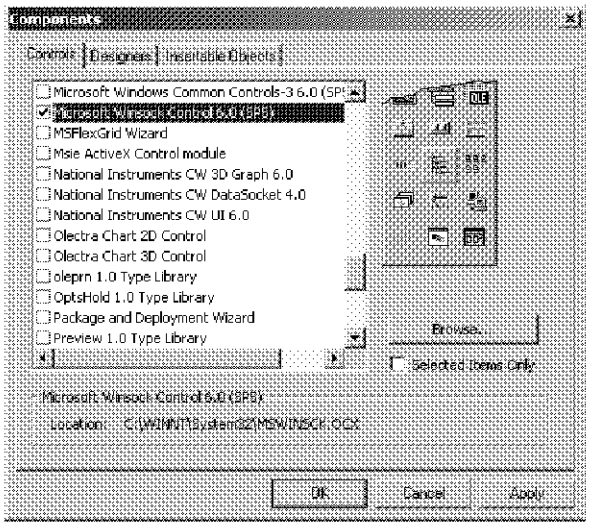
6.3.2 Basic Steps for LAN Control

This section describes step-by-step the operations required to control the LAN interface from Visual Basic. For the initialization of which depend on Visual Basic variables and the definition of function routines, follow the notational conventions of Visual Basic programs.

6.3.2.1 Reading the LAN Control Library for Visual Basic

To control a LAN interface board from a program written in Visual Basic, you must integrate the Winsock control provided by Microsoft into the Project of Visual Basic.

To use the Winsock control, make a setting so that WINSCK.OCX can be used in the setting of Visual Basic components. The following figure shows an example of adding WINSCK.OCX in Visual Basic 6.0. (Procedure: Select the Component (O) submenu from the Project (P) menu, check [Microsoft Winsock Control 6.0] on the list of the displayed component dialog, and click the OK button.)



After this setting is made, a Winsock control object is displayed in the tool box.

When you draw this Winsock control in the form, the LAN can be controlled by using the object drawn. After you draw the Winsock control and create an object, specify a unique object name. In a later part of this manual, explanation is given with the object name tcpClient.

6.3.2.1.1 Opening the Socket Interface (Initialization)

To communicate with this instrument through a LAN, you must first of all make a connection to the port of this instrument. To make a connection, you must specify the IP Address (or the host name) and the port number of this instrument in the properties of RemoteHost and RemotePort, respectively. In addition, specify the protocol (Protocol property) to be used in TCP (sckTCPProtocol). After that, a connection to this instrument is made by using the Connect method of the Winsock control. For the communication port number to communicate with this instrument, the number "5025" is used. Specify this number for the port number of the connection destination.

```
Rem ----------------- Connection LAN Interface -----------------------------
Public Sub ConnectTCP( )

tcpClient.
tcpClient.RemoteHost = "192.0.0.1"                  ' Set IP Address of SA
tcpClient.Protocol = sckTCPProtocol                 ' Set protocol to TCP
tcpClient.RemotePort = 5025                         ' Set port no. 5025 of SA


tcpClient.Connect                                   ' Connect to SA's port

End Sub
```

MEMO:

- ***To connect to this instrument, the above operation must be executed once before performing LAN control. Once it is executed, the connection is maintained until connection close processing is performed (in the above case, by executing the tcpClient.Close method).***
- ***Since close processing is usually performed at the end of the program, explicit close processing is not necessarily required.***
- ***Since frequent repetitions of Connect and Close may damage the Winsock control, design the program so that control is made in one Connect processing whenever possible.***

6.3.2.1.2 Initializing this Instrument

The following program initializes this instrument before controlling the LAN:

```
Rem ----------------- Initialize Spectrum Analyzer -----------------------------
Public Sub InitSA( )

tcpClient.SendData "*CLS" " & vbCrLf                ' Reset status register
tcpClient.SendData "*RST" " & vbCrLf                ' Reset this instrument

End Sub
```

6.3.2.1.3 Simple Setting Commands

The following program makes simple settings of this instrument:

```
Rem ----------------- Brief setting of Spectrum Analyzer ----------------------------
Rem ----------------- Set Center freq. to 1.9984GHz, Span to 10MHz -------------
Rem ------------------ and Reference level to 10dBm              --------------
Public Sub SASetting( )

tcpClient.SendData ":FREQ:CENT 1.9984GHZ" & vbCrLf
tcpClient.SendData ":FREQ:SPAN 10MHZ" & vbCrLf
tcpClient.SendData ":DISP:TRAC:Y:RLEV  10DBM" & vbCrLf

End Sub
```

6.3.2.1.4 Reading the Setting Values

The following program reads the setting values of this instrument:

```
Rem ----------------- Read the setting value of Spectrum Analyzer ---------------
Public Sub ReadSASetting( )

CF$= Space$(32)                                    ' Prepare the text variable for read
tcpClient.SendData ":FREQ:CENT?" & vbCrLf          ' Read request of center freq.

Do While (tcpClient.BytesReceived = 0)             ' Wait for receiving a character
  DoEvents
Loop

tcpClient.GetData CF$                              ' Read setting value
SP$= Space$(32)                                    ' Prepare the text variable for read
tcpClient.SendData ":FREQ:SPAN?" & vbCrLf          ' Read request of span freq.

Do While (tcpClient.BytesReceived = 0)             ' Wait for receiving a character
  DoEvents
Loop

tcpClient.GetData SP$                              ' Read setting value

Rem -------------------- Display setting value ----------------------------------------
                                                  -----
Call MsgBox( "Center freq.: " & CF$ & "Span freq.: " & SP$)

End Sub
```

6.3.2.1.5 Setting the Marker and Reading the Marker Value

The following program searches for the maximum level of the signal by using the marker and reads the level of the signal with the marker.

```
Rem ----------------- Read signal level using the marker function-------------------
Public Sub ReadMkrSignal( )

MKLevel$= Space$(32)                                  ' Prepare the text variable for read

tcpClient.SendData ":CALC:MARK:FUNC ON"& vbCrLf       ' Turn on the marker
tcpClient.SendData ":CALC:MARK:MAX" & vbCrLf          ' Search peak point of signal
tcpClient.SendData ":CALC:MARK:X?" & vbCrLf           ' Query the marker frequency

Do While (tcpClient.BytesReceived = 0)                ' Wait for receiving a character
  DoEvents
Loop

tcpClient.GetData MKFreq$                             ' Read it

tcpClient.SendData ":CALC:MARK:Y?" & vbCrLf           ' Query the marker level

Do While (tcpClient.BytesReceived = 0)                ' Wait for receiving a character
  DoEvents
Loop

tcpClient.GetData MKlevel$                            ' Read it

Rem -------------------- Display the freq. and level of signal-------------------------
Call MsgBox("Marker freq.: " & MKFreq$ & " Level: " & MKLevel$)

End Sub
```

6.3.2.1.6 ACP Measurement

This section shows an example of measuring the adjacent channel leakage power (ACP) of the signal by using the ACP measurement function, which is a type of the Power measurement functions.

```
Rem -----------------Measure Adjacent Channel Power ----------------------------------
Public Sub MeasACP( )

ResultACP$ = Space(200)

tcpClient.SendData ":FREQ:CENT 2GHZ" & vbCrLf       ' Set carrier freq.
tcpClient.SendData ":FREQ:SPAN 25MHZ" & vbCrLf

Rem ----------------- Setting of Adjacent channel parameters --------------
tcpClient.SendData ":ACP:CSBW:DATA:DEL" & vbCrLf    ' Clear Channel Space param.
tcpClient.SendData ":ACP:CBW 3.84MHz"& vbCrLf       ' Set Channel Bandwidth
tcpClient.SendData ":ACP:CSBW:DATA 5MHz,3.84MHz" & vbCrLf  'Adj. Channel param.
tcpClient.SendData ":ACP:CSBW:DATA 10MHz,3.84MHz" & vbCrLf ' Adj. Channel param.

Rem ----------------- Setting of Root Nyquist filter's parameters --------------
tcpClient.SendData ":ACP:RNYQ:SRAT 3.84MHz" & vbCrLf ' Set Symbol rate of filter
tcpClient.SendData ":ACP:RNYQ:RFAC 0.22" & vbCrLf   ' Set Roll off factor of filter
tcpClient.SendData ":ACP:RNYQ ON" & vbCrLf          ' Set Nyq. Filter operation to on

tcpClient.SendData ":ACP:AVER:COUN 10" & vbCrLf     ' Set average times
tcpClient.SendData ":ACP:AVER ON" & vbCrLf          ' Set average func. to ON

tcpClient.SendData ":MEAS:ACP?" & vbCrLf            ' Start measurement

Do While (tcpClient.BytesReceived = 0)              ' Wait for receiving a character
  DoEvents
Loop

tcpClient.GetData ResultACP$                        ' Read out all meas. results of ACP

Call MsgBox("ACP results : " & ResultACP$)

End Sub
```

6.4 SCPI Command Reference

This chapter describes the SCPI command reference for this instrument.

6.4.1 Command Reference Format

This section describes the format of explanations of each command described in this chapter.

Explanations of each command include the following items:

- Function description
- SCPI Command
- Parameter
- Query reply

- [Function description]

  The usage of commands and operation of this instrument when they are executed.

- [SCPI Command]

  The SCPI command shows the syntax of a command sent from the external controller to this instrument. The syntax consists of a command part and a parameter part. The command part and parameter part are delimited by a space.

  When there are multiple parameters, they are delimited by commas (,). The three points (...) displayed between commas represent the parameter(s) omitted in the position.

  For example, the description <numeric value 1>,..., <numeric value 4> shows that four parameters,<numeric value 1>, <numeric value 2>, <numeric value 3>, and <numeric value 4>, are required.

  When the parameter is a character string type such as <character string>,<character string 1>, the parameter must be enclosed in double quotation marks (" "). When the parameter is <block>, it shows the block format data.

  The part written in lowercase alphabetical characters in the syntax shows that it can be omitted.

  For example, ":CALibration:CABLe" can be abbreviated to ":CAL:CABL".

  The marks used in the syntax are defined as follows:

< >:	Shows a parameter required for sending a command
[ ] :	Shows that the command is optional It can be omitted
{ }:	Shows that only one item is required to be selected from multiple items
|:	Written in curly brackets {..} and used as a delimiter for multiple items
<ch>:	Written in the command header and shows the target input channel number of the command The channel number can be omitted. However, when it is written, the channel number 1 is selected

<screen>: Written in the command header and shows the target screen number of the command
The screen number can be omitted. However, when it is written, a value from 1 to 2 is selected
[{1|2}]

<trace>: Written in the command header and shows the target trace number of the command
The trace number can be omitted. However, when it is written, a value from 1 to 4 is selected
[{1|2|3|4}]

For example, when a syntax below is specified, :CALC:CORR:EDEL:TIME 0.1 and :CALCULATE1:SELECTED:CORR:EDEL:TIME 25E-3 are valid.

Syntax: CALCulate{[1]|2|3|4}[:SELected]:CORRection:EDELay:TIME <numeric value>

- [Parameter]

  Describes a parameter required for sending a command.

  When the parameter is a numeric type or a character (string) type, it is enclosed in angle brackets (< >).

  When the parameter is an optional type, it is enclosed in curly brackets { }.

  In this manual, parameter types are described in the following formats:

  < int >: A numeric value that can be input in the format NR1, NR2, or NR3 and rounded to an integer in this instrument

  < real >: A numeric value that can be input in the format NR1, NR2, or NR3 and rounded to a valid-digit real number in this instrument

  < bool >: String of OFF|ON

  < str >: A character string or alphanumeric symbols enclosed in quotation (' ') or double quotation (" ") marks

  < block >: Block data type
  The content of data is an 8-bit binary data array

  < type >: Character data selected from multiple types

- |Query reply|

  When there is a query reply to the command, the data format used for reading the query is described.

  Each parameter to be read is enclosed in curly brackets { }. When multiple items delimited by a vertical bar (|) exist in curly brackets { }, only one of those items is read out. When multiple parameters are read out, they are delimited by commas (,). The three points (...) displayed between commas represent the data omitted in the position. For example, the description <numeric value 1>,..., <numeric value 4> shows that four parameters <numeric value 1>, <numeric value 2>, <numeric value 3>, and <numeric value 4> are read.

  When the parameter to be read is enclosed in square brackets [ ], the parameter may be omitted, depending on the measurement result, etc.

  When the parameter to be read is a value in a unit, the description like "Unit: dBm" is added to display the unit of the parameter value. However, only when the parameter is described in a level unit "dBm", the level unit selected at that time will be applied to the parameter.

6.4.2 Common Commands

This section describes IEEE common commands.

Function description	SCPI Command	Parameter	Query reply	Remarks
Clears the status byte and related data	*CLS	-	-	
Sets the standard event status enable register	*ESE	<int>	<int>	
Reads the standard event status register	*ESR?	-	<int>	
Device inquiry	*IDN?	-	<str>	*1
Notice of completion of all running operations	*OPC	-	1	
Loads the device settings	*RCL	<int>|POFF	-	*2
Resets the device	*RST	-	-	
Saves the device settings	*SAV	<int>	<int>	
Sets the service request enable register	*SRE	<int>	<int>	
Reads the status byte register	*STB?	-	<int>	
Triggers the device	*TRG	-	-	
Executing Self-Test and reading the result	*TST?	-	<int>	*3
Waits for the completion of all running operations	*WAI	-	-	

*1 <str> is output in the following format: maker name, model name, serial number and version number.
*2 POFF indicates the parameter settings at the last power-off
*3 If <int> is 0, it indicates that Self-Test passes. If <int> is any other value, the value indicates an error code.

6.4.3 List of Commands

6.4.3.1 Subsystem-INPut

Function description	SCPI command	Parameter	Query reply	Remarks
INPut				
ATT setting (Manual)	:INPut:ATTenuation	<real>	<real>	
ATT(Auto/Manual)	:INPut:ATTenuation:AUTO	OFF|ON	OFF|ON	
Min ATT setting	:INPut:ATTenuation:MINimum	<real>	<real>	
Min ATT ON/OFF	:INPut:ATTenuation:MINimum:STATe	OFF|ON	OFF|ON	
Preamp ON/OFF	:INPut:GAIN:STATe	OFF|ON	OFF|ON	

6.4.3.2 Subsystem-SENSe

Function description	SCPI command	Parameter	Query reply	Remarks
FREQuency				
Setting the Center Freq	[:SENSe]:FREQuency<screen>:CENTer	<real>	<real>	
Setting the Center Freq setting resolution	[:SENSe]:FREQuency<screen>:CENTer :STEP	<real>	<real>	
Setting the Center Freq setting resolution mode	[:SENSe]:FREQuency<screen>:CENTer :STEP:AUTO	OFF|ON	OFF|ON	
Setting the Start Freq	[:SENSe]:FREQuency<screen>:STARt	<real>	<real>	
Setting the Stop Freq	[:SENSe]:FREQuency<screen>:STOP	<real>	<real>	
Setting the Span	[:SENSe]:FREQuency<screen>:SPAN	<real>	<real>	
Setting the Full Span	[:SENSe]:FREQuency<screen>:SPAN :FULL	--	--	
Setting the previous Span	[:SENSe]:FREQuency<screen>:SPAN :PREVious	--	--	
Setting the Zero Span	[:SENSe]:FREQuency<screen>:SPAN :ZERO	--	--	
Setting the Offset Freq	[:SENSe]:FREQuency<screen>:OFFSet	<real>	<real>	
Setting the Offset Freq condition	[:SENSe]:FREQuency<screen>:OFFSet :STATe	OFF|ON	OFF|ON	
Setting the channel number	[:SENSe]:FREQuency<screen>:CHANnel :NUMBer	<int>	<int>	
Setting the input filter mode	[:SENSe]:FREQuency:INPut:FILTer	OFF|ON	OFF|ON	
Setting the 1st mixer IF frequency	[:SENSe]:FREQuency<screen>:IF:SHIFt	AUTO|NORMal| LOW|HIGH	AUTO|NORM| LOW|HIGH	
BANDwidth				
Setting the RBW	[:SENSe]:{BANDwidth|BWIDth}<screen> [:RESolution]	<real>	<real>	
Setting the RBW mode	[:SENSe]:{BANDwidth|BWIDth}<screen> [:RESolution]:AUTO	OFF|ON	OFF|ON	
Setting the ratio between the span and the RBW	[:SENSe]:{BANDwidth|BWIDth}<screen> [:RESolution]:RATio	<real>	<real>	*1
Setting the ratio mode between the span and the RBW	[:SENSe]:{BANDwidth|BWIDth}<screen> [:RESolution]:RATio:STATe	OFF|ON	OFF|ON	
Setting the VBW	[:SENSe]:{BANDwidth|BWIDth}<screen> :VIDeo	<real>	<real>	
Setting the VBW setting mode	[:SENSe]:{BANDwidth|BWIDth}<screen> :VIDeo:AUTO	OFF|ON	OFF|ON	
Setting the ratio between the RBW and the VBW	[:SENSe]:{BANDwidth|BWIDth}<screen> :VIDeo:RATio	<real>	<real>	*2
Setting the ratio mode between the RBW and the VBW	[:SENSe]:{BANDwidth|BWIDth}<screen> :VIDeo:RATio:STATe	OFF|ON	OFF|ON	

*1: <real> = Ratio of span frequency to RBW and the setting range is between 2 to 1000
*2: <real> = Ratio of VBW to RBW and the setting range is between 0.001 to 10.000

Function description	SCPI command	Parameter	Query reply	Remarks
COUPle				
Setting an automatic coupling	[:SENSe]:COUPle<screen>:ALL:AUTO	--	--	
ADC				
Setting the ADC Dither	[:SENSe]:ADC<screen>:DITHer	OFF|ON	OFF|ON	
DETector				
Selecting the trace detector	[:SENSe]:DETector<screen>:TRACe [:NUMBer<trace>]:FUNCtion	NORMal| POSitive| NEGative| SAMPle| AVERage	NORM| POS| NEG| SAMP| AVER	
Selecting the trace detector mode	[:SENSe]:DETector<screen>:TRACe [:NUMBer<trace>]:FUNCtion:AUTO	OFF|ON	OFF|ON	
AVERage				
Setting the average mode of the average detector	[:SENSe]:AVERage<screen>:TYPE	RMS|VIDeo| VOLTage	RMS|VID| VOLT	
Setting the mode used when selecting the average detection mode of the average detector	[:SENSe]:AVERage<screen>:TYPE:AUTO	OFF|ON	OFF|ON	
PRESelector				
Manually adjusting the pre-selector	[:SENSe]:PRESelector<screen>	<int>	<int>	
Automatically adjusting the pre-selector	[:SENSe]:PRESelector<screen>:AUTO	--	--	
SWEep				
Setting the sweep time	[:SENSe]:SWEep<screen>:TIME	<real>	<real>	
Selecting the sweep time setting mode	[:SENSe]:SWEep<screen>:TIME:AUTO	OFF|ON	OFF|ON	
Setting the window sweep to ON or OFF	[:SENSe]:SWEep<screen>:WINDow	OFF|ON	OFF|ON	
Setting the gated sweep to ON or OFF	[:SENSe]:SWEep:GATE	OFF|ON	OFF|ON	
Setting the gate signal position	[:SENSe]:SWEep:GATE:DELay	<real>	<real>	
Setting the gate signal width	[:SENSe]:SWEep:GATE:WIDTh	<real>	<real>	
Switching the gate signal mode	[:SENSe]:SWEep:GATE:WIDTh:AUTO	OFF|ON	OFF|ON	
Setting the gated sweep trigger	[:SENSe]:SWEep:GATE:SOURce	IMMediate|IF| EXT1|EXT2	IMM|IF| EXT1|EXT2	
Setting the trigger polarity of each trigger source	[:SENSe]:SWEep:GATE:SLOPe	NEGative|POSitive	NEG|POS	
Setting the trigger level for an EXT2 (external input terminal 2) trigger	[:SENSe]:SWEep:GATE:LEVel:EXTernal	<real>	<real>	
Setting the trigger level for an IF trigger	[:SENSe]:SWEep:GATE:LEVel:IF	<real>	<real>	

6.4.3 List of Commands

Function description	SCPI command	Parameter	Query reply	Remarks
ROSCillator				
Setting the frequency of the external frequency reference	[:SENSe]:ROSCillator:SOURce :FREQuency	<real>	<real>	*3
Switching the frequency reference standard (internal/external)	[:SENSe]:ROSCillator:SOURce:AUTO	OFF|ON	OFF|ON	*3
Adjusting the correction value of the internal 10-MHz frequency reference coarsely	[:SENSe]:ROSCillator:SOURce :ADJust:COARse	<int>	<int>	
Adjusting the correction value of the internal 10-MHz frequency reference finely	[:SENSe]:ROSCillator:SOURce :ADJust:FINE	<int>	<int>	
Saving the correction value of the internal 10-MHz frequency reference	[:SENSe]:ROSCillator:SOURce :ADJust:SAVE	--	--	
Clearing the correction value of the internal 10-MHz frequency reference	[:SENSe]:ROSCillator:SOURce :ADJust:DEFault	--	--	
CORRection				
Switching the RF input level correction function ON or OFF	[:SENSe]:CORRection:CSET:STATe	OFF|ON	OFF|ON	
Entering the RF input level correction data	[:SENSe]:CORRection:CSET:DATA	<real1>, <real2>	--	*4
Deleting all the RF input level correction data	[:SENSe]:CORRection:CSET:DELete	--	--	
SWEep				
Setting the number of times sweep averaging or MAX/MIN HOLD is performed	[:SENSe]:SWEep<screen>:COUNt	<int>	<int>	
Setting the number of times sampling is performed in the artificial analog function	[:SENSe]:AANalog:SAMPle:COUNt	<int>	<int>	
Channel Power				
Setting the number of times averaging is performed	[:SENSe]:CPOWer<screen>:AVERage :COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:CPOWer<screen>:AVERage [:STATe]	OFF|ON	OFF|ON	
Specifying the calculation type of the averaging calculation mode	[:SENSe]:CPOWer<screen>:AVERage :MODE	CONTinuous|REPeat	CONT|REP	
Setting the measurement window display to ON or OFF	[:SENSe]:CPOWer<screen>:WINDow	OFF|ON	OFF|ON	
Specifying the measurement window display position	[:SENSe]:CPOWer<screen>:WINDow :POSition	<real>	<real>	
Specifying the measurement window display width	[:SENSe]:CPOWer<screen>:WINDow :WIDTh	<real>	<real>	
Specifying the measurement parameter setting mode	[:SENSe]:CPOWer<screen>:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:CPOWer<screen>:DATA:SAVE	--	--	
Setting the noise correction function to ON or OFF	[:SENSe]:CPOWer<screen>:NCORrection [:STATe]	OFF|ON	OFF|ON	

*3: This function can be used only when OPT21, OPT22, or OPT23 is installed.
*4: <real1> = frequency data
<real2> = Correction level data
Delimited by using a comma.

Function description	SCPI command	Parameter	Query reply	Remarks
Average Power				
Setting the number of times averaging is performed	[:SENSe]:APOWer<screen>:AVERage :COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:APOWer<screen>:AVERage [:STATe]	OFF|ON	OFF|ON	
Specifying the calculation type of the averaging calculation mode	[:SENSe]:APOWer<screen>:AVERage :MODE	CONTinuous| REPeat	CONT|REP	
Setting the measurement window display to ON or OFF	[:SENSe]:APOWer<screen>:WINDow	OFF|ON	OFF|ON	
Specifying the measurement window display position	[:SENSe]:APOWer<screen>:WINDow :POSition	<real>	<real>	
Specifying the measurement window display width	[:SENSe]:APOWer<screen>:WINDow :WIDTh	<real>	<real>	
Specifying the measurement parameter setting mode	[:SENSe]:APOWer<screen>:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:APOWer<screen>:DATA:SAVE	--	--	
Setting the noise correction function to ON or OFF	[:SENSe]:APOWer<screen>:NCORrection [:STATe]	OFF|ON	OFF|ON	
OBW				
Setting the number of times averaging is performed	[:SENSe]:OBW<screen>:AVERage :COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:OBW<screen>:AVERage [:STATe]	OFF|ON	OFF|ON	
Specifying the calculation type of the averaging calculation mode	[:SENSe]:OBW<screen>:AVERage:MODE	CONTinuous| REPeat	CONT|REP	
Specifying the OBW% value	[:SENSe]:OBW<screen>:PERCent	<real>	<real>	
Specifying the measurement parameter setting mode	[:SENSe]:OBW<screen>:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:OBW:DATA:SAVE	--	--	
ACP				
Setting the number of times averaging is performed	[:SENSe]:ACP:AVERage:COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:ACP:AVERage[:STATe]	OFF|ON	OFF|ON	
Specifying the calculation type of the averaging calculation mode	[:SENSe]:ACP:AVERage:MODE	CONTinuous| REPeat	CONT|REP	
Specifying the measurement parameter setting mode	[:SENSe]:ACP:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:ACP:DATA:SAVE	--	--	

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the carrier bandwidth, which is calculated for the reference power	[:SENSe]:ACP:CBWidth	<real>	<real>	
Setting the adjacent channel position and adjacent channel bandwidth	[:SENSe]:ACP:CSBW:DATA	<real>, <real>	<real>, <real>	
Initializing the adjacent channel position and adjacent channel bandwidth data	[:SENSe]:ACP:CSBW:DATA:DELete	--	--	
Setting the Root Nyquist band calculation mode to ON or OFF	[:SENSe]:ACP:RNYQuist	OFF|ON	OFF|ON	
Setting the Symbol Rate value, which is used in the Root Nyquist band calculation mode	[:SENSe]:ACP:RNYQuist:SRATe	<real>	<real>	
Setting the filter coefficient, which is used in the Root Nyquist band calculation mode	[:SENSe]:ACP:RNYQuist:RFACtor	<real>	<real>	
Setting the noise correction function to ON or OFF	[:SENSe]:ACP:NCORrection[:STATe]	OFF|ON	OFF|ON	
Executing the Auto Level Set function	[:SENSe]:ACP:POWer:LEVel:AUTO	--	--	
Multi Carrier ACP				
Setting the Root Nyquist filter calculation to ON or OFF	[:SENSe]:MCACp:RNYQuist	OFF|ON	OFF|ON	
Setting the Symbol Rate value for the Root Nyquist filter calculation	[:SENSe]:MCACp:RNYQuist:SRATe	<real>	<real>	
Setting the filter coefficient that is used in the Root Nyquist bandwidth operation mode.	[:SENSe]:MCACp:RNYQuist:RFACtor	<real>	<real>	
Setting the number of times averaging is performed	[:SENSe]:MCACp:AVERage:COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:MCACp:AVERage[:STATe]	OFF|ON	OFF|ON	
Specifying the calculation type of the averaging calculation mode	[:SENSe]:MCACp:AVERage:MODE	CONTinuous|REPeat	CONT|REP	
Specifying the measurement parameter setting mode	[:SENSe]:MCACp:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:MCACp:DATA:SAVE	--	--	
Setting the measurement carrier and adjacent channel to ON or OFF	[:SENSe]:MCACp:PARameter{1|2|...|16}:STATe	OFF|ON	OFF|ON	
Setting the offset frequency of the measurement carrier and adjacent channel	[:SENSe]:MCACp:PARameter{1|2|...|16}:FREQuency	<real>	<real>	
Setting the channel bandwidth of the measurement carrier and adjacent channel area	[:SENSe]:MCACp:PARameter{1|2|...|16}:BWIDth	<real>	<real>	
Setting the reference power area of the measurement carrier and adjacent channel	[:SENSe]:MCACp:PARameter{11|12|...|16}:REFerence	<int>	<int>	
Setting a limit value, which is used to check measurement results as pass or fail	[:SENSe]:MCACp:PARameter{11|12|...|16}:LIMit	<real>	<real>	
Setting the noise correction function to ON or OFF	[:SENSe]:MCACp:NCORrection[:STATe]	OFF|ON	OFF|ON	

Function description	SCPI command	Parameter	Query reply	Remarks
Executing the Auto Level Set function	[:SENSe]:MCACp:POWer:LEVel:AUTO	--	--	
Setting the Carrier Freq Adjustment value	[:SENSe]:MCACp:CARRier:ADJust	<real>	<real>	
Setting the Carrier Freq Adjustment function to ON or OFF	[:SENSe]:MCACp:CARRier:ADJust :STATe	OFF|ON	OFF|ON	
Spurious				
Registering the sweep parameters, which are used, in the Spurious table	[:SENSe]:SPURious:DATA [:NUMBer{1|2|3}]	<real1>,<real2>, <bool3>, <bool4>,<real4>, <bool5>,<real5>, <bool6>,<real6>, <real7>, <bool8>,<real8>, <bool9>, <real10>	--	*5
Selecting the Spurious table that is used	[:SENSe]:SPURious:DATA [:NUMBer{1|2|3}]:ACTive	--	<int>	
Clearing all data registered in the Spurious table that is used	[:SENSe]:SPURious:DATA [:NUMBer{1|2|3}]:DELete	--	--	
Selecting the table use mode of the Spurious table that is used	[:SENSe]:SPURious:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the Spurious table that is used	[:SENSe]:SPURious:DATA:SAVE	--	--	

*5: <real1> = Sweep Start frequency (GHz/MHz/kHz/Hz)
<real2> = Sweep Stop frequency (GHz/MHz/kHz/Hz)
<bool3> = {OFF|ON} Input Filter On/Off
<bool4> = {OFF|ON} RBW AUTO/MANUAL
<real4> = RBW (MHz/KHz/Hz)
<bool5> = {OFF|ON} VBW AUTO/MANUAL
<real5> = VBW (MHz/KHz/Hz)
<bool6> = {OFF|ON} Sweep time AUTO/MANUAL
<real6> = Sweep time (S/MS/US)
<real7> = Reference level (dBm)
<bool8> = {OFF|ON} Input ATT AUTO/MANUAL
<real8> = Input attenuator (dB)
<bool9> = {OFF|ON} Preamp ON/OFF
<real10> = Spurious level judgment value (dBm)

Function description	SCPI command	Parameter	Query reply	Remarks
Intermodulation Distortion Measurement				
Setting the maximum distortion order of signals that are measured	[:SENSe]:IM:ORDer	<int>	<int>	
Setting the pass/fail judgment values of the distortion signal	[:SENSe]:IM:THReshold{3|5|7|9}	<real>	<real>	
Setting the pass/fail judgment function to ON or OFF	[:SENSe]:IM:LIM:STATe	OFF|ON	OFF|ON	
Specifying the measurement parameter setting mode	[:SENSe]:IM:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:IM:DATA:SAVE	--	--	
Harmonic Measurement				
Setting the reference signal frequency	[:SENSe]:HARMonics:FFRequency	<real>	<real>	
Setting the reference signal frequency mode	[:SENSe]:HARMonics:FFRequency :STATe	OFF|ON	OFF|ON	
Setting the harmonic order that is measured	[:SENSe]:HARMonics:NUMBer	<int>	<int>	
Spectrum Emission Mask				
Setting the reference power calculation bandwidth	[:SENSe]:SEMask:CBWidth	<real>	<real>	
Setting the Root Nyquist filter calculation mode	[:SENSe]:SEMask:RNYQuist	OFF|ON	OFF|ON	
Setting the symbol rate, which is used for the Root Nyquist filter calculation	[:SENSe]:SEMask:RNYQuist:SRATe	<real>	<real>	
Setting the roll-off factor, which is used for the Root Nyquist filter calculation	[:SENSe]:SEMask:RNYQuist:RFACtor	<real>	<real>	
Setting the measurement parameter table	[:SENSe]:SEMask:DATA	<real1>, <real2>, <real3>, <real4>, <real5>, <real6>, <real7>, <real8>, <type>	--	*6
Clearing all measurement parameter tables	[:SENSe]:SEMask:DATA:DELete	--	--	

*6: <real1> = Offset Start frequency (GHz/MHz/kHz/Hz)
<real2> = Offset Stop frequency (GHz/MHz/kHz/Hz)
<real3> = Integration band(ABS) (GHz/MHz/kHz/Hz)
<real4> = Start value of the absolute level judgment (dBm)
<real5> = Stop value of the absolute level judgment (dBm)
<real6> = Integration band(REL) (GHz/MHz/kHz/Hz)
<real7> = Start value of the relative level judgment (dB)
<real8> = Stop value of the relative level judgment (dB)
<type> = { ABS | REL | AAR | AOR }

ABS: Judges only by using the absolute level judgment value.
REL: Judges only by using the relative level judgment value.
AAR: Judges by using the AND condition of the absolute and relative level judgment values.
AOR: Judges by using the OR condition of the absolute and relative level judgment values.

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the reference power calculation mode	[:SENSe]:SEMask:RPOWer:MODE	CHANnel|PEAK	CHAN|PEAK	
Setting the number of times averaging is performed	[:SENSe]:SEMask:AVERage:COUNt	<int>	<int>	
Setting the averaging measurement function to ON or OFF	[:SENSe]:SEMask:AVERage[:STATe]	OFF|ON	OFF|ON	
Setting the averaging mode of the averaging measurement function	[:SENSe]:SEMask:AVERage:MODE	CONTinuous|REPeat	CONT|REP	
Selecting the setting parameters that are used	[:SENSe]:SEMask:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the setting parameters that are used	[:SENSe]:SEMask:DATA:SAVE	--	--	
Executing the Auto Level Set function	[:SENSe]:SEMask:POWer:LEVel:AUTO	--	--	
Counter Function				
Setting the number of times averaging is performed	[:SENSe]:FCOunt<screen>:AVERage:COUNt	<int>	<int>	
Setting the Averaging process to ON or OFF	[:SENSe]:FCOunt<screen>:AVERage[:STATe]	OFF|ON	OFF|ON	
CCDF Measurement				
Setting the resolution bandwidth (RBW)	[:SENSe]:CCDF:{BANDwidth|BWIDth}[:RESolution]	<real>	<real>	
Setting the number of measurement samples	[:SENSe]:CCDF:POINt	<int>	<int>	
Setting the gate function to ON or OFF	[:SENSe]:CCDF:GATE	OFF|ON	OFF|ON	
Setting the threshold level of the gate function	[:SENSe]:CCDF:GATE:THReshold	<real>	<real>	
Multi Average Power				
Setting the Power Ratio measurement to ON or OFF	[:SENSe]:MAPower:PRATio	OFF|ON	OFF|ON	
Setting the number of times averaging is performed	[:SENSe]:MAPower:AVERage:COUNt	<int>	<int>	
Setting the averaging calculation mode to ON or OFF	[:SENSe]:MAPower:AVERage[:STATe]	OFF|ON	OFF|ON	
Specifying an operation type in the averaging calculation mode	[:SENSe]:MAPower:AVERage:MODE	CONTinuous|REPeat	CONT|REP	
Setting the measurement window display to ON or OFF	[:SENSe]:MAPower:WINDow[:NUMBer{1|2|...|9|10}]	OFF|ON	OFF|ON	
Specifying the measurement window display position	[:SENSe]:MAPower:WINDow[:NUMBer{1|2|...|9|10}]:POSition	<real>	<real>	
Specifying the measurement window display width	[:SENSe]:MAPower:WINDow[:NUMBer{1|2|...|9|10}]:WIDTh	<real>	<real>	
Specifying the active window	[:SENSe]:MAPower:WINDow[:NUMBer{1|2|...|9|10}]:ACTive	--	1|2|...|9|10	
Setting all windows except for window No.1 to OFF	[:SENSe]:MAPower:WINDow:RESet	--	--	
Setting the window display, which is coupled to Average Power, to ON or OFF	[:SENSe]:MAPower:WINDow:COUPling	OFF|ON	OFF|ON	
Specifying the measurement parameter setting mode	[:SENSe]:MAPower:DATA:MODE	DEFault|MANual	DEF|MAN	
Saving the measurement parameters	[:SENSe]:MAPower:DATA:SAVE	--	--	
Setting the noise correction function to ON or OFF	[:SENSe]:MAPower:NCORrection[:STATe]	OFF|ON	OFF|ON	
TG				
Executing the through collection	[:SENSe]:CORRection:COLLect:TG:SAVE	--	--	*7
Setting the through collection	[:SENSe]:CORRection:TG	OFF|ON	OFF|ON	*7

*7: This function is enabled when the OPT79 is included.

6.4.3.3 Subsystem-CONFigure

Function description	SCPI command	Parameter	Query reply	Remarks
Entering the Channel Power measurement mode	:CONFigure:CPOWer<screen>	--	--	
Entering the Average Power measurement mode	:CONFigure:APOWer<screen>	--	--	
Entering the OBW measurement mode	:CONFigure:OBW<screen>	--	--	
Entering the Multi-Carrier ACP measurement mode	:CONFigure:MCACp	--	--	
Entering the ACP measurement mode	:CONFigure:ACP	--	--	
Entering the Spurious measurement mode	:CONFigure:SPURious	--	--	
Entering the Spectrum Emission Mask measurement mode	:CONFigure:SEMask	--	--	
Entering the IM measurement mode	:CONFigure:IM	--	--	
Entering the harmonic measurement mode	:CONFigure:HARMonics	--	--	
Entering the CCDF measurement mode	:CONFigure:CCDF	--	--	
Entering the Multi Average Power measurement mode	:CONFigure:MAPower	--	--	
Leaving each measurement mode	:CONFigure:NORMal	--	--	

6.4.3.4 Subsystem-MEASure/READ/FETCh

MEMO: ***There is no difference in the reply format of the Measure, Read, and Fetch commands. Differences between these commands: When measurement is required to be performed, the Measure or Read commands are used, and when the result data is simply read, the Fetch command is used. Both the Measure command and the Read command perform measurement.However, initialization when entering the measurement mode differs depending on the measurement. The difference is explained in the Function Description item. The same operation applies if no special explanations are given. If the Fetch command is issued without entering the corresponding measurement mode, a Query error occurs.***

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the Channel Power measurement and reading the measurement result (Trace)	:MEASure:CPOWer<screen>?	--	<real>	
Performing the Channel Power measurement and reading the average power density (Trace)	:MEASure:CPOWer<screen>:PDENsity?	--	<real>	
Performing the Channel Power measurement and reading the measurement result (RMS)	:MEASure:CPOWer<screen>:RMS?	--	<real>	
Performing the Channel Power measurement and reading the average power density (RMS)	:MEASure:CPOWer<screen>:RMS :PDENsity?	--	<real>	
Performing the Average Power measurement and reading the measurement result (Trace)	:MEASure:APOWer<screen>?	--	<real>	
Performing the Average Power measurement and reading the average power density (Trace)	:MEASure:APOWer<screen>:PDENsity?	--	<real>	
Performing the Average Power measurement and reading the measurement result (RMS)	:MEASure:APOWer<screen>:RMS?	--	<real>	
Performing the Average Power measurement and reading the average power density (RMS)	:MEASure:APOWer<screen>:RMS :PDENsity?	--	<real>	
Performing the OBW measurement and reading all measurement results	:MEASure:OBW<screen>?	--	<real>, <real>	
Performing the OBW measurement and reading the measurement result (only OBW value)	:MEASure:OBW<screen>:OBW?	--	<real>	
Performing the OBW measurement and reading the measurement result (only OBW center frequency)	:MEASure:OBW<screen>:FCENter?	--	<real>	

6.4.3 List of Commands

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the ACP measurement and reading all measurement results	:MEASure:ACP[:NUMBer{1|2|3|4|5}]?	--	<real1>, <real2>, <real3>[, ...]	*1
Performing the ACP measurement and reading the reference power measurement result	:MEASure:ACP:RPOWer?	--	<real>	
Performing the ACP measurement and reading all measurement results of the specified channels on the Upper side	:MEASure:ACP :UPPer[:NUMBer{1|2|3|4|5}]?	--	<real1>[, ...]	*2
Performing the ACP measurement and reading all measurement results of the specified channels on the Lower side	:MEASure:ACP :LOWer[:NUMBer{1|2|3|4|5}]?	--	<real1>[, ...]	*2

*1: When the NUMBer header is omitted <real1>, <real2>, <real3>[, ...]

<real1> = Real value that indicates the reference power. Unit: dBm,
<real2> = Real value that indicates the lower level(1). Unit: dB,
<real3> = Real value that indicates the upper level(1). Unit: dB,
<real4> = Real value that indicates the lower level(2). Unit: dB,
<real5> = Real value that indicates the upper level(2). Unit: dB,
.....,
<real2n> = Real value that indicates the lower level(n). Unit: dB,
<real2n+1> = Real value that indicates the upper level(n). Unit: dB

n: Number of channels measured in the ACP measurement (up to 5 groups)

When the NUMBer header is specified <real1>, <real2>, <real3>

<real1> = Real value that indicates the reference power. Unit: dBm,
<real2> = Real value that indicates the lower level(m). Unit: dB,
<real3> = Real value that indicates the upper level(m). Unit: dB

m: The number that indicates the specified adjacent channel

*2: When the NUMBer header is omitted <real1>[, <real2>, ..., <realn>](Real value that indicates the Upper/Lower channel. Unit: dB)

<real1> = Real value that indicates the upper/lower level(1). Unit: dB,
<real2> = Real value that indicates the upper/lower level(2). Unit: dB,
.....,
<realn> = Real value that indicates the upper/lower level(n). Unit: dB

n: Number of channels measured in the ACP measurement (up to 5 groups)

When the NUMBer header is specified <real> (Real value that indicates the Upper/Lower Channel level{1|2|3|4|5}. Unit: dB)

<real1> = Real value that indicates the upper/lower level(m). Unit: dB

m: The number that indicates the specified adjacent channel

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the Multi-Carrier ACP measurement and reading the measurement result	:MEASure:MCACp [:NUMBer{1|2|3|4|5|6}]?	--	<real1>, <real2>, <int1>[, ...]	*3
Performing the Multi-Carrier ACP measurement and reading carrier power values	:MEASure:MCACp :CPOWer[:NUMBer{1|2|...|9|10}]?	--	<real>, <real>...	*4

*3: When the NUMBer header is omitted <real1>, <real2>, <int1>[, [<real>, <real>, <int>], ...[<real>, <real>, <int>]]

<real1> = Reference power(1): Unit: dBm,
<real2> = ACP level(1): Unit: dB,
<int1> = Pass/Fail(1): 0/1,

[[<real> = Reference power (2):,
<real> = ACP level(2),
<int> = Pass/Fail(2)],
.....,
[<real> = Reference power(n),
<real> = ACP level(n),
<int> = Pass/Fail:(n)]]

n: Number of channels measured in the multi-carrier power measurement (up to 6 groups)

When the NUMBer header is specified <real1>, <real2>, <int1>

<real1> = Reference power(m): Unit: dBm,
<real2> = ACP level(m): Unit: dB,
<int1> = Pass/Fail(m): 0/1,

m: Specified adjacent channel number

*4: When the NUMBer header is omitted <real1>[, <real>, <real>, <real>, <real>, ..., <real>]
(All real values that indicate the Carrier Power: Unit: dBm)

<real1> = Carrier Power(1): Unit: dBm,
[<real> = Carrier Power(2): Unit: ddBm
:
<real> = Carrier Power(n): Unit: dBm]

n: Number of carrier signals set before the measurement (up to 10)

When specified by the NUMBer header <real>(Real value that indicates the Carrier Power value. Unit: dBm)

<real> = Carrier Power(m): Unit: dBm

m: Specified carrier number

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the Spurious measurement and reading all measurement results	:MEASure:SPURious [:NUMBer{1|2|...|14|15}]?	--	<real1>, <real2>, <int>[, ...]	*5
Performing the Spectrum Emission Mask measurement and reading the results	:MEASure:SEMask[:NUMBer{1|2|3|4|5}]?	--	<real1>, <real2>, <real3>, <int1>, <real4>, <real5>, <real6>, <int4>	*6
Performing the Spectrum Emission Mask measurement and reading the reference power results	:MEASure:SEMask:RPOWer?	--	<real>	
Performing the Spectrum Emission Mask measurement and reading the total Pass/Fail judgment	:MEASure:SEMask:FAIL?	--	PASS|FAIL	

*5: When the NUMBer header is omitted <real1>, <real2>, <int>[, [<real>, <real>, <int>], ..., [<real>, <real>, <int>]]

<real1> = Freq(11): Unit: Hz
<real2> = Level(11): Unit: dBm,
<int> = P/F(11): 0/1,

[[<real> = Freq(12), <real> = Level(12), <int> = P/F(12)],
...,
[<real> = Freq(nm), <real> = Level(nm), <int> = P/F(nm)]]

n: Measurement area number in the Spurious table: Highest 15

m: Number of data items detected as spurious in one measurement area: Up to 10

n depends on the number of measurement areas in the set Spurious table
m depends on the number of spurious signals detected in the measurement area

When the NUMBer header is specified <real1>, <real2>, <int>[, [<real>, <real>, <int>], ..., [<real>, <real>, <int>]]

<real1> = Freq(n1): Unit: Hz
<real2> = Level(n1): Unit: dBm,
<int> = P/F(n1): 0/1,

[[<real> = Freq(n2), <real> = Level(n2), <int> = P/F(n2)],
...,
[<real> = Freq(nm), <real> = Level(nm), <int> = P/F(nm)]]

n: Measurement area number in the Spurious table: Can be set from 1 to 15

m: Number of data items detected as spurious: Up to 10

*6: When the NUMBer header is specified <real1>, <real2>, <real3>, <int1>, <real4>, <real5>, <real6>, <int4>,
[<real>, <real>, <real>, <int>, <real>, <real>, <real>, <int>],
.....], [<real>, <real>, <real>, <int>, <real>, <real>, <real>, <int>]]

<real1> = Upper freq(1): Unit: Hz,
<real2> = Upper Level Abs(1): Unit: dBm,
<real3> = Upper Level Rel(1): Unit: dB,
<int1> = Upper P/F(1): 0/1,
<real4> = Lower freq(1): Unit: Hz,
<real5> = Lower Level Abs(1): Unit: dBm,
<real6> = Lower Level Rel(1): Unit: dB,
<int4> = Lower P/F(1): 0/1,

[<real> = Upper freq(2), <real> = Upper Level Abs(2), <real> = Upper Level Rel(2),
<int> = Upper P/F(2), ...],
...,
[<real> = Upper Freq(n), <real> = Upper Level Abs(n), <real> = Upper Level Rel(n),
<int> = Upper P/F(n), <real> = Lower Freq(n), <real> = Lower level Abs(n),
<real> = Lower Level Rel(n), <int> = Lower P/F(n)]

n: Number of measurement areas that are defined: Up to 5

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the IM measurement and reading the measurement result	:MEASure:IM[:NUMBer{1|3|5|7|9}]?	--	<real1>, <real2>, <real3>, <real4>, <real5>, <int5>, <real6>, <int6> [, ...]	*7
Performing the IM measurement and reading the reference frequency data	:MEASure:IM:REFerence?	--	<real>, <real>	
Performing the IM measurement and reading the frequency difference between two signals	:MEASure:IM:DELTa?	--	<real>	
Performing the IM measurement and reading the 3rd order intercept point value	:MEASure:IM:IP3?	--	<real>	
Performing the IM measurement and reading the intercept point value	:MEASure:IM:IPOint[:NUMBer{3|5|7|9}]?	--	<real>[, ...]	*8

*7: When the NUMBer header is omitted <real1>, <real2>, <real3>, <real4>, <real5>, <int5>, <real6>, <int6>[, [<real7>, <int7>, <real8>, <int8>], ..., [<real>, <int>, <real>, <int>]

<real1> = Reference freq: Unit: Hz,
<real2> = Reference level: Unit: dBm,
<real3> = Delta freq: Unit: Hz,
<real4> = 3rd Intercept point. Unit: dBm,
<real5> = Fundamental Lower-side level. Unit: dB
<int5> = -1: Fixed value
<real6> = Fundamental Upper-side level. Unit: dB
<int6> = -1: Fixed value

<real7> = 3rd order distortion Lower-side level. Unit: dB,
<int7> = 3rd order distortion Lower-side P/F. 0/1,
<real8> = 3rd order distortion Upper-side level. Unit: dB,
<int8> = 3rd order distortion Upper-side P/F. 0/1,
.....,
[, <real> = nth order distortion Lower-side level: Unit: dB, <int> = nth order distortion Lower-side: P/F: 0/1,
<real> = nth order distortion Upper-side level. Unit: dB, <int> = nth order distortion Upper-side P/F: 0/1]

n: Set orders (orders 3/5/7/9th): Up to 4

When the NUMBer header is specified <real1>, <real2>, <real3>, <real4>, <real5>, <int5>, <real6>, <int6>

<real1> = Reference freq: Unit: Hz,
<real2> = Reference level: Unit: dBm,
<real3> = Delta freq: Unit: Hz,
<real4> = 3rd Intercept point. Unit: dBm,
<real5> = nth order distortion Lower-side level. Unit: dB
<int5> = nth order distortion Lower-side P/F. 0/1

<real6> = nth order distortion Upper-side level. Unit: dB,
<int6> = nth order distortion Upper-side P/F. 0/1,

n: Specified orders (orders 1/3/5/7/9th)

*8: When the NUMBer header is omitted <real>[, <real>, ..., <real>] (Intercept point value: Unit: dBm)

<real> = Real value that indicates the 3rd Intercept point value. Unit: dBm
[, <real> = Real value that indicates the 5th Intercept point value. Unit: dBm,
<real> = Real value that indicates the 7th Intercept point value. Unit: dBm,
<reeal> = Real value that indicates the 9th Intercept point value. Unit: dBm]

When the NUMBer header is specified (Real value that indicates Intercept point values {3|5|7|9}. Unit: dBm)

<real> = Real value that indicates the nth Intercept point value. Unit: dBm

n: Specified orders (orders 3/5/7/9th)

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the IM measurement and reading the specified-order modulation distortion measurement result	:MEASure:IM :UPPer[:NUMBer{1|3|5|7|9}]?	--	<real1>, <int1> [, ...]	*9
Performing the IM measurement and reading the specified-order modulation distortion measurement result	:MEASure:IM :LOWer[:NUMBer{1|3|5|7|9}]?	--	<real1>, <int1> [, ...]	*9
Performing the Harmonic measurement and reading all measurement results	:MEASure:HARMonics [:NUMBer{2|3|...|9|10}]?	--	<real1>, <real2>, <real3>, <real4>, <real5>[, ...]	*10
Performing the Harmonic measurement and reading the fundamental wave measurement result	:MEASure:HARMonics:FUNDamental?	--	<real>, <real>	

*9: When the NUMBer header is omitted <real1>, <int1>[, [<real2>, <int2>]...[<real9>, <int9>]]

<real1> = Fundamental Upper/Lower-side level. Unit: dB,
<int1> = -1: Fixed value

[, [<real2> = 3rd order distortion Upper/Lower-side level. Unit: dB,
<int2> = 3rd order distortion Upper/Lower-side P/F. 0/1],
.....,
[<real> = nth order distortion Upper/Lower-side level. Unit: dB,
<int> = nth order distortion Upper/Lower-side P/F. 0/1]]

n: Specified orders (orders 3/5/7/9th)

When the NUMBer header is specified <real>, <int>

<real> = nth order distortion Upper/Lower-side level. Unit: dB,
<int> = nth order distortion Upper/Lower-side P/F. 0/1

n: Specified orders (orders 1/3/5/7/9th)

*10: When the NUMBer header is omitted <real1>, <real2>, <real3>, <real4>, <real5>[, [<real>, <real>, <real>], ...[<real>, <real>, <real>]]

<real1> = Fundamental frequency. Unit: Hz,
<real2> = Fundamental absolute level. Unit: dBm,
<real3> = 2nd harmonic frequency. Unit: Hz,
<real4> = Absolute value level. Unit: dBm,
<real5> = Relative value level. Unit: dBc

[, [<real> = 3rd harmonic frequency. Unit: Hz,
<real> = Absolute value level. Unit: dBm,
<real> = Relative value level. Unit: dBc],
.....,
[<real> = nth harmonic frequency. Unit: Hz,
<real> = Absolute value level. Unit: dBm,
<real> = Relative value level. Unit: dBc]]

n: Set harmonic orders. Up to 10th

When the NUMBer header is specified <real1>, <real2>, <real3>, <real4>, <real5>

<real1> = Fundamental frequency. Unit: Hz,
<real2> = Fundamental absolute level. Unit: dBm,
<real3> = nth harmonic frequency. Unit: Hz,
<real4> = Absolute value level. Unit: dBm,
<real5> = Relative value level. Unit: dBc

n: Specified harmonic orders: 2 to 10

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the CCDF measurement and reading the measurement result	:MEASure:CCDF[:NUMBer{1|2|3|4|5|6}]?	--	<real1>, <real2>, <real3>, <real4>, <real5>, <real6>, <real7>, <real8>	*11
Performing the CCDF measurement and reading the Peak Factor	:MEASure:CCDF:PFACtor?	--	<real>	
Performing the CCDF measurement and reading the Average Power	:MEASure:CCDF:APOWer?	--	<real>	
Performing the CCDF measurement and reading the power ratio	:MEASure:CCDF :PRATio[:NUMBer{1|2|3|4|5|6}]?	--	<real1>, <real2>, <real3>, <real4>, <real5>, <real6>	*12

*11: When the NUMBer header is omitted <real1>, <real2>, <real3>, <real4>, <real5>, <real6>, <real7>, <real8>

<real1> = Peak Factor: Unit: dB,
<real2> = Average Power: Unit: dBm,
<real3> = 10.0 % of power ratio. Unit: dB,
<real4> = 1.0 % of power ratio. Unit: dB,
<real5> = 0.1 % of power ratio. Unit: dB,
<real6> = 0.01 % of power ratio. Unit: dB,
<real7> = 0.001 % of power ratio. Unit: dB,
<real8> = 0.0001 % of power ratio. Unit: dB

When the NUMBer header is specified <real1>, <real2>, <real3>

<real1> = Peak Factor: Unit: dB,
<real2> = Average Power: Unit: dBm,
<real3> = Specified power ratio. Unit: dB

*12: When the NUMBer header is omitted <real1>, <real2>, <real3>, <real4>, <real5>, <real6>

<real1> = 10.0 % of power ratio. Unit: dB,
<real2> = 1.0 % of power ratio. Unit: dB,
<real3> = 0.1 % of power ratio. Unit: dB,
<real4> = 0.01 % of power ratio. Unit: dB,
<real5> = 0.001 % of power ratio. Unit: dB,
<real6> = 0.0001 % of power ratio. Unit: dB

When the NUMBer header is specified <real> = Specified power ratio. Unit: dB

Function description	SCPI command	Parameter	Query reply	Remarks
Performing the Multi Average Power measurement and reading the measurement result (Trace)	:MEASure:MAPower [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*13
Performing the Multi Average Power measurement and reading the average power density (Trace)	:MEASure:MAPower:PDENsity [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*14
Performing the Multi Average Power measurement and reading Power Ratio (Trace)	:MEASure: MAPower:PRATio [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*15
Performing the Multi Average Power measurement and reading the measurement result (RMS)	:MEASure:MAPower:RMS [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*13
Performing the Multi Average Power measurement and reading the average power density (RMS)	:MEASure:MAPower:RMS:PDENsity [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*14
Performing the Multi Average Power measurement and reading Power Ratio (RMS)	:MEASure: MAPower:RMS:PRATio [:NUMBer{1|2...|9|10}]?	--	<real>[, ...]	*15

*13: When the NUMBer header is omitted:<real1> [, <real>, <real>, <real>, <real>, ..., <real>]
(All real values that indicate Average Power: Unit dBm)

<real1> = Average Power (1): Unit dBm,
[<real> = Average Power (2):Unit dBm
:
<real> = Average Power (n): Unit dBm]

n:The number of windows that are set to ON (Up to 10)

When a window number is specified by the NUMBer header:
<real1> (Real value that indicates Average Power: Unit dBm)

<real> = Average Power (m): Unit dBm

m:The specified window number

*14: When the NUMBer header is omitted: <real1> [, <real>, <real>, <real>, <real>, ..., <real>]
(All real values that indicate the average power density: Unit dBm/Hz or dBμV/√Hz)

<real1> = Average power density (1): Unit dBm/Hz or dBμV/√Hz,
[<real> = Average power density (2): Unit dBm/Hz or dBμV/√Hz
:
<real> = Average power density (n): Unit dBm/Hz or dBμV/√Hz]

n:The number of windows that are set to ON (Up to 10)

When a window number is specified by the NUMBer header:
<real1> (Real value that indicates the average power density: Unit dBm/Hz or dBμV/√Hz)

<real> = Average power density (m): Unit dBm/Hz or dBμV/√Hz]

m:The specified window number

*15: When the NUMBer header is omitted: <real1> [, <real>, <real>, <real>, <real>, ..., <real>]
(All real values that indicate Power Ratio: Unit dB)

<real1> = Power Ratio(1): Unit dB,
[<real> = Power Ratio(2): Unit dB
:
<real> = Power Ratio(n): Unit dB

n:The number of windows that are set to ON (Up to 10)

When a window number is specified by the NUMBer header:
<real1> (Real value that indicates Power Ratio: Unit dB)

<real> = Power Ratio(m): Unit dB

m:The specified window number

6.4.3.5 Subsystem-INITiate

Function description	SCPI command	Parameter	Query reply	Remarks
Continuous sweep mode ON/OFF	:INITiate:CONTinuous	OFF|ON	OFF|ON	
Starting a sweep or measurement	:INITiate[:IMMediate]	--	--	
Resetting and restarting a sweep	:INITiate:RESTart	--	--	
Stopping a sweep	:INITiate:ABORt	--	--	
Resetting and restarting a sweep, and suspending after the completion of the sweep	:INITiate:TS	--	--	

6.4.3.6 Subsystem-TRIGger

Function description	SCPI command	Parameter	Query reply	Remarks
TRIGger				
Setting the trigger	:TRIGger[:SEQuence<screen>]:SOURce	IMMediate| IF|VIDeo| EXT1|EXT2	IMM| IF|VID| EXT1|EXT2	*1
Setting the trigger polarity of each trigger source	:TRIGger[:SEQuence<screen>]:SLOPe	NEGative|POSitive	NEG|POS	
Setting the trigger level when using a Video trigger	:TRIGger[:SEQuence<screen>]:LEVel :VIDeo	<real>	<real>	
Setting the trigger level when using an EXT2 (external input terminal 2) trigger	:TRIGger[:SEQuence<screen>]:LEVel :EXTernal	<real>	<real>	
Setting the trigger level when using an IF trigger	:TRIGger[:SEQuence<screen>]:LEVel:IF	<real>	<real>	
Setting the trigger delay value	:TRIGger[:SEQuence<screen>]:DELay	<real>	<real>	
Setting ON or OFF the IF trigger monitor function	:TRIGger[:SEQuence]:IF:MONitor	OFF|ON	OFF|ON	

*1: IMMediate: Free-run mode without trigger setting
IF: IF trigger
VIDeo: Video trigger
EXT1: EXT1 input signal trigger
EXT2: EXT2 input signal trigger

6.4.3.7 Subsystem-DISPlay

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the display of the information data for the Cursor ON/ OFF	:DISPlay:ANNotation:CURSor	OFF|ON	OFF|ON	
Setting the date display ON/OFF	:DISPlay:ANNotation:DATE	OFF|ON	OFF|ON	
Setting the date display type	:DISPlay:ANNotation:DATE:FORMat	MDY|DMY|YMD	MDY|DMY|YMD	
Setting the display of the information data for the Display Line ON/OFF	:DISPlay:ANNotation:DLINe	OFF|ON	OFF|ON	
Setting the display of the ADVANTEST logo ON/OFF	:DISPlay:ANNotation:LOGO	OFF|ON	OFF|ON	
Setting the display of the information data for Reference Line ON/OFF	:DISPlay:ANNotation:RLINe	OFF|ON	OFF|ON	
Setting the screen title	:DISPlay:ANNotation:TITLe	<str>	<str>	
Setting the display of the information data for the measuring window ON/OFF	:DISPlay:ANNotation:WINDow	OFF|ON	OFF|ON	
Setting the TG information data display to ON or OFF	:DISPlay:ANNotation:TG	OFF|ON	OFF|ON	*1
WINDow				
Specifying the active screen when the waveform zoom function is turned on	:DISPlay[:WINDow<screen>]:ACTive	--	1|2	
Selecting the active trace	:DISPlay[:WINDow<screen>] :TRACe[:NUMBer{1|2|3|4}]:ACTive	--	1|2|3|4	
Setting the display mode of the specified trace	:DISPlay[:WINDow<screen>] :TRACe[:NUMBer{1|2|3|4}]:MODE	WRITe| VIEW| BLANk| MAXHold| MINHold| AVERage	WRIT| VIEW| BLAN| MAXH| MINH| AVER	
Setting the trace normalize function ON/ OFF	:DISPlay[:WINDow<screen>]:TRACe [:NUMBer{1|2|3|4}]:NCORrection:STATe	OFF|ON	OFF|ON	
Storing the reference waveform data to be used for the trace normalize function	:DISPlay[:WINDow<screen>]:TRACe [:NUMBer{1|2|3|4}]:NCORrection:STORe	--	--	
Setting the two screen display mode ON/ OFF	:DISPlay:TRACe:SPLit	OFF|ON	OFF|ON	
Storing the waveform data of trace 1 or 2	:DISPlay[:WINDow<screen>]:TRACe [:NUMBer{1|2}]:STORe	--	--	
Calculating trace waveforms Trace2 - Trace1 → Trace2 or Trace4 - Trace3 → Trace4	:DISPlay[:WINDow<screen>]:TRACe [:NUMBer{1|2|3|4}]:MATHematics:STATe	OFF|ON	OFF|ON	
Setting the artificial analog display mode ON/OFF	:DISPlay[:WINDow<screen>]:TRACe :AANalog:STATe	OFF|ON	OFF|ON	

*1: This function is enabled when the OPT79 is included.

Function description	SCPI command	Parameter	Query reply	Remarks
Selecting the waveform zoom function and releases the zoom function	:DISPlay:TRACe:X[:SCALe]:ZOOM :MODE	OFF|ZMFF| ZMTT|ZMFT	OFF|ZMFF| ZMTT|ZMFT	*2
Specifying the zoom frequency when the waveform zoom function is turned on	:DISPlay:TRACe:X[SCALe]:ZOOM :FREQuency:CENTer	<real>	<real>	
Specifying the zoom width when the waveform zoom function is turned on	:DISPlay:TRACe:X[SCALe]:ZOOM :FREQuency:SPAN	<real>	<real>	
Specifying the zoom time position when the waveform zoom function is turned on	:DISPlay:TRACe:X[SCALe]:ZOOM :TIME:DELay	<real>	<real>	
Specifying the zoom time width when the waveform zoom function is turned on	:DISPlay:TRACe:X[SCALe]:ZOOM :TIME:WIDTh	<real>	<real>	
Setting the reference level	:DISPlay[:WINDow<screen>]:TRACe :Y[:SCALe]:RLEVel	<real>	<real>	
Setting the Offset value to the reference level value	:DISPlay[:WINDow<screen>]:TRACe :Y[:SCALe]:RLEVel:OFFSet	<real>	<real>	
Setting the Offset value to the reference level value ON/OFF	:DISPlay[:WINDow<screen>]:TRACe :Y[:SCALe]:RLEVel:OFFSet:STATe	OFF|ON	OFF|ON	
Setting the value of one division when the log scale is displayed	:DISPlay[:WINDow<screen>]:TRACe :Y[:SCALe]:PDIVision	<real>	<real>	
Setting the type of the vertical scale	:DISPlay[:WINDow<screen>]:TRACe :Y[:SCALe]:SPACing	LOGarithmic| LINear	LOG|LIN	
Setting the reference waveform display in the CCDF measurement to ON or OFF	:DISPlay:TRACe:CCDF:STATe	OFF|ON	OFF|ON	
Setting the ideal gaussian noise in the CCDF measurement to ON or OFF	:DISPlay:TRACe:CCDF:GAUSsian:STATe	OFF|ON	OFF|ON	
Setting the maximum horizontal axis value for the waveform display in the CCDF measurement	:DISPlay:TRACe:X[:SCALe]:CCDF	<real>	<real>	

*2: OFF: Cancels the zoom state
ZMFF: Change to the zoom state (frequency axis to frequency axis)
ZMTT: Change to the zoom state (time axis to time axis)
ZMFT: Change to the zoom state (frequency axis to time axis)

6.4.3.8 Subsystem-TRACe

Function description	SCPI command	Parameter	Query reply	Remarks
Outputting the trace data	:TRACe[:DATA<screen>]?	TRACE1| TRACE2| TRACE3| TRACE4	<block> or <ASCII group>	*1

*1: The output data format is determined by the :FORMat:TRACe[:DATA] command and the :FORMat:BORDer command.

6.4.3.9 Subsystem-FORMat

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the output byte order of the trace data	:FORMat:BORDer	NORMal| SWAPped	NORM|SWAP	
Setting the output format of the trace data	:FORMat:TRACe[:DATA]	<type>, <int>	<type>, <int>	*1

*1: [Parameter]
<type> = { REAL | ASCii }
REAL: Selects Binary block format
ASCii: Selects ASCII fort

<int> = { 32 | 64 } If REAL is selected
{ 8|9|10| ... |21|22 } If ASCii is selected

[Query reply]
{ REAL | ASC }, { { 32 | 64 } | { 8 | 9 | 10 | ... | 21 | 22 } }
{ 32 | 64 } If REAL is selected
{ 8|9|10| ... |21|22 } If ASCii is selected

6.4.3.10 Subsystem-CALibration

Function description	SCPI command	Parameter	Query reply	Remarks
Executing the calibration by using the external CAL signal (including RF ATT)	:CALibration:SANalyzer	--	--	
Executing the calibration by using the internal CAL signal (excluding RF ATT)	:CALibration:SANalyzer :ATTenuation:NONE	--	--	
Setting the external CAL signal to ON or OFF	:CALibration:SIGNal:STATe	OFF|ON	OFF|ON	
Setting the external CAL signal level	:CALibration:SIGNal:LEVel	<real>	<real>	
TG level calibration	:CALibration:TG	--	--	*1

*1: This function is enabled when the OPT79 is included.

6.4.3.11 Subsystem-MMEMory

Function description	SCPI command	Parameter	Query reply	Remarks
Specifying the device used when executing the SAVE and LOAD functions.	:MMEMory:DEVice	C|D|E	C|D|E	*1
Executing the SAVE function used to save the settings of this instrument	:MMEMory:STORe:STATe	<int>	--	*2
Executing of the LOAD function used to load the settings of this instrument	:MMEMory:LOAD:STATe	<int>	--	*2
Setting the Save conditions of the setting parameters	:MMEMory:SELect:ITEM:SETup	OFF|ON	OFF|ON	
Setting the Save conditions of the trace data	:MMEMory:SELect:ITEM:TRACe	OFF|ON	OFF|ON	
Setting the Save conditions of the correction data for the Normalize function	:MMEMory:SELect:ITEM:NCORrection	OFF|ON	OFF|ON	
Setting the Save conditions of the limit line data for the limit line function	:MMEMory:SELect:ITEM:LIMit	OFF|ON	OFF|ON	
Setting the Save conditions of the level correction data for the input level correction function	:MMEMory:SELect:ITEM:CORRection	OFF|ON	OFF|ON	
Setting the Save conditions of the setting parameters for the Spurious measurement function	:MMEMory:SELect:ITEM:SPURious	OFF|ON	OFF|ON	
Setting the Save conditions of the setting parameters for the Spectrum Emission Mask measurement function	:MMEMory:SELect:ITEM:SEMask	OFF|ON	OFF|ON	

*1: The following devices are specified depending on the parameter:
C C:\MyData\SVRCL
D D:\ADVANTEST
E E:\ADVANTEST

*2: A number, which is a maximum of 4-digit and is added to the file name of the data to be saved or loaded, must be specified in <int>.

6.4.3.12 Subsystem-CALCulate

MEMO:

The following notations are used for convenience within the Calculate subsystem.

<mkr>: Written in the command header and indicates the active marker number of the command. The marker number ranges from 1 to 10. An equivalent notation is {1\|2\|3\|4\|5\|6\|7\|8\|9\|10}.

<area>: Written in the command header and indicates the active area number of the command. The area number ranges from 1 to 10. An equivalent notation is {1\|2\|3\|4\|5\|6\|7\|8\|9\|10}.

Function description	SCPI command	Parameter	Query reply	Remarks
Specifying an operation target marker (active marker) among the multimarkers	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:ACTive	--	<int>	
Setting ON or OFF marker functions	:CALCulate:MARKer<screen> :FUNCtion[:STATe]	OFF|ON	OFF|ON	
Setting ON or OFF the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>][:STATe]	OFF|ON	OFF|ON	
Specifying a frequency position and a time position of the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:X	<real>	<real>	
Reading the absolute values (frequency and time) of the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:X:ABSolute?	--	<real>	
Reading the absolute level value of the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:Y:ABSolute?	--	<real>	
Reading the level value of the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:Y?	--	<real>	
Searching for the maximum peak point using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum[:PEAK]	--	--	
Searching for the next peak using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum:NEXT	--	--	
Searching for the next peak in the left direction using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum:LEFT	--	--	
Searching for the next peak in the right direction using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum:RIGHt	--	--	
Searching for the minimum peak using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MINimum[:PEAK]	--	--	
Searching for the next minimum peak using the specified multimarker	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MINimum:NEXT	--	--	
Moving the specified marker to the specified trace	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:TRACe	<int>	<int>	
Setting all the markers except marker No. 1 off	:CALCulate:MARKer<screen>:RESet	--	--	
Displaying the marker list of the markers displayed	:CALCulate:MARKer<screen> :LIST[:STATe]	OFF|ON	OFF|ON	

Function description	SCPI command	Parameter	Query reply	Remarks
Searching for the peak points and displaying a marker list	:CALCulate:MARKer<screen> :MAXimum:LIST	FREQuency|LEVel	--	
Setting ON or OFF the continuous peak point search mode	:CALCulate:MARKer<screen> :MAXimum:CONTinuous	OFF|ON	OFF|ON	
Specifying a deviation for peak point judgment at the time of peak point search	:CALCulate:MARKer<screen> :MAXimum:DELTa	<real>	<real>	
Setting a marker step size	:CALCulate:MARKer<screen>:STEP	<real>	<real>	
Setting a marker step size mode	:CALCulate:MARKer<screen> :STEP:AUTO	OFF|ON	OFF|ON	
Setting a peak search range specification mode on the horizontal axis	:CALCulate:MARKer<screen> :SEARch:X:MODE	ALL|INNer|OUTer	ALL|INN|OUT	
Specifying the reference position of the peak search range on the horizontal axis	:CALCulate:MARKer<screen> :SEARch:X:POSition	<real>	<real>	
Specifying a search width from the reference position of the peak search range on the horizontal axis	:CALCulate:MARKer<screen> :SEARch:X:WIDTh	<real>	<real>	
Setting a move mode of the peak search range on the horizontal axis	:CALCulate:MARKer<screen> :SEARch:X:COUPling	OFF|ON	OFF|ON	
Setting a peak search range specification mode on the vertical axis	:CALCulate:MARKer<screen> :SEARch:Y:MODE	ALL|DLINe|LLINe	ALL|DLIN|LLIN	
Specifying the peak search range with Display Line used as the reference	:CALCulate:MARKer<screen> :SEARch:Y:DLINe	ABOVe|BELow	ABOV|BEL	
Specifying the peak search range with Limit Line1 used as the reference	:CALCulate:MARKer<screen> :SEARch:Y:LUPPer	ABOVe|BELow	ABOV|BEL	
Specifying the peak search range with Limit Line2 used as the reference	:CALCulate:MARKer<screen> :SEARch:Y:LLOWer	ABOVe|BELow	ABOV|BEL	
Setting ON or OFF the display of the marker frame for the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>	OFF|ON	OFF|ON	
Executing peak search in all marker frames by the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>:MAXimum:PEAK	--	--	
Reading the peak value in all marker frames by the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>:MAXimum:LIST?	--	[<int1>, <real1>, <real2>][, ...]	*1

*1: [<int1>, <real1>, <real2>][, <int>, <real>, <real>][, <int>, <real>, <real>][, ...]
[<int1> = Marker frame number (1): 1,
<real1> = Frequency (1): The maximum frequency in marker frame 1. Unit: Hz,
<real2> = Level (1): The maximum level in marker frame 1. Unit: dBm]
[,
<int> = Marker frame number (2): 2,
<real> = Frequency (2): The maximum frequency in marker frame 2. Unit: Hz,
<real> = Level (2): The maximum level in marker frame 2. Unit: dBm]
[, ...]
[,
<int> = Marker frame number (10): 10,
<real> = Frequency (10): The maximum frequency in marker frame 10. Unit: Hz,
<real> = Level (10): The maximum level in marker frame 10. Unit: dBm]

6.4.3 List of Commands

Function description	SCPI command	Parameter	Query reply	Remarks
Specifying a position on the horizontal axis in the marker frame by the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>:X:POSition	<real>	<real>	
Specifying the width of the marker frame on the horizontal axis by the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>:X:WIDTh	<real>	<real>	
Setting the specified marker frame and the vertical axis search range mode of the Multi Inner Search function	:CALCulate:MARKer<screen> :MINNer<area>:Y	OFF|ON	OFF|ON	
Specifying the lower position of the vertical axis of the marker frame	:CALCulate:MARKer<screen> :MINNer<area>:Y:LOWer	<real>	<real>	
Specifying the upper position of the vertical axis of the marker frame	:CALCulate:MARKer<screen> :MINNer<area>:Y:UPPer	<real>	<real>	
Setting the marker frequency as the center frequency	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:SET:CENTer	--	--	
Setting the marker level value as the reference level	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:SET:RLEVel	--	--	
Setting the marker frequency as the center frequency step size	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:SET:CENTer:STEP	--	--	
Setting the marker frequency as the marker frequency step size	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:SET:MARKer:STEP	--	--	
Setting the marker frequency as the center frequency after peak search is performed	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum:SET:CENTer	--	--	
Setting the marker level value as the reference level after peak search is performed	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:MAXimum:SET:RLEVel	--	--	
Setting the delta marker frequency as the center frequency	:CALCulate:DELTamarker<screen> [:NUMBer<mkr>]:SET:CENTer	--	--	
Setting the delta marker frequency as the span frequency	:CALCulate:DELTamarker<screen> [:NUMBer<mkr>]:SET:SPAN	--	--	
Setting the delta marker frequency as the center frequency step size	:CALCulate:DELTamarker<screen> [:NUMBer<mkr>]:SET:CENTer:STEP	--	--	
Setting the delta marker frequency as the marker step size	:CALCulate:DELTamarker<screen> [:NUMBer<mkr>]:MARKer:STEP	--	--	
Setting ON or OFF the display of the delta marker	:CALCulate:DELTamarker<screen> [:STATe]	OFF|ON	OFF|ON	
Setting ON or OFF the display of the fixed delta marker	:CALCulate:DELTamarker<screen> :FIXed[:STATe]	OFF|ON	OFF|ON	
Searching for the peak and setting a fixed marker	:CALCulate:DELTamarker<screen> :FIXed:MAXimum[:PEAK]	--	--	
Setting ON or OFF the display of the (1/ delta) marker	:CALCulate:DELTamarker<screen> :INVerse[:STATe]	OFF|ON	OFF|ON	
Reading the frequency value of the delta marker	:CALCulate:DELTamarker<screen>:X?	--	<real>	
Reading the level value of the delta marker	:CALCulate:DELTamarker<screen>:Y?	--	<real>	

Function description	SCPI command	Parameter	Query reply	Remarks
Specifying a reference for the relative value display of the marker	:CALCulate:MARKer<screen>:ROBJect	DELTamarker| ANCHor| LIM1|LIM2| DLINe|RLINe| TRA1|TRA2| TRA3|TRA4| OSCReen| NREFerence	DELT| ANCH| LIM1|LIM2| DLIN|RLIN| TRA1|TRA2| TRA3|TRA4| OSCR| NREF	
Setting ON or OFF the marker counter function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]FCOunt[:STATe]	OFF|ON	OFF|ON	
Reading the results of marker counter operation	:CALCulate:MARKer<screen> [:NUMBer<mkr>]FCOunt:FREQuency?	--	<real>	
Setting ON or OFF the Signal Tracking function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:STRack[:STATe]	OFF|ON	OFF|ON	
Executing the X dB Down function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:XDBDown	--	--	
Executing the X dB Down LEFT function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:XDBDown :LEFT	--	--	
Executing the X dB Down RIGHT function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:XDBDown :RIGHt	--	--	
Setting the Down width of the X dB Down function	:CALCulate:MARKer<screen> :FUNCtion:XDBDown:LEVel	<real>	<real>	
Executing the X dB Down function after peak search	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:XDBDown :PEAK	--	--	
Selecting a display mode after execution of the X dB Down function	:CALCulate:MARKer<screen> :FUNCtion:XDBDown:MODE	RELative| ABSLeft| ABSRight	REL| ABSL| ABSR	
Setting ON or OFF the continuous X dB Down function	:CALCulate:MARKer<screen> :FUNCtion:XDBDown :CONTinuous[:STATe]	OFF|ON	OFF|ON	
Setting ON or OFF the display of the reference marker when the X dB Down function is executed	:CALCulate:MARKer<screen> :FUNCtion:XDBDown:RMARker[:STATe]	OFF|ON	OFF|ON	
Setting a bandwidth for noise calculation in Noise/Hz measurement	:CALCulate:MARKer<screen> :FUNCtion:NOISe:BWIDth	<real>	<real>	
Setting ON or OFF the Noise/Hz function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:NOISe :STATe	OFF|ON	OFF|ON	
Selecting an operation mode for Noise/Hz function	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:NOISe :MODE	DBM|DBUV| DBC	DBM|DBUV| DBC	
Reading the results of noise power measurement	:CALCulate:MARKer<screen> :FUNCtion:NOISe?	--	<real>	
Reading the results of % AM measurement	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:AM?	--	<real>	
Setting ON or OFF the %AM measurement	:CALCulate:MARKer<screen> [:NUMBer<mkr>]:FUNCtion:AM:STATe	OFF|ON	OFF|ON	

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the display position of the display line	:CALCulate:DLINe<screen>	<real>	<real>	
Setting ON or OFF the display of the display line	:CALCulate:DLINe<screen>:STATe	OFF|ON	OFF|ON	
Setting the display position of the reference line	:CALCulate:RLINe<screen>	<real>	<real>	
Setting ON or OFF the display of the reference line	:CALCulate:RLINe<screen>:STATe	OFF|ON	OFF|ON	
Automatically adjusting the level position of the limit line	:CALCulate:LIMit<screen>:AUTO	--	--	
Selecting the domain of the limit line to be used	:CALCulate:LIMit<screen> :CONTrol:X:DOMain	FREQuency| TIME	FREQ| TIME	
Selecting horizontal axis data attributes of the limit line to be used	:CALCulate:LIMit<screen> :CONTrol:X:MODE	ABSolute| RELative	ABS| REL	
Specifying the reference position when the horizontal axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:X:REFerence	CENTer|LEFT| USER	CENT|LEFT| USER	
Setting the user-defined reference position when the horizontal axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:X:USER	<real>	<real>	
Setting the offset value when the horizontal axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:X:OFFSet	<real>	<real>	
Selecting vertical axis data attributes of the limit line to be used	:CALCulate:LIMit<screen> :CONTrol:Y:MODE	ABSolute| RELative	ABS| REL	
Specifying the reference position when the vertical axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:Y:REFerence	TOP|BOTTom| USER	TOP|BOTT| USER	
Setting the offset value when the vertical axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:Y:USER	<real>	<real>	
Setting the offset value when the vertical axis relative value attributes of the limit line to be used are selected	:CALCulate:LIMit<screen> :CONTrol:Y:OFFSet	<real>	<real>	
Reading the Pass/Fail judgment by the limit line	:CALCulate:LIMit<screen>:FAIL?	--	PASS|FAIL	
Copying the data for limit line 1 to limit line 2 or Copies the data for limit line 2 to limit line 1	:CALCulate:LIMit<screen> {:UPPer|:LOWer}:COPY	--	--	
Inputting data to limit line 1 or 2	:CALCulate:LIMit<screen> {:UPPer|:LOWer}:DATA	<real1>,<real2>	--	*1
Deleting the data from Limit Line Table 1 or 2	:CALCulate:LIMit<screen> {:UPPer|:LOWer}:DELete	--	--	
Setting the judgment condition for Pass/Fail judgment by Limit Line Table 1 or 2	:CALCulate:LIMit<screen> {:UPPer|:LOWer}:PASS	ABOVe|BELow	ABOV|BEL	
Setting ON or OFF the display of limit line 1 or 2	:CALCulate:LIMit<screen> {:UPPer|:LOWer}:STATe	OFF|ON	OFF|ON	

*1: <real1> = Frequency or time
<real2> = Level

Function description	SCPI command	Parameter	Query reply	Remarks
Setting ON or OFF the Pass/Fail judgment by the limit line	:CALCulate:LIMit<screen>:STATe	OFF|ON	OFF|ON	
Setting the position of the Measurement Window	:CALCulate:WINDow<screen>:POSition	<real>	<real>	
Setting the width of the Measurement Window	:CALCulate:WINDow<screen>:WIDTh	<real>	<real>	
Setting ON or OFF the display of the Measurement Window	:CALCulate:WINDow<screen>:STATe	OFF|ON	OFF|ON	
Setting ON or OFF the anchor function of the X and Y cursors	:CALCulate:CURSor<screen>:ANCHor	OFF|ON	OFF|ON	
Setting the display position of the X cursor when X and Y cursors are displayed	:CALCulate:CURSor<screen>:X	<real>	<real>	
Setting the display position of the Y cursor when X and Y cursors are displayed	:CALCulate:CURSor<screen>:Y	<real>	<real>	
Setting ON or OFF the display of the X and Y cursors	:CALCulate:CURSor<screen>:STATe	OFF|ON	OFF|ON	

6.4.3.13 Subsystem-UNIT

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the level unit system	:UNIT:POWer<screen>	DBM|DBMV| DBUV|DBUE| DBPW|VOLT| WATT	DBM|DBMV| DBUV|DBUE| DBPW|VOLT| WATT	

6.4.3.14 Subsystem-SYSTem

Function description	SCPI command	Parameter	Query reply	Remarks
Initialization of the current measurement systems	:SYSTem:PRESet	--	--	
Initialization of all measurement systems	:SYSTem:PRESet:ALL	--	--	
Selecting of a measurement system	:SYSTem:SELect	SANalyzer| TXTester	SAN|TXT	
Setting the measurement standard	:SYSTem:SELect:STANdard	<str1>,<str2>	<str1>,<str2>	*1
Last error inquiry	:SYSTem:ERRor?	--	<int>, <str>	*2
Error log contents inquiry	:SYSTem:ERRor:ALL?	--	<int>, <str>	*2
Inquiring about options of this instrument	:SYSTem:OPTions?	--	<str>[,...]	

*1 <str1> = Type (standard name)
<str2> = Meas Mode (band name)
*2: Returns an error number to <int> and an error message string to <str>.

6.4.3.15 Subsystem-OUTPut

Function description	SCPI command	Parameter	Query reply	Remarks
Setting ON or OFF the TG function	:OUTPut[:STATe]	OFF|ON	OFF|ON	*1

*1: This function is enabled when the OPT79 is included.

6.4.3.16 Subsystem-SOURce

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the TG output level	:SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]	<real>	<real>	*1
Setting the level correction function to ON or OFF	:SOURce:CORRection[:STATe]	OFF|ON	OFF|ON	*1

*1: This function is enabled when the OPT79 is included.

6.4.3.17 Subsystem-DIAGnostic

Function description	SCPI command	Parameter	Query reply	Remarks
Reading the Power on DIAG result	:DIAGnostic:PON?	--	PASS|FAIL	
Executing Self-Test and reading the result	:DIAGnostic:SELFtest?	--	PASS|FAIL	

6.4.3.18 Subsystem-STATus

Function description	SCPI command	Parameter	Query reply	Remarks
Setting the standard operation enable register to Enable	:STATus:OPERation:ENABle	<int>	<int>	
Reading of the standard operation event register	:STATus:OPERation:EVENt?	--	<int>	
Setting the questionable enable register to Enable	:STATus:QUEStionable:ENABle	<int>	<int>	
Reading of the questionable event register	:STATus:QUEStionable:EVENt?	--	<int>	
Setting the measuring enable register to Enable	:STATus:OPERation:MEASure:ENABle	<int>	<int>	
Reading of the measuring event register	:STATus:OPERation:MEASure:EVENt?	--	<int>	

6.4.3.19 Subsystem-HCOPy

Function description	SCPI command	Parameter	Query reply	Remarks
Outputting a copy to a file or a printer	:HCOPy[:IMMediate]	--	--	
Specifying the output destination	:HCOPy:DESTination	PRINt|C|D|E	PRIN|C|D|E	
Specifying the output file number	:HCOPy:MMEMory:FILE:NUMBer	<int>	<int>	
Specifying the output file type	:HCOPy:MMEMory:FILE:TYPE	BITMap| PNGraphic	BITM|PNG	
Setting whether to output the menu	:HCOPy:ITEM:MENU:STATe	OFF|ON	OFF|ON	

7. SPECIFICATIONS

This chapter describes the specifications of this instrument.

The performance of this instrument is guaranteed under the following conditions unless otherwise specified.

- The specified calibration period must be adhered to.
- After turning on the power and warming-up for 5 minutes or more under the specified environmental conditions.
- After automatic calibration has been performed.

Reference data is provided to help you use the product efficiently, but it will not guarantee the performance of this instrument. The data is described by using the following notation.

Specifications (spec.):	Indicates the specifications within which the performance of the product can be guaranteed. Includes variations in the performance of each product, uncertainty in calibrations, and changes in performance due to the environment.
Typical value (typ.):	Indicates the average performance of the product. Excludes variations in the performance of each product, uncertainty in measurements, and changes in performance due to the environment.
Nominal value (nom.):	Indicates the general performance of the product and does not refer to the guaranteed performance.

7.1 R3477 Performance Specifications

7.1.1 Frequency

<table>
<tr><th>Description</th><th>Specifications</th></tr>
<tr><td>Frequency range
Spectrum analysis mode</td><td>9 kHz to 13.5 GHz
<table>
<tr><th>Frequency Range</th><th>Frequency Band</th><th>Harmonic Mixing mode (N)</th></tr>
<tr><td>9 kHz to 3.3 GHz</td><td>0</td><td>1-</td></tr>
<tr><td>3.2 GHz to 7.5 GHz</td><td>1</td><td>1-</td></tr>
<tr><td>7.4 GHz to 13.5 GHz</td><td>2</td><td>2-</td></tr>
<tr><td colspan="3">The built-in YIG tuned pre-selector is used in bands 1 and 2.</td></tr>
</table></td></tr>
<tr><td>Modulation analysis mode
(When the modulation analysis option is set)</td><td>20 MHz to 3.3 GHz
<table>
<tr><th>Frequency Range</th><th>Frequency Band</th><th>Harmonic Mixing mode (N)</th></tr>
<tr><td>20 MHz to 3.3 GHz</td><td>0</td><td>1-</td></tr>
</table></td></tr>
<tr><td>Built-in preamp
(Only in band 0)</td><td>100 kHz to 3.3 GHz Gain 20 dB (Typ.)</td></tr>
<tr><td>Input coupling</td><td>DC</td></tr>
<tr><td>Internal frequency reference stability
Aging rate
Temperature stability

Warm-up (nom.)</td><td>
$\pm 5 \times 10^{-8}$/ day, $\pm 5 \times 10^{-7}$/ year
$\pm 1 \times 10^{-7}$ (Temperature range: 0 °C to 50 °C, Relative to the frequency at 25 °C)
$\pm 5 \times 10^{-7}$/minute</td></tr>
<tr><td>Marker frequency counter
Accuracy
Resolution</td><td>(S/N > 50 dB)
± (Marker frequency × Frequency reference error + Residual FM)
0.01 Hz</td></tr>
<tr><td>Frequency reading accuracy</td><td>(Resolution bandwidth 1 Hz to 3 MHz)
± (Frequency reading × Frequency reference error + span × span accuracy + resolution bandwidth × 0.1 + residual FM)</td></tr>
<tr><td>Frequency stability
Residual FM</td><td>
(When the internal frequency reference is used and OPT23 is excluded installed.)
≤ (3 Hz × N) p-p/100 ms
(When the internal frequency reference is used and OPT23 is installed.)
≤ (12 Hz × Measurement frequency/10^9) p-p/100 ms</td></tr>
<tr><td>Frequency span
Range
Accuracy</td><td>
20 Hz to 13.5 GHz, 0 Hz (Zero span)
± 1% (200 Hz ≤ Span)
± 1 × N% (20 Hz ≤ Span < 200 Hz)</td></tr>
</table>

<table>
<tr><th>Description</th><th>Specifications</th></tr>
<tr><td>Signal purity
(IF Shift Normal, When the internal frequency reference is used.)</td><td>At 1 GHz input
<table>
<tr><th>Offset</th><th>20°C to 30°C</th><th>0°C to 50°C</th></tr>
<tr><td>1 kHz</td><td>< -91 dBc/Hz
-95 dBc/Hz (Typ.)</td><td>< -90 dBc/Hz</td></tr>
<tr><td>10 kHz</td><td>< -99 dBc/Hz
-102 dBc/Hz (Typ.)</td><td>< -98 dBc/Hz</td></tr>
<tr><td>100 kHz</td><td>< -111 dBc/Hz
-115 dBc/Hz (Typ.)</td><td>< -110 dBc/Hz</td></tr>
<tr><td>1 MHz</td><td>< -133 dBc/Hz
-137 dBc/Hz (Typ.)</td><td>< -132 dBc/Hz</td></tr>
<tr><td>5 MHz</td><td></td><td>-150 dBc/Hz (nom.)</td></tr>
</table></td></tr>
<tr><td>Resolution bandwidth (RBW)
Range
Accuracy

Selectivity (60 dB/ 3 dB)</td><td>
1 Hz to 10 MHz (1 and 3 sequence)
± 3% : Resolution bandwidth 1 Hz to 300 kHz
± 7% : Resolution bandwidth 1 MHz to 3 MHz
± 20% : Resolution bandwidth 10 MHz
< 6:1 (5:1, typ.)</td></tr>
<tr><td>Video bandwidth (VBW)
Range</td><td>
1 Hz to 10 MHz (1 and 3 sequence)</td></tr>
</table>

7.1.2 Sweep

Description	Specifications
Sweep	
Sweep time setting range	
Zero span	1 µs to 6000 s
Span> 0 Hz	2 ms to 2000 s
Sweep time accuracy	± 2%
Sweep mode	Continuous, Single
Trigger function	
Trigger source	Free Run, Video, IF, External 1 (TTL level), External 2 (0 to 5 V, resolution: 20 mV)
Trigger delay setting range (Zero span)	-(Sweep Time) to +1 s
Resolution	100 ns

7.1.3 Amplitude

Description	Specifications
Amplitude measurement range	
Preamp off	+30 dBm to displayed average noise level
Preamp on	+30 dBm to displayed average noise level (Only in band 0)
Maximum safe input level	
Average continuous power	
Preamp off	+30 dBm (Input attenuator ≥ 10 dB)
Preamp on	+13 dBm (Input attenuator ≥ 10 dB)
DC voltage	0 V (Do not apply a DC voltage to the signal.)
Input attenuator range	0 to 75 dB, 5 dB step
Display range	10 div. fixed
Log scale	0.1 dB to 1 dB/div., 0.1 dB steps 1 dB to 20 dB/div., 1 dB steps
Linear scale	10%/div. of the reference level
Scale Unit	dBm, dBmV, dBµV, dBµVemf, dBpW, W, V
Reference level setting range	
Preamp off	
Log scale	-170 dBm to +60 dBm, 0.01 dB steps
Linear scale	707.1 pV to 223.6 V, approx. 1% steps
Preamp on	
Log scale	-170 dBm to +30 dBm, 0.01 dB steps
Linear scale	707.1 pV to 7.071 V, approx. 1% steps
Trace	A maximum of 4
Detector mode	Normal, Positive Peak, Negative Peak, Sample, Average (RMS, Video, Voltage)

7.1.4 Amplitude Accuracy

<table>
<tr><th>Description</th><th>Specifications</th></tr>
<tr><td>Calibration signal accuracy (50 MHz)
Amplitude
Accuracy</td><td>-10 dBm
± 0.2 dB (20°C to 30°C), ± 0.3 dB (0°C to 50°C)</td></tr>
<tr><td>Frequency response
Spectrum analysis mode
Preamp off

Preamp on</td><td>(After performing the automatic calibration, Measured relative to the level at 50 MHz, Input attenuator: 10 dB, IF Shift Normal, After tuning the pre-selector peak)
<table>
<tr><th rowspan="2">Frequency</th><th colspan="2">Temperature range</th><th rowspan="2">In-band flatness</th></tr>
<tr><th>20°C to 30°C</th><th>0°C to 50°C</th></tr>
<tr><td>50 MHz to 2.5 GHz
(Input filter OFF)</td><td>< ±0.4 dB</td><td>< ±0.9 dB</td><td>-</td></tr>
<tr><td>9 kHz to 3.3 GHz</td><td>< ±1.0 dB</td><td>< ±1.5 dB</td><td>-</td></tr>
<tr><td>3.3 GHz to 7.5 GHz</td><td>< ±1.5 dB</td><td>< ±3.5 dB</td><td>< ±1.5 dB</td></tr>
<tr><td>7.5 GHz to 13.5 GHz</td><td>< ±2.0 dB</td><td>< ±4.0 dB</td><td>< ±2.0 dB</td></tr>
</table>
<table>
<tr><th rowspan="2">Frequency</th><th colspan="2">Temperature range</th></tr>
<tr><th>20°C to 30°C</th><th>0°C to 50°C</th></tr>
<tr><td>50 MHz to 2.5 GHz</td><td>< ±1.0 dB</td><td>< ±1.5 dB</td></tr>
<tr><td>100 kHz to 3.3 GHz</td><td>< ±2.0 dB</td><td>< ±2.5 dB</td></tr>
</table></td></tr>
<tr><td>Input attenuator switching error</td><td>(Attenuator: 10 dB reference)
<table>
<tr><th>Frequency range</th><th>Switching error</th></tr>
<tr><td>9 kHz to 8 GHz</td><td>< ±1.2 dB (5 dB to 50 dB)
< ±1.8 dB (55 dB to 75 dB)</td></tr>
<tr><td>8 GHz to 13.5 GHz</td><td>< ±1.4 dB (5 dB to 50 dB)
< ±2.3 dB (55 dB to 75 dB)</td></tr>
</table></td></tr>
<tr><td>Scale display error</td><td>(Relative to the mixer input level of -20 dBm, Mixer input level: -10 dBm to -50 dBm, temperature range 20°C to 30°C)
< ±0.13 dB</td></tr>
<tr><td>Resolution bandwidth switching error</td><td>(Relative to the resolution bandwidth of 300 kHz, after autocalibration, 10 dB/div. or less)
< ±0.05 dB (1 Hz to 3 MHz)
< ±0.3 dB (10 MHz)</td></tr>
<tr><td>Total level accuracy</td><td>(After performing the automatic calibration, Signal level: -10 dBm to -50 dBm, Preamp Off, Input attenuator: 10dB, RBW: 300 kHz, Temperature 20°C to 30°C)
< ± (0.2 dB + frequency response + scale display error)</td></tr>
</table>

7.1.5 Dynamic Range

Description	Specifications
Displayed average noise level	(Input connector is terminated, Input attenuator: 0 dB, RBW is normalized to 1 Hz, VBW: 1 Hz, Detector: Sample, Averaging: 20 times or more, Average type: Video, Temperature range: 20 °C to 30 °C) (2 dB is added to the specification in the temperature range of 0 °C to -50°C.)

Spectrum analysis mode

Preamp off

Frequency	Specification	Typical value
10 kHz	< -125 dBm	-133 dBm
100 kHz	< -135 dBm	-143 dBm
1 MHz	< -145 dBm	-153 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 3.3 GHz	< -148 dBm	-150 dBm
3.3 GHz to 7.5 GHz	< -146 dBm	-149 dBm
7.5 GHz to 13.5 GHz	< -146 dBm	-149 dBm

Preamp on

Frequency	Specification	Typical value
100 kHz	< -140 dBm	-155 dBm
1 MHz	< -150 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 3.3 GHz	< -156 dBm	-162 dBm

Description	Specifications
1 dB Gain compression (Two-tone signal)	(Separation: RBW × 15, 50 kHz min.)

Input frequency	Specification	Typical value
50 MHz to 200 MHz	> +2 dBm	+5 dBm
200 MHz to 3.3 GHz	> +6 dBm	+9 dBm
3.3 GHz to 7.5 GHz	> -5 dBm	-2 dBm
7.5 GHz to 13.5 GHz	> -3 dBm	+0 dBm

<table>
<tr><th>Description</th><th>Specifications</th></tr>
<tr><td>Second harmonic distortion</td><td>
<table>
<tr><th>Input frequency</th><th>Specification (SHI)</th><th>Mixer level</th></tr>
<tr><td>50 MHz to 1.65 GHz</td><td>< -60 dBc (+40 dBm)</td><td>-20 dBm</td></tr>
<tr><td>720 MHz to 958 MHz
(Input filter ON)</td><td>< -100 dBc (+90 dBm)</td><td>-10 dBm</td></tr>
<tr><td>> 1.65 GHz</td><td>< -100 dBc (+90 dBm)</td><td>-10 dBm</td></tr>
</table>
</td></tr>
<tr><td>Third order intermodulation distortion (TOI)</td><td>(Mixer level: -10 dBm, separation: RBW×15, 25 kHz min)
<table>
<tr><th>Input frequency</th><th>Specification</th><th>Typical value</th></tr>
<tr><td>10 MHz to 200 MHz</td><td>> +12 dBm</td><td>+16 dBm</td></tr>
<tr><td>200 MHz to 500 MHz</td><td>> +16 dBm</td><td>+20 dBm</td></tr>
<tr><td>500 MHz to 1 GHz</td><td>> +20 dBm</td><td>+24 dBm</td></tr>
<tr><td>1 GHz to 2 GHz</td><td>> +21 dBm</td><td>+25 dBm</td></tr>
<tr><td>2 GHz to 3.3 GHz</td><td>> +22 dBm</td><td>+26 dBm</td></tr>
<tr><td>3.3 GHz to 7.5 GHz</td><td>> +5 dBm</td><td>+10 dBm</td></tr>
<tr><td>7.5 GHz to 13.5 GHz</td><td>> +8 dBm</td><td>+12 dBm</td></tr>
</table>
</td></tr>
<tr><td>Image responses, Multiple responses, and Out-of-band responses</td><td>(Spectrum analysis mode)
<table>
<tr><th>Frequency</th><th>Specification</th></tr>
<tr><td>10 MHz to 13.5 GHz</td><td>< -70 dBc</td></tr>
</table>
</td></tr>
<tr><td>Residual responses</td><td>(Spectrum analysis mode, No signal input, Input termination, Input attenuator: 0 dB)
<table>
<tr><th></th><th>Frequency</th><th>Specification</th></tr>
<tr><td>Preamp On</td><td>1 MHz to 3.3 GHz</td><td>< -100 dBm</td></tr>
<tr><td rowspan="2">Preamp Off</td><td>1 MHz to 3.3 GHz</td><td>< -100 dBm</td></tr>
<tr><td>3.3 GHz to 13.5 GHz</td><td>< - 90 dBm</td></tr>
</table>
</td></tr>
</table>

7.1.6 Input and Output

Description	Specifications
RF Input	
Connector	Type-N (f) on the front panel
Impedance	50 Ω (nom.)
VSWR	Input attenuator ≥ 10 dB, In the set frequency < 1.5:1 (9 kHz ≤ f ≤ 3.3 GHz) (nom.) < 2.0:1 (3.3 GHz < f GHz) (nom.)
Calibration signal output	
Connector	BNC (f) on the front panel
Impedance	50 Ω (nom.)
Frequency	50 MHz
Probe power supply	
Connector	4-pin connector, Rear panel
Output voltage and current	± 15 V, 150 mA (nom.)
External trigger input 1	
Connector	SMA (f) on the rear panel
Impedance	10 kΩ (nom.), DC coupling
Trigger level	TTL level
External trigger input 2	
Connector	SMA (f) on the rear panel
Impedance	10 kΩ (nom.), DC coupling
Trigger level	0 V to 5 V
Trigger output	
Connector	SMA (f) on the rear panel
Amplitude	TTL level
Frequency reference input	
Connector	BNC (f) on the rear panel
Impedance	50 Ω (nom.)
Frequency	10 MHz
Amplitude	0 dBm to ± 5 dB
10 MHz Frequency reference output	
Connector	BNC (f) on the rear panel
Impedance	50 Ω (nom.)
Frequency	10 MHz
Amplitude	0 dBm to ± 5 dB
421.4 MHz IF Output	
Connector	BNC (f) on the rear panel
Impedance	50 Ω (nom.)
Frequency	421.4 MHz
Amplitude	Mixer input level -7 dB (Typical value at 50 MHz)

Description	Specifications
I/O	
USB	Front panel
GPIB	IEEE-488.2 compatible, Rear panel
LAN	10Base-T, protocol used: TCP/IP, Rear panel
External display signal	15-pin D-SUB connector (VGA), Rear panel

7.1.7 General Specifications

Description	Specifications
Operation Environment	Ambient temperature: 0°C to +50°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 Supply Input	AC100 V to 120 V, 50 Hz/60 Hz AC220 V to 240 V, 50 Hz/60 Hz (Automatically switches the input voltage between 100 V AC and 220 V AC.)
Power Consumption	360 VA or less Approx. 250 VA (without option)
Dimensions	Approximately 365 mm (W) × 177 mm (H) × 417 mm (D) (Including the handle and feet)
Weight	Approximately 18 kg or less (without option)

7.1.8 Options

- OPTION 21 High Stability Frequency Reference

Description	Specifications
Reference Frequency Stability	
Aging Rate	$\pm 5 \times 10^{-9}$/ day, $\pm 8 \times 10^{-8}$/ year
Temperature drift	$\pm 5 \times 10^{-8}$ (0°C to +50°C, frequency at 25°C used as the reference)
Warm-up drift (nom.)	$\pm 5 \times 10^{-8}$ / 10 min
External frequency reference input	
Frequency range	5 MHz to 20 MHz
Frequency setting resolution	1 Hz

- OPTION 22 High Stability Frequency Reference

Description	Specifications
Reference Frequency Stability	
Aging Rate	$\pm 3 \times 10^{-10}$/ day, $\pm 2 \times 10^{-8}$/ year
Temperature drift	$\pm 5 \times 10^{-9}$ (0°C to +50°C, frequency at 25°C used as the reference)
Warm-up drift (nom.)	$\pm 1 \times 10^{-8}$/ 30 min, $\pm 5 \times 10^{-9}$/ 60 min (frequency at 25°C, 24 hours after power on used as reference)
External frequency reference input	
Frequency range	5 MHz to 20 MHz
Frequency setting resolution	1 Hz

- OPTION 23 High Stability Frequency Reference

Description	Specifications
Reference Frequency Stability	
Frequency accuracy	$\pm 5 \times 10^{-9}$
Aging Rate	$\pm 1 \times 10^{-10}$/ month
Temperature drift	$\pm 1 \times 10^{-9}$ (0°C to +40°C, frequency at 25°C used as the reference)
Warm-up drift (nom.)	$\pm 1 \times 10^{-9}$ / 15 min
External frequency reference input	
Frequency range	5 MHz to 20 MHz
Frequency setting resolution	1 Hz

- OPTION 71 6 GHz Wide-band Converter

Description	Specifications
Frequency range	3.3 GHz to 6 GHz
Modulation analysis bandwidth	25 MHz

- OPTION 79 Tracking Generator

Description	Specifications
Output frequency	100 kHz to 3.3 GHz
Output level Setting range Setting resolution Output level flatness Output level accuracy Vernier accuracy	 -10 dBm to 0 dBm 0.1 dB < ±3 dB (100 kHz to 3.3 GHz, Relative value) < ±1 dB (50 MHz, -10 dBm, 25°C ± 10°C) < 0.5 dB/1 dB
Output spurious Harmonics Non-harmonics	 < -15 dBc (When 0 dBm is output) < -25 dBc (When 0 dBm is output)
TG Leakage	INPUT and TG OUTPUT are terminated, Input attenuator: 0 dB < -100 dBm (100 kHz ≤ f ≤ 3.3 GHz)
TG output Impedance (nom.) VSWR (When 10 dBm is output, nom.)	 50 Ω (nom.) < 2.0:1 (100 kHz ≤ f ≤ 3.0 GHz) < 3.0:1 (3.0 GHz < f ≤ 3.3 GHz)

8. OPTIONS AND ACCESSORIES

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

8.1 Options

Table 8-1 Options

Option	Explanation
OPT21	High stability frequency reference source (5×10^{-9}/day X'tal)
OPT22	High stability frequency reference source (3×10^{-10}/day X'tal)
OPT23	High stability frequency reference source (Rubidium)
OPT50	3GPP (HSDPA) analysis software
OPT52	cdma 2000 1xEV-DV analysis software
OPT54	cdma 2000 1xEV-DO analysis software
OPT71	6 GHz Wide-band Converter
OPT79	Tracking Generator

8.2 Accessories

Table 8-2 Accessories

Accessory name	Part code
Rack-mount set (JIS standard)	A122001
Rack-mount set (EIA standard)	A124001
Transit case	R160005

9. MAINTENANCE

This chapter describes the following information which relates to the maintenance of this instrument.

9.1 Cleaning
9.2 Calibration
9.3 Replacing Parts with Limited Life
9.4 Storage
9.5 Transportation
9.6 Notes Regarding Repair, Replacement, and Periodic Calibration
9.8 Error Message List
9.9 Product Disposal and Recycle

9.1 Cleaning

This section describes the cleaning procedure of this instrument and warning messages.

WARNING: ***To protect you from electric shock, set the MAIN POWER switch on the rear panel of this instrument to OFF and remove the power cable from the AC power outlet.***
Never attempt to remove the cover to clean the inside of the instrument.

9.1.1 Cleaning the Outside

Perform the following procedure to clean the outside of the instrument.

Wipe the surface with a soft dry cloth.
If the surface remains unclean, repeat with a cloth soaked in a weakened neutral detergent.
Afterwards, wipe the surface with a soft dry cloth.

NOTE: ***Do not allow water inside the instrument.***
Do not use an organic solvent such as benzene, toluene, xylene, or acetone for cleaning. Organic solvents cause the paint to peel, deform, and degrade. Do not use any cleansers.

9.1.2 Cleaning the Touch Screen

Clean with a soft dry cloth. If the touch screen remains unclean, wipe the surface with a soft cloth soaked in ethanol.

NOTE: ***Do not apply excessive pressure to the touch screen surface. The screen surface may be damaged. The touch screen consists of glass. If any excessive pressure is applied to the screen, it may break. Handle the touch screen carefully.***

9.1.3 Cleaning Others

Take appropriate precautions to protect this instrument from dust.

WARNING: ***Periodically remove any dust which builds up on the AC power outlets and plugs. The tracking phenomenon, which can be caused by wet dust, may cause a fire.***
There is an exhaust-cooling fan on the rear panel and exhaust vents on both sides of this instrument. Keep these vents clean to allow sufficient ventilation. If there is insufficient exhaust, the internal temperature will rise and the instrument may operate incorrectly.

9.2 Calibration

Calibration should be performed periodically to prevent the performance of the instrument from deteriorating and to correct changes in performance over time.
We recommend that calibration be performed once a year.

Calibration should be performed at our factory site.
For more information, contact an Advantest sales representative.

9.3 Replacing Parts with Limited Life

Parts with limited life used in this instrument are listed in Table 9-1.
Call our service center (Advantest Customer Support (ACS)) to replace the parts, referring to limited life listed in Table 9-1.

Note that the life span may become shorter than that described depending on the operating environment, frequency of use, and storage environment.

MEMO: ***The table shows the life spans of parts and the number of times parts can be used before requiring replacement, but they are not guaranteed.***

Table 9-1 Parts with Limited Life

Name	Life (Reference values provided by parts manufacturer)
Panel key switch	1,000,000 operations
LCD back light	50,000 hours
Rotary encoder	2,000,000 operations
Cooling fan	40,000 hours
Lithium batteries for data backup	Approximately 7 years
Input attenuator	2,000,000 operations
Mechanical relay	1,000,000 operations

9.4 Storage

Store this instrument in the following environment.

- An area free from vibrations
- A dust-free area
- An area away from direct sunlight
- Temperature range: -20 °C to +60 °C
- Relative humidity range: 30 % to 85 %

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

9.5 Transportation

9.5.1 Transportation

When transporting this instrument, use the packing materials used for the shipping of this instrument. If other materials must be used, double-pack the instrument according to the following procedure.

1. Cover the instrument with a protective plastic sheet. (Put desiccant inside to remove moisture)
2. Prepare an inner carton case.

   The thickness of the carton case must be 5 mm or more and the inner dimensions must be 10 cm or more larger than the physical size of this instrument to accommodate cushioning material.

   Place the cushioning (plastic foam) material inside the carton case, place the instrument on the layer of cushioning material and then cover all sides of the instrument with cushioning material. (The thickness of the cushioning material must be 4 cm or more.)
3. Seal the carton case with an industrial stapler or shipping tape.
4. Prepare an outer carton case.

   The thickness of the carton case must be 5 mm or more and the dimensions must be 10 cm or more than the inner carton case on all sides. Place a 4-cm or more layer of cushioning material into the outer carton case, place the inner carton case into the outer carton case, and then surround the inner carton case with cushioning material.
5. After stuffing sufficient cushioning material in the space between the inner and outer cases, seal and fasten the outer case with packing strings.

9.6 Notes Regarding Repair, Replacement, and Periodic Calibration

9.6.1 Contacting Advantest for Repair or Calibration

When sending this instrument to a sales representative, attach a tag that indicates the following information.

- 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)

9.6.2 Address and Phone Number

Call the nearest Advantest sales and support office.

9.7 System Recovery Procedure

This instrument adopts Microsoft Windows XP Embedded and the measurement functions are performed in the Windows environment.
The system files required for the operation of this instrument are stored in the built-in system drive.
If system files are damaged for any reason while this instrument operates, the instrument may not operate correctly.
In such a case, contact an Advantest sales representative to perform the recovery operation.

IMPORTANT: ***The contents of the built-in system drive are lost when the recovery operation is performed. Therefore, all network and printer settings are also lost.***

9.8 Error Message List

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

- Error number
- Error message
- Cause of the error and action to be taken

Error number	Displayed message	Description
-232	Invalid data format.	The file format is not recognized. Check the file format and extension.
-257	Bad File name.	The file name is invalid. Change the file name.
-330	Self-test failed.	An error occurred in the self-diagnostic function when the power turns on. Details of the error can be checked in the Self Test dialog box selected by pressing MENU, Special, and Self Test. After checking all details, contact an Advantest sales representative.
-1250	No such file or directory.	The 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 any 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.	No standard is selected. Select a standard and then execute.
-1257	Standard is selected.	The Standard is selected. Deselect the standard and then execute.
-1300	Device is not ready.	No media for recording data is provided.
-1310	Unlock 200MHz PLL.	The 200 MHz PLL circuit used in the system is unlocked. Check the external reference input setting. This error message may be displayed for a few minutes when the reference frequency is switched from external to internal or after the power is turned on in a low temperature environment.

Error number	Displayed message	Description
-1312	Unlock Sampler PLL.	The Sampler PLL circuit used in the system is unlocked. Contact an Advantest sales representative for repair.
-1313	Unlock YTO PLL.	The YTO PLL circuit used in the system is unlocked. Contact an Advantest sales representative for repair.
-1314	Oven Cold	The oven of the frequency reference source is not heated. (When option23 is installed.)
-1400	There is no data in the effective state.	This error is for GPIB only. The requested data is invalid. Re-perform the measurement to receive the correct data.
-1500	Option required.	The appropriate option function is required.
-1510	Invalid Frequency-Correction Data1. Please contact a service engineer.	The internal frequency correction data is invalid. Contact an Advantest sales representative for repair.
-1511	Invalid Frequency-Correction Data2. Please contact a service engineer.	The internal frequency correction data is invalid. Contact an Advantest 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 a linear scale. Select the dB/div scale.
-2204	ΔMarker is not active. Please activate ΔMarker. [MKR → Delta Marker]	The Δ marker is not set to ON. Set the Δ marker to ON
-2205	Blank mode is selected. Please change to Write mode. [Trace → Write]	The trace cannot be executed because the mode is set to Blank. Change the mode to Write.
-2206	No peak is detected.	The peak cannot be found.
-2207	Marker Frequency is base-band.	Pre-selector tuning cannot be executed because the marker is in the base-band frequency range.
-2208	Not available. Trigger source is Free Run.	The trigger slope cannot be switched because the trigger source is set to Free Run.
-2209	Gated sweep setup mode. Please select the same Gate source.	Gated sweep setting mode. The trigger, which does not meet the gated sweep trigger condition, cannot be selected.
-2210	Trace Normalize is active. Turn Trace Normalize off.	Normalize function is being performed. Set the Normalize function to OFF.
-2211	Display line is not active.	The Display line is se to OFF and cannot be selected.
-2212	Reference line is not active.	The Reference line is set to OFF and cannot be selected.

Error number	Displayed message	Description
-2213	Limit Line1 is not active.	The Limit Line 1 is set to OFF and cannot be selected.
-2214	Limit Line2 is not active.	The Limit Line 2 is set to OFF and cannot be selected.
-2215	Anchor is not active.	The anchor of the XY cursor is set to OFF and cannot be selected.
-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. Set the trigger mode other than the 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 FreeRun.	The trigger source is set incorrectly. Set the trigger source to IF Power or Free Run.
-2222	Not available. RBW is less than 1kHz.	Cannot be executed because RBW is less than1 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 the measurement.
-2241	Incorrect data. Set span to (1.0 + α) *Tf or more.	The root Nyquist filter is set to a value that cannot be measured. Change the setting to a value that allows the following requirement. Frequency span > (1.0+Rolloff Factor) × Symbol Rate
-2242	Frequency table contains no data.	The function cannot be performed because no data exists 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 allows the following requirement. Frequency span > Carrier bandwidth
-2245	Not available. Spurious is ON.	Cannot be executed in the spurious measurement mode.
-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. Spectrum Emission Mask is ON.	Cannot be executed in the spectrum emission mask measurement mode.
-2281	Not available in Single-screen mode.	Cannot be displayed in the single-screen mode.

Error number	Displayed message	Description
-2282	Not available in Zoom(F/F) mode.	Cannot be executed in the Zoom(F/F) display.
-2283	Not available in Zoom(T/T) mode.	Cannot be executed in the Zoom(T/T) display.
-2284	Not available in F/T mode.	Cannot be executed in the F/T display.
-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 the Zoom (F/F, T/T) or F/T mode is not selected. Select the Zoom or F/T mode.
-2500	Cal data is not enough. Please execute SA Cal	No CAL data exists. Execute SA Cal.
-2501	CAL Level out of range	The Cal signal level is outside the specified range. Check the cable connections between CAL OUT and INPUT.
-2502 to -2999	(The calibration error message is displayed.)	Calibration failed.
-6200	Through Correction failed. Check connection between TG OUTPUT and INPUT.	Through correction failed. Check the cable connections between TG OUTPUT and INPUT.
-6201	Invalid Level Cal data. Execute TG Level Cal.	No level calibration data exists. Perform the level calibration.
-6202	Invalid Through Correction data. Execute Through Correction	No through correction data exists. Perform through correction.
-6203	TG Frequency is out of range.	Cannot be set because the frequency exceeds the available frequency range while TG is set to ON.
-6500	No TG signal detected. Check TG OUTPUT signal	The TG output signal cannot be detected. Check the output signal of TG OUTPUT.

9.9 Product Disposal and Recycle

Disposal of this product should comply with the regulations and laws that are established by your country and municipality.

When treating this product, separately collect components according to this chapter to prevent the spread of substances, which may be harmful to humans, and to protect the global environment.

Components, which must be separately collected, are shown in the following table.

The treatment of this product should comply with the relevant laws of your country and waste-disposal regulations of your company.

Substance/Component	Component	Location	Quantity in maximum configuration	Remarks
Polychlorinated biphenyls (PCB) containing capacitors	-	-	-	
Mercury	-	-	-	
Batteries	Lithium batteries	CPU board	1	
Printed circuit boards	PEB-**, PLB-**, PPB-**	Inside the instrument	5	
	PLC-**, PPC-**	Inside the instrument	5	
	PED-**	Inside the instrument	1	
	PEK-**, PLK-**, PPK-**	Inside the instrument	8	
Toner cartridges	-	-	-	
Plastic containing brominated flame retardants	LCP-**, SEE-**, SIM-**	BLB-**, BLK-**, BPB-**, BPK-**	16	
Asbestos waste	-	-	-	
CRT	-	-	-	
CFC, HCF, HFC, HC	-	-	-	
Gas discharge lamps	LCD back-light	Front panel	1	
LCD	-	Front panel	1	
External electric cables	DCB-**	Accessories	2	Power cable RF cable
Components containing refractory ceramic fibers	-	-	-	
Components containing radioactive substances	-	-	-	
Electrolyte capacitors containing substances of concern	-	-	-	

Substance/Component	Component	Location	Quantity in maximum configuration	Remarks
Arsenic compound semi-conductors	GaAs amplifier GaAs switch GaAs FET	BEK-031930 BEB-031932 BED-031936 BEB-023132 WHB-TOP2311X WHB-TOP3138A	51	

APPENDIX

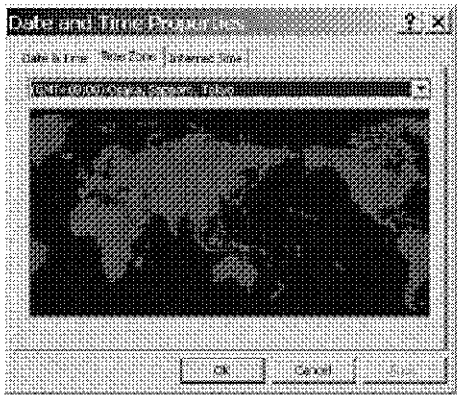
A.1 Time and Time Zone Setting

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 how to set the time and time zone.

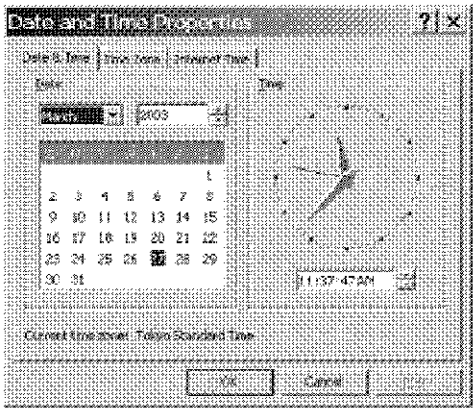
[Procedures]

1. Press MENU, **System**, and **Date and Time**.
   The **[Date and Time Properties]** dialog box is displayed.
2. Touch the **[Time Zone]** tab on the displayed **[Date and Time Properties]** dialog box.
3. Select the area, in which this instrument is used, from the drop down list box of the time zone.



4. Touch the **[Date & Time]** tab on the displayed **[Date and Time Properties]** dialog box.

   The dialog box for setting the date and time is displayed. Set the date and time.



5. Touch the **[OK]** button and close the dialog box.

A.2 Printer Driver Installation

This section describes how to install the printer driver.

[Obtaining the Printer Drive]

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:

- ***Press the STOP button on the front panel to stop any measuring before installing a printer driver.***
- ***Use the printer driver for Windows XP.***
- ***Before installing the printer driver, connect this instrument to the printer by using a USB cable and turn on the printer power.***
  If the USB is not recognized, the USB can not be specified as the output destination.

[Installing the Printer Driver]

Install the printer driver according to the attached installation procedure.
If the printer driver is provided on the CD-ROM, place the CD-ROM drive in a PC attached to the network and install the printer driver from there.
"Standard TCP/IP Port" is not supported in this instrument.

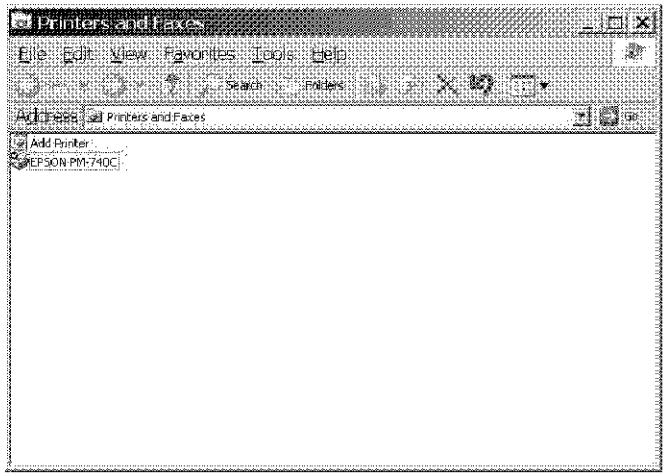
[Setting the printer]

Set the printer in the displayed **[Printers and Faxes]** window after pressing **MENU**, **System**, and **Printers Setup**.

[Deleting the Printer Driver]

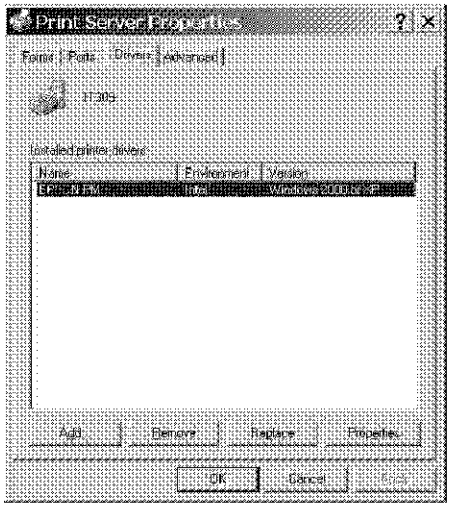
The printer driver is installed in the system folder of this instrument. Therefore the printer driver might not be installed if there is insufficient space in the system folder to install the printer driver. In this case, install the printer driver after deleting any unused printer drivers according to the following procedure.

1. Press **MENU**, **System**, and **Printers Setup** to open the **[Printers and Faxes]** window.



2. Select the printer driver to be deleted from the window and touch **[File]**. Select **[Delete]**, touch the **[Yes]** button in the displayed dialog box to delete the printer driver from the available printers.

3. Touch the **[File]** menu in the **[Printers and Faxes]** window, select **[Server Properties]**, and then the **[Printers Server Properties]** dialog box is displayed.



4. Touch the **[Drivers]** tab in the **[Printers Server Properties]** dialog box to display the printer drivers installed in this instrument. Touch the printer driver to be deleted in the displayed printer drivers and touch the **[Remove]** button. After this, touch the **[Yes]** button when prompted to delete the printer driver.

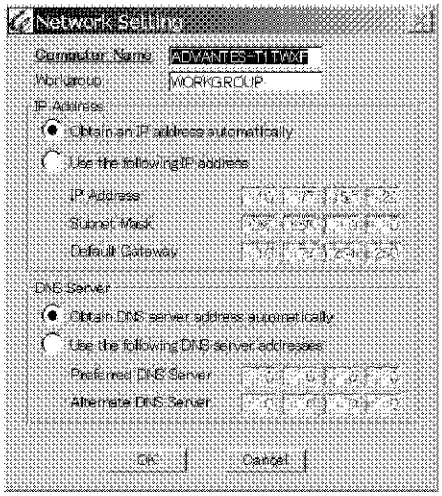
A.3 Network Setting

When connecting this instrument to a network, this instrument and network computers share files and folders. This section describes each item in the network setting dialog box.

IMPORTANT: Press the [STOP] button on the front panel to stop any measuring before setting a network.

---

1. Press **[MENU]**, **System**, and **Network Setup**.
   The **[Network Setting]** dialog box is displayed.



[Computer Name] Displays the name of the computer, in which this software is installed, on the network. If this item is changed, the change is applied when the computer restarts.

[Workgroup] Displays the Windows work group of this instrument. If this item is changed, the change is applied when the computer restarts.

[IP Address]

[Obtain an IP address automatically]
Obtains the IP address from the DHCP server.

[Use the following IP address] Used to manually specify the IP address.

[IP Address] Displays the currently set IP address.

[Subnet Mask] Displays the currently set Subnet Mask.

[Default Gateway] Displays the currently set Default Gateway.

[DNS Server]

[Obtain DNS server address automatically]
Obtains the DNS server information from the DHCP server.

[Use the following DNS server address]
Used to manually set the DNS server.

[Preferred DNS Server]Displays the currently set DNS Server address.

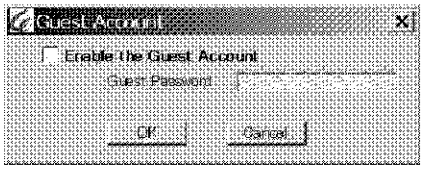
[Alternate DNS Server]Displays the currently set Alternate DNS Server address.

A.4 Guest Account Setting

A guest account must be set up in order to access this instrument from a remote PC through a network and share files.
Because the guest account is disabled when this instrument is shipped from the factory, the guest account must be setup before files can be shared.

This section describes each item in the guest account setting dialog box.

1. Press **MENU**, **System**, and **Guest Account**.
   The **[Guest Account]** setting dialog box is displayed.



[Enable the Guest Account] — If this check box is checked, the Guest Account is enabled. The guest password can only be entered when this check box is checked.

[Guest Password] — This text box is used to enter the Guest Account password. The currently set password is not displayed. To set no password, enter nothing in the box and press the **[OK]** button.

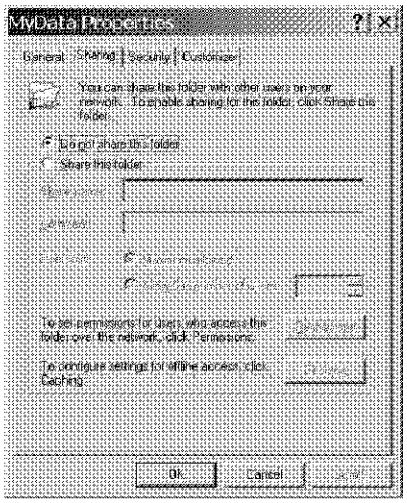
A.5 File Sharing Setting

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

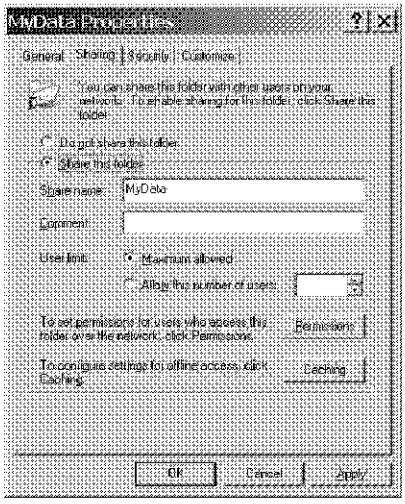
This section describes how to set the file sharing.

[Procedures]

1. Press **MENU**, **System**, and **Explorer** to display Explorer.
2. Select the folder to be shared.
3. Touch **[File]** on the menu bar of Explorer and select **[Sharing and Security...]**.
   The **[Shared Documents Properties]** dialog box is displayed.

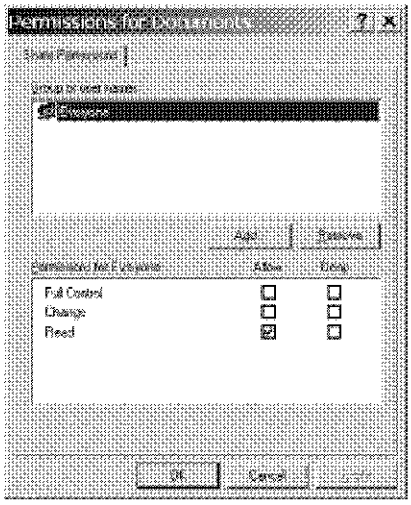


4. Select **[Share this folder]** and enter the share name into **[Share name]**.

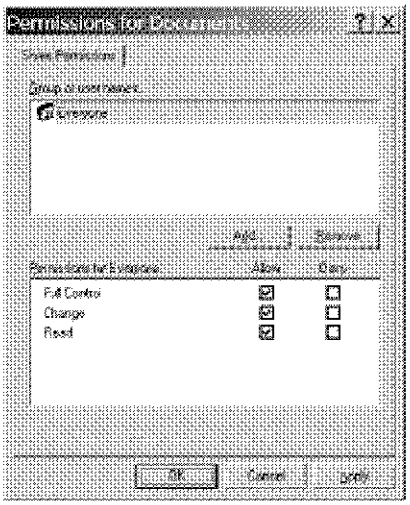


If you want to write from an external PC, perform the following setting.

5. Touch the **[Permissions]** button.
   The **[Permissions for Documents]** dialog box is displayed.



6. Select the **[Full Control]** check box in **[Everyone]**.



7. Press the **[OK]** buttons of all displayed dialog boxes to apply the settings and close the dialog boxes.

A.6 Initial Setting List

This section describes the default preset parameter setting list.

Function	Parameter	Initial set value
[FREQ]	Center Freq setting	6.75 GHz
	Start Freq setting	0 Hz
	Stop Freq setting	13.5 GHz
	Freq Offset setting	0 Hz
	Freq Offset On/Off	Off
	CF Step Size setting (Manual)	1.35 GHz
	CF Step Size Auto/Manual	Auto
[SPAN]	Presele Manual Tune setting	0
	Span setting	13.5 GHz
	Last Span setting	13.5 GHz
[LEVEL]	Ref Level setting	5.0 dBm
	LOG/LIN selection	LOG
	dB/div setting	10 dB/div
	Unit setting	dBm
	ATT Auto/Manual	Auto
	ATT setting (Manual)	10 dB
	Min ATT setting	10 dB
	Min ATT On/Off	On
	Preamp On/Off	Off
	Ref Offset setting	0.00 dB
	Ref Offset On/Off	Off
	Correction Factor On/Off	Off
[BW]	RBW setting (Manual)	3 MHz
	RBW Auto/Manual	Auto
	VBW setting (Manual)	3 MHz
	VBW Auto/Manual	Auto
	VBW/RBW ratio	1
	VBW/RBW ratio Auto/Manual	Auto
	SPAN/RBW ratio	100
	SPAN/RBW ratio Auto/Manual	Auto
	ADC Dither On/Off	Off

Function	Parameter	Initial set value
[SWEEP]	Sweep Time setting (Manual)	135 ms
	Sweep Time Auto/Manual	Auto
	Trigger Source Free Run/IF Power/Video/Ext1/Ext2	Free Run
	Trigger Slope +/-	+
	Video Level setting	0 dBm
	Ext2 Level setting	2.5 V
	IF Power Level setting	50%
	Trigger Delay setting	0.0 ms
[SEARCH]	Search Condition (Normal)	
	X Range Mode All/Inner/Outer	All
	X Range Limit Position setting	6.75 GHz (freq)
	X Range Limit Width setting	1.35 GHz (freq)
	Couple to Freq (Time) ON/OFF	OFF
	Y Range Mode All/Disp Line/Limit Line	All
	Y Range Display Line Above/Below	Above
	Y Range Limit Line 1 Above/Below	Above
	Y Range Limit Line 2 Above/Below	Above
	Peak ΔY setting	10 dB
	Continuous Peak On/Off	Off
	Search Condition (Multi Inner)	
	Mkr X Range Inner Limit ON/OFF	OFF
	Mkr X Range Position setting	6.75 GHz (freq)
	Mkr X Range Width setting	1.35 GHz (freq)
	Mkr Y Range Inner Limit ON/OFF	OFF
	Mkr Y Range Top setting	1000 dBm
	Mkr Y Range Bottom setting	-1000 dBm
	Couple to Freq (Time) ON/OFF	OFF
	Marker List On/Off	Off
[MKR]	Marker Function ON/OFF	OFF
	ΔMarker On/Off	Off
	Fixed ΔMarker On/Off	Off
	1/Δ Marker On/Off	Off
	Marker No.	1
	Active Marker	1
	Reference Object	No Reference
	Signal Track On/Off	Off
	Marker Trace 1/2/3/4	1
	Marker Step Size setting (Manual)	1.35 GHz (freq) 1 ms (time)
	Marker Step Size Auto/Manual	Auto

Function	Parameter	Initial set value
[TRACE]	Trace setting	Write
	Active Trace setting	1
	Trace Detector Normal/Positive/Negative/Sample/Average	Normal
	Detector Auto/Manual	Auto
	Average Type RMS/Video/Voltage	RMS
	Average Type Auto/Manual	Auto
	Normalize Correction On/Off	Off
	Artificial Analog On/Off	Off
	Analog Sampling Times setting	5
[POWER] Channel Power	Channel Power Window On/Off	On
	Channel Power Window Position setting	Center frequency
	Channel Power Window Width setting	2.7 GHz
	Average Times setting	100
	Average Times On/Off	On
	Avg Mode Cont/Rep	Continuous
	Parameters Default/Manual	Manual
[POWER] Average Power	Average Power Window On/Off	Off
	Average Power Window Position setting	Center frequency
	Average Power Window Width setting	2.7 GHz
	Average Times setting	100
	Average Times On/Off	On
	Avg Mode Cont/Rep	Continuous
	Parameters Default/Manual	Manual
[POWER] OBW	OBW % setting	99%
	Average Times setting	5
	Average Times On/Off	Off
	Avg Mode Cont/Rep	Repeat
	Parameters Default/Manual	Manual

Function	Parameter	Initial set value
[POWER] ACP	Average Times setting	5
	Average Times On/Off	Off
	Avg Mode Cont/Rep	Repeat
	Carrier Band Width setting	3.84 MHz
	Channel Space & Band Width Data In	CS:5 MHz/BS:3.84 MHz
	√Nyquist filter On/Off	Off
	Symbol Rate setting	3.84 MHz
	Rolloff factor setting	0.22
	Parameters Default/Manual	Manual
	Noise Correction On/Off	Off
[POWER] Multi Carrier ACP	Symbol Rate setting	3.84 MHz
	Rolloff Factor setting	0.22
	√Nyquist filer On/Off	Off
	Average Times setting	5
	Average Times On/Off	Off
	Average Mode Cont/Rep	Repeat
	Parameter Setup Default/Manual	Manual
	Noise Correction On/Off	Off
	Carrier Freq Adjustment setting	0 Hz
	Carrier Freq Adjustment On/Off	Off
[POWER] Spurious Emissions	Spurious Table No.	1
	Parameters Default/Manual	Manual
[POWER] Spectrum Emission Mask	Carrier Band Width setting	3.84 MHz
	√Nyquist filter On/Off	Off
	Symbol Rate setting	3.84 MHz
	Rolloff factor setting	0.22
	Ref Power Chan/Peak	Channel
	Average Times setting	5
	Average Times On/Off	Off
	Parameters Default/Manual	Manual
[POWER] CCDF	CCDF RBW setting	10 MHz
	Meas Sample setting	1 k
	Trace Write On/Off	Off
	Gaussian On/Off	Off
	X Scale Max	100 dB
	CCDF Gate On/Off	Off

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

Function	Parameter	Initial set value
[DISPLAY]	Display Line On/Off	Off
	Display Line setting	-50 dBm
	Reference Line On/Off	Off
	Reference Line setting	-50 dBm
	XY Cursor On/Off	Off
	Cursor Position X setting	6.75 GHz
	Cursor Position Y setting	-50 dBm
	Anchor On/Off	Off
	Meas Window On/Off	Off
	Window Position setting	6.75 GHz
	Window Width setting	2.7 GHz
	Zoom F/F, Zoom T/T, F/T, OFF	OFF
	Split On/Off	Off
	Active Screen setting	1
	Annotations Setup	
	Disp Line On/Off	On
	Ref Line On/Off	On
	XY Cursor On/Off	On
	Meas Window On/Off	On
[GPIB Address]	GPIB address of this instrument	8 *1
[Freq Reference]	Manual Mode On/Off	Off *1
	Ext. Reference	10 MHz *1
[Display]	Date Format YMD/MDY/DMY	YMD *1
	Date On/Off	On *1
	Title setting	NULL
[Save Item]	Setup On/Off	On *1
	Trace On/Off	Off *1
	Normalize Correction On/Off	Off *1
	Limit Line On/Off	Off *1
	Correction Factor On/Off	Off *1
	Spectrum Emission Mask On/Off	Off *1
	Spurious On/Off	Off *1

*1: These settings are not initialized when preset is done.

A.7 Principle of Operation

This section describes a root Nyquist filter used for input saturation and ACP measurement based on the operating 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.

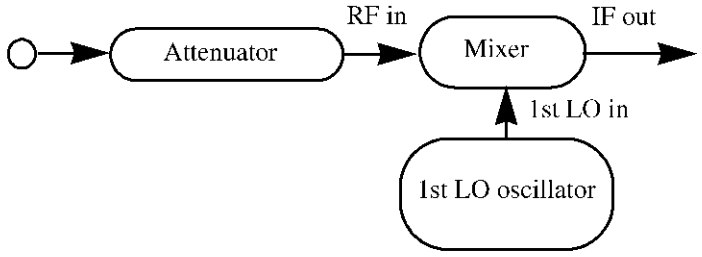


Figure A-1 Block Diagram of the Input Section

Under normal conditions, the input level and output level of the mixer are proportionate to each other. However, if the input level of the mixer increases, the mixer becomes saturated and the output level of the mixer is disproportionate to the input level.
This phenomena is called input saturation and it prevents accurate measurements from being made (see Figure A-2).

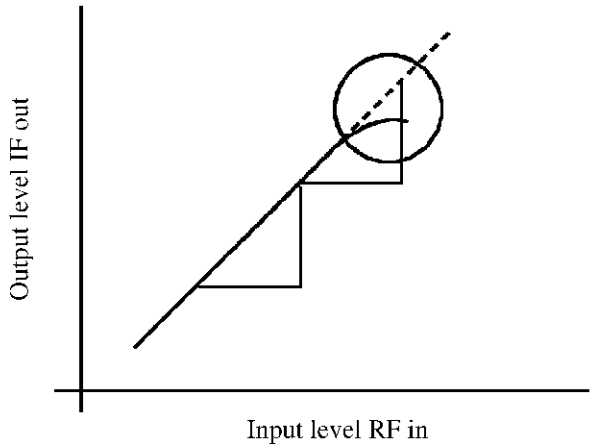


Figure A-2 Relation Between Input and Output of the Mixer

- Preventing 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 high, the mixer input signal becomes smaller and analysis becomes impossible. However, if the attenuator setting is too low, the internal mixer circuit may become damaged.***

Usually, the appropriate settings are automatically set for a continuous wave (CW) input signal if you set the attenuator to auto and set the peak of the signal to or below the reference level.

If the resolution bandwidth (RBW) is narrower than the modulation bandwidth in the measurement of an input signal with a wide modulation band, the display level decreases. Therefore, the attenuator must be manually set to the optimum value.

- Confirming that the attenuator is set to the optimum value

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

     Input attenuator set value (dB) ≥ Input level (dBm) + 5 dB
  2. Decrease the attenuator setting in steps while watching the screen. If the peak value on the screen does not change, no input saturation occurs and the measurement can be continued.
     If the peak value changes, increase the attenuator setting to eliminate the change.

A.7.2 Root Nyquist Filter

When measuring the adjacent channel leakage power, this instrument is able to make a correction to the input signal equivalent to as if the signal passed through the root Nyquist filter.

When calculating the power for each channel by integrating the trace data, the power is multiplied 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 roll-off factor (α) by using the following formula.

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

The characteristics of the root Nyquist filter are shown below.

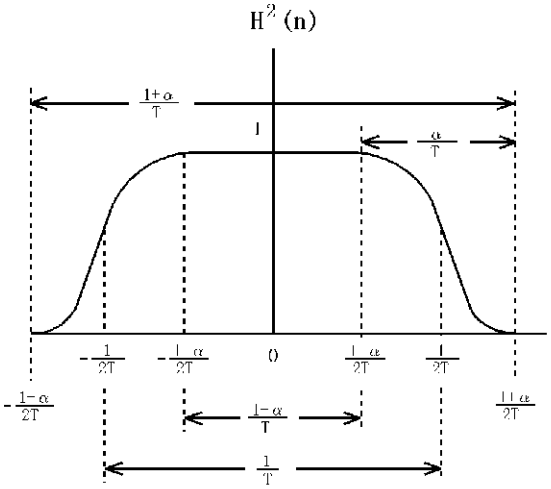


Figure A-3 Characteristics of the Root Nyquist Filter

A.8 Glossary

Resolution Bandwidth

The spectrum analyzer uses the band-pass filter (BPF) to analyze certain frequencies in the input signal. The 3dB bandwidth of the BPF is called the resolution bandwidth. (See ***) The 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 and the resolution of the spectrum analyzer should be expressed by using the narrowest resolution bandwidth (See Figure A-4 (b) below).

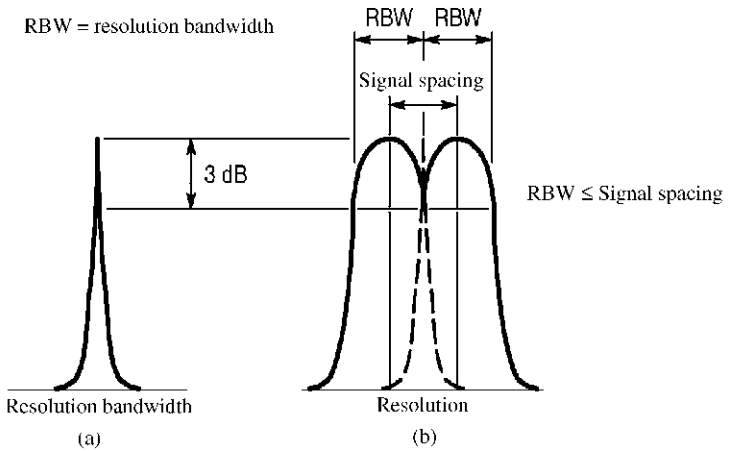


Figure A-4 Resolution Bandwidth

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.

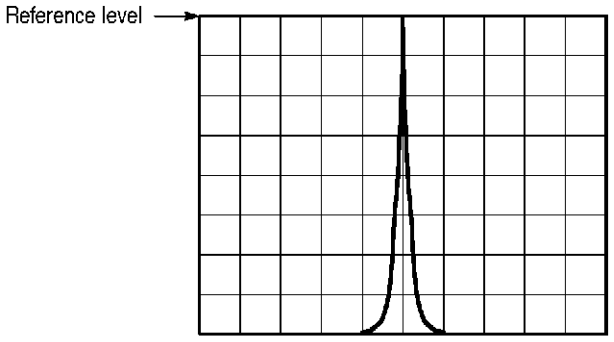


Figure A-5 IF Gain Uncertainty

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 the linearity in 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.

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

Noise sidebands are used to show the purity of the oscillator.
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.
Therefore, the sideband noise of the analyzer is defined and the signals that are larger than the sideband noise of the analyzer can be analyzed.
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-6 (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 dBc/Hz at 20 kHz apart from the carrier when the resolution bandwidth is 1 kHz.

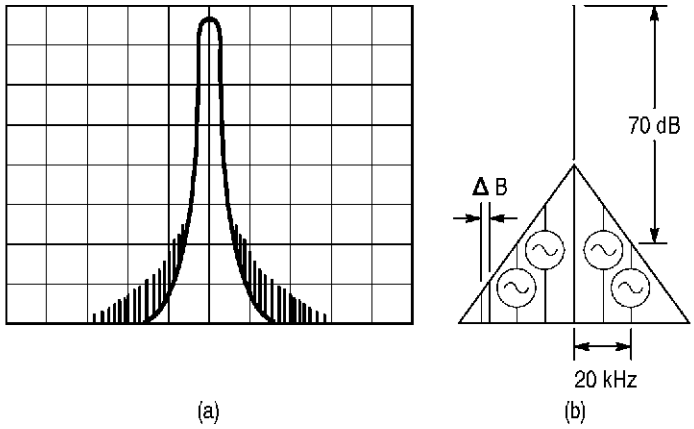


Figure A-6 Noise Sidebands

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 how much the spurious signal, which is generated by the spectrum analyzer, is suppressed after being treated as an input signal.
Residual response is generated by the leaking of signals such as local oscillator output in the spectrum analyzer. This should be taken into consideration when analyzing a low-level input signal.

Frequency Response

This term represents the amplitude characteristics for given frequencies (frequency characteristics).

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.

Spurious Response

Spurious responses that mean any non-measured signal 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 and undistorted signal is input to the spectrum analyzer. This performance determines spectrum analyzer's capability of measuring harmonic distortion.(see Figure A-7)

Third Order Distortion:

The third order distortion is caused by the non-linearity of a spectrum analyzer when two signals with different frequencies f1 and f2 are input and two signals of 2f1-f2 and 2f2-fi are generated near the input signals. The amplitude of these signals depends on the mixer input level. (see Figure A-7)
The maximum value is specified.

Image/Multiple/Out-of-band responses:

In addition to the two types of spurious signals described above, a spurious called "non-harmonic spurious" is generated at particular frequencies by the spectrum analyzer. There are three types of responses in the non-harmonic spurious: the image, multiple and out-of-band responses.

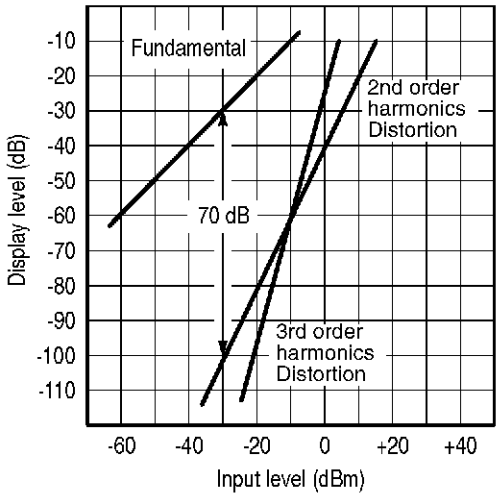


Figure A-7 Spurious Response

Zero Span

The spectrum analyzer sweeps the time in the horizontal axis at certain frequency but does not sweep frequencies in this mode.

Occupied Bandwidth

When information is transmitted through radio waves, the spread 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 total average power. (see Figure A-8)

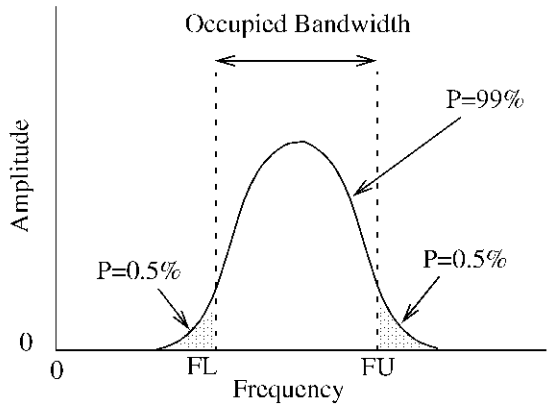


Figure A-8 Occupied Bandwidth

Bandwidth Selectivity

The band-pass filter normally has a Gaussian distribution characteristics instead of the so-called rectangular characteristic. Consequently, if two adjacent signals of different levels exist, the smaller signal hides in the skirt of the larger signal. (See Figure A-9)

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.

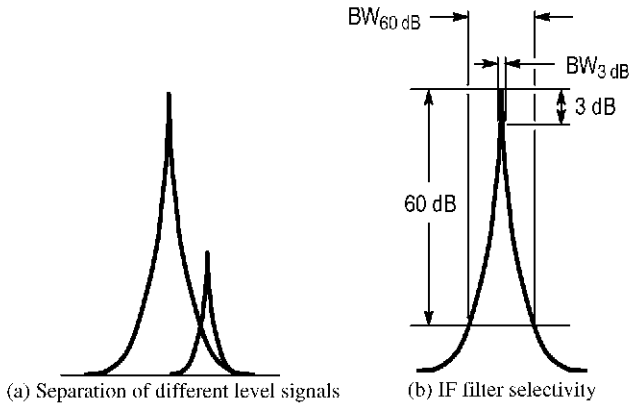


Figure A-9 Bandwidth Selectivity

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 specification has almost no effect when measuring the level of a continuous signal, but it should be taken into consideration when measuring the level of a noise signal.

Bandwidth Switching Uncertainty

Several resolution bandwidth filters are used to obtain the optimal resolution in a signal spectrum analysis according to the frequency span. When switching from one resolution bandwidth filter to another while measuring one signal, an error is generated because of the differences in loss between resolution bandwidth filters. This error is defined as the bandwidth switching uncertainty.

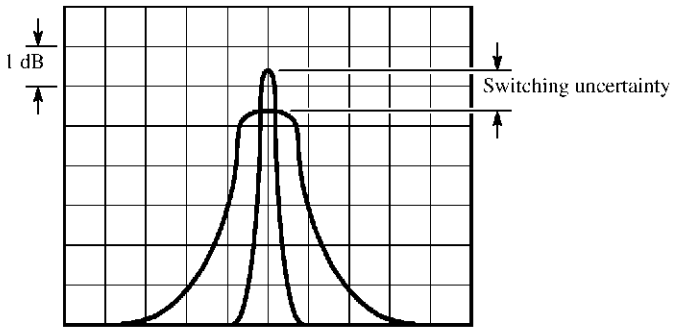


Figure A-10 Bandwidth Switching Uncertainty

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 used resolution bandwidth. 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.

VSWR: Voltage Standing Wave Ratio

This shows the state of impedance matching when a spectrum analyzer is connected to a signal source that includes ideal and nominal output impedance. 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 E1 at the receiving end (the spectrum analyzer input section) is the same as the signal E0 at the transmitting end 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 ER 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 $= (E_0 + E_R) / (E_0 - E_R)$

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.

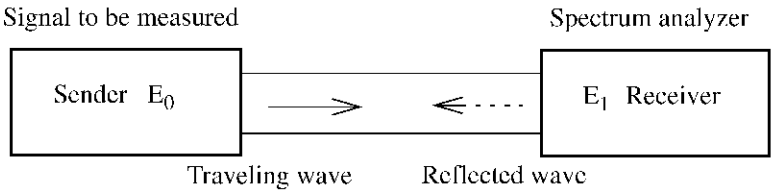


Figure A-11 VSWR

A.9 dB Conversion Formula

1. Definitions

0dBV = 1Vrms	$YdBV = 20\log \frac{XV}{1V}$
0dBm = 1mW	$YdBm = 10\log \frac{XmW}{1mW}$
0dBμV = 1μVrms	$YdB\mu V = 20\log \frac{X\mu V}{1\mu V}$
0dBpw = 1pW	$YdBpw = 10\log \frac{XpW}{1pW}$

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

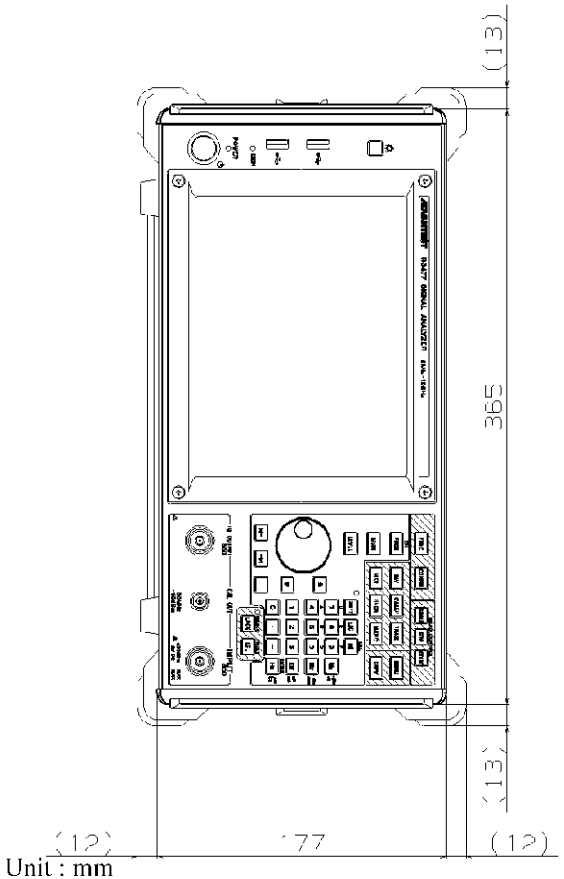
Converting 0dBm into dBμV:
- 0dBm + 107dB = 107dBμV(R = 50Ω)
- 0dBm + 109dB = 109dBμV(R = 75Ω)

Converting 60dBμV into dBm:
- 60dBμV - 107dB = -47dBm(R = 50Ω)
- 60dBμV - 109dB = -49dBm(R = 75Ω)

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

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

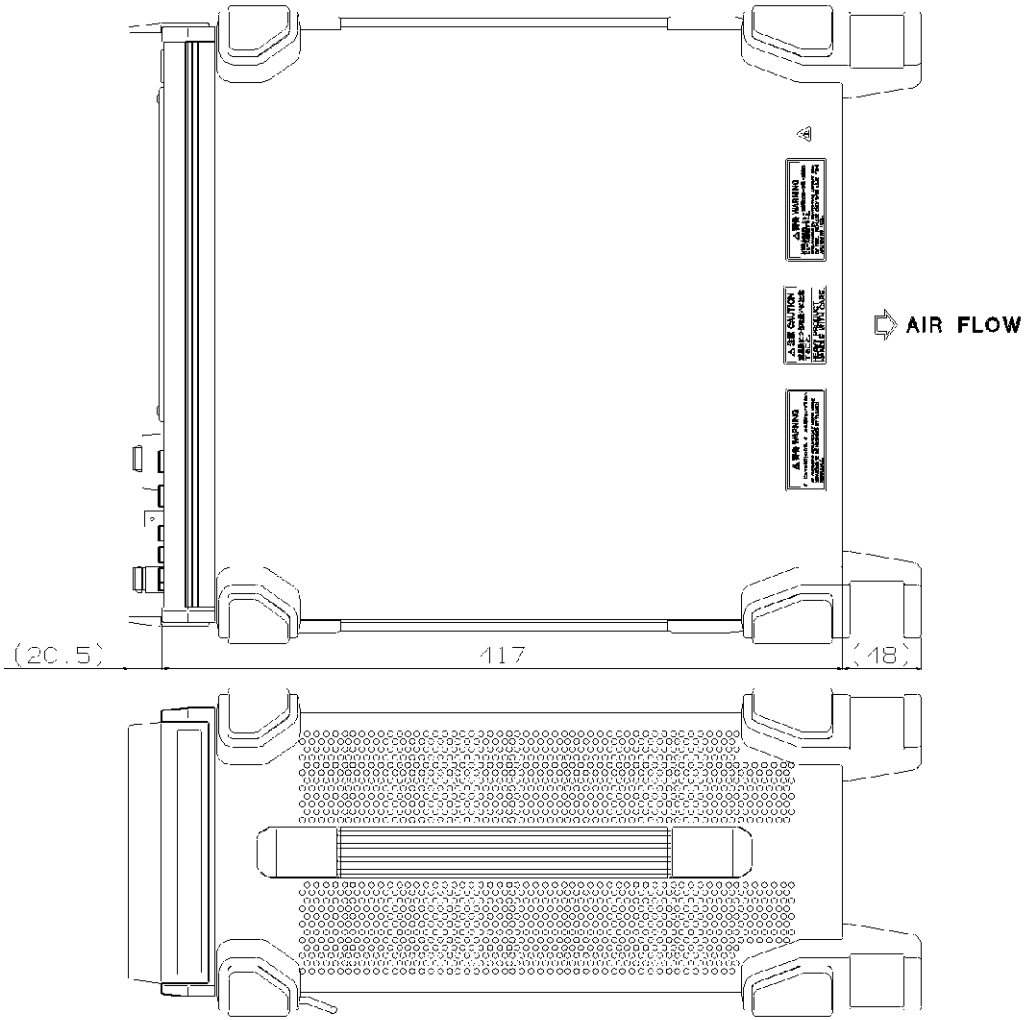


Unit : mm

CAUTION

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.



DIMENSIONAL OUTLINE DRAWING

ALPHABETICAL INDEX

[Symbol]

[Numerics]

[A]

[B]

[C]

[D]

[E]

[F]

[G]

[H]

[I]

[O]

[P]

[R]

[S]

[T]

[U]

[V]

[W]

[X]

[Y]

[Z]

IMPORTANT INFORMATION FOR ADVANTEST SOFTWARE

PLEASE READ CAREFULLY: This is an important notice for the software defined herein. Computer programs including any additions, modifications and updates thereof, operation manuals, and related materials provided by Advantest (hereafter referred to as "SOFTWARE"), included in or used with hardware produced by Advantest (hereafter referred to as "PRODUCTS").

SOFTWARE License

All rights in and to the SOFTWARE (including, but not limited to, copyright) shall be and remain vested in Advantest. Advantest hereby grants you a license to use the SOFTWARE only on or with Advantest PRODUCTS.

Restrictions

(1) You may not use the SOFTWARE for any purpose other than for the use of the PRODUCTS.
(2) You may not copy, modify, or change, all or any part of, the SOFTWARE without permission from Advantest.
(3) You may not reverse engineer, de-compile, or disassemble, all or any part of, the SOFTWARE.

Liability

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

LIMITED WARRANTY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CUSTOMER SERVICE DESCRIPTION

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

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

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

SALES & SUPPORT OFFICES

Advantest Korea Co., Ltd.
22BF, Kyobo KangNam Tower,
1303-22, Seocho-Dong, Seocho-Ku, Seoul #137-070, Korea
Phone: +82-2-532-7071
Fax: +82-2-532-7132

Advantest (Suzhou) Co., Ltd.
Shanghai Branch Office:
Bldg. 6D, NO.1188 Gumei Road, Shanghai, China 201102 P.R.C.
Phone: +86-21-6485-2725
Fax: +86-21-6485-2726

Shanghai Branch Office:
406/F, Ying Building, Quantum Plaza, No. 23 Zhi Chun Road,
Hai Dian District, Beijing,
China 100083
Phone: +86-10-8235-3377
Fax: +86-10-8235-6717

Advantest (Singapore) Pte. Ltd.
438A Alexandra Road, #08-03/06
Alexandra Technopark Singapore 119967
Phone: +65-6274-3100
Fax: +65-6274-4055

Advantest America, Inc.
3201 Scott Boulevard, Suite, Santa Clara, CA 95054, U.S.A
Phone: +1-408-988-7700
Fax: +1-408-987-0691

ROHDE & SCHWARZ Europe GmbH
Mühldorfstraße 15 D-81671 München, Germany
(P.O.B. 80 14 60 D-81614 München, Germany)
Phone: +49-89-4129-13711
Fax: +49-89-4129-13723

ADVANTEST®

http://www.advantest.co.jp

ADVANTEST CORPORATION
Shin-Marunouchi Center Building, 1-6-2 Marunouchi, Chiyoda-ku, Tokyo 100-0005, Japan
Phone: +81-3-3214-7500