MS2690A/MS2691A/MS2692A
Signal Analyzer
Operation Manual
Mainframe
Operation

35th Edition

For safety and warning information, please read this manual before attempting to use the equipment.
Keep this manual with the equipment.

ANRITSU CORPORATION

Document No.: M-W2850AE-35.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

⚠DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

⚠WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

⚠CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MS2690A/MS2691A/MS2692A
Signal Analyzer
Operation Manual Mainframe Operation

15 May 2007 (First Edition)
25 November 2014 (35th Edition)

For Safety

⚠ WARNING

- ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

- Overvoltage Category
  This equipment complies with overvoltage category II defined in IEC 61010. DO NOT connect this equipment to the power supply of overvoltage category III or IV.

Electric Shock

- To ensure that the equipment is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with an ground terminal. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

Repair

- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Calibration

- The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. Be careful not to break the seal by opening the equipment or unit covers. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed.

For Safety

⚠ WARNING

Falling Over

- This equipment should always be positioned in the correct manner. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
  Always set up the equipment in a position where the power switch can be reached without difficulty.

Replacing Battery

- When replacing the battery, use the specified battery and insert it with the correct polarity. If the wrong battery is used, or if the battery is inserted with reversed polarity, there is a risk of explosion causing severe injury or death.

Battery Fluid

- DO NOT short the battery terminals and never attempt to disassemble the battery or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak. This fluid is poisonous.
  DO NOT touch the battery fluid, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

Battery Disposal

- DO NOT expose batteries to heat or fire. Do not expose batteries to fire. This is dangerous and can result in explosions or fire. Heating batteries may cause them to leak or explode.

LCD

- This equipment uses a Liquid Crystal Display (LCD). DO NOT subject the equipment to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
  This liquid is very caustic and poisonous.
  DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

⚠ CAUTION

Cleaning

- Always remove the main power cable from the power outlet before cleaning dust around the power supply and fan.
  - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
  - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Check Terminal

- Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.

For Safety

⚠ CAUTION

Replacing Memory Back-up Battery

This equipment uses a Poly-carbomonofluoride lithium battery to backup the memory. This battery must be replaced by service personnel when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

Note: The battery used in this equipment has a maximum useful life of 7 years. It should be replaced before this period has elapsed.

External Storage Media

This equipment uses USB memory as external storage media for storing data and programs.

If this media is mishandled or becomes faulty, important data may be lost. To prevent this chance occurrence, all important data and programs should be backed-up.

Anritsu will not be held responsible for lost data.

Pay careful attention to the following points.

- Never remove the USB memory from the equipment while it is being accessed.
- The USB memory may be damaged by static electric charges.
- Anritsu has thoroughly tested all external storage media shipped with this equipment. Users should note that external storage media not shipped with this equipment may not have been tested by Anritsu, thus Anritsu cannot guarantee the performance or suitability of such media.

For Safety

⚠ CAUTION

Hard disk

The equipment is equipped with an internal hard disk from which, as with any hard disk, data may be lost under certain conditions. To prevent this chance occurrence, all important data and programs should be backed-up.
Anritsu will not be held responsible for lost data.

To reduce the possibility of data loss, particular attention should be given to the following points.

- The equipment should only be used within the recommend temperature range, and should not be used in locations where the temperature may fluctuate suddenly.
- Always follow the guidelines to ensure that the equipment is set up in the specified manner.
- Always ensure that the fans at the rear and side of the equipment are not blocked or obstructed in any way.
- Exercise care not to bang or shake the equipment whilst the power is on.
- Never disconnect the mains power at the plug or cut the power at the breaker with the equipment turned on.

Notes on Handling (When Rubidium Reference Oscillator Option is Installed)

Please use the carrying case or the original packing materials when you transport it.

Because Rubidium Reference Oscillator frequency changes by the magnet, please do not set the one to have the magnetism (more than 0.5 Gauss) such as magnets near it.

Use in a residential environment

This equipment is designed for an industrial environment.
In a residential environment this equipment may cause radio interference in which case the user may be required to take adequate measures.

Use in Corrosive Atmospheres

Exposure to corrosive gases such as hydrogen sulfide, sulfurous acid, and hydrogen chloride will cause faults and failures.
Note that some organic solvents release corrosive gases.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault. However, software fixes will be made in accordance with the separate Software End-User License Agreement. Moreover, Anritsu Corporation will deem this warranty void when:

- The fault is outside the scope of the warranty conditions separately described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster, including fire, wind, flooding, earthquake, lightning strike, or volcanic ash, etc.
- The fault is due to damage caused by acts of destruction, including civil disturbance, riot, or war, etc.
- The fault is due to explosion, accident, or breakdown of any other machinery, facility, or plant, etc.
- The fault is due to use of non-specified peripheral or applied equipment or parts, or consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.
- The fault is due to use in unusual environments(Note).
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Note:
For the purpose of this Warranty, "unusual environments" means use:

- In places of direct sunlight
- In dusty places
- Outdoors
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in place chemically active gases (sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen oxide, or hydrogen chloride etc.) are present
- In places where high-intensity static electric charges or electromagnetic fields are present
- In places where abnormal power voltages (high or low) or instantaneous power failures occur
- In places where condensation occurs
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Software End-User License Agreement (EULA)

Please read this Software End-User License Agreement (hereafter this EULA) carefully before using (includes executing, copying, registering, etc.) this software (includes programs, databases, scenarios, etc., used to operate, set, etc., Anritsu electronic equipment). By reading this EULA and using this software, you are agreeing to be bound by the terms of its contents and Anritsu Corporation (hereafter Anritsu) hereby grants you the right to use this Software with the Anritsu-specified equipment (hereafter Equipment) for the purposes set out in this EULA.

1. Grant of License and Limitations

1. Regardless of whether this Software was purchased from or provided free-of-charge by Anritsu, you agree not to rent, lease, lend, or otherwise distribute this Software to third parties and further agree not to disassemble, recompile, reverse engineer, modify, or create derivative works of this Software.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer this software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for personal injury, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, arising out of or related to your use or inability to use this Software.

3. Limitation of Liability

a. If a fault (bug) is discovered in this Software, preventing operation as described in the operation manual or specifications whether or not the customer uses this software as described in the manual, Anritsu shall at its own discretion, fix the bug, or exchange the software, or suggest a workaround, free-of-charge. However, notwithstanding the above, the following items shall be excluded from repair and warranty.
   i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   ii) If this Software is used in conjunction with other non-Anritsu-approved software.
   iii) Recovery of lost or damaged data.
   iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
   v) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, etc.

b. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs by Anritsu engineers necessitated by the above faults shall be borne by you.

c. The warranty period for faults listed in article 3a above covered by this EULA shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair, whichever is longer.

4. Export Restrictions

You may not use or otherwise export or re-export directly or indirectly this Software except as authorized by Japanese and United States law. In particular, this software may not be exported or re-exported (a) into any Japanese or US embargoed countries or (b) to anyone on the Japanese or US Treasury Department's list of Specially Designated Nationals or the US Department of Commerce Denied Persons List or Entity List. By using this Software, you warrant that you are not located in any such country or on any such list. You also agree that you will not use this Software for any purposes prohibited by Japanese and US law, including, without limitation, the development, design and manufacture or production of missiles or nuclear, chemical or biological weapons of mass destruction.

5. Termination

Anritsu shall deem this EULA terminated if you violate any conditions described herein. This EULA shall also be terminated if the conditions herein cannot be continued for any good reason, such as violation of copyrights, patents, or other laws and ordinances.

6. Reparations

If Anritsu suffers any loss, financial or otherwise, due to your violation of the terms of this EULA, Anritsu shall have the right to seek proportional damages from you.

7. Responsibility after Termination

Upon termination of this EULA in accordance with item 5, you shall cease all use of this Software immediately and shall as directed by Anritsu either destroy or return this Software and any backup copies, full or partial, to Anritsu.

8. Dispute Resolution

If matters of dispute or items not covered by this EULA arise, they shall be resolved by negotiations in good faith between you and Anritsu.

9. Court of Jurisdiction

This EULA shall be interpreted in accordance with Japanese law and any disputes that cannot be resolved by negotiation described in Article 8 shall be settled by the Japanese courts.

Using VISA Driver for Remote Control of This Equipment

When controlling this measuring equipment remotely using the Ethernet port, a VISA*1 driver must be installed in the PC controller. We recommend using NI-VISA™*2 from National Instruments™ (NI hereafter) as the VISA driver.

Although a license is generally required to use NI-VISA™, the licensed NI-VISA™ driver is provided free-of-charge for use when performing remote control (Note) of this measuring equipment.

The NI-VISA™ driver can be downloaded from the NI website at:

http://sine.ni.com/psp/app/doc/p/id/psp-411

Be sure to comply with the NI license agreement for the usage and license scope.

Be sure to uninstall the NI-VISA™ driver when disposing of this measuring equipment or transferring it to a third party, etc., when ceasing to use NI-VISA™, or upon completion of the contract term when using this equipment on a rental contract.

(Notes)

Although the NI-VISA™ driver itself can be downloaded free-of-charge from the web, an implementation license is required for legal reasons when some requirements are not met. (Check the NI web page for the detailed requirements.)

If these requirements are not met, permission is not granted to use NI hardware and software and an NI implementation license must be purchased. However, since this measuring equipment incorporates NI hardware (GPIB ASIC), the NI-VISA™ driver can be downloaded and used free-of-charge.

Glossary of Terms:

*1: VISA: Virtual Instrument Software Architecture
I/O software specification for remote control of measuring instruments using interfaces such as GPIB, Ethernet, USB, etc.

*2: NI-VISA™
World *de facto* standard I/O software interface developed by NI and standardized by the VXI Plug&Play Alliance.

Trademarks:

- National Instruments™, NI™, NI-VISA™ and National Instruments Corporation are all trademarks of National Instruments Corporation.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Trademark and Registered Trademark

IQproducer™ is a registered trademark of Anritsu Corporation in the United States and/or other countries.

Lifetime of Parts

The life span of certain parts used in this instrument is determined by the operating time or the power-on time. Due consideration should be given to the life spans of these parts when performing continuous operation over an extended period. These parts must be replaced at the customer's expense even if within the guaranteed period described in Warranty at the beginning of this manual. For details on life span, refer to the corresponding section in this manual.

Example: Display backlight, internal hard disk, removable hard disk, connector for hard disk, cooling fan

Cautions against computer virus infection

- Copying files and data
  Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
  All other required files should be transferred by means of USB or CompactFlash media after undergoing a thorough virus check.
- Adding software
  Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
  Ensure that the network has sufficient anti-virus security protection in place.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2002/96/EC (the “WEEE Directive”) in European Union.

For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

CE Conformity Marking

Anritsu affixes the CE Conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

CE

1. Product Model

Model: MS2690A/MS2691A/MS2692A Signal Analyzer

2. Applied Directive

EMC: Directive 2004/108/EC

LVD: Directive 2006/95/EC

3. Applied Standards

- EMC: Emission: EN 61326-1: 2006 (Class A)
  Immunity: EN 61326-1: 2006 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-8 (RPFMF)	A
IEC 61000-4-11 (V dip/short)	B, C

*: Performance Criteria

A: During testing normal performance within the specification limits.

B: During testing temporary degradation, or loss of function or performance which is self-recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Harmonic current emissions:
EN 61000-3-2: 2006 +A1:2009 A2:2009
(Class A equipment)

- LVD: EN 61010-1: 2010 (Pollution Degree 2)

4. Authorized representative

Name:	Murray Coleman
	Head of Customer Service EMEA
	ANRITSU EMEA Ltd.
Address, city:	200 Capability Green, Luton
	Bedfordshire, LU1 3LU
Country:	United Kingdom

C-Tick Conformity Marking

Anritsu affixes the C-Tick marking on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-Tick marking

1. Product Model

Model: MS2690A/MS2691A/MS2692A Signal Analyzer

2. Applied Standards

EMC:Emission: EN 61326-1: 2006 (Class A equipment)

Anritsu Eco Label

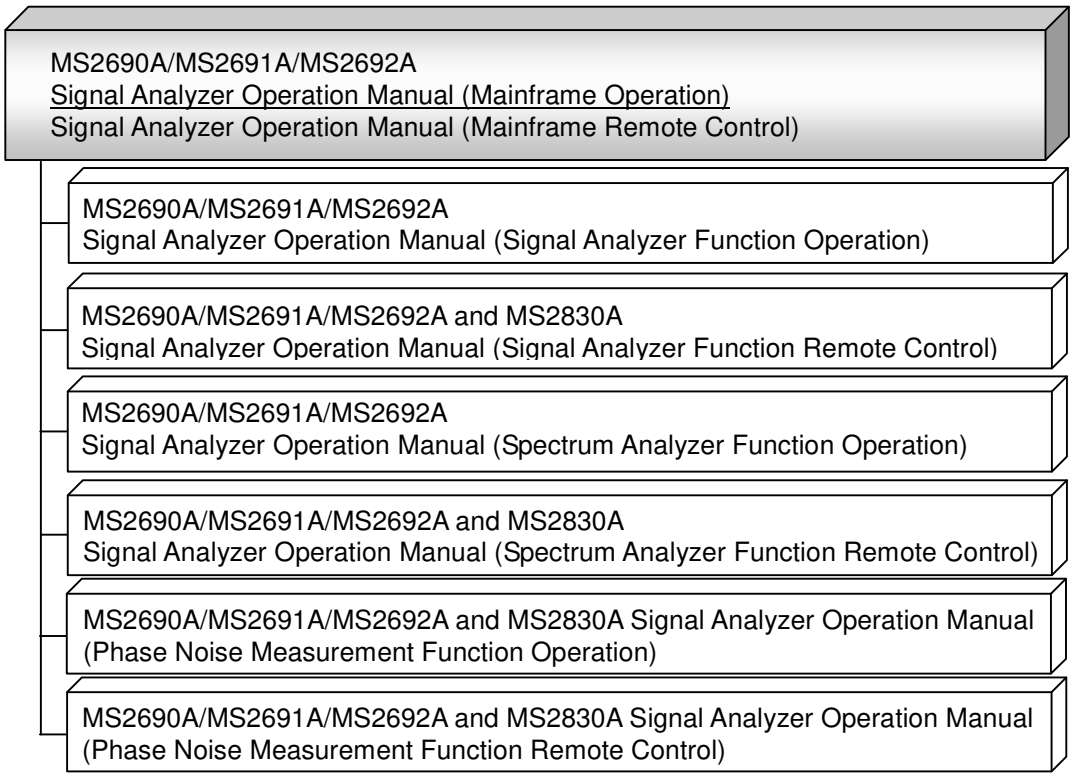
The label shown on the left is attached to Anritsu products meeting our environmental standards.

Details about this label and the environmental standards are available on the Anritsu website at http://www.anritsu.com

About This Manual

■ Associated Documents

The operation manual configuration of the MS2690A/MS2691A/MS2692A Signal Analyzer is shown below.



- Signal Analyzer Operation Manual (Mainframe) <This document>
- Signal Analyzer Operation Manual (Mainframe Remote Control)

  Description of basic operations, maintenance procedures, common functions and common remote functions of the mainframe

- Signal Analyzer Operation Manual (Signal Analyzer Function)
- Signal Analyzer Operation Manual (Signal Analyzer Function Remote Control)

  Description of basic operations, functions and remote functions of the signal analyzer

- Signal Analyzer Operation Manual (Spectrum Analyzer Function)
- Signal Analyzer Operation Manual (Spectrum Analyzer Function Remote Control)

  Description of basic operations, functions and remote functions of the spectrum analyzer

- Signal Analyzer Operation Manual (Phase Noise Measurement Function Operation)
- Signal Analyzer Operation Manual (Phase Noise Measurement Function Remote Control)

Description of basic operations, functions and remote functions of the phase noise measurement function.

In this document,  indicates a panel key.

Table of Contents

Chapter 1 Overview

This chapter provides an overview of the MS2690A/MS2691A/MS2692A Signal Analyzer and product configuration.

1.1 Product Overview

The MS2690A/MS2691A/MS2692A Signal Analyzer (hereinafter, referred to as "MS2690A/MS2691A/MS2692A") enables high-speed, high-accuracy, and simple measurements of transmission characteristics of radio devices for various mobile communications types.

The MS2690A/MS2691A/MS2692A enables high-speed and high-accuracy signal processing of wide-ranging analyses at full-span, a characteristic of conventional sweep-type spectrum analyzers, using a digital IF block. In addition, the FFT process (high-speed Fourier conversion) realizes high-speed spectrum analysis and simultaneous analysis on frequency and time axes not possible with conventional sweep-type spectrum analyzers. It also records RF input signals as digital data (digitize function). It can be used in a variety of applications from research and development to manufacturing thanks to its characteristics.

The following are characteristics of the MS2690A/MS2691A/MS2692A.

- Wide frequency band (6 GHz/13.5 GHz/26.5 GHz)
- Wide analysis bandwidth (31.25 MHz; however, 62.5/125 MHz when the option is installed)
- High dynamic range (180 dB)
- Enables full-span sweep
- High-speed, high-accuracy signal analysis using digital IF
- Enables time-continuous analysis of loaded data
- Loaded with large capacity waveform memory
- Enables high-speed spectrum analysis
- Rich measurement functions

The MS2690A/MS2691A/MS2692A is equipped with the hardware product made by National Instruments and comes with the license for NI-VISA. NI-VISA can be used for the purpose of controlling the MS2690A/MS2691A/MS2692A.

1.2 Product Configuration

1.2.1 Standard configuration

Tables 1.2.1-1 through 1.2.1-3 list the respective standard configurations of the MS2690A, MS2691A and MS2692A. First, after opening the packaging, check that all listed products are included. Contact an Anritsu Service and Sales office or agent about missing or damaged parts.

Table 1.2.1-1 Standard configuration (MS2690A)

Item	Model Number	Product Name	Q'ty	Remarks
Unit	MS2690A	Signal Analyzer	1	–
Accessories		Power cord	1	
	P0031A	USB memory	1	USB 2.0 Flash Driver (256 MB or more)
	Z0541A	USB mouse	1	Microsoft Basic Optical Mouse
	–	Installation CD-ROM	1	Application software, Operation Manual CD-ROM

Table 1.2.1-2 Standard configuration (MS2691A)

Item	Model Number	Product Name	Q'ty	Remarks
Unit	MS2691A	Signal Analyzer	1	–
Accessories		Power cord	1	
	P0031A	USB memory	1	USB 2.0 Flash Driver (256 MB or more)
	Z0541A	USB mouse	1	Microsoft Basic Optical Mouse
	–	Installation CD-ROM	1	Application software, Operation Manual CD-ROM

Table 1.2.1-3 Standard configuration (MS2692A)

Item	Model Number	Product Name	Q'ty	Remarks
Unit	MS2692A	Signal Analyzer	1	–
Accessories		Power cord	1	
	P0031A	USB memory	1	USB 2.0 Flash Driver (256 MB or more)
	Z0541A	USB mouse	1	Microsoft Basic Optical Mouse
	–	Installation CD-ROM	1	Application software, Operation Manual CD-ROM

1.2.2 Required setup services

Table 1.2.2-1 lists the required setup services for the MS2690A/MS2691A/ MS2692A.

Table 1.2.2-1 Required options (MS2690A/MS2691A/MS2692A)

Model Number	Product Name	Remarks
Z0979A	Optional setup service*	–

*: The following contents are contained in the optional setup service.

- Initial setting and activation of Windows XP Professional
- Software installation

1.2.3 Options

Tables 1.2.3-1 through 1.2.3-4 list the options for the MS2690A/MS2691A/MS2692A. These options are sold separately.

Note:

There is a risk of losing the data when adding additional option(s), so **back up the data** stored on the hard disk, in advance. Anritsu is not responsible for any loss of data.

Table 1.2.3-1 Additional Options at/after shipment (MS2690A)

Option Number	Product Name	Remarks
MS2690A-001	Rubidium Reference Oscillator	Aging rate $\pm 1 \times 10^{-10}$/month
MS2690A-101	Rubidium Reference Oscillator Retrofit	Aging rate $\pm 1 \times 10^{-10}$/month
MS2690A-004	Wideband Analysis Hardware	Extends the Analysis Bandwidth to 125 MHz
MS2690A-104	Wideband Analysis Hardware Retrofit	Extends the Analysis Bandwidth to 125 MHz
MS2690A-008	6 GHz Preamplifier	100 kHz to 6 GHz
MS2690A-108	6 GHz Preamplifier Retrofit	100 kHz to 6 GHz
MS2690A-017	Noise Figure Measurement Function	
MS2690A-117	Noise Figure Measurement Function Retrofit	
MS2690A-020	Vector Signal Generator	125 MHz to 6 GHz
MS2690A-120	Vector Signal Generator Retrofit	125 MHz to 6 GHz
MS2690A-050	HDD Digitizing Interface	Supports External HDD
MS2690A-150	HDD Digitizing Interface Retrofit	Supports External HDD

Table 1.2.3-1 Additional Options at/after shipment (MS2690A) (Cont'd)

Option Number	Product Name	Remarks
MS2690A-077	Analysis Bandwidth Extension to 62.5MHz	Extends Analysis Bandwidth to 62.5 MHz
MS2690A-177	Analysis Bandwidth Extension to 62.5MHz Retrofit	Extends Analysis Bandwidth to 62.5 MHz
MS2690A-078	Analysis Bandwidth Extension to 125MHz	Extends Analysis Bandwidth to 125 MHz
MS2690A-178	Analysis Bandwidth Extension to 125MHz Retrofit	Extends Analysis Bandwidth to 125 MHz
MS2690A-180	CPU/Windows7 Upgrade Retrofit	Upgrades the CPU and operating system to Windows 7.

Table 1.2.3-2 Additional Options at/after shipment (MS2691A)

Option Number	Product Name	Remarks
MS2691A-001	Rubidium Reference Oscillator	Aging rate $\pm 1 \times 10^{-10}$/month
MS2691A-101	Rubidium Reference Oscillator Retrofit	Aging rate $\pm 1 \times 10^{-10}$/month
MS2691A-003	Extension of Preselector Lower Limit to 3 GHz	Preselector lower limit, 3 GHz
MS2691A-103	Extension of Preselector Lower Limit to 3 GHz Retrofit	Preselector lower limit, 3 GHz
MS2691A-004	Wideband Analysis Hardware	Extends the Analysis Bandwidth to 125 MHz
MS2691A-104	Wideband Analysis Hardware Retrofit	Extends the Analysis Bandwidth to 125 MHz
MS2691A-008	6 GHz Preamplifier	100 kHz to 6 GHz
MS2691A-108	6 GHz Preamplifier Retrofit	100 kHz to 6 GHz
MS2691A-017	Noise Figure Measurement Function	
MS2691A-117	Noise Figure Measurement Function Retrofit	
MS2691A-020	Vector Signal Generator	125 MHz to 6 GHz
MS2691A-120	Vector Signal Generator Retrofit	125 MHz to 6 GHz
MS2691A-050	HDD Digitizing Interface	Supports External HDD
MS2691A-150	HDD Digitizing Interface Retrofit	Supports External HDD
MS2691A-077	Analysis Bandwidth Extension to 62.5MHz	Extends Analysis Bandwidth to 62.5 MHz
MS2691A-177	Analysis Bandwidth Extension to 62.5MHz Retrofit	Extends Analysis Bandwidth to 62.5 MHz
MS2691A-078	Analysis Bandwidth Extension to 125MHz	Extends Analysis Bandwidth to 125 MHz
MS2691A-178	Analysis Bandwidth Extension to 125MHz Retrofit	Extends Analysis Bandwidth to 125 MHz

Table 1.2.3-3 Additional Options at/after shipment (MS2692A)

Option Number	Product Name	Remarks
MS2692A-001	Rubidium Reference Oscillator	Aging rate ±1 × 10^{-10}/month
MS2692A-101	Rubidium Reference Oscillator Retrofit	Aging rate ±1 × 10^{-10}/month
MS2692A-003	Extension of Preselector Lower Limit to 3 GHz	Preselector lower limit, 3 GHz
MS2692A-103	Extension of Preselector Lower Limit to 3 GHz Retrofit	Preselector lower limit, 3 GHz
MS2692A-004	Wideband Analysis Hardware	Extends the Analysis Bandwidth to 125 MHz
MS2692A-104	Wideband Analysis Hardware Retrofit	Extends the Analysis Bandwidth to 125 MHz
MS2692A-008	6 GHz Preamplifier	100 kHz to 6 GHz
MS2692A-108	6 GHz Preamplifier Retrofit	100 kHz to 6 GHz
MS2692A-017	Noise Figure Measurement Function	
MS2692A-117	Noise Figure Measurement Function Retrofit	
MS2692A-020	Vector Signal Generator	125 MHz to 6 GHz
MS2692A-120	Vector Signal Generator Retrofit	125 MHz to 6 GHz
MS2692A-050	HDD Digitizing Interface	Supports External HDD
MS2692A-150	HDD Digitizing Interface Retrofit	Supports External HDD
MS2692A-067	Microwave Preselector Bypass	Enables the preselector bypass.
MS2692A-167	Microwave Preselector Bypass Retrofit	Enables the preselector bypass.
MS2692A-077	Analysis Bandwidth Extension to 62.5MHz	Extends Analysis Bandwidth to 62.5 MHz
MS2692A-177	Analysis Bandwidth Extension to 62.5MHz Retrofit	Extends Analysis Bandwidth to 62.5 MHz
MS2692A-078	Analysis Bandwidth Extension to 125MHz	Extends Analysis Bandwidth to 125 MHz
MS2692A-178	Analysis Bandwidth Extension to 125MHz Retrofit	Extends Analysis Bandwidth to 125 MHz
MS2691A-180	CPU/Windows7 Upgrade Retrofit	Upgrades the CPU and operating system to Windows 7.

Table 1.2.3-4 Optional warranty extension (MS2690A/MS2691A/MS2692A)

Option Number	Product Name	Remarks
MS2690A-ES210	2-year warranty service	–
MS2690A-ES310	3-year warranty service	–
MS2690A-ES510	5-year warranty service	–
MS2691A-ES210	2-year warranty service	–
MS2691A-ES310	3-year warranty service	–
MS2691A-ES510	5-year warranty service	–
MS2692A-ES210	2-year warranty service	–
MS2692A-ES310	3-year warranty service	–
MS2692A-ES510	5-year warranty service	–

Tables 1.2.3-5 and 1.2.3-6 list the software options for the MS2690A/MS2691A/MS2692A. These options are sold separately.

Table 1.2.3-5 Optional software

Option Number	Product Name	Remarks
MX269010A	Mobile WiMAX Measurement Software	CD-ROM containing license and operation manual
MX269011A	W-CDMA/HSPA Downlink Measurement Software	CD-ROM containing license and operation manual
MX269012A	W-CDMA/HSPA Uplink Measurement Software	CD-ROM containing license and operation manual
MX269013A	GSM/EDGE Measurement Software	CD-ROM containing license and operation manual
MX269014A	ETC/DSRC Measurement Software	CD-ROM containing license and operation manual
MX269015A	TD-SCDMA Measurement Software	CD-ROM containing license and operation manual
MX269016A	XG-PHS Measurement Software	CD-ROM containing license and operation manual
MX269017A	Vector Modulation Analysis Software	CD-ROM containing license and operation manual
MX269020A	LTE Downlink Measurement Software	CD-ROM containing license and operation manual
MX269021A	LTE Uplink Measurement Software	CD-ROM containing license and operation manual
MX269022A	LTE TDD Downlink Measurement Software	CD-ROM containing license and operation manual
MX269023A	LTE TDD Uplink Measurement Software	CD-ROM containing license and operation manual
MX269024A	CDMA2000 Forward Link Measurement Software	CD-ROM containing license and operation manual
MX269026A	EV-DO Forward Link Measurement Software	CD-ROM containing license and operation manual
MX269028A	WLAN(802.11)Measurement Software	CD-ROM containing license and operation manual
MX269030A	W-CDMA BS Measurement Software	CD-ROM containing license and operation manual
MX269036A	Measurement Software for MediaFLO	CD-ROM containing license and operation manual
MX269037A	ISDB-Tmm Analysis Software	CD-ROM containing license and operation manual
MX269050A	Extended Digitizing Software	CD-ROM containing license and operation manual
MX269074A	Power Amplifier Measurement Software	CD-ROM containing license and operation manual

Table 1.2.3-6 Optional software (IQproducer™)

Option Number	Product Name	Remarks
MX269901A	HSDPA/HSUPA IQproducer™	CD-ROM containing license and operation manual
MX269902A	TDMA IQproducer™	CD-ROM containing license and operation manual
MX269904A	Multi-carrier IQproducer™	CD-ROM containing license and operation manual
MX269905A	Mobile WiMAX IQproducer™	CD-ROM containing license and operation manual
MX269908A	LTE IQproducer™	CD-ROM containing license and operation manual
MX269909A	XG-PHS IQproducer™	CD-ROM containing license and operation manual
MX269910A	LTE TDD IQproducer™	CD-ROM containing license and operation manual
MX269911A	WLAN IQproducer™	CD-ROM containing license and operation manual
MX269912A	TD-SCDMA IQproducer™	CD-ROM containing license and operation manual

1.2.4 Applicable parts

Table 1.2.4-1 lists the applicable parts for the MS2690A/MS2691A/MS2692A. These parts are sold separately.

Table 1.2.4-1 Applicable parts

Model Number	Product Name	Remarks
W2850AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)	Printed version
W2851AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Remote Control)	Printed version
W2852AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)	Printed version
W2853AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Remote Control)	Printed version
W2854AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Spectrum Analyzer Function Operation)	Printed version
W2855AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Spectrum Analyzer Function Remote Control)	Printed version
W3117AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Phase Noise Measurement Function Operation)	Printed version
W3118AE	MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Phase Noise Measurement Function Remote Control)	Printed version
W2856AE	MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator Operation Manual (Operation)	Printed version
W2857AE	MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator Operation Manual (Remote Control)	Printed version
W2914AE	MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator Operation Manual (IQproducer™)	Printed version
W2929AE	MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator Operation Manual (Standard Waveform Pattern)	Printed version

Table 1.2.4-1 Applicable parts (Cont'd)

Model Number	Product Name	Remarks
K240B	Power divider (K connector)	DC to 26.5 GHz, 50 Ω K-J, 1 Wmax
MA1612A	FOUR-PORT Junction PAD	5 MHz to 3 GHz, N-J
MP752A	TERMINATION	DC to 12.4 GHz, 50 Ω N-P
MA24106A	USB Power Sensor	50 MHz to 6 GHz, USB/Mini B with cable (Refer to Appendix C)
MA2512A	Band pass filter	W-CDMA compatible, Pass band: 1.92 to 2.17 GHz
J0576B	Coaxial cord	Approx. 1 m length (N-P, 5D-2W, N-P)
J0576D	Coaxial cord	Approx. 2 m length (N-P, 5D-2W, N-P)
J0127A	Coaxial cord	Approx. 1 m length (BNC-P, RG58A/U, BNC-P)
J0127B	Coaxial cord	Approx. 2 m length (BNC-P, RG58A/U, BNC-P)
J0127C	Coaxial cord	Approx. 0.5 m length (BNC-P, RG58A/U, BNC-P)
J0322A	Coaxial cord	DC to 18 GHz, approx 0.5 m length (SMA-P, 50 Ω SUCOFLEX104, SMA-P)
J0322B	Coaxial cord	DC to 18 GHz, approx. 1 m length (SMA-P, 50 Ω SUCOFLEX104, SMA-P)
J0322C	Coaxial cord	DC to 18 GHz, approx. 1.5 m length (SMA-P, 50 Ω SUCOFLEX104, SMA-P)
J0322D	Coaxial cord	DC to 18 GHz, approx. 2 m length (SMA-P, 50 Ω SUCOFLEX104, SMA-P)
J1398A	N-SMA ADAPTOR	DC to 26.5 GHz, 50 Ω N-P, SMA-J
J0911	Coaxial cord, 1.0 M (for 40 GHz)	DC to 40 GHz, approx 1 m length (SF102A, 11K254/11K254/1.0M)
J0912	Coaxial cord, 0.5 M (for 40 GHz)	DC to 40 GHz, approx 0.5 m length (SF102A, 11K254/11K254/0.5M)
41KC-3	Fixed Attenuator, 3 dB	DC to 40 GHz, 3 dB

Table 1.2.4-1 Applicable parts (Cont'd)

Model Number	Product Name	Remarks
J1261A	Ethernet cable (shield type)	Straight cable, approx. 1 m length
J1261B	Ethernet cable (shield type)	Straight cable, approx. 3 m length
J1261C	Ethernet cable (shield type)	Cross cable, approx. 1 m length
J1261D	Ethernet cable (shield type)	Cross cable, approx 3 m length
J0008	GPIB cable, 2.0 m	Approx. 2 m length
J1373A	AUX conversion adapter	AUX → BNC For vector signal generator option
B0597A	Rack mount kit	
B0589A	Carrying case	Protective cover, casters
B0633A	Carrying case (Soft Type)	
Z0975A	Keyboard (USB)	

1.3 Specifications

1.3.1 Mainframe (MS2690A/MS2691A)

Tables 1.3.1-1 through 1.3.1-4 show the specifications for the MS2690A/MS2691A.

The following specification values are those under the conditions after 30-min warm-up at stable ambient temperature. Also, note that the Typ. values are provided as reference data, and are not guaranteed specifications.

Setting Frequency Band Mode to Spurious can be performed when installing the MS2691A-003/103.

Table 1.3.1-1 Specifications for mainframe

Item	Specification		
Frequency			
Frequency range	50 Hz to 6 GHz 50 Hz to 13.5 GHz	(MS2690A) (MS2691A)	
Frequency band Configuration		Band	Mixer harmonic order[N]
	50 Hz to 6.0 GHz	0	1
	3 to 6.0 GHz when MS2691A-003/103 is mounted (MS2691A)	1 – L	1
	5.9 to 8.0 GHz (MS2691A)	1–	1
	7.9 to 13.5 GHz (MS2691A)	1+	1
Preselector range	Frequency Band Mode: Normal 5.9 to 13.5 GHz (MS2691A) Frequency Band Mode: Spurious 3 to 13.5 GHz		
Frequency settings			
Settable range	0 Hz to 6 GHz 0 Hz to 13.5 GHz	(MS2690A) (MS2691A)	
Resolution	1 Hz		

Table 1.3.1-1 Specifications for mainframe (Cont'd)

Item	Specification
Internal reference oscillator	
Activation characteristics	Based on frequency 24 hours after power application, at 23°C $\pm 5 \times 10^{-7}$ (2 minutes after power application) $\pm 5 \times 10^{-8}$ (5 minutes after power application)
Aging rate	$\pm 1 \times 10^{-7}$/year
Temperature characteristics	$\pm 2 \times 10^{-8}$ (5 to 45°C)
	When Option 001/101 Rubidium Reference Oscillator is installed
Activation characteristics	Based on frequency 24 hours after power application, at 23°C $\pm 1 \times 10^{-9}$ (7 minutes after power application)
Aging rate	$\pm 1 \times 10^{-10}$/month
Temperature characteristics	$\pm 1 \times 10^{-9}$ (5 to 45°C)
Single side band noise	At 18 to 28°C, 2 GHz (Frequency offset) 100 kHz –116 dBc/Hz 1 MHz –137 dBc/Hz
Amplitude	
Measurement range	Displays average noise level up to +30 dBm
Maximum input level	
Continuous wave average Power	+30 dBm (Input attenuator ≥ 10 dB)
DC	0 Vdc
Input attenuator	0 to 60 dB, 2 dB steps
Input attenuator switching error	Based on input attenuator 10 dB Frequency Band Mode: Normal ≤ 6 GHz: ±0.2 dB (10 to 60 dB) > 6 GHz: ±0.75 dB (10 to 60 dB) (MS2691A) Frequency Band Mode: Spurious < 3 GHz: ±0.2 dB (10 to 60 dB) (MS2691A) ≥ 3 GHz: ±0.75 dB (10 to 60 dB) (MS2691A)
Reference Level	
Setting range	Log scale: –120 to +50 dBm or equivalent value Linear scale: 22.4 μV to 70.7 V or equivalent value Resolution: 0.01 dB or equivalent level
Units	Log scale: dBm, dBμV, dBmV, dBμV (emf), dBμV/m, V, W Linear scale: V
Linearity error	Excluding the noise floor effect ±0.07 dB (Mixer input level ≤ –20 dBm) ±0.10 dB (Mixer input level ≤ –10 dBm) Frequency Band Mode: Normal ±0.15 dB (Mixer input level ≤ 0 dBm, frequency ≤ 6 GHz) ±0.50 dB (Mixer input level ≤ 0 dBm, frequency > 6 GHz) Frequency Band Mode: Spurious ±0.15 dB (Mixer input level ≤ 0 dBm, frequency < 3 GHz) ±0.50 dB (Mixer input level ≤ 0 dBm, frequency ≥ 3 GHz)

Table 1.3.1-1 Specifications for mainframe (Cont'd)

Item	Specification
RF frequency characteristics	After CAL execution, input attenuator = 10 dB, at 18 to 28°C ±0.35 dB (9 kHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Normal) (9 kHz ≤ frequency < 3 GHz, Frequency Band mode: Spurious) After CAL execution, input attenuator = 10 dB, after preselector tuning, at 18 to 28°C (MS2691A) ±1.50 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band mode: Spurious)
1-dB gain compression	At mixer input level ≥ +3 dBm (100 MHz ≤ frequency < 400 MHz) ≥ +7 dBm (400 MHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Normal) (400 MHz ≤ frequency < 3 GHz, Frequency Band mode: Spurious) ≥ +3 dBm (MS2691A) (3 GHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Spurious) ≥ +3 dBm (MS2691A)(6 GHz < frequency ≤ 13.5 GHz)
Spurious Response	
Secondary harmonic wave distortion	At mixer input level = –30 dBm Harmonic wave [dBc] — SHI [dBm] ≤ –60 — ≥ +30 (10 MHz ≤ Input frequency ≤ 400 MHz) ≤ –75 — ≥ +45 (0.4 GHz < Input frequency ≤ 0.8 GHz) ≤ –75 — ≥ +45 (0.8 GHz < Input frequency ≤ 1 GHz) ≤ –75 — ≥ +45 (1 GHz < Input frequency ≤ 3 GHz) At mixer input level = –10 dBm (MS2691A) Harmonic wave [dBc] — SHI [dBm] ≤ –90 — ≥ +80 (3 GHz <Input frequency, Frequency Band mode: Normal) ≤ –90 — ≥ +80 (1.5 GHz ≤ Input frequency, Frequency Band mode: Spurious)
Residual response	Frequency ≥ 1 MHz, at input attenuator = 0 dB, 50 Ω (Excluding "bandwidth > 31.25 MHz" in Signal Analyzer.) ≤ –100 dBm

Table 1.3.1-1 Specifications for mainframe (Cont'd)

Item	Specification
Connector	
RF input	
Connector	Front panel, N-J, 50 Ω VSWR: Input attenuator ≥10 dB, 18 to 28°C ≤ 1.2 (Nominal value) (40 MHz ≤ frequency ≤ 3 GHz) ≤ 1.5 (Nominal value) (3 GHz < frequency ≤ 6 GHz) ≤ 2.0 (Nominal value) (6 GHz < frequency ≤ 13.5 GHz) (MS2691A)
IF Output	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	875 MHz (when not installing the Signal Analyzer and MS269xA-004/104/077/177/078/178 or setting bandwidth ≤ 31.25 MHz) 900 MHz (when installing the Signal Analyzer and MS269xA-004/104/077/177/078/178 or setting bandwidth >31.25) 874.988 MHz (Spectrum Analyzer)
Gain	At the reference RF input level, 1 GHz RF frequency , and 0 dB input attenuator (nominal value) 0 dB (nominal value)
IF bandwidth	120 MHz (nominal value)
External reference input	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	10 MHz or 13 MHz
Operating range	±1 ppm
Input level	–15 dBm ≤ level ≤ +20 dBm, 50 Ω (AC coupling)

Table 1.3.1-1 Specifications for mainframe (Cont'd)

Item	Specifications
Reference signal output	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	10 MHz
Output level	≥ 0 dBm (AC coupling)
Sweep status output	
Connector	Rear panel, BNC-J
Output level	TTL level (high level at sweep or waveform acquisition)
Trigger input	
Connector	Rear panel, BNC-J
Input level	TTL level
External controls	Control from external controller (except power)
Ethernet (10/100/1000Base-T)	
Connector	Rear panel, RJ-45
GPIB	
Connector	IEEE488.2 compatible Rear panel, IEEE488 bus connector
Interface function	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2
USB (B)	
Connector	USB2.0 compatible Rear panel, USB-B connector
USB	
Connector	Enables waveform hard copy to USB compatible external device and saving mainframe setting parameters USB 2.0 compatible USB-A connector (2 ports on front panel, 2 ports on rear panel)
Monitor output	
Connector	Rear panel, VGA compatibility, mini D-SUB 15 pin
Aux	
Connector	Used for trigger input/output from/to Option 020/120, etc. Rear panel, 68 pins (DX10BM-68S equivalent part)
Screen	XGA color LCD (resolution: 1024 × 768) 8.4 inch (213 mm diagonal)

Table 1.3.1-1 Specifications for mainframe (Cont'd)

Item	Specification
Overall Specifications	
Size, Weight	
Size	340 mm (w) × 200 mm (h) × 350 mm (d) (excluding protrusions)
Weight	≤ 13.5 kg (excluding options)
Power	
Voltage	Rated Voltage: AC 100 to 120 V or 200 to 240 V *
Frequency	50 Hz to 60 Hz
Power consumption	≤ 260 VA (excluding options) ≤ 440 VA (including all options, maximum value)
Temperature	
Operating temperature	5 to 45°C
Storage temperature	–20 to 60°C
Environment Performance	
Conducted disturbance	EN 61326-1: 2006 (Class A)
Electromagnetic radiated disturbance	EN 61326-1: 2006 (Class A)
Harmonic current emission	EN 61000-3-2: 2006 +A1:2009 A2:2009 (Class A equipment)
Electrostatic discharge	EN 61326-1: 2006 (Table 2)
Electromagnetic field immunity	EN 61326-1: 2006 (Table 2)
Fast transient/burst	EN 61326-1: 2006 (Table 2)
Surge	EN 61326-1: 2006 (Table 2)
Conducted RF	EN 61326-1: 2006 (Table 2)
Power frequency magnetic field	EN 61326-1: 2006 (Table 2)
Voltage dips/short interruption	EN 61326-1: 2006 (Table 2)

*: Operating voltage: within the range of +10% to –15% from the rated voltage (Max. 250 V)

Also refer to Table 1.3.4-1 “Specifications for Wideband Analysis Hardware Options” when MS269xA-004/104 is installed.

Table 1.3.1-2 Specifications for signal analyzer function

Item	Specification
Common	
Trace mode	Spectrum, Power vs Time, Frequency vs Time, CCDF, Spectrogram No Trace
Bandwidth Range	 Specifies the capture analysis bandwidth from the center frequency 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz
Sampling rate Range	 Automatically set depending on analysis bandwidth 2 kHz to 50 MHz (1-2-5 sequence)
Capture time Capture time length Setting mode	 Sets the capture time length Minimum capture time length: 2 μs to 50 ms (determined depending on analysis bandwidth) Maximum capture time length: 2 to 2000 s (determined depending on analysis bandwidth) Auto, Manual
Trigger Trigger mode	 Free Run (Trig Off), Video, Wide IF Video, External (TTL) SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)
ADC resolution	16bits (when not installing the MS269xA-004/104/077/177/078/178 or setting bandwidth ≤ 31.25 MHz)
Spectrum indicator function	
Function overview	Displays spectrums within random time spans and frequency ranges in captured waveform data.
Analysis time range Analysis Start Time Analysis Time Length Setting mode	 Sets analysis start time position from beginning of waveform data Sets analysis time length Auto, Manual
Frequency	Center frequency and SPAN can be set within the frequency range in waveform data
Indicator frequency accuracy	±[Indicator frequency × reference frequency accuracy + SPAN frequency × reference frequency accuracy + RBW × 0.05 + 2 × N + SPAN frequency / (Trace point count – 1)] Hz N:Mixer harmonic order
Resolution bandwidth (RBW) Setting range Selectivity	 1 Hz to 1 MHz (1-3 sequence) (–60 dB/–3 dB) 4.5:1, nominal value

Table 1.3.1-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Absolute amplitude accuracy	After CAL execution, 18 to 28°C, input attenuator ≥ 10 dB, mixer input level ≤ 0 dBm, RBW = Auto, Time Detection = Average, Marker Result = Integration or Peak(Accuracy), center frequency CW, excluding the noise floor effect ±0.5 dB (50 Hz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (50 Hz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) After Preselector tuning (MS2691A) ±1.8 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error, and input attenuator switching error.
In-band frequency characteristics	On the basis of a level of the center frequency, in center frequency ±10 MHz, when MS269xA-004/104/077/177/078/178 is not installed or the bandwidth is ≤31.25 MHz: ±0.31 dB (30 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (30 MHz ≤ Frequency ≤ 3 GHz, Frequency Band Mode: Spurious)
Display average noise level	Input attenuator 0 dB, at 18 to 28°C 100 kHz –132.5 [dBm/Hz] 1 MHz –142.5 [dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –152.5 [dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –150.5 [dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency < 4 GHz –150.5 [dBm/Hz] 4 GHz ≤ frequency < 5 GHz –149.5 [dBm/Hz] 5 GHz ≤ frequency < 6 GHz –149.5 [dBm/Hz] 6 GHz ≤ frequency < 10 GHz –148.5 [dBm/Hz] (MS2691A) 10 GHz ≤ frequency ≤ 13.5 GHz –147.5 [dBm/Hz] (MS2691A)
Adjacent channel power (ACP) leakage	Reference: Span Total, Carrier Total, Both Sides of Carriers, or Carrier Select Adjacent channel specification: 3 channels × 2
Channel power Absolute value measurement	dBm, dBm/Hz
Occupied bandwidth (OBW)	N% of Power method, X dB Down method

Table 1.3.1-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Power vs Time Display Function	
Function overview	Indicates time changes of power for captured waveform data
Analysis time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Resolution bandwidth	
Filter type	Rect, Gaussian, Nyquist, Root Nyquist, Off (default: Off)
Roll-off rate setting	0.01 to 1 (settable for Nyquist and Root Nyquist)
Filter frequency offset	Filter center frequency can be set within frequency band of waveform data
Peak to Peak measurement	Measured using AM Depth or marker function +Peak, –Peak, (P-P)/2, Average
Burst average power	Measures average power of burst signal
Frequency vs. Time Display Function	
Function overview	Displays frequency time fluctuations of input signal from captured waveform data
Resolution time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Operating level range	–17 to +30 dBm (input attenuator ≥ 10 dB)
Frequency (vertical axis)	
	Center frequency and SPAN can be set within frequency range in waveform data
Display frequency range	Selectable from 1/25, 1/10, 1/5 and 1/2 of analysis bandwidth
Input frequency range	10 MHz to 6 GHz
Indicator frequency accuracy	
At CW input	Input level = –17 to +30 dBm, SPAN ≤ 31.25 MHz, scale = SPAN/25, ±(reference oscillator accuracy × center frequency + indicator frequency range × 0.01) Hz
Peak to Peak measurement	Measured using FM Deviation or marker function +Peak, –Peak, (P-P)/2, Average
Phase vs Time Display Function	
Function overview	Displays the phase time fluctuation of the input signal in the acquired waveform data.
Analysis Time Range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data.
Analysis Time Length	Sets analysis time span.
Available Mode	Auto, Manual
Phase (Vertical Axis)	
Display Mode	Wrap, Unwrap
Phase Display Range	Settable between 0.01 deg./div to 200G deg./div.
Offset	–100M to 100 M deg.

Table 1.3.1-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
CCDF Display Function	
Function overview	Displays CCDF and APD of waveform data captured at specific time
Analysis time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Display	
Histogram resolution	Graphically displays CCDF and APD 0.01 dB
Numerical value indicator	Average Power, Max Power, Crest Factor
Resolution bandwidth	
Filter type	Rectangle, Off (default: Off)
Filter frequency offset	Filter center frequency can be set within frequency band of waveform data
Spectrogram Display Function	
Function overview	Displays Spectrogram in arbitrary time length within the captured waveform data
Analysis time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting Mode	Auto, Manual
Frequency	Center frequency and SPAN can be set within frequency range in waveform data
Resolution Bandwidth(RBW)	
Setting Range	1 Hz to 1 MHz (1-3 Sequence)
Selectivity	(–60 dB/–3 dB) 4.5:1, Nominal value
Digitize Function	
Function overview	Capable of outputting captured waveform data to internal hard disk or external device
Waveform data	
Format	I, Q (each 32 bit Float Binary format)
Level	$\sqrt{(I^2 + Q^2)}$ = 1 at 0 dBm input
Level accuracy:	Same as absolute amplitude accuracy of signal analyzer
External output	Capable of outputting to external PC through Ethernet

Table 1.3.1-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Replay Function	
Function overview	Analyzes traces of saved waveform data
Waveform data format	I, Q (Binary format)
Conditions for measurable waveform data	Analyzable combinations of SPAN and sampling rate SPAN — Sampling rate 1 kHz — 2 kHz 2.5 kHz — 5 kHz 5 kHz — 10 kHz 10 kHz — 20 kHz 25 kHz — 50 kHz 50 kHz — 100 kHz 100 kHz — 200 kHz 250 kHz — 500 kHz 500 kHz — 1 MHz 1 MHz — 2 MHz 2.5 MHz — 5 MHz 5 MHz — 10 MHz 10 MHz — 20 MHz 18.6 MHz — 20 MHz 20 MHz — 25 MHz 25 MHz — 50 MHz 31.25 MHz — 50 MHz 50 MHz — 100 MHz 62.5 MHz — 100 MHz 100 MHz — 200 MHz 125 MHz — 200 MHz

Table 1.3.1-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Conditions for measurable waveform data	Combinations of SPAN and minimum capture sample SPAN — Minimum Capture Sample 1 kHz — 74000 (37 s) 2.5 kHz — 160000 (32 s) 5 kHz — 310000 (31 s) 10 kHz — 610000 (30.5 s) 25 kHz — 730000 (14.6 s) 50 kHz — 730000 (7.3 s) 100 kHz — 730000 (3.65 s) 250 kHz — 730000 (1.46 s) 500 kHz — 730000 (730 ms) 1 MHz — 730000 (365 ms) 2.5 MHz — 730000 (146 ms) 5 MHz — 730000 (73 ms) 10 MHz — 730000 (36.5 ms) 18.6 MHz — 730000 (36.5 ms) 20 MHz — 730000 (29.2 ms) 25 MHz — 730000 (14.6 ms) 31.25 MHz — 730000 (14.6 ms) 50 MHz — 730000 (7.3 ms) 62.5 MHz — 730000 (7.3 ms) 100 MHz — 730000 (3.65 ms) 125 MHz — 730000 (3.65 ms)

Table 1.3.1-3 Specifications for spectrum analyzer function

Item	Specification
Frequency	
Span	
Range	0 Hz, 300 Hz to 6 GHz (MS2690A) 0 Hz, 300 Hz to 13.5 GHz (MS2691A)
Resolution	2 Hz
Span accuracy	±0.2%
Indicator frequency accuracy	± [Indicator frequency × reference frequency accuracy + SPAN frequency × SPAN accuracy + RBW × 0.05 + 2 × N + SPAN frequency/(Trace point count –1)] Hz N is Mixer harmonic order
Resolution bandwidth (RBW)	
Setting range	30 Hz to 3 MHz (1-3 sequence), 50 kHz, 5 MHz, 10 MHz, 20 MHz, 31.25 MHz 31.25 MHz can be set only when SPAN is 0 Hz.
Selectivity	(–60 dB/–3 dB) 4.5:1 (Nominal value, when setting at 30 Hz to 10 MHz)
Video bandwidth (VBW)	
Setting range	1 Hz to 10 MHz (1-3 sequence), 5 kHz, OFF
VBW mode	Video Average/Power Average
Amplitude	
Display average noise level	Detector = Sample, VBW = 1 Hz (Video Average), Input Attenuator 0 dB, 18 to 28°C 100 kHz –135 [dBm/Hz] 1 MHz –145 [dBm/Hz] 30 MHz ≤ Frequency < 2.4 GHz –155 [dBm/Hz] 2.4 GHz ≤ Frequency < 3 GHz –153 [dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ Frequency < 4 GHz –153 [dBm/Hz] 4 GHz ≤ Frequency < 5 GHz –152 [dBm/Hz] 5 GHz ≤ Frequency < 6 GHz –152 [dBm/Hz] 6 GHz ≤ Frequency < 10 GHz –151 [dBm/Hz] (MS2691A) 10 GHz ≤ Frequency ≤ 13.5 GHz –150 [dBm/Hz] (MS2691A)
Absolute amplitude accuracy	After CAL execution, 18 to 28°C, input attenuator ≥ 10 dB, mixer input level ≤ 0 dBm, Auto Sweep Time Select = Normal, RBW ≤ 1 MHz, Detection = Positive, CW, excluding the noise floor effect ±0.5 dB (50 Hz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (50 Hz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) After preselector tuning (MS2691A) ±1.8 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error, and input attenuator switching error.

Table 1.3.1-3 Specifications for spectrum analyzer function (Cont'd)

Item	Specification
Spurious Response	
Two-tone third-order intermodulation distortion	Mixer input level = –15 dBm (per wave), ≥ 300 kHz separation, 18 to 28°C ≤ –60 dBc (TOI = +15 dBm) (30 MHz ≤ frequency < 400 MHz) ≤ –66 dBc (TOI = +18 dBm) (400 MHz ≤ frequency < 700 MHz) ≤ –74 dBc (TOI = +22 dBm) (700 MHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal) (700 MHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) ≤ –66 dBc (TOI = +18 dBm) (4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) ≤ –45 dBc (TOI = +7.5 dBm) (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious)
Image response	≤ –70 dBc
Sweep	
Sweep mode	Single, Continuous
Sweep time Setting range	 2 ms to 1000 s (SPAN ≥ 300 Hz) 1 µs to 1000 s (SPAN = 0 Hz)
Detection mode	Pos & Neg, Positive Peak, Sample, Negative Peak, RMS
Data point count	When SPAN > 500 MHz: 1001, 2001, 5001, 10001 When 100 MHz < SPAN ≤ 500 MHz: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When 300 Hz ≤ SPAN ≤ 100 MHz and Sweep Time > 10 s: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When 300 Hz ≤ SPAN ≤ 100 MHz and Sweep Time ≤ 10s: 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When Span = 0 Hz and Sweep Time > 10 s: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When Span = 0 Hz and Sweep Time ≤ 10 s: 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001
Scale Log indicator (10 div/12 div) Lin indicator (10 div)	 20 to 0.1 dB/div, 1-2-5 sequence 1 to 10%/div, 1-2-5 sequence
Trigger function Trigger mode	 Free Run (Trig Off), Video, Wide IF, External (TTL) SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)
Gate function Gate mode	 Off, Wide IF, External, SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)

Table 1.3.1-3 Specifications for spectrum analyzer function (Cont'd)

Item	Specification
Measurement function	
Adjacent channel leakage power (ACP)	Reference: Span Total, Carrier Total, Both Sides of Carriers, or Carrier Select Adjacent channel specification: 3 channels × 2 (Normal Mode) 8 channels × 2 (Advanced Mode)
Burst average	Indicates average power of specified time in the time domain mode
Channel power Absolute value measurement	dBm, dBm/Hz
Occupied bandwidth(OBW)	N% of Power method, X dB Down method
Spectrum Emission Mask (SEM)	Peak/Margin measurement: Pass/fail judgment is performed by Peak/Margin measurement.
Spurious Emission	Worst/Peaks measurement: Pass/fail judgment is performed by Worst/Peaks measurement.
Two-tone third-order intermodulation distortion	IM3, TOI measurement from two-tone signal.
Frequency counter	Center frequency =1 GHz, SPAN ≤ 1 MHz, RBW = 1 kHz, S/N ≥ 50 dB, Gate Time ≥ 100 ms ± (Marker frequency × Reference frequency Accuracy + (0.01/Gate Time[s])Hz)

Table 1.3.1-4 Phase Noise Measurement Function Specification

Item	Specification
Frequency	
Carrier Frequency Range	10 MHz to 6 GHz (MS2690A) 10 MHz to 13.5 GHz (MS2691A)
Offset Frequency Range	10 Hz to 10 MHz
Marker Mode	Normal, Integral Noise, RMS Noise, Jitter, Residual FM, Off

1.3.2 Mainframe (MS2692A)

Tables 1.3.2-1 through 1.3.2-4 show the specifications for the MS2692A.

The following specification values are those under the conditions after 30-min warm-up at stable ambient temperature. Also, note that the Typ. values are provided as reference data, and are not guaranteed specifications.

Setting Frequency Band Mode to Spurious can be performed when installing the MS2691A-003/103.

Table 1.3.2-1 Specifications for mainframe

item	Specification
Frequency	
Frequency range	50 Hz to 26.5 GHz
Frequency band configuration	Band / Mixer harmonic order[N] 50 Hz to 6.0 GHz: 0 / 1 3 to 6.0 GHz: 1–L / 1 When MS2692A-003/103 is installed 5.9 to 8.0 GHz: 1– / 1 7.9 to 13.5 GHz: 1+ / 1 13.4 to 20.0 GHz: 2– / 2 19.9 to 26.5 GHz: 2+ / 2
Preselector range	Frequency Band Mode: Normal 5.9 to 26.5 GHz Frequency Band Mode: Spurious 3 to 26.5 GHz
Frequency settings Settable range Resolution	 0 Hz to 26.5 GHz 1 Hz
Internal reference oscillator Activation characteristics Aging rate Temperature characteristics	 Based on frequency 24 hours after power application, at 23°C ±5×10^{-7} (2 minutes after power application) ±5×10^{-8} (5 minutes after power application) ±1×10^{-7}/year ±2×10$^{\times 8}$ (5 to 45°C)
When Option 001/101 Rubidium Reference Oscillator is installed Activation characteristics Aging rate Temperature characteristics	 Based on frequency 24 hours after power application, at 23°C ±1×10^{-9} (7 minutes after power application) ±1×10^{-10}/month ±1×10^{-9} (5 to 45°C)
Single side band noise	At 18 to 28°C, 2 GHz (Frequency Offset) 100 kHz: –116 dBc/Hz 1 MHz: –137 dBc/Hz

Table 1.3.2-1 Specifications for mainframe (Cont'd)

Item	Specification
Amplitude	
Measurement range	Displays Average noise level up to +30 dBm
Maximum input level Continuous wave average Power DC	 +30 dBm (Input attenuator ≥ 10 dB) 0 Vdc
Input attenuator	0 to 60 dB, 2 dB steps
Input attenuator switching error	Based on input attenuator 10 dB Frequency Band Mode: Normal ≤ 6 GHz: ±0.2 dB (10 to 60 dB) > 6 GHz: ±0.75 dB (10 to 60 dB) Frequency Band Mode: Spurious < 3 GHz: ±0.2 dB (10 to 60 dB) ≥ 3 GHz: ±0.75 dB (10 to 60 dB)
Reference Level	
Setting range	Log scale: –120 to +50 dBm or equivalent value Linear scale: 22.4 µV to 70.7 V or equivalent value Resolution: 0.01 dB or equivalent level
Units	Log scale: dBm, dBµV, dBmV, dBµV (emf), dBµV/m, V, W Linear scale: V
Linearity error	excluding the noise floor effect ±0.07 dB (Mixer input level ≤ –20 dBm) ±0.10 dB (Mixer input level ≤ –10 dBm) Frequency Band Mode: Normal ±0.15 dB (Mixer input level ≤ 0 dBm, frequency ≤ 6 GHz) ±0.60 dB (Mixer input level ≤ 0 dBm, frequency > 6 GHz) Frequency Band Mode: Spurious ±0.15 dB (Mixer input level ≤ 0 dBm, frequency < 3 GHz) ±0.60 dB (Mixer input level ≤ 0 dBm, frequency ≥ 3 GHz)
RF frequency characteristics	After CAL execution, input attenuator = 10 dB, at 18 to 28°C ±0.35 dB (9 kHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Normal) (9 kHz ≤ frequency < 3 GHz, Frequency Band mode: Spurious) After CAL execution, input attenuator = 10 dB, after preselector tuning, at 18 to 28°C, when MS2692A-067/167 is not installed or Microwave Preselector Bypass is Off: ±1.50 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band mode: Spurious) ±2.50 dB (13.5 GHz < frequency ≤ 26.5 GHz)

Table 1.3.2-1 Specifications for mainframe (Cont'd)

Item	Specification
1-dB gain compression	At mixer input level ≥ +3 dBm (100 MHz ≤ frequency < 400 MHz) ≥ +7 dBm (400 MHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Normal) (400 MHz ≤ frequency < 3 GHz, Frequency Band mode: Spurious) ≥ +0 dBm (3 GHz ≤ frequency ≤ 6 GHz, Frequency Band mode: Spurious) ≥ +0 dBm (6 GHz < frequency ≤ 26.5 GHz)
Spurious Response	
Secondary harmonic wave distortion	At mixer input level = –30 dBm Harmonic wave [dBc] SHI [dBm] ≤ –60 ≥ +30 (10 MHz ≤ Input frequency ≤ 400 MHz) ≤ –75 ≥ +45 (0.4 GHz < Input frequency ≤ 0.8 GHz) ≤ –75 ≥ +45 (0.8 GHz < Input frequency ≤ 1 GHz) ≤ –75 ≥ +45 (1 GHz < Input frequency ≤ 3 GHz) At mixer input level = –10 dBm, when MS2692A-067/167 is not installed Harmonic wave [dBc] SHI [dBm] ≤ –90 ≥ +80 (3 GHz < Input frequency, Frequency Band mode: Normal) ≤ –90 ≥ +80 (1.5 GHz ≤ Input frequency, Frequency Band mode: Spurious) At mixer input level = –10 dBm, when MS2692A-067/167 is not installed or Microwave Preselector Bypass is Off: Harmonic wave [dBc] SHI [dBm] ≤ –70 ≥ +60 (3 GHz < Input frequency ≤13.25 GHz)
Residual response	Frequency ≥ 1 MHz, at input attenuator = 0 dB (Excluding "bandwidth > 31.25 MHz" in Signal Analyzer.) ≤ –100 dBm
Connector	
RF input Connector	Front panel, N-J, 50 Ω VSWR: Input attenuator ≥10 dB, 18 to 28°C ≤ 1.2 (Nominal value) (40 MHz ≤ frequency ≤ 3 GHz) ≤ 1.5 (Nominal value) (3 GHz < frequency ≤ 6 GHz) ≤ 2.0 (Nominal value) (6 GHz < frequency ≤ 26.5 GHz)

Table 1.3.2-1 Specifications for mainframe (Cont'd)

Item	Specification
IF Output	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	875 MHz (when not installing the Signal Analyzer and MS269xA-004/104/077/177/078/178 or setting bandwidth ≤ 31.25 MHz) 900 MHz (when installing the Signal Analyzer and MS269xA-004/104/077/177/078/178 or setting bandwidth >31.25 MHz) 874.988 MHz (Spectrum Analyzer)
Gain	At the reference RF input level, 1 GHz RF frequency, and 0 dB input attenuator (nominal value)
IF bandwidth	120 MHz (nominal value)
External reference input	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	10 MHz or 13 MHz
Operating range	±1 ppm
Input level	–15 dBm ≤ level ≤ +20 dBm, 50 Ω (AC coupling)
Reference signal output	
Connector	Rear panel, BNC-J, 50 Ω (nominal value)
Frequency	10 MHz
Output level	≥ 0 dBm (AC coupling)
Sweep status output	
Connector	Rear panel, BNC-J
Output level	TTL level (high level at sweep or waveform acquisition)
Trigger input	
Connector	Rear panel, BNC-J
Input level	TTL level
External controls	Control from external controller (except power)
Ethernet (10/100/1000Base-T)	
Connector	Rear panel, RJ-45
GPIB	
Connector	IEEE488.2 compatible Rear panel, IEEE488 bus connector
Interface function	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2
USB (B)	
Connector	USB2.0 compatible Rear panel, USB-B connector
USB	
Connector	Enables waveform hard copy to USB compatible external device and saving mainframe setting parameters USB 2.0 compatible USB-A connector (2 ports on front panel, 2 ports on rear panel)
Monitor output	
Connector	Rear panel, VGA compatibility, mini D-SUB 15 pin

Table 1.3.2-1 Specifications for mainframe (Cont'd)

Item	Specification
Aux	
Connector	Used for trigger input/output from/to Option 020/120, etc. Rear panel, 68 pins (DX10BM-68S equivalent part)
Screen	XGA color LCD (resolution: 1024 × 768) 8.4 inch (213 mm diagonal)
Overall Specifications	
Size, Weight	
Size	340 mm (w) × 200 mm (h) × 350 mm (d) (excluding protrusions)
Weight	≤ 13.5 kg (excluding options)
Power	
Voltage	Rated Voltage: AC 100 to 120 V or 200 to 240 V *
Frequency	50 Hz to 60 Hz
Power consumption	≤ 260 VA (excluding options) ≤ 440 VA (including all options, maximum value)
Temperature	
Operating temperature	5 to 45°C
Storage temperature	–20 to 60°C
Environment Performance	
Conducted disturbance	EN 61326-1: 2006 (Class A)
Electromagnetic radiated disturbance	EN 61326-1: 2006 (Class A)
Harmonic current emission	EN 61000-3-2: 2006 +A1:2009 A2:2009 (Class A equipment)
Electrostatic discharge	EN 61326-1: 2006 (Table 2)
Electromagnetic field immunity	EN 61326-1: 2006 (Table 2)
Fast transient/burst	EN 61326-1: 2006 (Table 2)
Surge	EN 61326-1: 2006 (Table 2)
Conducted RF	EN 61326-1: 2006 (Table 2)
Power frequency magnetic field	EN 61326-1: 2006 (Table 2)
Voltage dips/short interruption	EN 61326-1: 2006 (Table 2)

*: Operating voltage: within the range of +10% to –15% from the rated voltage (Max. 250 V)

Also refer to Table 1.3.4-1 “Specifications for Wideband Analysis Hardware Options” when MS269xA-004/104 is installed.

Table 1.3.2-2 Specifications for signal analyzer function

Item	Specification
Common	
Trace mode	Spectrum, Power vs Time, Frequency vs Time, CCDF, Spectrogram, No Trace
Bandwidth Range	 Specifies the capture analysis bandwidth from the center frequency 1 kHz to 25 MHz (1-2.5-5 sequence), 31.25 MHz
Sampling rate Range	 Automatically set depending on analysis bandwidth 2 kHz to 50 MHz (1-2-5 sequence)
Capture time Capture time length Setting mode	 Sets the capture time length Minimum capture time length: 2 μs to 50 ms (determined depending on analysis bandwidth) Maximum capture time length: 2 to 2000 s (determined depending on analysis bandwidth) Auto, Manual
Trigger Trigger mode	 Free Run (Trig Off), Video, Wide IF Video, External (TTL) SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)
ADC resolution	16bits (when not installing the Signal Analyzer and MS269xA-004/104/077/177/078/178 or setting bandwidth ≤ 31.25 MHz)
Spectrum indicator function	
Function overview	Displays spectrums within random time spans and frequency ranges in captured waveform data.
Analysis time range Analysis Start Time Analysis Time Length Setting mode	 Sets analysis start time position from beginning of waveform data Sets analysis time length Auto, Manual
Frequency	Center frequency and SPAN can be set within the frequency range in waveform data
Indicator frequency accuracy	±[Indicator frequency × reference frequency accuracy + SPAN frequency × reference frequency accuracy + RBW × 0.05 + 2 × N + SPAN frequency / (Trace point count – 1)] Hz N:Mixer harmonic order
Resolution bandwidth (RBW) Setting range Selectivity	 1 Hz to 1 MHz (1-3 sequence) (–60 dB/–3 dB) 4.5:1, nominal value

Table 1.3.2-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Absolute amplitude accuracy	After CAL execution, 18 to 28°C, input attenuator ≥ 10 dB, mixer input level ≤ 0 dBm, RBW = Auto, Time Detection = Average, Marker Result = Integration or Peak(Accuracy), center frequency CW, excluding the noise floor effect ±0.5 dB (50 Hz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (50 Hz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) After Preselector tuning ±1.8 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious) ±3.0 dB (13.5 GHz < frequency ≤ 26.5 GHz) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error.
In-band frequency characteristics	On the basis of a level of the center frequency, in center frequency ± 10 MHz, when MS269xA-004/104/077/177/078/178 is not installed or the bandwidth is ≤31.25 MHz: ±0.31 dB (30 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (30 MHz≤ frequency ≤3 GHz, Frequency Band Mode: Spurious)
Display average noise level	Input attenuator 0 dB, at 18 to 28°C, 6 GHz ≤ frequency ≤26.5 GHz when MS2692A-067/167 is not installed 100 kHz –132.5 [dBm/Hz] 1 MHz –142.5 [dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –152.5 [dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –150.5 [dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency < 4 GHz –150.5 [dBm/Hz] 4 GHz ≤ frequency < 5 GHz –149.5 [dBm/Hz] 5 GHz ≤ frequency < 6 GHz –149.5 [dBm/Hz] 6 GHz ≤ frequency < 10 GHz –148.5 [dBm/Hz] 10 GHz ≤ frequency ≤ 13.5 GHz –147.5 [dBm/Hz] 13.5 GHz ≤ frequency ≤ 20 GHz –144.5 [dBm/Hz] 20 GHz ≤ frequency ≤ 26.5 GHz –140.5 [dBm/Hz]
Adjacent channel power (ACP) leakage	Reference: Span Total, Carrier Total, Both Sides of Carriers, or Carrier Select Adjacent channel specification: 3 channels × 2
Channel power Absolute value measurement	dBm, dBm/Hz
Occupied bandwidth (OBW)	N% of Power method, X dB Down method

Table 1.3.2-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Power vs Time Display Function	
Function overview	Indicates time changes of power for captured waveform data
Analysis time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Resolution bandwidth	
Filter type	Rect, Gaussian, Nyquist, Root Nyquist, Off (default: Off)
Roll-off rate setting	0.01 to 1 (settable for Nyquist and Root Nyquist)
Filter frequency offset	Filter center frequency can be set within frequency band of waveform data
Peak to Peak measurement	Measured using AM Depth or marker function +Peak, –Peak, (P-P)/2, Average
Burst average power	Measures average power of burst signal
Frequency vs. Time Display Function	
Function overview	Displays frequency time fluctuations of input signal from captured waveform data
Resolution time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Operating level range	–17 to +30 dBm (input attenuator ≥ 10 dB)
Frequency (vertical axis)	Center frequency and SPAN can be set within frequency range in waveform data
Display frequency range	Selectable from 1/25, 1/10, 1/5, and 1/2 of analysis bandwidth
Input frequency range	10 MHz to 6 GHz
Indicator frequency accuracy	
At CW input	Input level = –17 to +30 dBm, SPAN ≤ 31.25 MHz, scale = SPAN/25, ±(reference oscillator accuracy × center frequency + indicator frequency range × 0.01) Hz
Peak to Peak measurement	Measured using FM Deviation or marker function +Peak, –Peak, (P-P)/2, Average

Table 1.3.2-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
CCDF Display Function	
Function overview	Displays CCDF and APD of waveform data captured at specific time
Analysis time range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting mode	Auto, Manual
Display	
Histogram resolution	Graphically displays CCDF and APD 0.01 dB
Numerical value indicator	Average Power, Max Power, Crest Factor
Resolution bandwidth	
Filter type	Rectangle, Off (default: Off)
Filter frequency offset	Filter center frequency can be set within frequency band of waveform data
Spectrogram Display Function	
Function Overview	Displays Spectrogram in arbitrary time length within the captured waveform data
Analysis Time Range	
Analysis Start Time	Sets analysis start time position from beginning of waveform data
Analysis Time Length	Sets analysis time length
Setting Mode	Auto,Manual
Frequency	Center frequency and SPAN can be set within frequency range in waveform data
Resolution Bandwidth(RBW)	
Setting Range	1 Hz to 1 MHz (1-3 Sequence)
Selectivity	(–60 dB/–3 dB) 4.5:1, Nominal value
Digitize Function	
Function overview	Capable of outputting captured waveform data to internal hard disk or external device
Waveform data	
Format	I, Q (each 32 bit Float Binary format)
Level	$\sqrt{(I^2 + Q^2)}$ = 1 at 0 dBm input
Level accuracy:	Same as absolute amplitude accuracy of signal analyzer
External output	Capable of outputting to external PC through Ethernet

Table 1.3.2-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Replay Function	
Function Overview	Analyzes traces of saved waveform data
Waveform Data Format	I, Q (Binary format)
Conditions for measurable waveform data	Analyzable combinations of SPAN and sampling rate SPAN — Sampling rate 1 kHz — 2 kHz 2.5 kHz — 5 kHz 5 kHz — 10 kHz 10 kHz — 20 kHz 25 kHz — 50 kHz 50 kHz — 100 kHz 100 kHz — 200 kHz 250 kHz — 500 kHz 500 kHz — 1 MHz 1 MHz — 2 MHz 2.5 MHz — 5 MHz 5 MHz — 10 MHz 10 MHz — 20 MHz 18.6 MHz — 20 MHz 20 MHz — 25 MHz 25 MHz — 50 MHz 31.25 MHz — 50 MHz 50 MHz — 100 MHz 62.5 MHz — 100 MHz 100 MHz — 200 MHz 125 MHz — 200 MHz

Table 1.3.2-2 Specifications for signal analyzer function (Cont'd)

Item	Specification
Conditions for measurable waveform data	Combinations of SPAN and minimum capture sample SPAN — Minimum Capture Sample 1 kHz — 74000 (37 s) 2.5 kHz — 160000 (32 s) 5 kHz — 310000 (31 s) 10 kHz — 610000 (30.5 s) 25 kHz — 730000 (14.6 s) 50 kHz — 730000 (7.3 s) 100 kHz — 730000 (3.65 s) 250 kHz — 730000 (1.46 s) 500 kHz — 730000 (730 ms) 1 MHz — 730000 (365 ms) 2.5 MHz — 730000 (146 ms) 5 MHz — 730000 (73 ms) 10 MHz — 730000 (36.5 ms) 18.6 MHz — 730000 (36.5 ms) 20 MHz — 730000 (29.2 ms) 25 MHz — 730000 (14.6 ms) 31.25 MHz — 730000 (14.6 ms) 50 MHz — 730000 (7.3 ms) 62.5 MHz — 730000 (7.3 ms) 100 MHz — 730000 (3.65 ms) 125 MHz — 730000 (3.65 ms)

Table 1.3.2-3 Specifications for spectrum analyzer function

Item	Specification
Frequency	
Span	
Range	0 Hz, 300 Hz to 26.5 GHz
Resolution	2 Hz
Span accuracy	±0.2%
Indicator frequency accuracy	± [Indicator frequency × reference frequency accuracy + SPAN frequency × SPAN accuracy + RBW × 0.05 + 2 × N + SPAN frequency/(Trace point count – 1)] Hz N is Mixer harmonic order
Resolution bandwidth (RBW)	
Setting range	30 Hz to 3 MHz (1-3 sequence), 50 kHz, 5 MHz, 10 MHz, 20 MHz 31.25 MHz 31.25 MHz can be set when SPAN is 0 Hz.
Selectivity	(–60 dB/–3 dB) 4.5:1 (nominal value, at 30 Hz to 10 MHz)
Video bandwidth (VBW)	
Setting range	1 Hz to 10 MHz (1-3 sequence), 5 kHz, OFF
VBW mode	Video Average/Power Average
Amplitude	
Display average noise level	Detector = Sample, VBW = 1 Hz (Video Average), Input Attenuator 0 dB, 18 to 28°C, 6 GHz ≤ Frequency ≤26.5 GHz when MS2692A-067/167is not installed. 100 kHz –135 [dBm/Hz] 1 MHz –145 [dBm/Hz] 30 MHz ≤ Frequency < 2.4 GHz –155 [dBm/Hz] 2.4 GHz ≤ Frequency < 3 GHz –153 [dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ Frequency < 4 GHz –153 [dBm/Hz] 4 GHz ≤ Frequency < 5 GHz –152 [dBm/Hz] 5 GHz ≤ Frequency < 6 GHz –152 [dBm/Hz] 6 GHz ≤ Frequency < 10 GHz –151 [dBm/Hz] 10 GHz ≤ Frequency ≤ 13.5 GHz –150 [dBm/Hz] 13.5 GHz ≤ Frequency ≤ 20 GHz –147 [dBm/Hz] 20 GHz ≤ Frequency ≤ 26.5 GHz –143 [dBm/Hz]

Table 1.3.2-3 Specifications for spectrum analyzer function(Cont'd)

Item	Specification
Absolute amplitude accuracy	After CAL execution, 18 to 28°C, input attenuator ≥ 10 dB, mixer input level ≤ 0 dBm, Auto Sweep Time Select = Normal, RBW ≤ 1 MHz, Detection = Positive, CW, excluding the noise floor effect ±0.5 dB (50 Hz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (50 Hz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) After preselector tuning (MS2691A) ±1.8 dB (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious) ±3.0 dB (13.5 GHz < frequency ≤ 26.5 GHz) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error.
Spurious Response	
Two-tone third-order inter modulation distortion	Mixer input level = –15 dBm (per wave), ≥ 300 kHz separation, 18 to 28°C With MS2692A-067/167 and Microwave Preselector Bypass turned off ≤ –60 dBc (TOI = +15 dBm) (30 MHz ≤ frequency < 400 MHz) ≤ –66 dBc (TOI = +18 dBm) (400 MHz ≤ frequency < 700 MHz) ≤ –74 dBc (TOI = +22 dBm) (700 MHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal) (700 MHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) ≤ –66 dBc (TOI = +18 dBm) (4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) ≤ –45 dBc (TOI = +7.5 dBm) (6 GHz < frequency ≤ 26.5 GHz, Frequency Band Mode: Normal) (3 GHz ≤ frequency ≤ 26.5 GHz, Frequency Band Mode: Spurious)
Image response	Without MS2692A-067/167: ≤ –70 dBc (frequency ≤ 13.5 GHz) ≤ –65 dBc (13.5 GHz < frequency ≤ 26.5 GHz) When MS2692A-067/167 is not installed, refer to Table 1.3.7-1.
Sweep	
Sweep mode	Single, Continuous
Sweep time Setting range	 2 ms to 1000 s (SPAN ≥ 300 Hz) 1 μs to 1000 s (SPAN = 0 Hz)
Detection mode	Pos&Neg, Positive Peak, Sample, Negative Peak, RMS

Table 1.3.2-3 Specifications for spectrum analyzer function(Cont'd)

Item	Specification
Data point count	When SPAN > 500 MHz: 1001, 2001, 5001, 10001 When 100 MHz < SPAN ≤ 500 MHz: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When 300 Hz ≤ SPAN ≤ 100 MHz and Sweep Time > 10 s: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When 300 Hz ≤ SPAN ≤ 100 MHz and Sweep Time ≤ 10 s: 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When Span = 0 Hz and Sweep Time > 10 s: 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001 When Span = 0 Hz and Sweep Time ≤ 10 s: 11, 21, 41, 51, 101, 201, 251, 401, 501, 1001, 2001, 5001, 10001
Scale Log indicator (10 div/12 div) Lin indicator (10 div)	 20 to 0.1 dB/div, 1-2-5 sequence 1 to 10%/div, 1-2-5 sequence
Trigger function Trigger mode	 Free Run (Trig Off), Video, Wide IF, External (TTL) SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)
Gate function Gate mode	 Off, Wide IF, External, SG Marker (when Option 020/120 is installed) BBIF (when Option 040/140 is installed)
Measurement function	
Adjacent channel leakage power (ACP)	Reference: Span Total, Carrier Total, Both Sides of Carriers, or Carrier Select Adjacent channel specification: 3 channels × 2 (Normal Mode) 8 channels × 2 (Advanced Mode)
Burst average	Indicates average power of specified time in the time domain mode
Channel power Absolute value measurement	dBm, dBm/Hz
Occupied bandwidth(OBW)	N% of Power method, X dB Down method
Spectrum Emission Mask (SEM)	Peak/Margin measurement: Pass/fail judgment is performed by Peak/Margin measurement.
Spurious Emission	Worst/Peaks measurement: Pass/fail judgment is performed by Worst/Peaks measurement.
Two-tone third-order intermodulation distortion	IM3, TOI measurement from two-tone signal.
Frequency counter	Center frequency=1 GHz, SPAN ≤ 1 MHz, RBW = 1 kHz, S/N ≥ 50 dB, Gate Time ≥ 100 ms ± (Marker frequency × Reference frequency Accuracy + (0.01/Gate Time[s])Hz)

Table 1.3.2-4 Phase Noise Measurement Function Specification

Item	Specification
Frequency	
Carrier Frequency Range	10 MHz to 26.5 GHz
Offset Frequency Range	10 Hz to 10 MHz
Marker Mode	Normal, Integral Noise, RMS Noise, Jitter, Residual FM, Off

1.3.3 Pre-amp option (MS269xA-008/108)

Table 1.3.3-1 shows the specifications for the Pre-amp option.

The following specification values are those under the conditions after 30-min. warm-up at stable ambient temperature. Also note that the Typ. values are provided as reference data, and are not guaranteed specifications.

Table 1.3.3-1 Specifications for Pre-amp option

Item	Specification
Frequency	
Frequency range	100 kHz to 6 GHz
Amplitude	
Measurement range	Display average noise level at least +10 dBm
Maximum input level	+10 dBm (When the input attenuator is 0 dB)
Gain	14 dB (≤ 3 GHz) 13 dB (3 GHz < frequency ≤ 4 GHz) 11 dB (4 GHz < frequency ≤ 5 GHz) 10 dB (5 GHz < frequency ≤ 6 GHz)
Noise index	7 dB (≤ 3 GHz) 8.5 dB (3 GHz < frequency ≤ 4 GHz) 9.5 dB (4 GHz < frequency ≤ 6 GHz)
Amplitude	
Display average noise level (signal analyzer function)	Input attenuator 0 dB, at 18 to 28°C (When Pre-amp is ON) 100 kHz –147.5[dBm/Hz] 1 MHz –156.5[dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –163.5[dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –162.5[dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency < 4 GHz –161.5[dBm/Hz] 4 GHz ≤ frequency < 5 GHz –158.5[dBm/Hz] 5 GHz ≤ frequency ≤ 6 GHz –156.5[dBm/Hz] Pre-amp input level is calculated by the following formula. Pre-amp input level = RF input level – input attenuator setting value When the Pre-amp option is installed and pre-amp is OFF, the items of the display average noise level shown in Tables 1.3.1-2 and 1.3.2-2 will change to the following values. Input attenuator 0 dB, at 18 to 28°C 100 kHz –132.5[dBm/Hz] 1 MHz –142.5[dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –150.5[dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –149.5[dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency <4 GHz –148.5[dBm/Hz] 4 GHz ≤ frequency <5 GHz –147.5[dBm/Hz] 5 GHz ≤ frequency <6 GHz –146.5[dBm/Hz]

Table 1.3.3-1 Specifications for Pre-amp option (Cont'd)

Item	Specification
Amplitude	
Display average noise level (spectrum analyzer function)	Detector = Sample, VBW = 1 Hz (Video Average),input attenuator 0 dB, at 18 to 28°C (When Pre-amp is ON) 100 kHz –150[dBm/Hz] 1 MHz –159[dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –166[dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –165[dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency < 4 GHz –164[dBm/Hz] 4 GHz ≤ frequency < 5 GHz –161[dBm/Hz] 5 GHz ≤ frequency ≤ 6 GHz –159[dBm/Hz] Pre-amp input level is calculated by the following formula. Pre-amp input level = RF input level -input attenuator setting value When the Pre-amp option is installed and pre-amp is OFF, the items of the display average noise level shown in Tables 1.3.1-3 and 1.3.2-3 will change to the following values. Detector = Sample, VBW = 1 Hz (Video Average), input attenuator 0 dB, at 18 to 28°C 100 kHz –135[dBm/Hz] 1 MHz –145[dBm/Hz] 30 MHz ≤ frequency < 2.4 GHz –153[dBm/Hz] 2.4 GHz ≤ frequency < 3 GHz –152[dBm/Hz] Frequency Band Mode: Normal 3 GHz ≤ frequency < 4 GHz –151[dBm/Hz] 4 GHz ≤ frequency < 5 GHz –150[dBm/Hz] 5 GHz ≤ frequency < 6 GHz –149[dBm/Hz]

Table 1.3.3-1 Specifications for Pre-amp option (Cont'd)

Item	Specification
Amplitude	
RF frequency characteristics	After CAL execution, input attenuator = 10 dB, at 18 to 28°C ±0.65 dB (100 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (100 kHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)
Input attenuator switching error	Frequency Band Mode: Normal ≤ 6 GHz: ±0.65 dB (10 to 60 dB)
Linearity error	Excluding the noise floor effect ± 0.07 dB (Pre-amp input level ≤ –40 dBm) ± 0.10 dB (Pre-amp input level ≤ –30 dBm) Frequency Band Mode: Normal ±0.50 dB (Pre-amp input level ≤ –20 dBm, frequency ≤ 6 GHz)
Secondary harmonic wave distortion	At pre-amp input level–45 dBm Harmonic wave [dBc] SHI[dBm] ≤ –50 ≥ +5 (10 Hz ≤ Input frequency ≤ 400 MHz) ≤ –55 ≥ +10 (0.4 GHz < Input frequency≤ 0.8 GHz) ≤ –55 ≥ +10 (0.8 GHz < Input frequency ≤ 1 GHz) ≤ –55 ≥ +10 (1 GHz < Input frequency ≤ 3 GHz)
1-dB gain compression	At pre-amp input level ≥ –20 dBm (100 MHz ≤ frequency < 400 MHz) ≥ –15 dBm (400 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) (400 MHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)
Two-tone third-order inter-modulation distortion	Pre-amp input level = –45 dBm(per 1 wave),≥ 300 kHz separation, at 18 to 28°C ≤ –73 dBc (TOI = –8.5 dBm) (30 MHz ≤ frequency < 400 MHz) ≤ –78 dBc (TOI = –6 dBm) (400 MHz ≤ frequency<700 MHz) ≤ –81 dBc (TOI = –4.5 dBm) (700 MHz ≤ frequency < 4 GHz, Frequency Band Mode: Normal) (700 MHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious) ≤ –78 dBc (TOI = –6 dBm) (4 GHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)

1.3.4 Wideband Analysis Hardware Options (MS269xA-004/104)

Table 1.3.4-1 shows the specifications for the wideband analysis hardware options.

The following specification values are those under the conditions after 30-min warm-up at stable ambient temperature. Also, note that the Typ. values are provided as reference data, and are not guaranteed specifications.

Table 1.3.4-1 Specifications for Wideband Analysis Hardware Options

Item	Specification
Function	
Bandwidth Range	 The following bandwidth is set in addition to the standard capture analysis bandwidth. 50 MHz, 100 MHz, 125 MHz
Sampling rate Range	 Automatically set depending on analysis bandwidth 100 MHz, 200 MHz
Capture Time Capture Time Length	 Sets the capture time length Minimum capture time length: 500 ns to 1 µs (determined depending on analysis bandwidth) Maximum capture time length: 500 ms
Resolution bandwidth (RBW) Setting range Selectivity	 3 kHz to 10 MHz (1-3 sequence) (–60 dB/–3 dB) 4.5:1, nominal value
ADC resolution	12 bits
Frequency	
Frequency range	100 MHz to 6 GHz

Table 1.3.4-1 Specifications for Wideband Analysis Hardware Options (Cont'd)

Item	Specification
Amplitude	
Display average noise level	At input attenuator 0 dB, 18 to 28°C (When MS269xA-008/108 is not installed or Pre-amp is OFF) 100 MHz ≤ frequency < 2.4 GHz –143[dBm/Hz] 2.4 GHz ≤ frequency < 4 GHz –141[dBm/Hz] 4 GHz ≤ frequency < 6 GHz –139[dBm/Hz] (Frequency Band Mode: Normal) At input attenuator 0 dB, 18 to 28°C (When MS269xA-008/108 is installed and Pre-amp is ON) 100 MHz ≤ frequency < 2.4 GHz –156[dBm/Hz] 2.4 GHz ≤ frequency < 4 GHz –154[dBm/Hz] 4 GHz ≤ frequency < 6 GHz –150[dBm/Hz] (Frequency Band Mode: Normal)
Absolute amplitude accuracy	After CAL execution, 18 to 28°C, input attenuator ≥ 10 dB, mixer input level ≤ 0 dBm, RBW = Auto, Time Detection = Average, Marker Result = Integration or Peak(Accuracy), center frequency CW, (When MS269xA-008/108 is not installed or Pre-amp is OFF) Except noise floor effect ±0.5 dB (100 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error, and input attenuator switching error.
Linearity error	Except noise floor effect (When MS269xA-008/108 is not installed or Pre-amp is OFF) ±0.07 dB(mixer input level ≤ –20 dBm) ±0.10 dB(mixer input level ≤ –10 dBm) ±0.30 dB(mixer input level ≤ 0 dBm) (Frequency Band Mode: Normal) Except noise floor effect (When MS269xA-008/108 is installed and Pre-amp is ON) ±0.07 dB (mixer input level ≤ –40 dBm) ±0.10 dB (mixer input level ≤ –30 dBm) ±0.50 dB (mixer input level ≤ –20 dBm) (Frequency Band Mode: Normal)
RF frequency characteristics	After CAL execution, input attenuator = 10 dB, at 18 to 28°C (When MS269xA-008/108 is not installed or Pre-amp is OFF) ±0.35 dB (100 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal) After CAL execution, input attenuator = 10 dB, at 18 to 28°C (When MS269xA-008/108 is installed and Pre-amp is ON) ±0.65 dB (100 MHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)

1.3.5 Baseband Interface Unit option (MS269xA-040/140)

The Baseband Interface Unit option is not supported by the software package of Ver.6.00.00 or later.

1.3.6 HDD Digitizing Interface Option (MS269xA-050/150)

Table 1.3.6-1 lists the specifications for the HDD Digitizing Interface Option is installed.

Table 1.3.6-1 HDD Digitizing Interface Option Specifications

Item	Specification
Feature/Performance	
Interface	
Connector	External Serial ATA connector
Data Rate	1.5 Gbps
Hot Plugging	Non compliant (When connecting or disconnecting a connector, make sure to turn off the power of the MS2690A/MS2691A/MS2692A and external HDD.)

1.3.7 Microwave Preselector Bypass Option (MS2692A-067/167)

Table 1.3.7-1 lists the specifications for the Microwave Preselector Bypass Option is installed.

Table 1.3.7-1 Microwave Preselector Bypass Option Specifications

Item	Specification
Amplitude	
Functional Outline	Bypasses the preselector to improve the RF frequency characteristics and the in-band frequency characteristics. By bypassing the image response elimination filter, the image response cannot be excluded. So, the spurious measurement is not supported. Cannot install simultaneously with MS2692A-003/103/008/108.
Frequency	
Frequency range	6 GHz to 26.5 GHz
Amplitude	
RF frequency characteristics	After CAL execution, input attenuator = 10 dB, at 18 to 28°C, and when Microwave Preselector Bypass is On: ±1.0 dB (6 GHz ≤ Frequency ≤ 13.5 GHz) ±1.5 dB (13.5 GHz < Frequency ≤ 26.5 GHz) After CAL execution, input attenuator = 10 dB, at 18 to 28°C, and when Microwave Preselector Bypass is Off: See Table 1.3.2-1.
Display average noise level	At 18 to 28°C, Detector = Sample, VBW = 1 Hz (Video Average), input attenuator = 0 dB, with Microwave Preselector Bypass turned on/off, 6 GHz ≤ Frequency <10 GHz –146[dBm/Hz] 10 GHz ≤ Frequency ≤13.5 GHz –145[dBm/Hz] 13.5 GHz < Frequency ≤20 GHz –142[dBm/Hz] 20 GHz < Frequency ≤26.5 GHz –138 [dBm/Hz]
Image response	With Microwave Preselector Bypass turned off, ≤ –60 dBc (6 GHz< Frequency ≤26.5 GHz)

1.3.8 Analysis Bandwidth Extension (MS2692A-077/177)

Table 1.3.8-1 lists the specifications for the Analysis Bandwidth Extension Option is installed.

The following specification values are those under the conditions after 30-min warm-up at stable ambient temperature. Typ. value is not the guaranteed performance with this specification; it is for reference.

Table 1.3.8-1 Analysis Bandwidth Extension Specifications

Item	Specification
Function	
Functional Outline	Extends Analysis Bandwidth to 62.5 MHz in Signal Analyzer mode
Bandwidth Range	The following bandwidth is added along with the standard capture analysis bandwidth. 50 MHz, 62.5 MHz
Sampling rate Range	When setting Bandwidth > 31.25 MHz: 100 MHz
Capture Time Capture Time Length	When setting Bandwidth > 31.25 MHz: To set the capture time length: Min. capture time length: 1 μs (depending on the analysis bandwidth) Max. capture time length: 500 ms
Resolution bandwidth (RBW) Setting range Selection	When setting Bandwidth > 31.25 MHz: 3 kHz to 3 MHz (1-3 sequence) (–60 dB/–3 dB) 4.5:1, Nominal value
ADC resolution	14 bits
Frequency	
Frequency range	When MS2692A-067/167 is not installed and the bandwidth is set to > 31.25 MHz: 100 MHz to 6 GHz When MS2692A-067/167 is not installed and the bandwidth is set to > 31.25 MHz: 100 MHz to 26.5 GHz

Table 1.3.8-1 Analysis Bandwidth Extension Specifications (Cont'd)

Item	Specification
Amplitude	
Display average noise level	At 18 to 28ºC, input attenuator = 0 dB, (Without MS269xA-008/108 or with Preamplifier turned on) 100 MHz ≤ Frequency <2.2 GHz –147 [dBm/Hz] 2.2 GHz ≤ Frequency <4 GHz –145 [dBm/Hz] 4 GHz ≤ Frequency ≤ 6 GHz –143 [dBm/Hz] (Frequency Band Mode: Normal) At 18 to 28ºC, input attenuator = 0 dB, (With MS269xA-008/108 and with Preamplifier turned on) 100 MHz≤ Frequency <2.2 GHz –160[dBm/Hz] 2.2 GHz≤ Frequency <4 GHz –158[dBm/Hz] 4 GHz ≤ Frequency ≤6 GHz –154[dBm/Hz] (Frequency Band Mode : Normal) At 18 to 28ºC, input attenuator = 0 dB, (With MS2692A-067/167 and with Microwave Preselector Bypass turned on) 6 GHz < Frequency <10 GHz –140[dBm/Hz] 10 GHz ≤ Frequency≤ 13.5 GHz –136[dBm/Hz] 13.5 GHz<Frequency≤ 20 GHz –133[dBm/Hz] 20 GHz<Frequency ≤ 26.5 GHz –129[dBm/Hz]

Table 1.3.8-1 Analysis Bandwidth Extension Specifications (Cont'd)

Item	Specification
Absolute amplitude accuracy	After CAL execution at 18 to 28°C, input attenuator ≥10 dB, Mixer input level ≤–10 dBm, RBW=Auto,Time Detection=Average, Marker Result = Integration or Peak (Accuracy), center frequency, CW, (Without MS269xA-008/108 or with Preamplifier turned off) When setting Bandwidth >31.25 MHz: Excluding noise floor effects ±0.5 dB (100 MHz ≤ Frequency ≤6 GHz, Frequency Band Mode: Normal) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error. After CAL execution at 18 to 28°C, input attenuator ≥10 dB, Mixer input level ≤–10 dBm, RBW=Auto,Time Detection=Average, Marker Result = Integration or Peak (Accuracy), center frequency, CW, (Without MS269xA-008/108 or with Preamplifier turned on) When setting Bandwidth >31.25 MHz: Excluding noise floor effects ±1.0 dB (100 MHz ≤ Frequency≤6 GHz, Frequency Band Mode: Normal) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error. After CAL execution at 18 to 28°C, input attenuator ≥10 dB, Mixer input level ≤–10 dBm, RBW=Auto, Time Detection=Average, Marker Result = Integration or Peak (Accuracy), center frequency, CW, (With MS269xA-067/167 or with Microwave Preselector Bypass turned on) When setting Bandwidth >31.25 MHz: Excluding noise floor effects ±1.8 dB (6 GHz ≤ Frequency ≤ 13.5 GHz, Frequency Band Mode:Normal) ±3.0 dB (13.5 GHz ≤ Frequency ≤ 26.5 GHz) The absolute amplitude accuracy is calculated from an RSS (root summed square) error of the RF frequency characteristics, linear error and input attenuator switching error.

Table 1.3.8-1 Analysis Bandwidth Extension Specifications (Cont'd)

Item	Specification
Linearity error	Excluding noise floor effects (Without MS269xA-008/108 or with Preamplifier turned off) ±0.07 dB (Mixer input level ≤–20 dBm) ±0.10 dB (Mixer input level ≤–10 dBm) ±0.30 dB (Preamplifier input level≤0 dBm, Frequency ≤ 6 GHz) (Frequency Band Mode:Normal) Excluding noise floor effects (With MS269xA-008/108 and with Preamplifier turned on) ±0.07 dB (Preamplifier input level ≤–40 dBm) ±0.10 dB (Preamplifier input level ≤–30 dBm) ±0.50 dB (Preamplifier input level ≤–20 dBm) (Frequency Band Mode:Normal) Excluding noise floor effects (With MS2692A-067/167 and with Microwave Preselector Bypass turned on) ±0.60 dB (Preamplifier input level ≤ 0 dBm, Frequency >6 GHz)
RF frequency characteristics	After CAL execution at 18 to 28°C, input attenuator = 10 dB (Without MS269xA-008/108 or with Preamplifier turned off) ±0.35 dB (100 MHz ≤ Frequency ≤ 6 GHz, Frequency Band Mode : Normal) After CAL execution at 18 to 28°C, input attenuator = 10 dB (With MS269xA-008/108 and with Preamplifier turned on) ±0.65 dB (100 MHz≤ Frequency ≤6 GHz, Frequency Band Mode : Normal) After CAL execution at 18 to 28°C, input attenuator = 10 dB (With MS2692A-067/167 and with Microwave Preselector Bypass turned on) ±1.0 dB (6 GHz <Frequency ≤13.5 GHz) ±1.5 dB (13.5 GHz <Frequency ≤26.5 GHz)

1.3.9 Analysis Bandwidth Extension (MS2692A-078/178)

Table 1.3.9-1 lists the specifications for the Analysis Bandwidth Extension Option is installed.

The following specification values are those under the conditions after 30-min warm-up at stable ambient temperature. Typ. value is not the guaranteed performance with this specification; it is for reference.

Table 1.3.9-1 Analysis Bandwidth Extension Specifications

Item	Specification
Function	
Functional Outline	Extends Analysis Bandwidth to 125 MHz in Signal Analyzer mode The MS269xA-077/177 is required to install this option.
Bandwidth Range	The following bandwidth is added along with the standard capture analysis bandwidth. 50 MHz, 62.5 MHz, 100 MHz, 125 MHz
Sampling rate Range	When setting Bandwidth > 31.25 MHz: 100 MHz, 200 MHz (depending on the analysis bandwidth)
Capture Time Capture Time Length	When setting Bandwidth > 31.25 MHz: To set the capture time length: Min. capture time length: 500 ns to 1 µs (depending on the analysis bandwidth) Max. capture time length: 500 ms
Resolution bandwidth (RBW) Setting range Selection	When setting Bandwidth > 31.25 MHz: 3 kHz to 10 MHz (1-3 sequence) (–60 dB/–3 dB) 4.5:1, Nominal value
ADC resolution	14 bits
Frequency	
Frequency range	Refer to Table 1.3.8-1.
Amplitude	
Display average noise level	Refer to Table 1.3.8-1.
Absolute amplitude accuracy	Refer to Table 1.3.8-1.
Linearity error	Refer to Table 1.3.8-1.
RF frequency characteristics	Refer to Table 1.3.8-1.

Chapter 2 Before Use

This chapter describes items that you should know before using the MS2690A/MS2691A/MS2692A. Be sure to read this section at least once as it contains safety tips and cautions for avoiding failure during use.

2.1 On Transportation

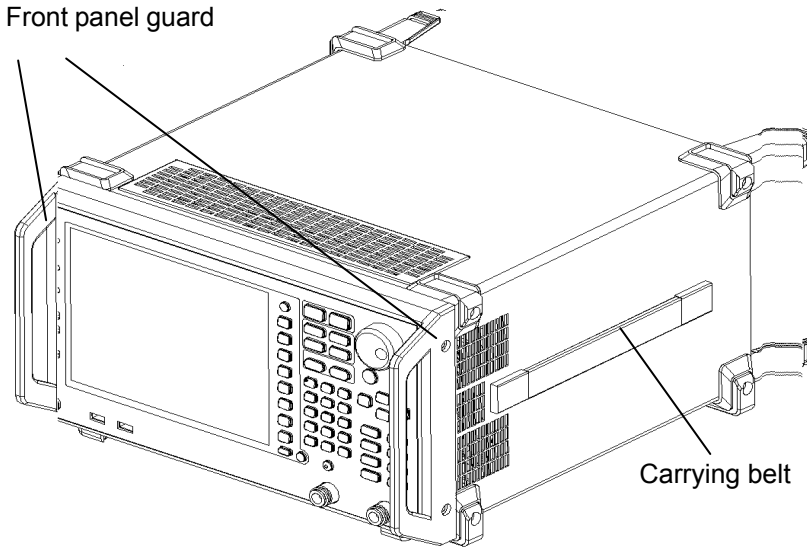


Figure 2.1-1 Guard and Carrying Belt

When carrying the unit, hold tightly the carrying belts on both sides. Do not use the front panel guard for moving. Doing so may loosen the fixing screws and damage the guard. (The guard is provided for protecting front panel connectors.)

2.2 Installation Location

2.2.1 Installation orientation

Install the MS2690A/MS2691A/MS2692A horizontally or at an angle using the tilted legs as shown in Figure 2.2.1-1. Do not place objects on top of the MS2690A/MS2691A/MS2692A when tilted.

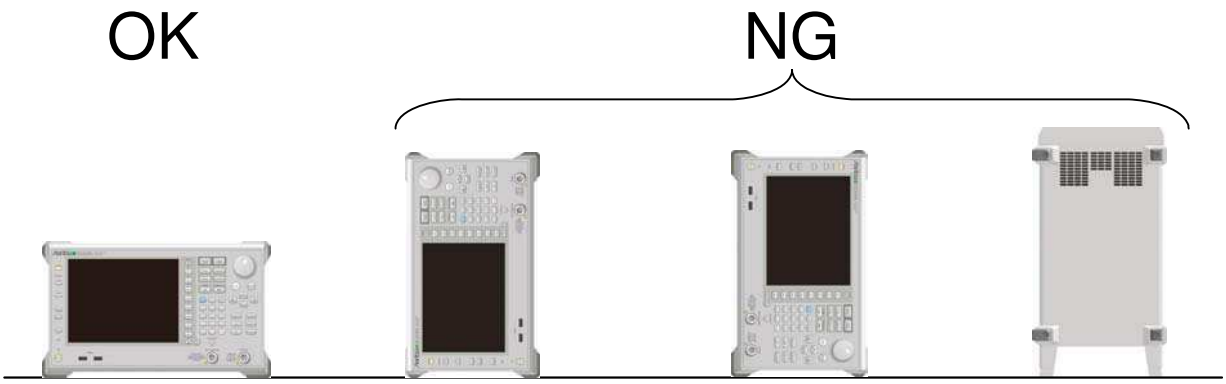


Figure 2.2.1-1 Installation orientation

⚠ CAUTION

If the MS269xA is not installed in a "OK" direction as above, a small shock may turn it over and harm the user.

2.2.2 Distance from surrounding objects

A fan is installed to the MS2690A/MS2691A/MS2692A to prevent the internal temperature from rising. Install the MS2690A/MS2691A/MS2692A in a location with the vents at least 10 cm away from walls, peripherals or other obstructions so as not to block the fan perimeter.

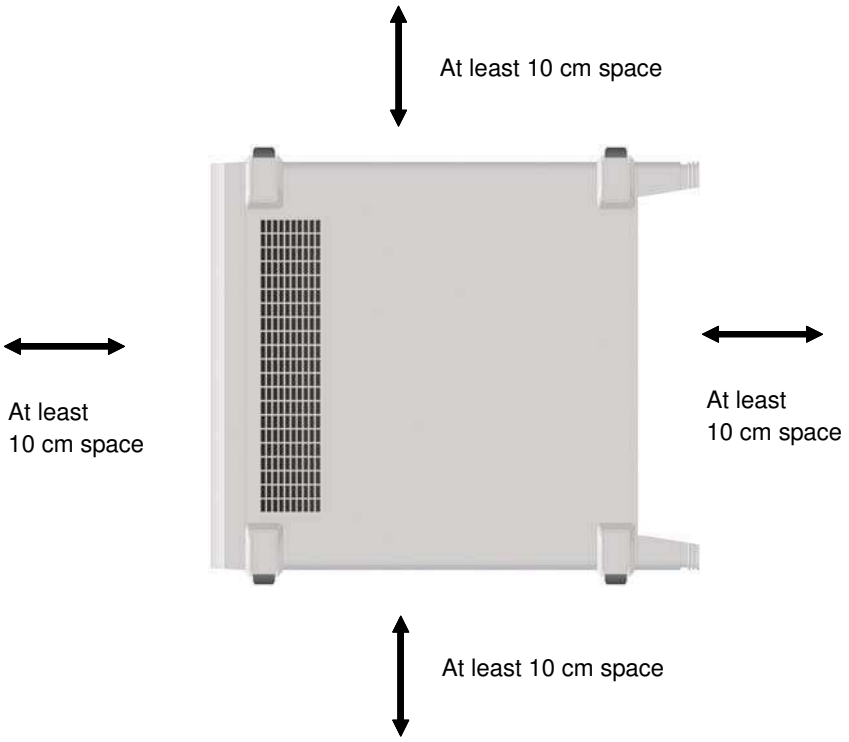


Figure 2.2.2-1 Distance from surrounding objects

2.2.3 Installation location conditions

Although the MS2690A/MS2691A/MS2692A operates at an ambient temperature of 5°C to 45°C, avoid using it in locations, such as the following, since it may cause failure.

- Locations with strong vibrations
- Humid and dusty locations
- Locations with direct sunlight
- Locations where there is the risk of exposure to active gases
- Locations where power voltage severely fluctuates

2.3 Items to Check Before Use

2.3.1 Safety labels

To protect the safety of the user, the WARNING label shown in Figure 2.3.1-1 is affixed to the rear panel. Observe the instructions on the label.

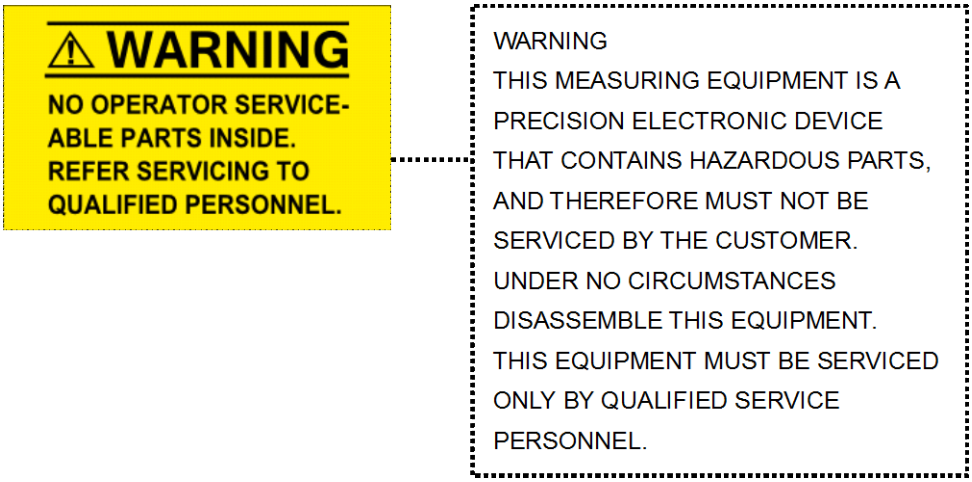


Figure 2.3.1-1 Warning labels

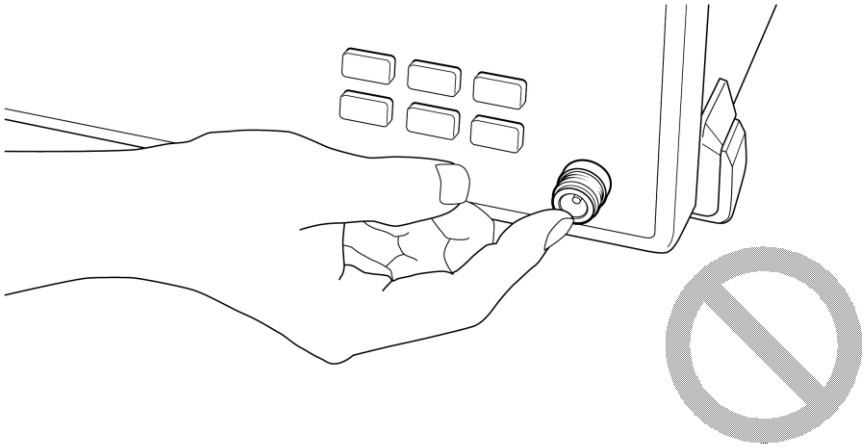
2.3.2 Input level and reverse power (when vector signal generator is installed) to RF Input

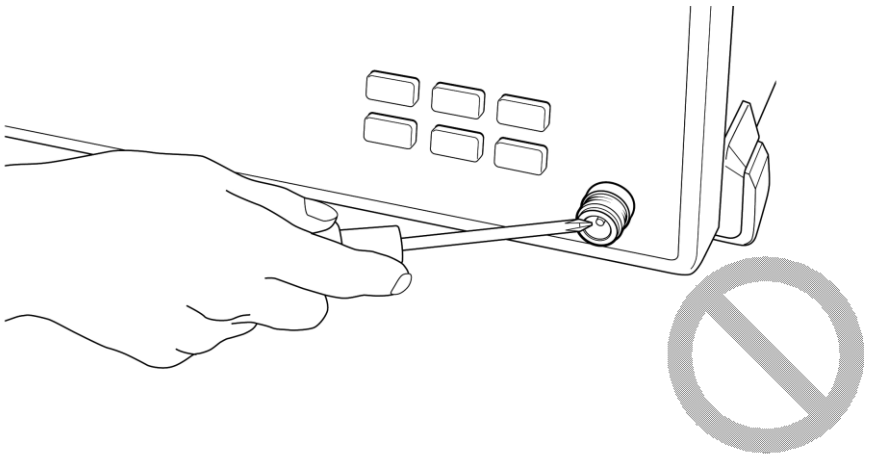
The MS2690A/MS2691A/MS2692A is not provided with over-power protection. Apply +30 dBm or lower power (mixer input level at maximum +20 dBm) to the RF input connector. In addition, do not apply DC voltage even when within the range described above.
When Pre-amp (optional) is ON, apply +10 dBm or lower power to the RF input connector.
There is no reverse power protection for the SG output connector when the vector signal generator (optional) is added. Be careful not to apply reverse power above +30 dBm (frequency greater than 300 MHz) or +24 dBm (frequency up to 300 MHz) to the SG output connector. In addition, ensure that DC voltage is not applied even when within the range described above.

2.3.3 Electrostatic

⚠ CAUTION

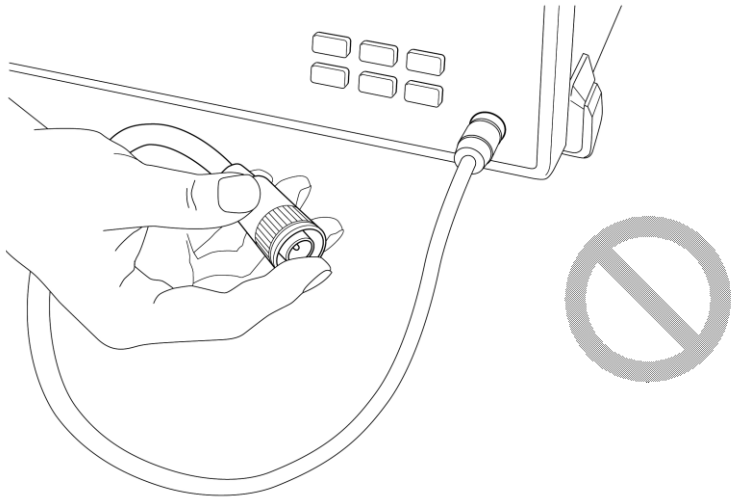
- **Always use the supplied 3-pin power cord to ground both the MS2690A/MS2691A/MS2692A and DUT (included in test circuit). After confirming that both the MS2690A/MS2691A/MS2692A and DUT are grounded, use coaxial cables to connect them.**
  NEVER connect the MS2690A/MS2691A/MS2692A and DUT without grounding, otherwise electrostatic discharge may damage the MS2690A/MS2691A/MS2692A.
- **Do not touch the core conductor of the connector or bring it into contact with metal. Doing so may damage the input circuit of the MS2690A/MS2691A/MS2692A.**





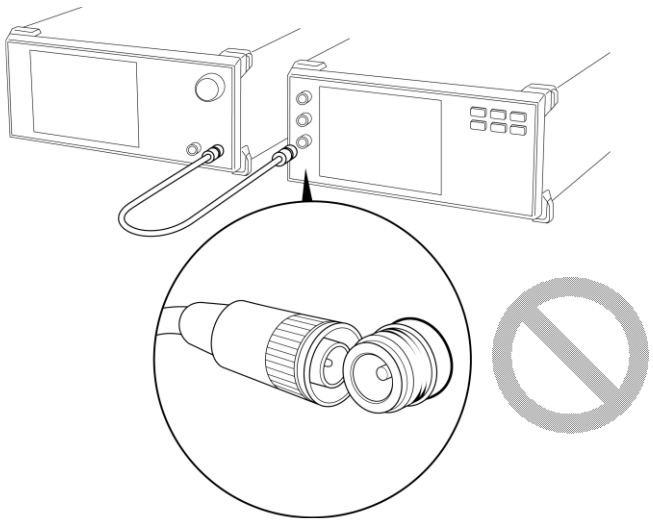
⚠ CAUTION

Do not touch the core conductor of the coaxial cable connected to the input connector or bring it into contact with metal.
Doing so may damage the input circuit of the MS2690A/MS2691A/MS2692A.



⚠ CAUTION

Do not touch the core conductor to the metal when connecting the coaxial cable to the connector.
Doing so may damage the input circuit of the MS2690A/MS2691A/MS2692A.



2.3.4 Notes on handling input connector and SG output connector (when vector signal generator is installed)

Connect only an N-type connector to RF Input and SG Output.
Connecting a different connector will damage the connector.

2.3.5 USB memory

Note the orientation of the connection when using a USB memory.
Plugging in a USB memory in the wrong direction may damage the connector.

2.4 Power Connection

This section describes the procedures for supplying power.

2.4.1 Power requirements

For normal operation of the MS2690A/MS2691A/MS2692A, observe the power voltage range described below.

Power source	Voltage range	Frequency
100 Vac system	100 to 120 V	50 to 60 Hz
200 Vac system	200 to 240 V	50 to 60 Hz

Changeover between 100 and 200 V system is made automatically.

The maximum power consumption of the MS2690A/MS2691A/MS2692A is 440 VA. Provide sufficient power capacity.

⚠ CAUTION

Supplying power exceeding the above range may result in electrical shock, fire, failure, or malfunction.

2.4.2 Connecting power cord

Insert the power plug into a grounded outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is properly grounded, always use the supplied 3-pin power cord.

⚠ WARNING

Always connect the instrument to a properly grounded outlet. Do not use the instrument with an extension cord or transformer that does not have a ground wire.

If the instrument is connected to an ungrounded outlet, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.

Unless otherwise specified, the signal-connector ground terminal, like an external conductor of the coaxial connector, of the instrument is properly grounded when connecting the power cord to a grounded outlet. Connect the ground terminal of DUT to a ground having the same potential before connecting with the instrument. Failure to do so may result in an electric shock, fire, failure, or malfunction.

⚠ CAUTION

If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by disconnecting either end of the power cord.

When installing the instrument, place the instrument so that an operator may easily connect or disconnect the power cord from the power inlet and outlet. Moreover, DO NOT fix the power cord around the plug and the power inlet with a holding clamp or similar device.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

It should be noted that, the power switch on the front panel of the instrument is a standby switch, and cannot be used to cut the main power.

Chapter 3 Common Operations

This chapter describes items to be understood before actually operating the MS2690A/MS2691A/MS2692A, including part names, basic parameter setting methods, modulation operation method and useful functions.

3.1 Part Names

3.1.1 Part names

Front Panel

This section describes the keys and connectors located on the front panel.

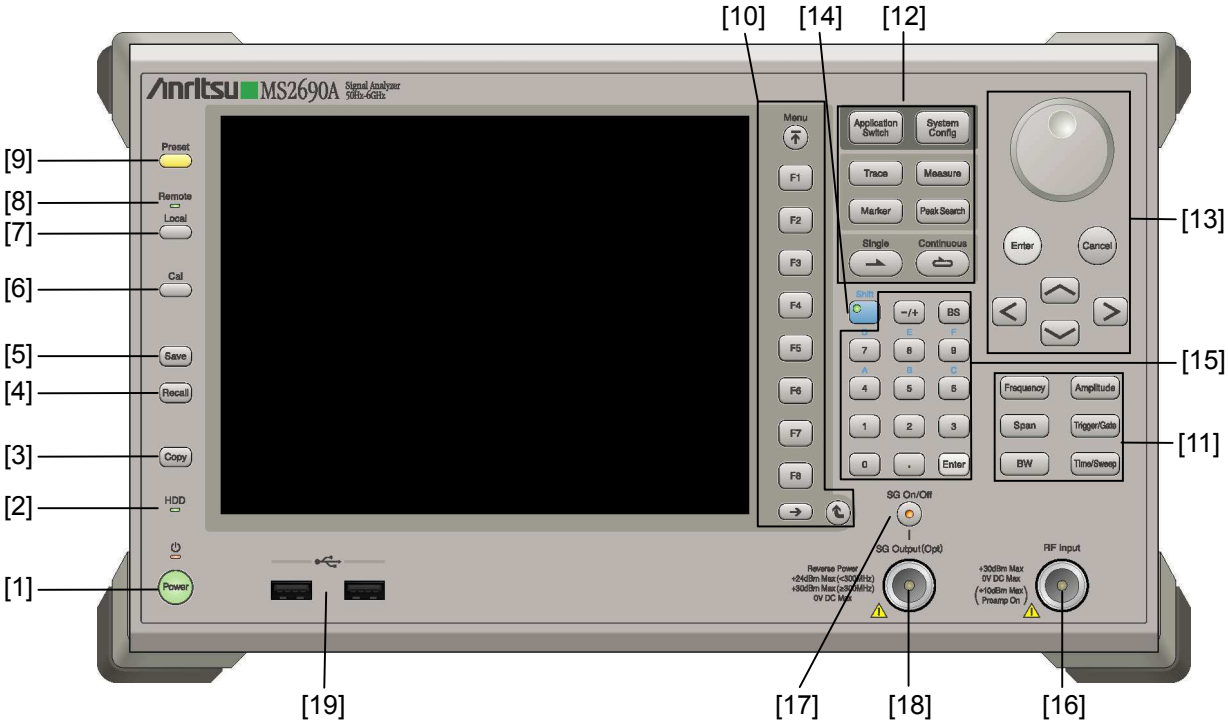


Figure 3.1.1-1 Front Panel

[1] Power Switch

Press to switch between the standby state in which AC power is supplied and the Power On state in which the MS2690A/MS2691A/MS2692A is under operation. The Power lamp lights up orange in the standby state, and lights up green in the Power On state. Press the power switch for a reasonably long duration (for about two seconds).

[2] Hard disk access lamp

Lights up when the MS2690A/MS2691A/MS2692A internal hard disk is being accessed.

[3] Copy key

Press to capture a screen image from the display and save it to a file.

[4] Recall key

Press to recall a parameter file.

[5] Save key

Press to save a parameter file.

[6] Cal key

Press to display the calibration execution menu.

[7] Local key

Press to return to local operation from remote control operation through GPIB, Ethernet or USB (B), and enable panel settings.

[8] Remote lamp

Lights up when the MS2690A/MS2691A/MS2692A is in a remote control state.

[9] Preset key

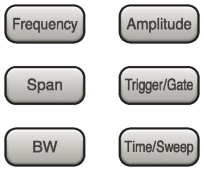
Resets parameters to their initial settings.

[10] Function keys

Used for selecting or executing function menu displayed on the right of the screen. The function menu contents are provided in multiple pages and layers.

Press → to open the next function menu page. The menu page number is displayed at the bottom of the function menu screen (e.g., "1 of 2").

Sublayer menus may be displayed when a function menu is executed. Press ← to go back to the upper layer, and press Menu to go back to the uppermost (top) layer.



[11] Main function keys 1

Used to set or execute main functions of the MS2690A/MS2691A/ MS2692A.
Executable functions vary depending on the application currently selected.

Frequency Press to set parameters related to frequency.

Amplitude Press to set parameters related to level.

Span Press to set parameters related to frequency span.

Trigger/Gate Press to set parameters related to trigger.

BW Press to set parameters related to RBW/VBW.

Time/Sweep Press to set parameters related to Time/Sweep.

[12] Main function keys 2

Used to set or execute main functions of the MS2690A/MS2691A/ MS2692A.
Executable functions vary depending on the application currently selected.

Application Switch Press to switch an application.

System Config Press to display the Configuration screen.

Trace Press to set parameters related to trace.

Measure Press to set parameters related to the measurement function.

Marker Press to set parameters related to the marker function.

Peak Search Press to set parameters related to the peak search function.

Single Press to start a single measurement.

Continuous Press to start continuous measurements.

[13] Rotary knob/Cursor keys/Enter key/Cancel key

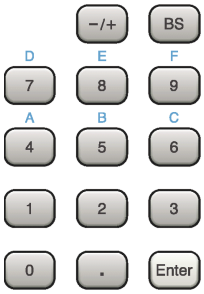
The rotary knob and cursor keys are used to select display items or change settings.

Pressing Enter fixes the entered or selected data.

Pressing Cancel cancels the entered or selected data.

[14] Shift key

Used to operate any keys with functions described in blue characters on the panel. First press the Shift key, then press the target key when the Shift key lamp lights up green.



[15] Numeric keypad

Used to enter numbers on parameter setup screens.

Pressing BS deletes the last entered digit or character.

Hexadecimal values [A] to [F] can be entered by pressing 4 to 9 when the Shift key lamp Shift lights up green.

[16] RF Input connector

Inputs an RF signal.

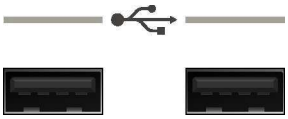
A conversion adapter (J1398A N-SMA ADAPTOR) is recommended for the measurement in the frequency 18 GHz or more.

[17] RF output control key

If the MS2690A/MS2691A/MS2692A Option 020 Vector Signal Generator is installed, pressing SG On/Off enables (On) or disables (Off) the RF signal output. The lamp of the RF output control key lights up orange when the RF signal output is set to On.

[18] RF output connector (if MS2690A-020/MS2691A-020/MS2692A-020 installed)

Outputs an RF signal.



[19] USB connector (type A)

Used to connect a USB keyboard or mouse or the USB memory supplied with the MS2690A/MS2691A/MS2692A.

Rear panel

This section describes the connectors located on the rear panel.

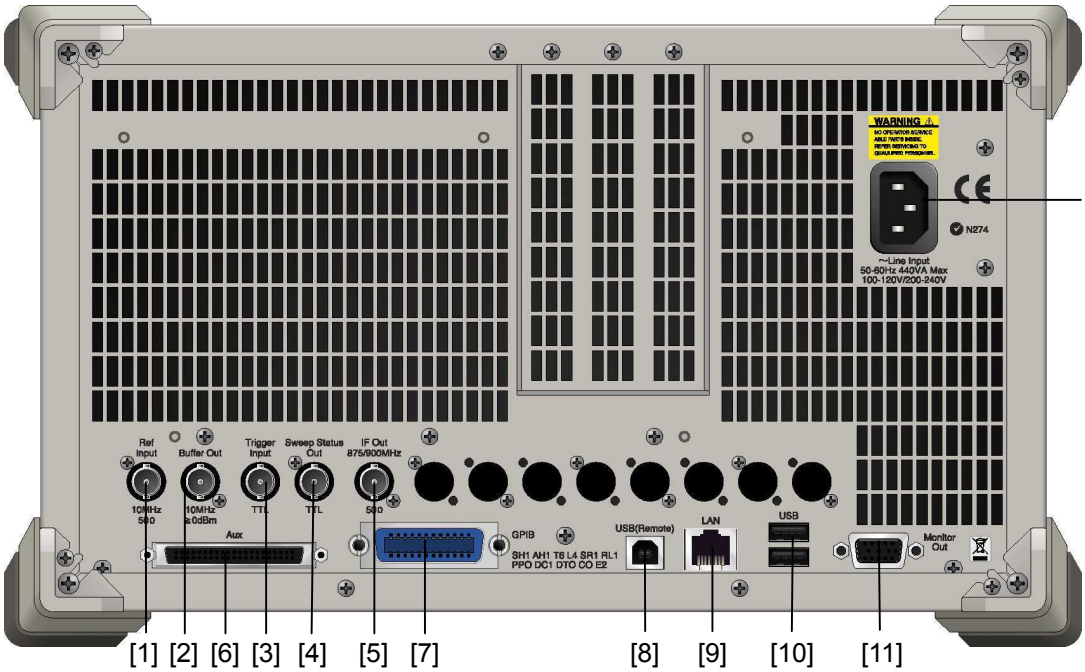


Figure 3.1.1-2 Rear panel

Ref Input

[1] Ref Input connector (reference frequency signal input connector)

Inputs an external reference frequency signal (10 MHz or 13 MHz). It is used for inputting reference frequency signals with accuracy higher than that of those inside the MS2690A/MS2691A/MS2692A, or for synchronizing the frequency of the MS2690A/MS2691A/MS2692A to that of other device.

Buffer Out

[2] Buffer Out connector (reference frequency signal output connector)

Outputs the reference frequency signal (10 MHz) generated inside the MS2690A/MS2691A/MS2692A. It is used for synchronizing the frequencies between other devices and the MS2690A/MS2691A/MS2692A based on the reference frequency signal output from this connector.

Trigger Input

[3] Trigger Input connector

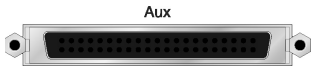
Inputs a trigger signal from an external device. Refer to the operation manual of each application for operations when a trigger signal is input.

[4] Sweep Status Out connector

Outputs a signal that is enabled when an internal measurement is performed or measurement data is obtained.

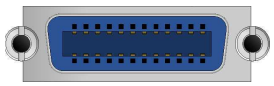
[5] IF Out connector

Outputs an IF signal. 874.988 MHz is specified as the center frequency during spectrum analyzer operations, and 875 MHz is specified during signal analyzer operations. It becomes 900 MHz when the MS2690A/MS2691A/MS2692A Option 004 Wideband Analysis Hardware is enabled. The IF signal is output without band limitation by RBW during both spectrum analyzer and signal analyzer operations.



[6] AUX connector

This is a complex connector for inputting an error rate measurement signal (optional) and inputting a baseband clock reference signal of the MS2690A-020/MS2691A-020/MS2692A-020 Vector Signal Generator (optional). See Table 3.1.1-1 for the internal pin assignment of the AUX connector.

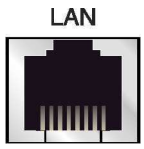


[7] GPIB connector

Used when controlling the MS2690A/MS2691A/MS2692A externally via GPIB.

[8] USB connector (type B)

Used when controlling the MS2690A/MS2691A/MS2692A externally via USB.



[9] Ethernet connector

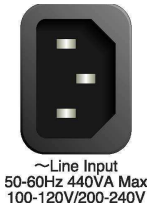
Used for connecting to a personal computer (PC) or for Ethernet connection.

[10] USB connectors (type A)

Used to connect a USB keyboard or mouse or the USB memory supplied with the MS2690A/MS2691A/MS2692A.

[11] Monitor Out connector

Used for connection with an external display.



[12] AC inlet

Used for supplying power.

Table 3.1.1-1 Pin assignment of AUX connector

Function	Pin Number	Signal Name
BER	18	GND
	19	GND
	20	GND
	51	BER_CLK
	52	BER_EN
	53	BER_DATA
SG	21	GND
	22	GND
	26	GND
	27	MARKER1
	28	MARKER3
	30	GND
	54	PULS_MOD
	55	BB_REF_CLK
	61	MARKER2
	62	GND

Do not connect anything to connectors not listed in Table 3.1.1-1, because they are interface connectors provided for device maintenance.

3.2 Turning Power On/Off

3.2.1 Turning power On

The following shows the procedure for turning the power On.

<Procedure>

1. Plug in the power cord jack side to the AC power inlet on the rear panel. Make sure it is plugged all the way in at this time.
2. Plug the power cord plug side to the AC power outlet. The MS2690A/MS2691A/MS2692A enters standby state and the power switch lamp lights up orange.
3. Press the power switch. The Power lamp lights up green and startup begins.

Turning the power On starts Windows then the MS2690A/MS2691A/MS2692A software. The following startup screen is displayed during startup. Do not press the power switch while the startup screen is displayed. The software may not startup normally when the power switch is pressed.

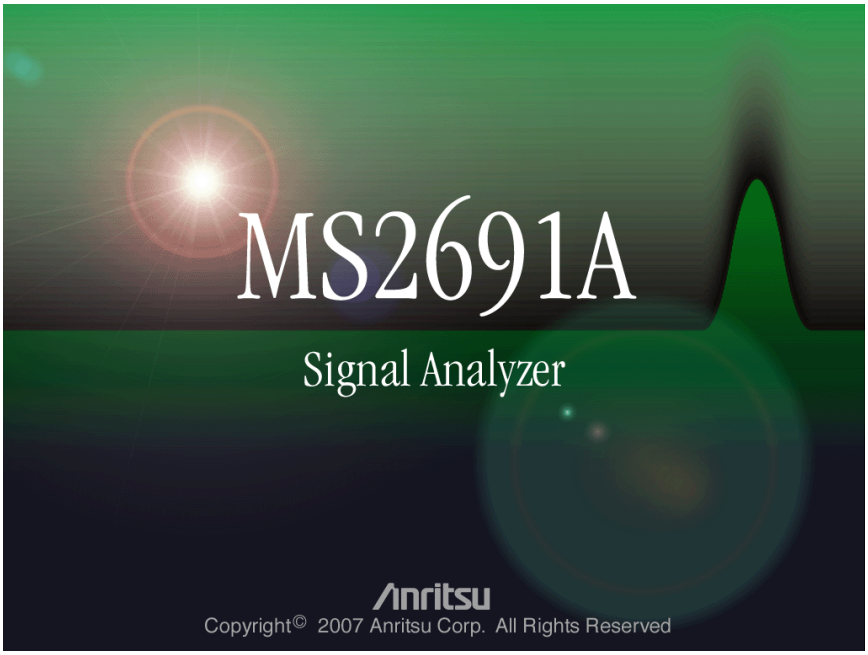


Figure 3.2.1-1 Example of Startup Screen

3.2.2 Turning power Off

The following shows the procedure for turning the power Off.

When turning power Off using panel keys

<Procedure>

1. Press the power switch to close applications and start shutdown. The green power switch power lamp lights off, the ⏻ lamp lights up orange, and the power is turned Off. The main power is On at this time.

Note:

Do not press the power switch for more than 4 seconds. Doing so will forcibly shut down the system during software closing processing.

When turning power Off using mouse connected to MS2690A/MS2691A/MS2692A

<Procedure>

1. Connect the supplied mouse to the MS2690A/MS2691A/MS2692A and open the Start Menu from the Windows Taskbar.
2. Select "Turn off computer."
3. Select "Turn off."
4. Shutdown begins, the green power switch power lamp lights off, the ⏻ lamp lights up orange, and the power is turned Off. The main power is On at this time.

Forced shutdown

<Procedure>

1. Press the power switch for four seconds or more. The green power switch power lamp lights off, the ⏻ lamp lights up orange, and the power is turned Off.

Notes:

1. Use forced shutdown as an emergency operation only when key, mouse, or keyboard operations are disabled. A failure may have occurred in the event the power cannot be turned Off even after pressing the power switch for 4 or more seconds. Unplug the power cord from the outlet and contact an Anritsu Service and Sales office or agent.

2. Unplugging the power plug while accessing the hard disk may result in hard disk failures. Unplug the power plug when the power is turned Off.

3.3 Auto Calibration

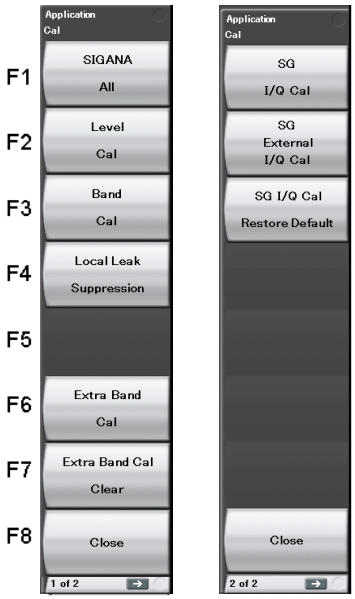
An auto calibration function that uses an internal calibrating oscillator is provided to minimize measurement errors of the MS2690A/MS2691A/ MS2692A.

⚠ CAUTION

Do not input signals to RF input when calibrating. Correct calibration values cannot be obtained when the auto calibrating function is executed while signals are being input.

Press Cal (Cal) to display the Cal function menu.

Figure 3.3-1 Cal key



Page 1 Page 2

Figure 3.3-2 Cal function menu

Table 3.3-1 Description of Cal function menu

Menu Display	Function
Page 1	
SIGANA All	Executes all calibrations (Level Cal, Band Cal, Local Leak Suppression) except Extra Band Cal.
Level Cal	Executes level calibration.
Band Cal	Executes analysis band calibration.
Local Leak Suppression	Executes local leak suppression.
Extra Band Cal	Executes analysis bandwidth calibration within the current center frequency.
Extra Band Cal Clear	Clears the all calibration values obtained by Extra Band Cal to zero.
Close	Returns to the application screen.
Page 2	Displayed only when the Vector Signal Generator option is installed.
SG I/Q Cal	Calibrates Vector Signal Generator option. SG Output and RF Input do not need to be connected by cable.
SG External I/Q Cal	Calibrates Vector Signal Generator option. SG Output and RF Input need to be connected by cable. Do not input signals in RF Input.
SG I/Q Cal Restore Default	Deletes the values obtained by SG I/Q Cal and SG External I/Q Cal and restores the factory defaults.

The auto calibration function in Page 1 includes the following four calibration functions and a function to execute functions (1) to (3) at one time.

(1) Level calibration (Level Cal)

Calibrates reference level errors, RBW switching errors and input attenuator switching errors to minimize level measurement errors.

Example: Executing signal level calibration

<Procedure>

1. Press Cal (Cal).
2. Select F2 (Level Cal).

(2) Analysis band calibration (Band Cal)

Calibrates the frequency flatness and phase characteristics within the analyzed band.

Example: Executing analysis band calibration

<Procedure>

1. Press Cal (Cal).
2. Select F3 (Band Cal).

(3) Local Leak Suppression

Executes calibration to suppress local leaks affecting low frequency and low level measurements.

Example: Suppressing local leaks using local leak suppression function

<Procedure>

1. Press Cal (Cal).
2. Select F4 (Local Leak Suppression).

The following are the steps to batch execute all calibration functions.

<Procedure>

1. Press Cal (Cal).
2. Select F1 (SIGANA All).

(4) Extra Band Cal

Executes analysis bandwidth calibration within the current center frequency.

Example: Executing analysis bandwidth calibration within the current center frequency.

<Procedure>

1. Press Cal (Cal).
2. Select F6 (Extra Band Cal).

When Extra Band Cal is executed, the obtained calibration value is held separately for each center frequency at the time of execution. When Extra Band Cal is executed at the center frequency already having the calibration value, the old calibration value is discarded. Up to 100 values obtained by Extra Band Cal can be held. If Extra Band Cal is executed when the number of the obtained values has reached 100, the oldest value is discarded and replaced by the newly obtained one.

The calibration value is applied if both of the following conditions are met:

- The difference between "the center frequency at the time of executing Extra Band Cal" and "the set value for the current center frequency" is 100 kHz or less.
- Both of the center frequencies are on the same frequency band.

This function cannot be executed when Spectrum Analyzer is selected. To activate Extra Band Cal, select any function other than Spectrum Analyzer, Signal Generator, BER Measurement, and Power Meter when Spectrum Analyzer is selected.

Depending on the version of the software you install, the existing Extra Band Cal calibration values might be cleared when installing the software. When the software is installed successfully, retry to execute Extra Band Cal and obtain a calibration value. For how to install the software, refer to 3.8.1 "Installing software".

(5) Extra Band Cal Clear

Clears the all calibration values obtained by Extra Band Cal.

Example: Clearing the all calibration values obtained by Extra Band Cal.

<Procedure>

1. Press Cal (Cal).
2. Select F7 (Extra Band Cal).

The auto calibration function of Vector Signal Generator option in Page 2 includes the following two calibration functions (6) and (7) and a function (8) to delete the values calibrated by (6) and (7).

(6) SG I/Q Cal

(7) SG External I/Q Cal

(8) SG I/Q Cal Restore Default

For details, see Section 2.9 “Auto Calibration” in MS2690A/MS2691A/MS2692A Signal Analyzer Option 020: Vector Signal Generator Operation Manual (Mainframe Operation).

3.4 Settings on Configuration Screen

MS2690A/MS2691A/MS2692A system settings, and settings for system information display and common application functions can be configured in the Configuration screen.

Press System Config to display the Configuration screen.

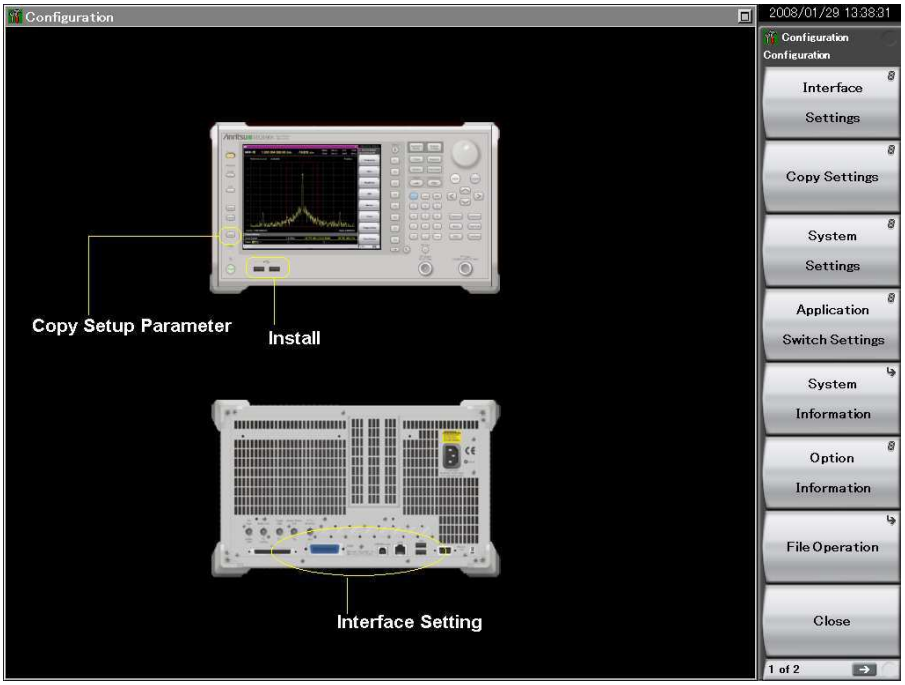


Figure 3.4-1 Configuration screen

3.4.1 Display description

The function menu in the Configuration screen consists of two pages, which can be toggled by pressing (→).

Table 3.4.1-1 Configuration menu

Function Key	Menu Display	Function
Page 1	Configuration	Press System Config to display.
F1	Interface Settings	Sets interface used for remote control. ☞ Mainframe Remote Control 1.3.3 "Mainframe settings" ☞ 3.4.2 "Interface Settings"
F2	Copy Settings	Sets screen hard copy. ☞ 3.4.3 "Copy Settings"
F3	System Settings	Sets buzzer On/Off. ☞ 3.4.4 "System Settings"
F4	Application Switch Settings	Sets loading/unloading of applications. ☞ 3.4.5 "Application Switch Settings"
F5	System Information	Displays MS2690A/MS2691A/MS2692A system information. ☞ 3.4.6 "System Information"
F6	Option Information	Displays options installed in the MS2690A/MS2691A/ MS2692A. ☞ 3.4.7 "Option Information"
F7	File Operation	Sets file and data management. ☞ 3.4.8 "File Operation"
F8	Close	Closes Configuration screen.
Page 2	Configuration	Press System Config , then press (→) to display.
F1	Software Install	Sets software and license installation. ☞ 3.4.9 "Software Install/Uninstall"
F4	Display Annotation	Turns on and off frequency and level display on the application screen. On: Display (default), Off: Hide ☞ 3.4.11 Display Annotation
F6	Save&Recall Settings	Sets the mode for save and recall functions. ☞ 3.6.4 "Simple Save&Recall"
F7	Correction	Sets the correction function. ☞ 3.4.10 "Correction"
F8	Close	Closes Configuration screen.

3.4.2 Interface Settings

Pressing F1 (Interface Settings) after System Config displays the Interface Settings screen. GPIB, Ethernet and USB interface conditions used for remote control can be set in this screen. Select the item to be set with the cursor, and then press F7 (Set) to reflect the settings of that item.

Refer to Section 1.3 "Interface Settings" in the MS2690A/MS2691A/MS2692A Operation Manual (Mainframe Remote Control) for details.

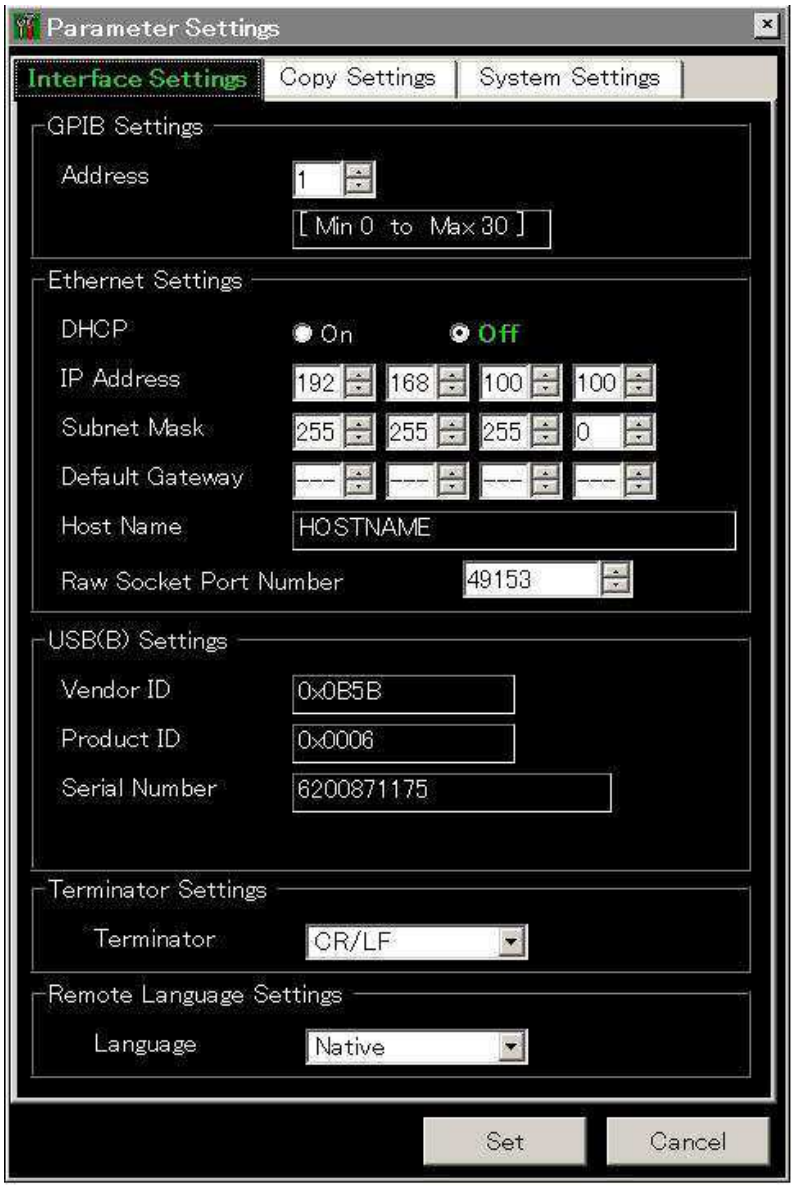


Figure 3.4.2-1 Interface Settings screen

3.4.3 Copy Settings

Pressing F2 (Copy Settings) after System Config displays the Copy Settings screen. Screen hard copy conditions can be set in this screen. Select the item to be set with the cursor, and then press F7 (Set) to reflect the settings of that item.

Figure 3.4.3-1 Copy Settings screen

Table 3.4.3-1 Copy settings items

No.	Item	Description
<1>	File Type Settings	Selects the file format. BMP or PNG can be set.
<2>	Color Settings	Sets the screen hard copy color. The available color settings are: Normal (same as screen display), Reverse, Monochrome, or Reversed Monochrome.
<3>	File Name Settings	The file naming method can be selected from auto (date + sequence number) or random. This setting is applied also to determining file name for parameters/waveform data saving. ☞ 3.6.1 “Saving parameters and waveform data”
<4>	Storage Place Settings	The file save location can be selected.

3.4.4 System Settings

Pressing F3 (System Settings) after System Config displays the System Settings screen. Select the item to be set with the cursor, and then press F7 (Set) to reflect the settings of that item.

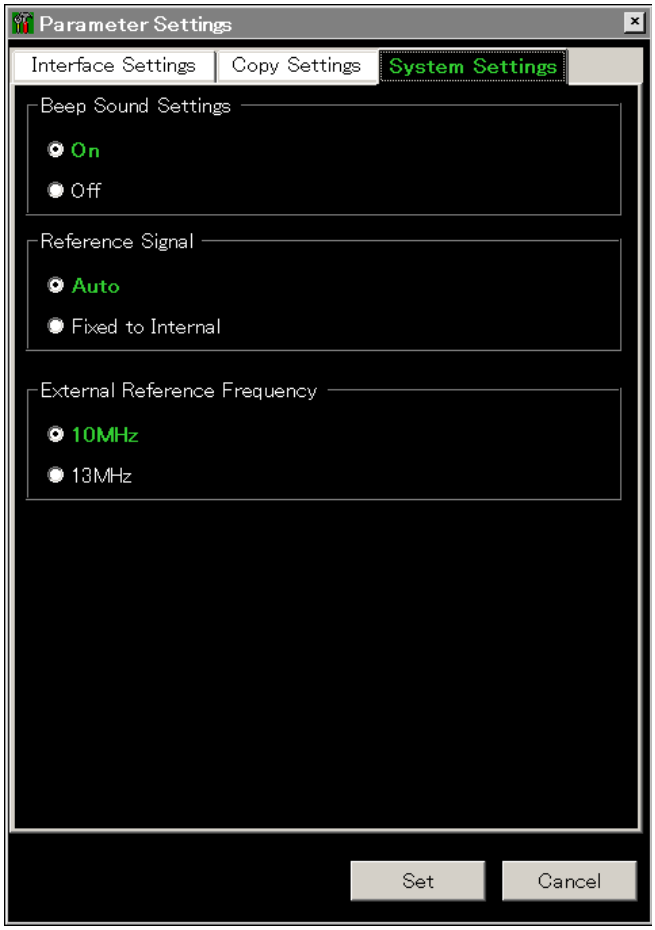


Figure 3.4.4-1 System Settings screen

Table 3.4.4-1 System Settings items

Item	Description
Beep Sound Setting	Sets the warning sound On/Off.
Reference Signal	Selects the reference frequency signal type. Auto Detects and automatically selects external reference signal input. Synchronizes the internal reference oscillator when an external input is not detected, and synchronizes to the external reference signal when an external input is detected. Fixed to Internal Uses the internal reference oscillator.

Table 3.4.4-1 System Settings items(Cont'd)

Item	Description
External Reference Frequency	Selects signal frequency, when using external reference signal as the signal source for reference frequency. 13 MHz external reference signal is available only when Board Revision of IF Local Board Revision is three or greater. You can check Board Revision using the procedure below: 1. After pressing System Config, press F5 (System Information) to display the System Information menu. 2. Press F4 (Board Revision View) to display the Board Revision list. 3. The Board Revision of IF Local Board displays to the right of IF Local Board. If using the Board Revision of IF Local Board Revision with 3 or less, and also using the 13 MHz external reference versions, contact an Anritsu Service and Sales office immediately. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

3.4.5 Application Switch Settings

Pressing F4 (Application Switch Settings) after System Config displays the Application Switch Settings menu. The loading/unloading of applications can be set from this menu. Select the item to be set with the cursor, and then press F7 (Set) to display the setting window of that item or start performing the setting.

Figure 3.4.5-1 Application Switch Settings menu

Table 3.4.5-1 Setting items of Application Switch Settings

Menu Display	Description
Load Application Select	Selects an application located in the Unloaded Applications frame to startup the selected application.
Unload Application Select	Selects an application located in the Loaded Applications frame to end the selected application.
Position Change	Sets the loaded application anywhere on the Application Switch menu.

3.4.6 System Information

Pressing F5 (System Information) after System Config displays the System Information menu. The MS2690A/MS2691A/MS2692A system information can be viewed from this menu. Pressing the function key corresponding to the system information to be viewed displays the window of the selected item.

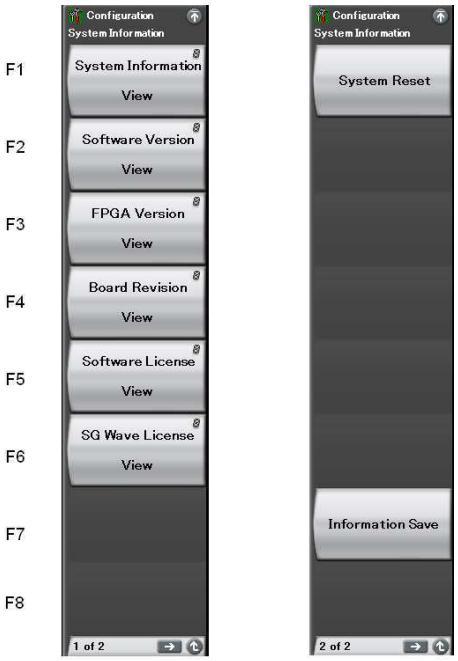


Figure 3.4.6-1 System Information menu

Table 3.4.6-1 System Information setting items

Menu Display	Description
System Information View	Displays the MS2690A/MS2691A/MS2692A product type, serial number, operating time, and attenuator switching counts. ATT01:2dB ATT02:4dB ATT03:8dB ATT04:10dB ATT05:16dB ATT06:20dB
Software Version View	Displays the version of the software installed in the MS2690A/MS2691A/ MS2692A.
FPGA Version View	Displays the FPGA version for each board installed in the MS2690A/MS2691A/ MS2692A.
Board Revision View	Displays the revisions of each board installed in the MS2690A/MS2691A/ MS2692A. (Some boards are not displayed.)
Software License View	Displays the license of software installed in the MS2690A/MS2691A/MS2692A.
SG Wave License View	Displays the license of SG waveforms installed in the MS2690A/MS2691A/ MS2692A (only when a vector signal generator is installed).
System Reset	Initializes the system.
Information Save	Saves the MS2690A/MS2691A/MS2692A system information.

3.4.7 Option Information

Pressing F6 (Option Information) after System Config displays the option screen. Information on options installed in the MS2690A/MS2691A/MS2692A can be viewed in this screen.

3.4.8 File Operation

Pressing F7 (File Operation) after System Config displays the File Operation menu. Data files can be managed from this menu. Pressing the function key corresponding to the data file to be managed displays the setting window of that item.

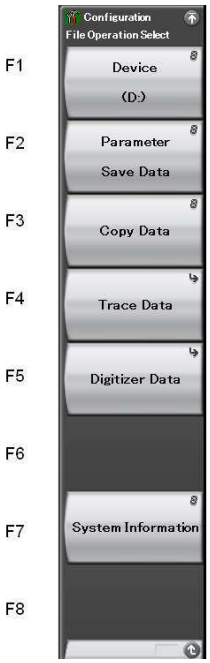


Figure 3.4.8-1 File Operation menu

Table 3.4.8-1 File Operation setting items

Item	Description
Device (D:)	Selects the drive.
Parameter Save Data	Manages save data of parameter settings file.
Copy Data	Manages copied file data.
Trace Data	Manages trace data.
Digitizer Data	Manages digitized data.
System Information	Manages the MS2690A/MS2691A/MS2692A system information.

3.4.9 Software Install/Uninstall

Pressing F1 (Software Install) after System Config from page 2 of the System Information menu displays the Software Install menu. Software can be installed and uninstalled to/from the MS2690A/MS2691A/MS2692A from this menu. Pressing the function key corresponding to the item to be set executes the selected item.
Refer to Section 3.8 “Installing and Uninstalling” for details.

3.4.10 Correction

When making measurements with a spectrum analyzer, it may be necessary to correct the error and gain of the measurement system. The following are examples of them:

Frequency characteristics and loss of measurement cables

Frequency characteristics and loss of pre-amplifier, etc. connected to RF input connector.

When wanting to measure the field strength with an antenna or near-field probe connected (antenna factor correction).

In the cases above, Correction functions allow you to correct the error and gain.

You can input correction value via csv file or remote control operation. If inputting via csv file, refer to the Recall Correction Table. For details of remote command input, see “Correction Make Up” in Chapter 4 of the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual Mainframe Remote Control*.

Pressing F7 (Correction) on page 2 of Correction function menu after System Config displays Correction function menu. Those functions are used to set correction factors for frequency characteristics.

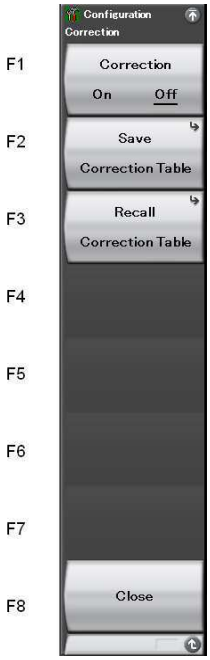


Figure 3.4.10-1 Correction function menu

Table 3.4.10-1 Items of Correction

Item	Description
Correction (On/Off)	Sets Correction to On/Off. When set to On, the level correction processing function is executed.
Save Correction Table	Opens the Save Correction Table function menu.
Recall Correction Table	Opens the Recall Correction Table function menu.
Close	Returns to the Configuration menu.

Pressing F2 (Save Correction Table) on Correction function menu displays Save Correction Table function menu. Those functions are used to save level frequency characteristics.

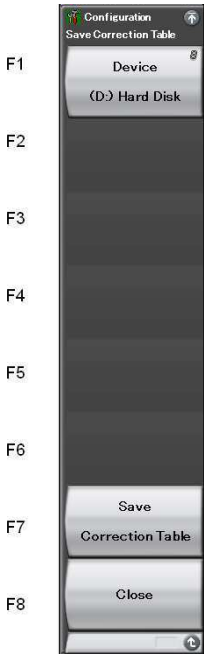


Figure 3.4.10-2 Save Correction Table function menu

Table 3.4.10-2 Items of Save Correction Table

Item	Description
Device (D:)	Selects the drive.
Save Correction Table	Saves the level frequency characteristics. When File Name Setting is set to Data + sequential, the file is automatically named ”Corr date_sequential number”. The file is in CSV format and is saved in “[Selected drive]:\Anritsu Corporation\Signal Analyzer\User Data\Corrections\”. Up to 1000 files can be saved in the folder.
Close	Returns to the Configuration menu.

Pressing F3 (Recall Correction Table) on Correction function menu displays the Recall Correction Table function menu. Those functions are used to recall the saved level frequency characteristics.

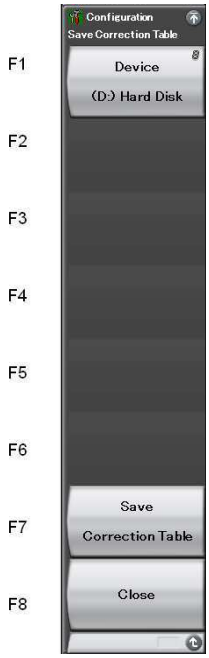


Figure 3.4.10-3 Recall Correction Table function menu

Table 3.4.10-3 Items of Recall Correction Table

Item	Description
Device (D:)	Selects the drive.
Recall Correction Table	Recalls the level frequency characteristics. A file is in CSV format.
Close	Returns to the Configuration menu.

A Correction file is in CSV format, as shown below. Signal levels can be corrected by sets of frequency and level in the Correction file. Also, the correction factors between Fa and Fb are calculated by the linear interpolation of log value at Fa and Fb.

Frequency(Hz),Level(dB)
0,0
980000000,1
1000000000,4
1200000000,1

Describe the frequency and level to be corrected within the following range for the CSV file.

Up to 4096 items of correction data can be set.

[Frequency]

Range –1 to 400 GHz
Resolution 1 Hz
Set the unit in Hz.

[Level]
Range –100 to 100 dB
Resolution 0.001 dB

As shown in Figure 3.4.10-4, if the frequency range over which the correction factors are entered is from Fa to Fb, displayed frequency ranges lower than Fa or higher than Fb have correction factors applied. The correction factor for frequencies lower than Fa is the same as that (La) for Fa and the correction factor for frequencies higher than Fb is the same as that (Lb) for Fb. The correction factors between Fa and Fb are calculated by the linear interpolation of log value at Fa and Fb.

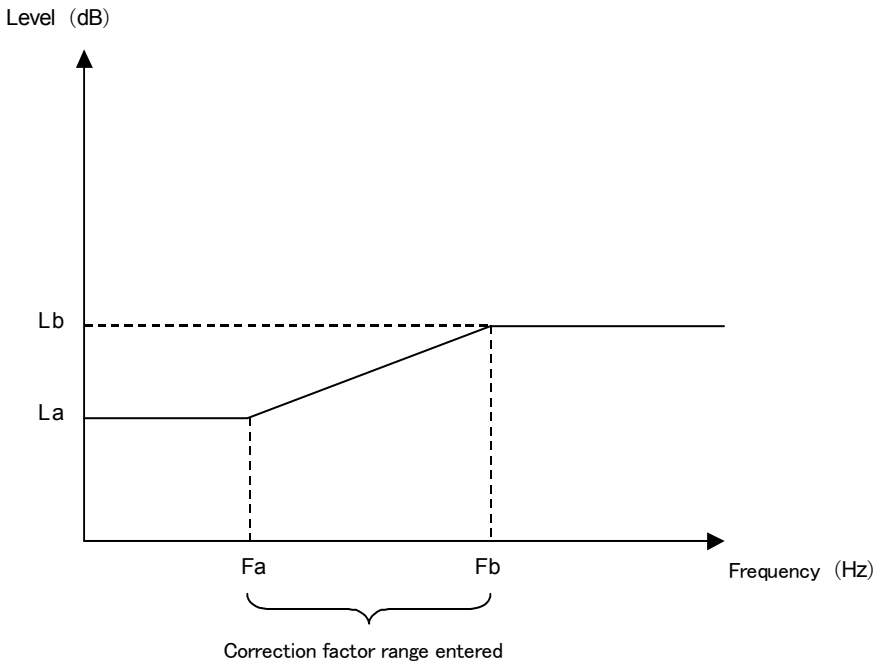


Figure 3.4.10-4 Operation When Correction Factors Are Entered

Correction factors apply to all the applications other than Signal Generator, BER Test, and RNC Simulator.

In Signal Analyzer functions, the correction factors of the center frequency are applied to all the trace data in the same span.

Executing the following functions initializes the correction factors. Installing application software does not initialize the correction factors.

To execute System Reset.

To execute the system recovery functions.

3.4.11 Display Annotation

When Display Annotation is OFF, the measurement target's frequency and level included in the frequency-related settings, level-related settings, marker values, and measurement results are hidden from the application screen to avoid being seen.

Press System Config and then press →. Switch On/Off the display by pressing F4 (Display Annotation) on Page 2 of the Configuration function menu.

On	Displays frequency and signal level. (Default)
Off	Hides frequency and signal level.

Note:

When Display Annotation is Off, only applications that support Display Annotation function are displayed in the Application Switch menu.

3.5 Loading, Unloading, and Switching Applications

The following describes the procedures for loading, unloading and switching applications (signal analyzer, spectrum analyzer, etc.).

Loading applications refers to the setting of applications already installed to an execution state. Loaded applications are registered to the Application Switch menu and are in an operable state. In addition, these applications enter an execution state when the power is turned On after registration. All applications are in a loaded state at factory shipment.

Unloading applications refers to the halting and ending of applications in an execution state. Unloaded applications are released from Application Switch menu registration and will not run until they are re-loaded.

Switching applications refers to the operation for selecting the applications to be operated from the applications in an execution state. You can select the target applications from the Application Switch menu.

⚠ CAUTION

1. **Applications registered to the Application Switch menu automatically enter an execution state when starting up the MS2690A/MS2691A/MS2692A. The more registered applications, the longer startup will take.**

2. **In the event running applications are suddenly ended while operating Windows, press Power, turn the MS2690A/MS2691A/MS2692A power Off or shutdown Windows, and then turn the MS2690A/MS2691A/ MS2692A power On again.**

3. **When many applications are running simultaneously and the measurement software calls a measurement function from the signal or spectrum analyzer functions, sometimes the application may take a long time to switch. Reducing the number of simultaneously running applications by unloading them will help prevent this problem.**

3.5.1 Loading applications

Applications can be loaded from the Configuration screen.

<Procedure>

1. After pressing System Config, press F4 (Application Switch Settings) to display the Application Switch Registration screen.
2. Press F1 (Load Application Select), select the applications to be loaded from the applications displayed in "Unloaded Applications" at the bottom part of the screen, and then press F7 (Set).
   Press F1 (Load Application Select) once again, when an error message "Loading application failed" is displayed.

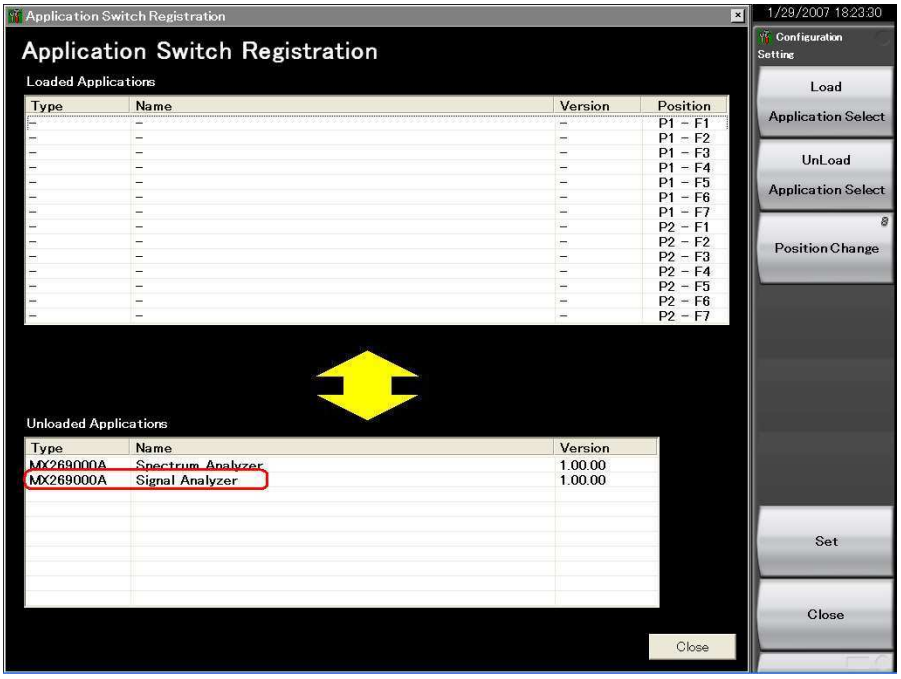


Figure 3.5.1-1 Application Switch Registration screen

3. When registered correctly, the selected applications will be displayed in “Loaded Applications” at the top part of the screen.

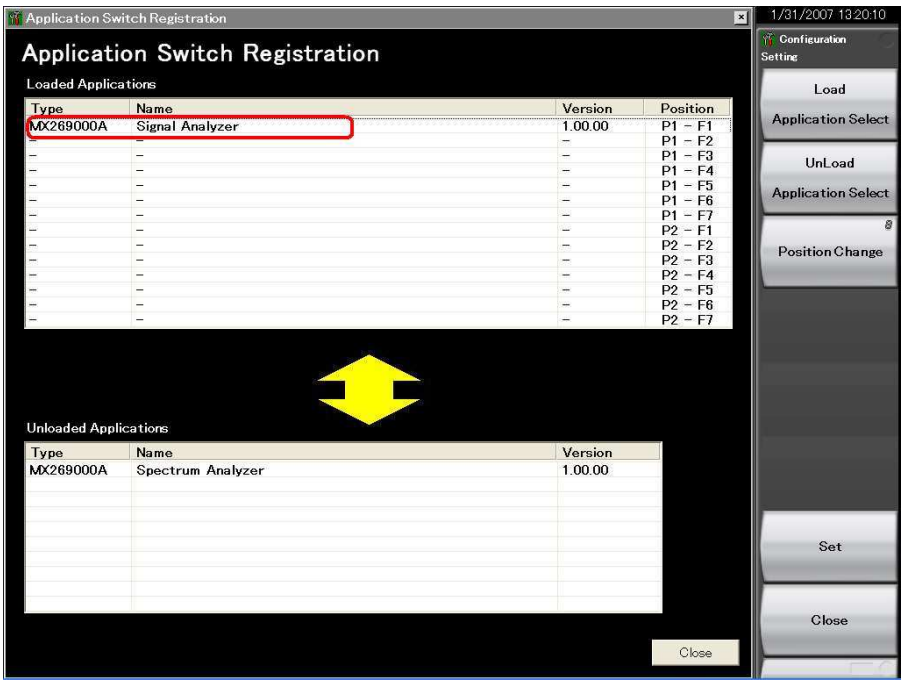


Figure 3.5.1-2 Application Switch Registration screen

4. Press Application Switch to display the Application Switch menu. Check that the loaded application is displayed in the menu. Select the application with the function key to operate the application.

Figure 3.5.1-3 Application Switch Menu screen

3.5.2 Unloading applications

Applications can be unloaded from the Configuration screen.

<Procedure>

1. After pressing System Config, press F4 (Application Switch Settings) to display the Application Switch Registration screen.
2. Press F2 (Unload Application Select), select the application to be unloaded from the applications displayed in "Loaded Applications" at the top part of the screen with the cursor, and then press F7 (Set).

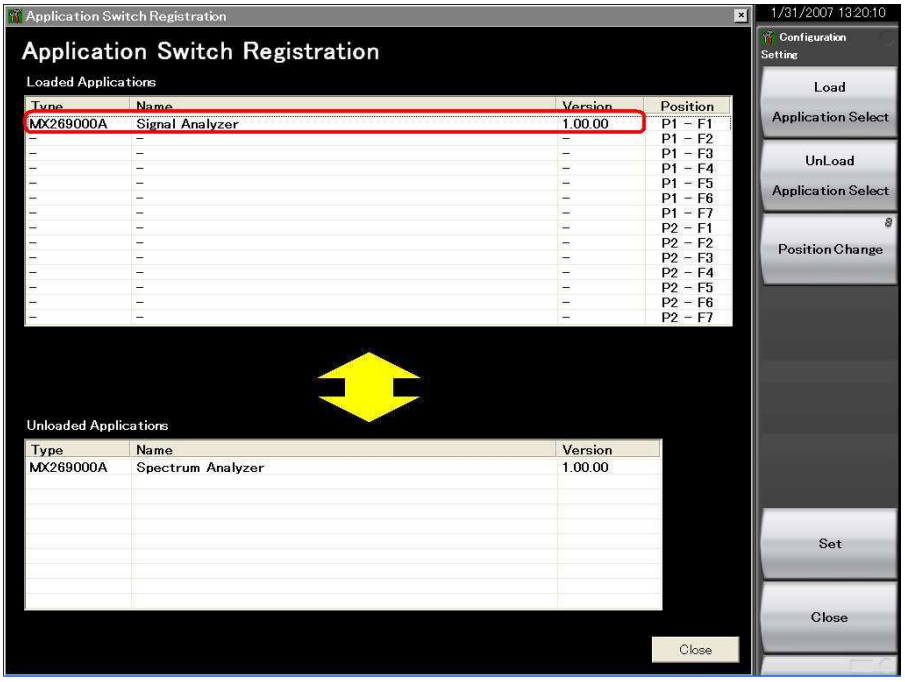


Figure 3.5.2-1 Application Switch Registration screen

3. When ended correctly, the selected applications will be displayed in "Unloaded Applications" at the bottom part of the screen.

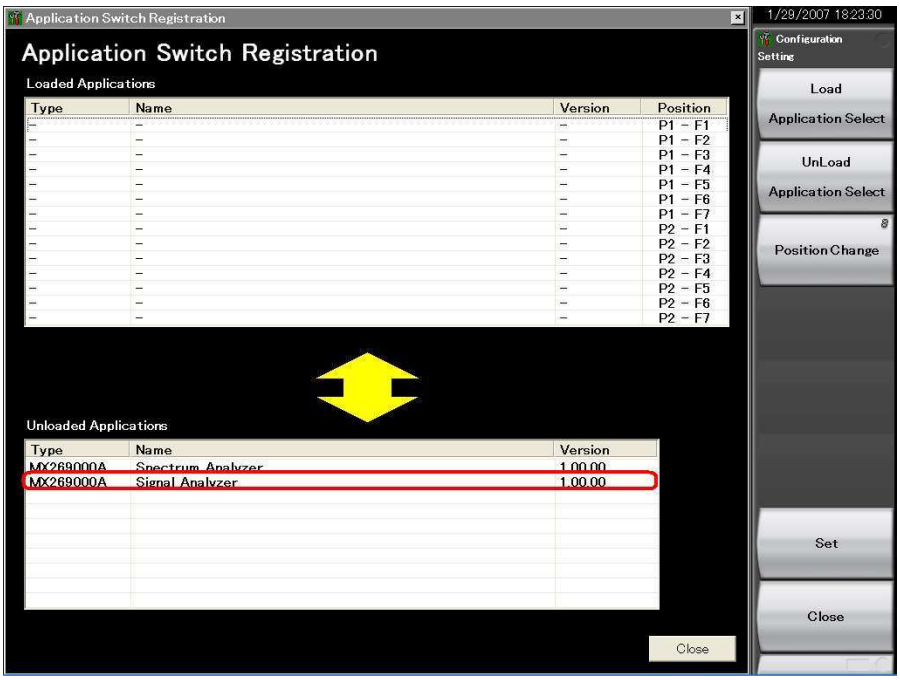


Figure 3.5.2-2 Application Switch Settings screen

3.5.3 Switching applications

Applications to be operated can be switched in the Application Switch menu.

Pressing 

displays the Application Switch menu screen. Pressing the function key corresponding to the application to be switched switches to the selected application screen.

Note:

When Display Annotation is Off, only applications that support Display Annotation function are displayed in the Application Switch menu.

Figure 3.5.3-1 Application Switch menu

3.5.4 Changing application layout

The layout of applications can be changed as desired in the Application Switch menu. Set the application layout in the Configuration screen.

<Procedure>

1. After pressing System Config, press F4 (Application Switch Settings) to display the Application Switch Registration screen.
2. Press F3 (Position Change) to display the Application Switch Function Position Edit screen.
3. In the Function Position field, select the application whose layout is to be changed with the cursor, and then press Enter.

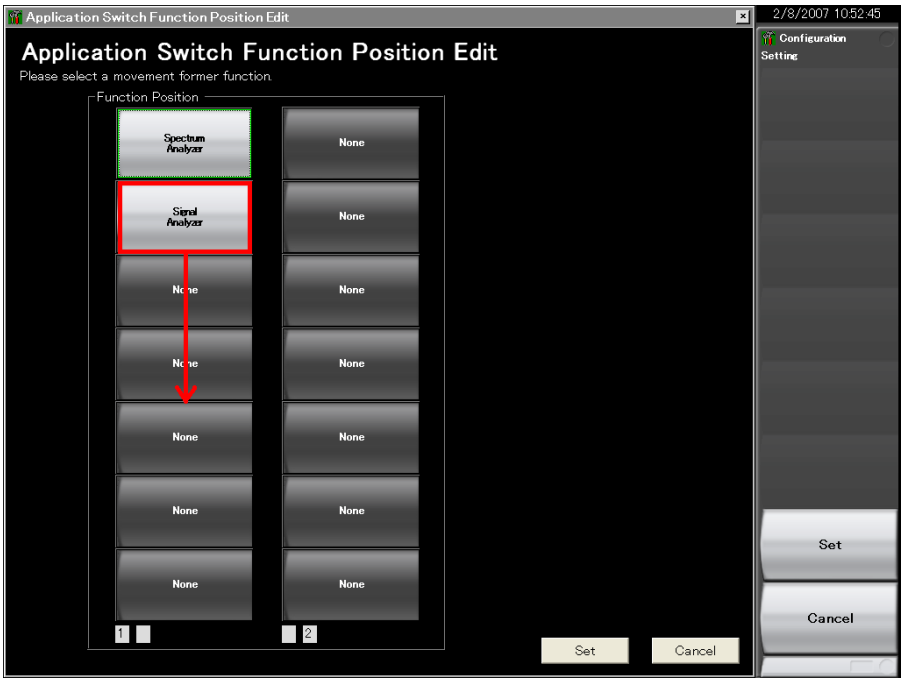


Figure 3.5.4-1 Application Switch Function Position Edit screen

4. Select the layout position from the slots in the Function Position field with the cursor, and then press Enter.
5. After checking that the application is placed in the selected position, press F7 (Set).

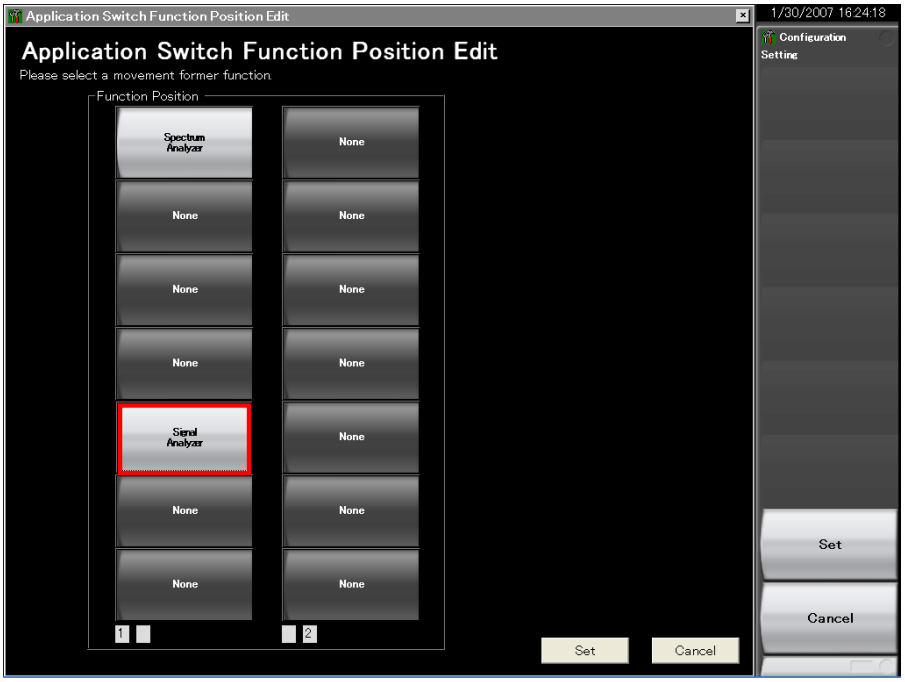


Figure 3.5.4-2 Application Switch Function Position Edit screen

3.6 Save and Recall Functions

This section describes the conditions for setting parameters to the internal hard disk and USB memory (Parameter) and saving (Save) and recalling (Recall) of waveform data (Trace).

Note:

Use the USB memory supplied with the MS2690A/MS2691A/ MS2692A. Using other USB memories may cause malfunction due to device incompatibility.

3.6.1 Saving parameters and waveform data

With the MS2690A/MS2691A/MS2692A, the current setting conditions and waveform data can be saved to the internal hard disk or a USB memory.

Saving parameter settings

<Procedure>

1. Press Save from the Configuration screen, Signal Analyzer screen, or Spectrum Analyzer screen to display the Save menu shown in Figure 3.6.1-1.
2. Press F1 (Device) to change the save destination. When the Setting window is displayed, select the drive to be saved and then press F7 (Set) to set.
3. When the save destination has been determined, press F7 (Save Application). The save target will be all parameter setting conditions (Parameter) of the launched applications.

The parameter saving file will be output with the name "Param_*date*_*sequential number*.xml." If a parameter is saved on the same date, the file is automatically named in the order "Param_*date*_000.xml," "Param_*date*_001.xml," "Param_*date*_002.xml" and so on. Parameter saves of up to "Param_*date*_999.xml" can be made.

A sequential number from 000 to 999 will be added to the file name.

For file name specification, set User Specified Name as File Name Settings of Copy Settings. The parameter saving file name can be specified when saving.

☞ 3.4.3 "Copy Settings"

Files will be saved in the following directory of the save target drive specified in F1 (Device).
\Anritsu Corporation\Signal Analyzer\User Data\ Parameter Setting

Up to 1000 files can be saved in the folder.

Saving waveform data

<Procedure>

1. Press Save from the Signal Analyzer and Spectrum Analyzer screen to display the Save menu shown in Figure 3.6.1-1.
2. Press F1 (Device) to change the save destination. When the Setting window is displayed, select the drive to be saved and then press F7 (Set) to set.
3. When the save destination has been determined, press F5 (Save Waveform CSV DATA). The save target will be the waveform data (Trace).

Table 3.6.1-1 Description of Save function menu

Function Key	Menu Display	Function
F1	Device (D:)	Changes the saving destination.
F3	Save Limit	Displays the Save Limit function menu.
F4	Save on Event	Displays the Save on Event function menu.
F5	Save Waveform CSV DATA	Saves the displayed waveform data (Trace).
F7	Save Application	Saves the parameter setting conditions of all the launched applications.
F8	Close	Returns to the Configuration screen.

A sequential number from 00 to 99 will be added to the file name. If a file with file number 99 is used, no more files can be saved.

For file name specification, set User Specified Name as File Name Settings of Copy Settings. The waveform data file name can be specified when saving.

☞ 3.4.3 “Copy Settings”

Files will be saved in the following directory of the save target drive specified in F1 (Device).
\Anritsu Corporation\Signal Analyzer\User Data\Trace Data

The maximum number of files in one folder is:
Signal Analyzer: 1000
Spectrum Analyzer: 100

3.6.2 Recalling parameters

With the MS2690A/MS2691A/MS2692A, settings can be restored by loading saved setting conditions from the internal hard disk or a USB memory.

Recalling parameter setting conditions only of applications to be operated using Application Switch

<Procedure>

1. Press Recall from the Configuration, Signal Analyzer, or Spectrum Analyzer screen to display the Recall menu shown in Figure 3.6.2-1.
2. Press F1 (Device) to change the location of saved parameter setting conditions. When the Setting window is displayed, select the drive in which parameter setting conditions are saved, and then press F7 (Set) to set.
3. Press F6 (Recall Current Application) to display the Parameter Save Data List.
4. Select the parameter setting conditions to be recalled with the cursor, and then press F7 (Set) to recall parameter setting conditions to the application.

Recalling parameter setting conditions for all launched applications.

<Procedure>

1. Press Recall from the Configuration, Signal Analyzer or Spectrum Analyzer screen to display the Recall menu shown in Figure 3.6.2-1.
2. Press F1 (Device) to change the location of saved setting parameters. When the Setting window is displayed, select the drive in which setting parameters are saved, and then press F7 (Set) to set.
3. Press F7 (Recall All Application) to display the Parameter Save Data List.
4. Select the parameter setting conditions to be recalled with the cursor, and then press F7 (Set) to recall the parameter setting conditions to all loaded applications.

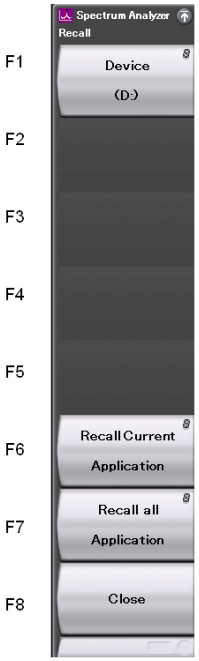


Figure 3.6.2-1 Recall menu

3.6.3 Screen hard copy

A displayed screen image can be saved to the internal hard disk or a USB memory as a BMP or PNG formatted file.

The conditions for copying a screen image can be set in the Copy Settings screen. Refer to the following section for details.

3.4.3 “Copy Settings”

Executing screen hard copy

<Procedure>

1. Display the screen to be saved.
2. Press Copy to save the screen image to the selected media in BMP or PNG format. A saved file name is displayed when saving is completed.

The image file will be output with the file name “Copy_Date_Sequence_Number.bmp”. When screen hard copies are made on the same date, they are automatically named in an order as “Copy_Date_000.bmp”, “Copy_Date_001.bmp”, “Copy_Date_002.bmp”, and so on. Screen hard copies of up to “Copy_Date_999.bmp” can be made. A sequential number from 000 to 999 will be added to the file name.

Files will be saved in the following directory of the save target drive specified in F1 (Device).
\Anritsu Corporation\Signal Analyzer\User Data\Copy Files

Up to 1000 files can be saved in the folder.

3.6.4 Simple Save&Recall

This function allows parameter setting conditions to be recalled with little operations.

Enabling Simple Save&Recall:

<Procedure>

1. Press System Config to display the Configuration screen.
2. Press → to display page 2 of the Configuration screen.
3. Press F6 (Save&Recall Settings) to display the Save&Recall Settings menu in Figure 3.6.4-1.

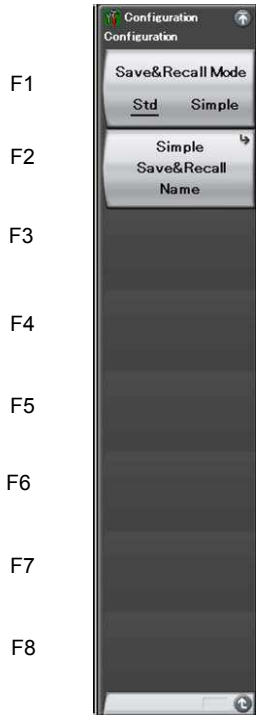


Figure 3.6.4-1 Save&Recall Settings menu

Table 3.6.4-1 Correction Settings items

Menu Display	Description
Save&Recall Mode	Switches the Save&Recall mode. Set the Standard mode or Simple mode. ☞ 3.6.1 "Saving parameters and waveform data" ☞ 3.6.2 "Recalling parameters"
Simple Save&Recall Name	Use this item to change the parameter name (file name) to be saved from the default setting in Simple mode.

Changing the parameter name (file name) to be saved from the default setting

Pressing F2 (Simple Save&Recall Name) in Figure 3.6.4-1 displays the Simple Save&Recall Name menu in Figure 3.6.4-2. Up to ten parameter names can be registered in Simple mode.

The default parameter names are PRM_1 to PRM_10.

To change the parameter name, press the function key to be changed.

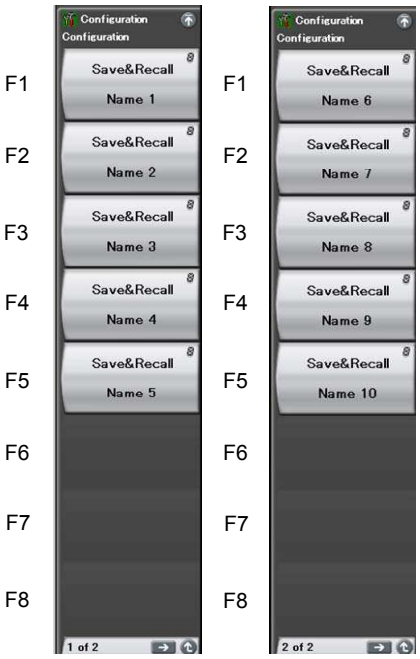


Figure 3.6.4-2 Simple Save&Recall Name menu

Simple Save function

Pressing Save in Simple mode displays the Simple Save menu in Figure 3.6.4-3.

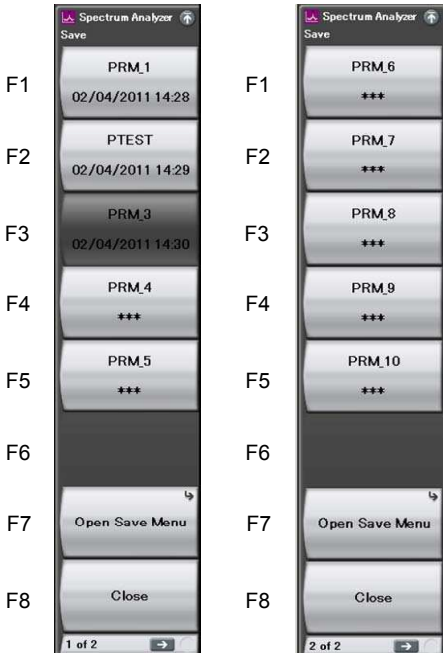


Figure 3.6.4-3 Simple Save menu

Parameter names set with the Simple Save&Recall Name menu are displayed on the function keys.

When the Protect of the parameter saving file has been set to On (when set to Read-only), the relevant function key is grayed out, and if it is pressed, an error message is displayed.

The last saved date and time of the parameter saving file is displayed in the second line. If the corresponding parameter saving file does not exist, "***" is displayed on the function key.

In the example in Figure 3.6.4-3, the parameter name of PRM_2 has been changed to the parameter name of PTEST. Also, PRM_3 file has been set to Read-only.

Pressing the function key stores the parameter saving file with the parameter name displayed.

\Anritsu Corporation\Signal Analyzer\User Data\Parameter Setting

The parameter settings can be saved in Standard mode on Open Save Menu.

3.6.1 "Saving parameters and waveform data"

Simple Recall function

Pressing the image of Recall button in Simple mode displays the Simple Recall menu in Figure 3.6.4-4.

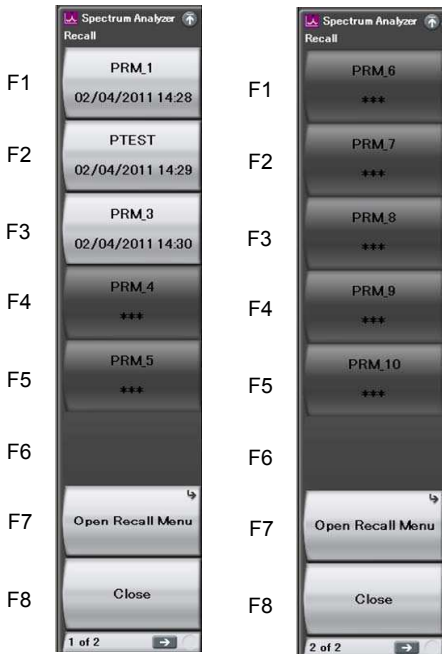


Figure 3.6.4-4 Simple Recall menu

Parameter names set with the Simple Save&Recall Name menu are displayed on the function keys.

The last saved date and time of the parameter saving file is displayed in the second line.

Pressing the function key executes Recall of the corresponding parameter saving file.

If the corresponding parameter saving file does not exist, the function key is grayed out, and if it is pressed, an error message is displayed.

The parameter settings can be recalled in Standard mode on Open Recall Menu.

☞ 3.6.2 “Recalling parameters”

3.7 Initializing

This section describes how to initialize settings.

3.7.1 Preset

Preset is a function for initializing application settings. Configuration screen settings are not initialized using this function. Similarly, there is no effect on user data saved to the internal hard disk.

<Procedure>

1. Press Preset to display the Preset menu.
2. Press F1 (Preset) to initialize only applications to be operated using the Application Switch.
3. Press F5 (Preset All Application) to initialize all loaded applications.

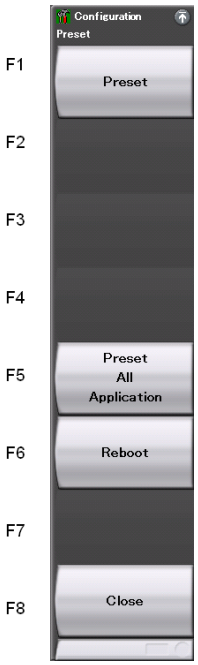


Figure 3.7.1-1 Preset menu

3.7.2 System Reset

System Reset is a function for initializing all installed applications and Configuration screen settings, and deleting all user data saved to the internal hard disk.

Note:

User data deleted by executing this function cannot be recovered.

<Procedure>

1. Press System Config to display the Configuration screen.
2. Press F5 (System Information) and then press → to display page 2 of the System Information menu.
3. Press F1 (System Reset) to execute System Reset.
4. The MS2690A/MS2691A/MS2692A restarts automatically when System Reset is completed.

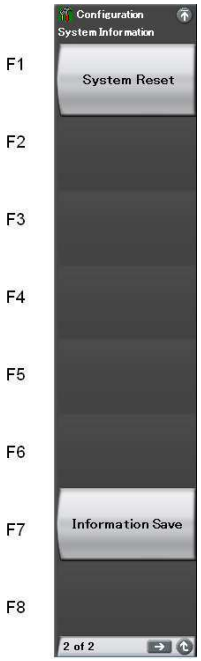


Figure 3.7.2-1 System Information menu (2 of 2)

3.8 Installing and Uninstalling

This section describes the procedure for installing application software and licenses.

Note:

Before installing software, confirm that its version is later than the already installed software. Each of the following actions will initialize the calibration values stored in the hardware. If initialized, the accuracy of the measurement results may not satisfy the specifications. The mainframe needs to be returned to Anritsu when writing the calibration values again.

- Installation of the earlier software version than 4.09.00 initializes the calibration values related to the hardware options added to the version 4.09.00 or later.
- Installation of the earlier software version than 2.02.00 initializes the calibration values related to the hardware options added to the version 2.02.00 or later.

3.8.1 Installing software

Preparation for installing USB memory

<Procedure>

1. Connect the USB memory to the PC, and then insert the installation disk.
2. Select MS269xA Install from Install Software on the installation menu.
3. Specify the root directory of the connected USB memory on the installation directory specification window (e.g., "E:\" when the USB memory is drive E).
4. Click [OK] to copy the installation data into the USB memory.
   The installation data is copied into the "E:\Anritsu Corporation\Signal Analyzer\Install" folder, when the USB memory is drive E.
   Set the same folder configuration before the installation, in order to manually install by copying a set of the installation files in the USB memory and drive D.

Installing software

<Procedure>

1. Remove the peripheral devices from the USB ports of the MS2690A/MS2691A/MS2692A, other than mouse and keyboard.
2. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
3. The Software Install menu shown in Figure 3.8.1-1 is displayed. Press F1 (Install).
4. The installation selection menu is displayed. Insert the USB memory containing the purchased software data into the USB port of the MS2690A/MS2691A/MS2692A.

Note:

Do not insert any devices other than USB memory to the USB ports during installation.

5. Press F1 (Software) to display the device selection window.
6. Select the USB memory device containing the software with the cursor, and then press F7 (Set) to start the installation. The versions of the already installed software (Installed Applications) and of the software to install (Installation Package on XX) are displayed. They cannot be selected and installed individually.
7. When pressing F1 (Install), a message box asking "Do you install the application software?" is displayed. Press **Yes** to start installation.
8. The MS2690A/MS2691A/MS2692A restarts automatically when the installation is completed.

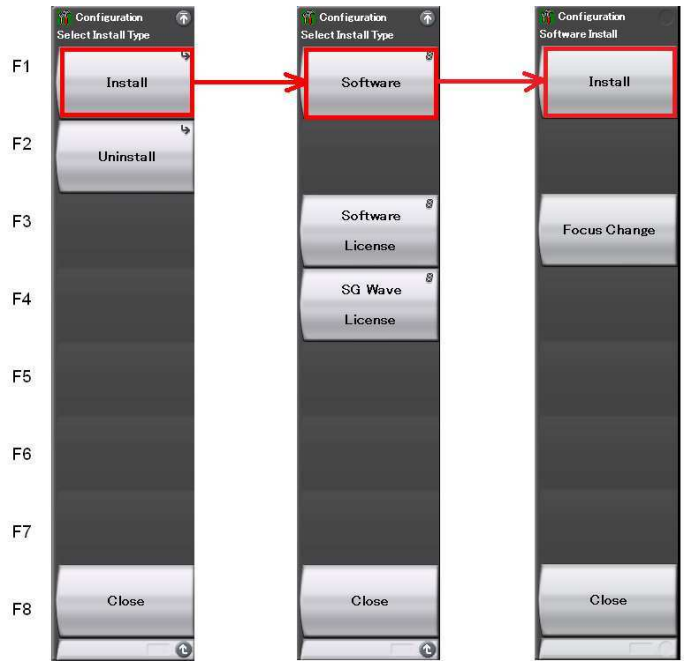


Figure 3.8.1-1 Software Install menu

Installing software licenses

<Procedure>

1. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
2. The Software Install menu shown in Figure 3.8.1-2 is displayed. Press F1 (Install).
3. The installation selection menu is displayed. Insert the USB memory containing the purchased software license data into the USB port of the MS2690A/MS2691A/MS2692A.
4. Press F3 (Software License) to display the device selection window.
5. Select the USB memory device containing the software license with the cursor, and then press F7 (Set) to start the installation. The licenses already installed (Installed Licenses) and the licenses to install (Installation Licenses on XX) are displayed. Select licenses to install.
6. When pressing F1 (Install), a message box asking "Do you install the selected application software license?" is displayed. Press **Yes** to start installation.
7. The license becomes valid when the MS2690A/MS2691A/MS2692A is restarted after installation is completed.

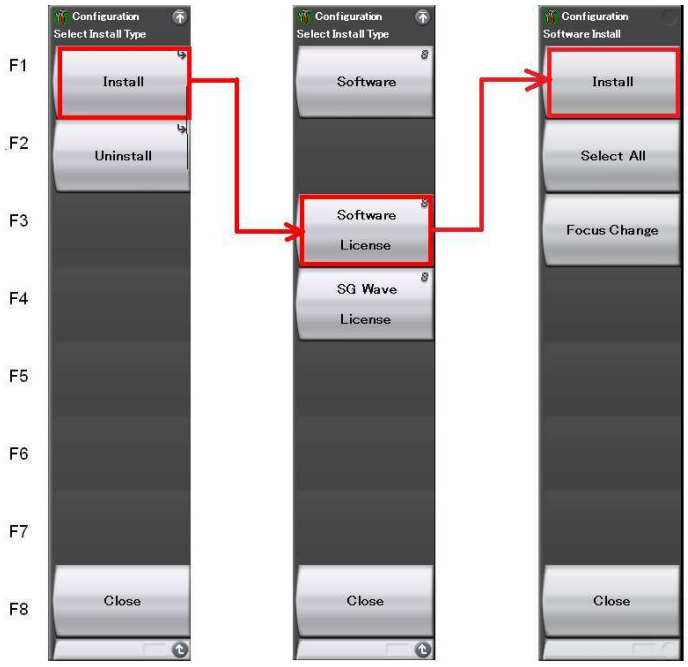


Figure 3.8.1-2 Software Install menu

Installing waveform pattern licenses

<Procedure>

1. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
2. The Software Install menu shown in Figure 3.8.1-3 is displayed. Press F1 (Install).
3. The installation selection menu is displayed. Insert the USB memory containing the purchased software license data into the USB port of the MS2690A/MS2691A/MS2692A.
4. Press F4 (SG Wave License) to display the device selection window.
5. Select the USB memory device containing the software license with the cursor, and then press F7 (Set) to start the installation. The licenses already installed (Installed Licenses) and the licenses to install (Installation Licenses on XX) are displayed. Select licenses to install.
6. When pressing F1 (Install), a message box asking "Do you install the selected SG Waveform license?" is displayed. Press **Yes** to start installation.
7. The license will be valid when the MS2690A/MS2691A/MS2692A is restarted after installation is completed.

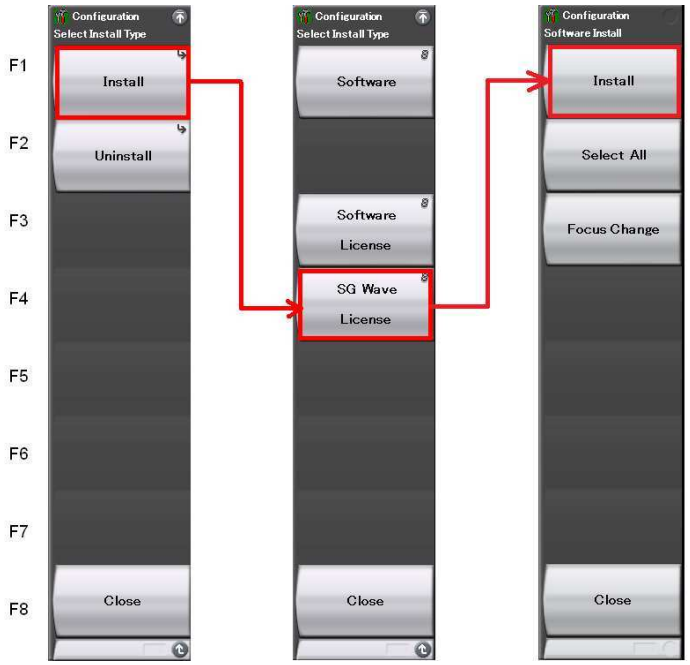


Figure 3.8.1-3 Software Install menu

3.8.2 Uninstalling software

The Install screen must be displayed in order to uninstall software or license files from the MS2690A/MS2691A/MS2692A.

Uninstalling software

<Procedure>

1. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
2. The Software Install menu shown in Figure 3.8.2-1 is displayed. Press F2 (Uninstall).
3. The installation selection menu is displayed. Press F1 (Software).
4. The installed software list screen is displayed. Select the software to be uninstalled from the installed software with the cursor.
5. When pressing F3 (Uninstall), a message box asking "Do you uninstall the selected application software?" is displayed. Press **Yes** to start uninstallation.

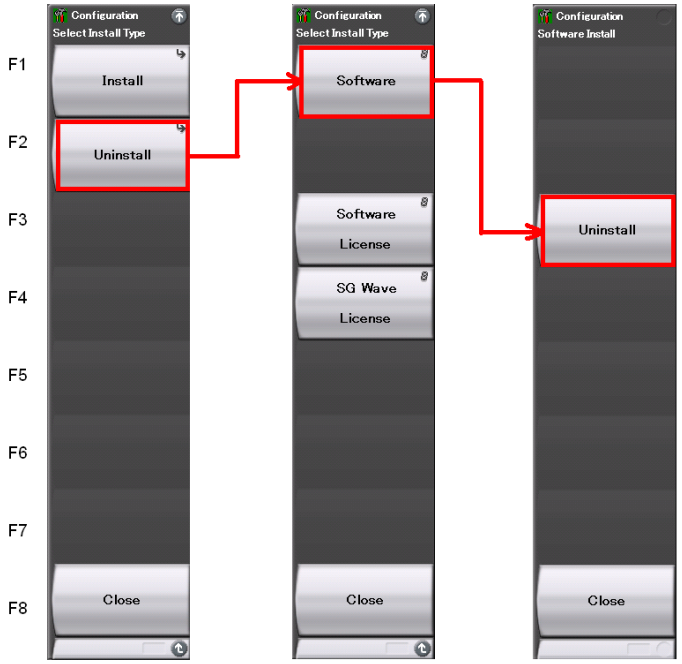


Figure 3.8.2-1 Software Install menu

Uninstalling software licenses

<Procedure>

1. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
2. The Software Install menu shown in Figure 3.8.2-2 is displayed. Press F2 (Uninstall).
3. The installation selection menu is displayed. Press F3 (Software License).
4. The installed software license list screen is displayed. Select the software license to be uninstalled from the installed software licenses with the cursor.
5. When pressing F3 (Uninstall), a message box asking "Do you uninstall the selected application software license?" is displayed. Press **Yes** to start uninstallation.

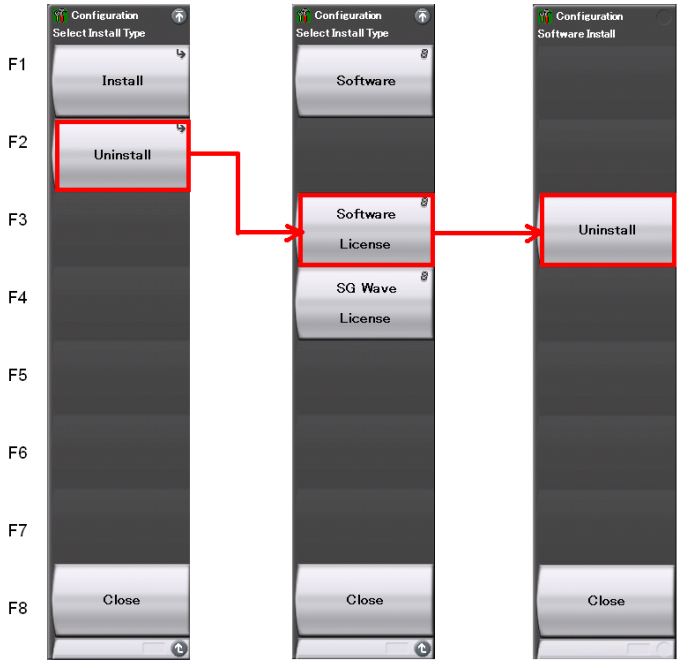


Figure 3.8.2-2 Software Install menu

Uninstalling waveform pattern licenses

<Procedure>

1. Press System Config to display the Configuration screen, and then press F1 (Software Install) from page 2 of the Configuration menu.
2. The Software Install menu shown in Figure 3.8.2-3 is displayed. Press F2 (Uninstall).
3. The installation selection menu is displayed. Press F4 (SG Wave License).
4. The installed software license list screen is displayed. Select the software license to be uninstalled from the installed software licenses with the cursor.
5. When pressing F3 (Uninstall), a message box asking "Do you uninstall the selected SG Waveform license?" is displayed. Press **Yes** to start uninstallation.

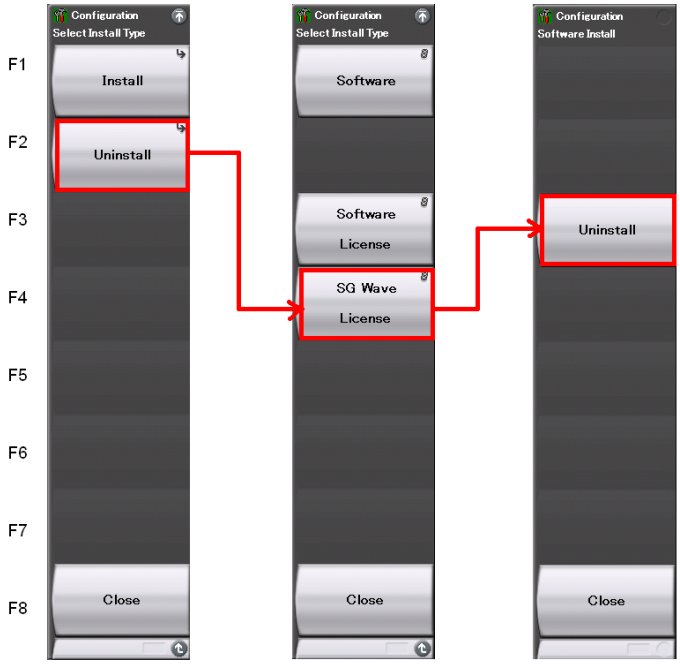


Figure 3.8.2-3 Software Install menu

Chapter 4 Tutorial

This chapter describes the waveform display of the signal analyzer and spectrum analyzer.

4.1 Spectrum Analysis Using Signal Analyzer

4.1.1 Spectrum analysis

The section describes the operation procedure for outputting input signal waveforms to the application screen of the signal analyzer.

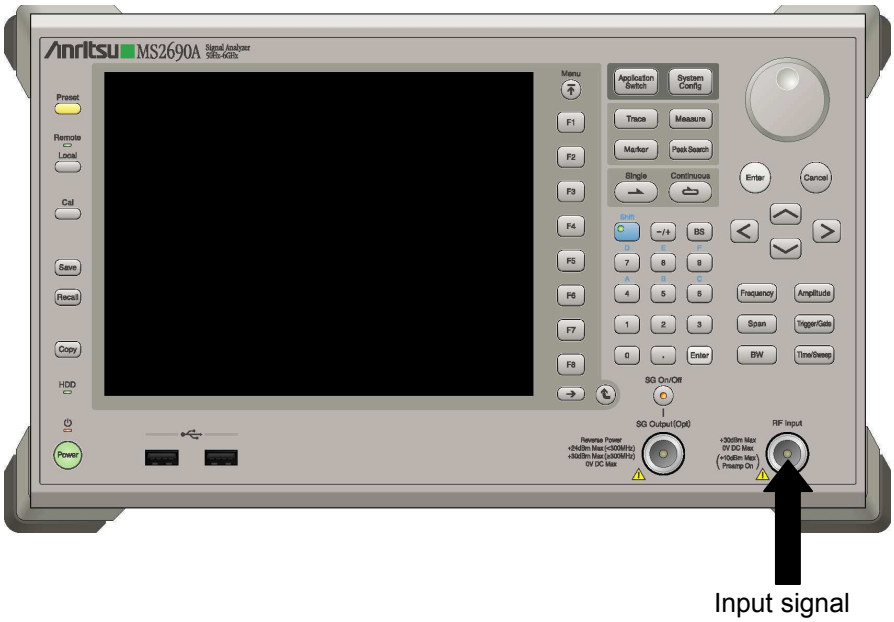


Figure 4.1.1-1 Front panel

Example: Input Signal: Frequency: 1 GHz (CW)
Level: –10 dBm

<Procedure>

1. Connect the input signal to the RF Input (N-type connector) on the front panel of the MS2690A/MS2691A/MS2692A.
2. Press System Config then F4 (Application Switch Settings) to display the Application Switch Settings menu.
3. Press F1 (Load Application Select) to select within the "Unload Applications" column of the application with the cursor. Select "Signal Analyzer" here with the cursor, and then press F7 (Set).
4. Check that "Signal Analyzer" is displayed within the "Loaded Applications" column then press Application Switch.
5. Pressing the function key corresponding to the Signal Analyzer from the Application Switch Settings menu displays the application main screen of the Signal Analyzer.

Figure 4.1.1-2 Application main screen

Table 4.1.1-1 Display items for Signal Analyzer

Item	Description
[1]	This is the main function key of the signal analyzer. Basic parameter settings of the signal analyzer are configured here. Signal Analyzer Function Operation ☞ 2.1 "Display Description"
[2]	Displays signal waveforms.
[3]	Displays the center frequency, frequency span and other frequency parameters. Signal Analyzer Function Operation ☞ 2.2 "Setting Frequency"
[4]	Displays the reference level, input attenuator value and other level parameters. Signal Analyzer Function Operation ☞ 2.3 "Setting Level"
[5]	Displays the trigger source, trigger level and other trigger parameters. Signal Analyzer Function Operation ☞ 3.2 "Trigger Function"
[6]	Displays the start frequency. Signal Analyzer Function Operation ☞ 2.2.3 "Setting start frequency"
[7]	Displays the stop frequency. Signal Analyzer Function Operation ☞ 2.2.4 "Setting stop frequency"
[8]	Displays the analysis start time, analysis time span, resolution bandwidth and other Spectrum trace parameters. Signal Analyzer Function Operation ☞ 4.2.1 "Spectrum"
[9]	Displays marker values. Signal Analyzer Function Operation ☞ 4.2.9 "Setting marker search"
[10]	This is used as an indictor expressing an analysis progression rate.

6. Frequency settings must be changed to display the input signal in the waveform display screen. Press F1 (Frequency).
7. Press F1 (Center Frequency) and then enter the desired frequency using the numeric keypad. The center frequency setup window is displayed.

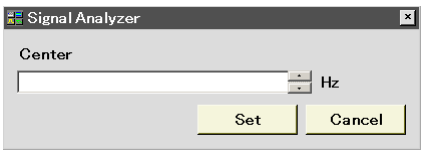


Figure 4.1.1-3 Center frequency setup window

8. Enter the center frequency then select the unit, from GHz, MHz, kHz, and Hz.

   Example: To set 1 GHz for the center frequency, press [1] and then [F1] (GHz).

The waveform of the input signal is now displayed on the screen (see Figure 4.1.1-5).

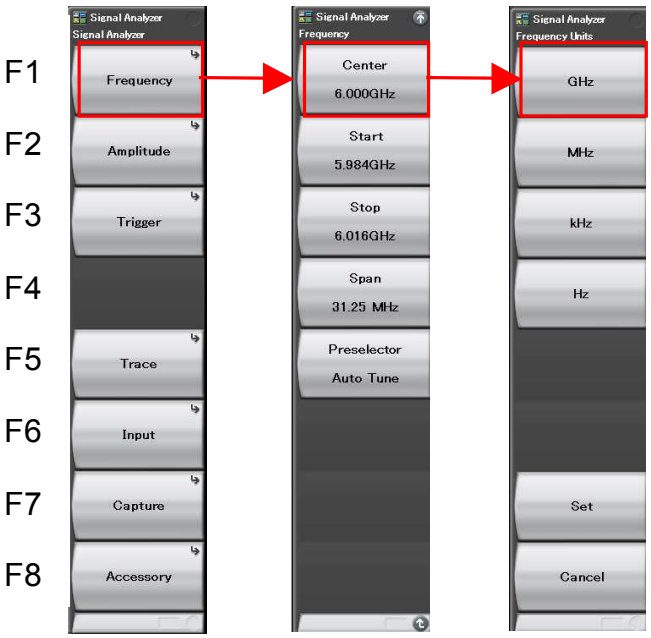


Figure 4.1.1-4 Signal analyzer main function menu

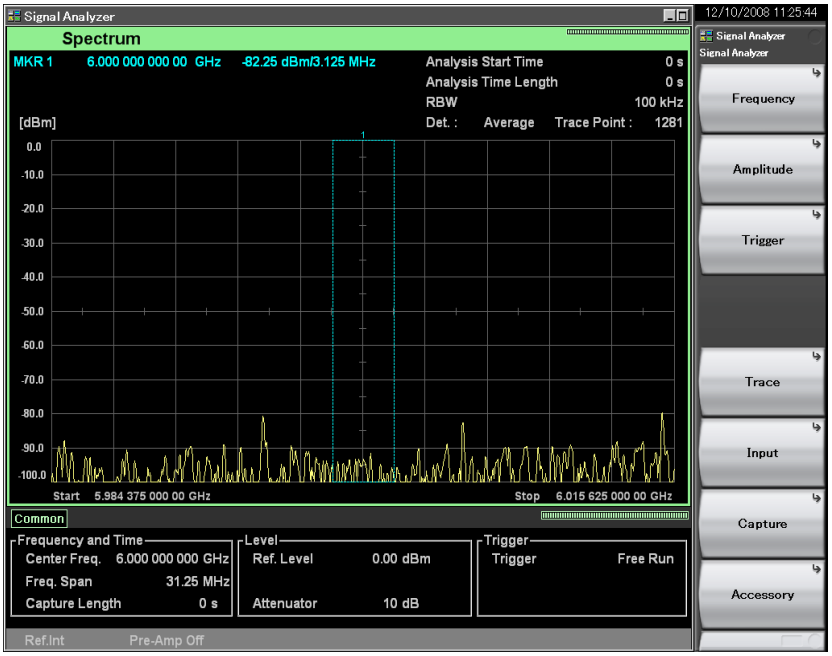


Figure 4.1.1-5 Waveform display using Signal Analyzer

Refer to the MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation) for how to use the Signal Analyzer.

4.2 Spectrum Analysis Using Spectrum Analyzer

4.2.1 Spectrum Analysis

This section describes the operation procedure for outputting input signal waveforms to the application screen of the spectrum analyzer.

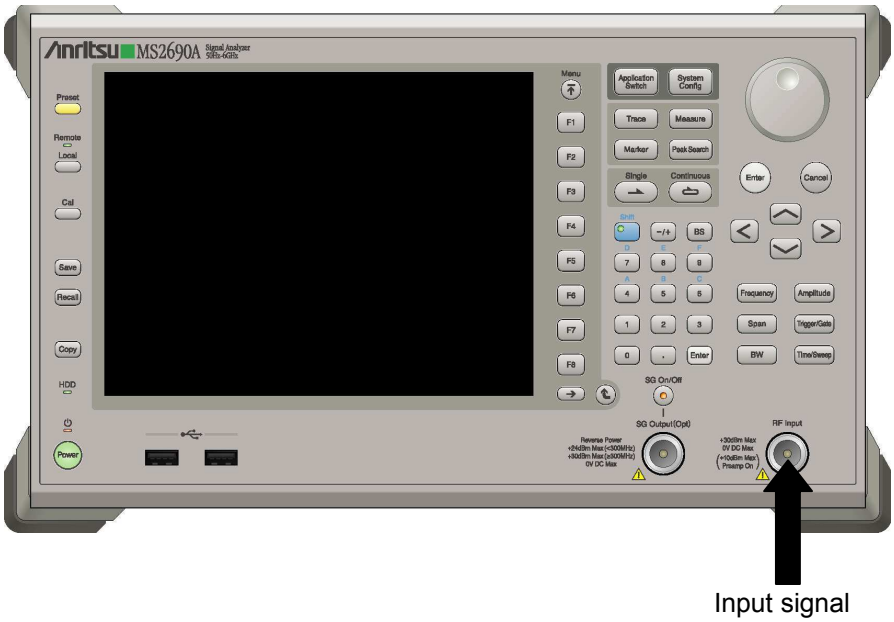


Figure 4.2.1-1 Front panel

Example: Input Signal: Frequency: 1 GHz (CW)
Level: –10 dBm

<Procedure>

1. Connect the input signal to the RF Input (N-type connector) on the front panel of the MS2690A/MS2691A/MS2692A.
2. Press System Config then F4 (Application Switch Settings) to display the Application Switch Settings menu.
3. Press F1 (Load Application Select) to select within the "Unload Applications" column of the application with the cursor. Select "Spectrum Analyzer" here with the cursor, and then press F7 (Set).
4. Check that "Spectrum Analyzer" is displayed within the "Loaded Applications" column then press Application Switch.
5. Pressing the function key corresponding to the Spectrum Analyzer from the Application Switch Settings menu displays the application main screen of the Spectrum Analyzer.

The application is shipped already loaded.

The application is set to start automatically at power startup.

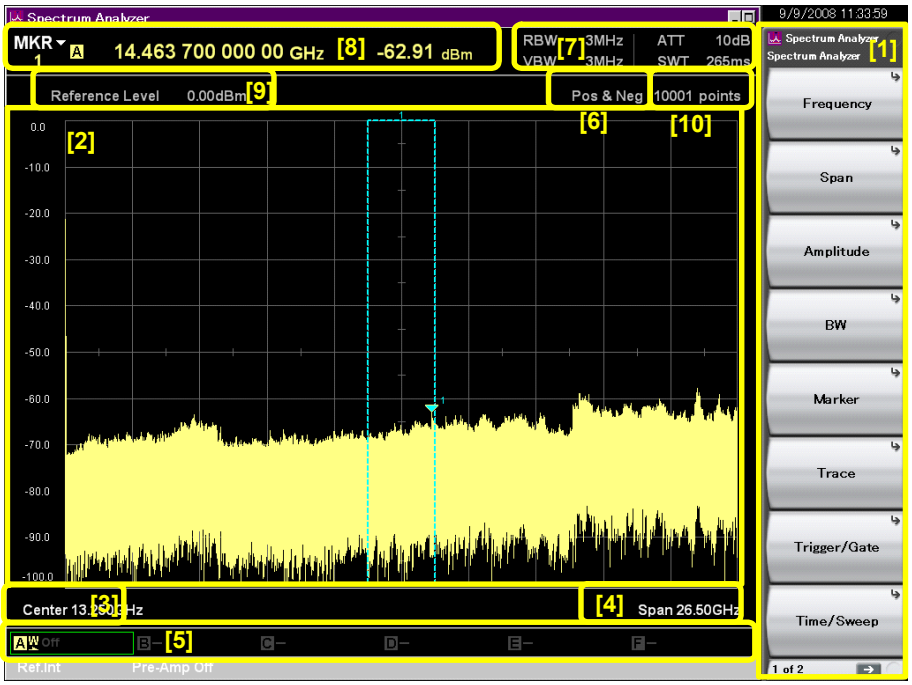


Figure 4.2.1-2 Application main screen

Table 4.2.1-1 Display items for Spectrum Analyzer

Item	Description
[1]	This is the main function key of the spectrum analyzer. Basic parameter settings of the spectrum analyzer are configured here. Spectrum Analyzer Function Operation ☞ 2.1 "Display Description"
[2]	Displays signal waveforms.
[3]	Displays the start frequency. Spectrum Analyzer Function Operation ☞ 2.3.3 "Setting start frequency"
[4]	Displays the stop frequency. Spectrum Analyzer Function Operation ☞ 2.3.4 "Setting stop frequency"
[5]	Displays trace parameters. Spectrum Analyzer Function Operation ☞ Chapter 3 "Selecting Display Mode"
[6]	Displays the wave detection mode status. Spectrum Analyzer Function Operation ☞ 3.1.4 "Setting wave detection mode"
[7]	Displays the resolution bandwidth, video bandwidth, input attenuator and sweep time parameters. Spectrum Analyzer Function Operation ☞ 2.4.2 "Setting input attenuator" ☞ 2.5 "Setting RBW/VBW"
[8]	Displays marker values. Spectrum Analyzer Function Operation ☞ 4.1 "Setting Marker"
[9]	Displays the reference level. Spectrum Analyzer Function Operation ☞ 2.4.1 "Setting reference level"
[10]	Displays the number of trace points. Spectrum Analyzer Function Operation ☞ 3.3 "Setting Time/Sweep"

6. Frequency settings must be changed to display the input signal to the waveform display screen. Press F1 (Frequency).
7. Press F1 (Center Frequency) and then enter the desired frequency using the numeric keypad. The center frequency setup window is displayed.

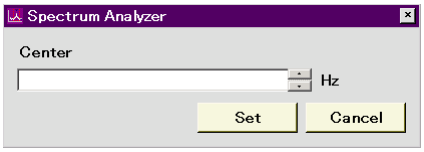


Figure 4.2.1-3 Center frequency setup window

8. Enter the center frequency then select the unit, from GHz, MHz, kHz, and Hz.

   Example: To set 1 GHz for the center frequency, press [1] and then [F1] (GHz).

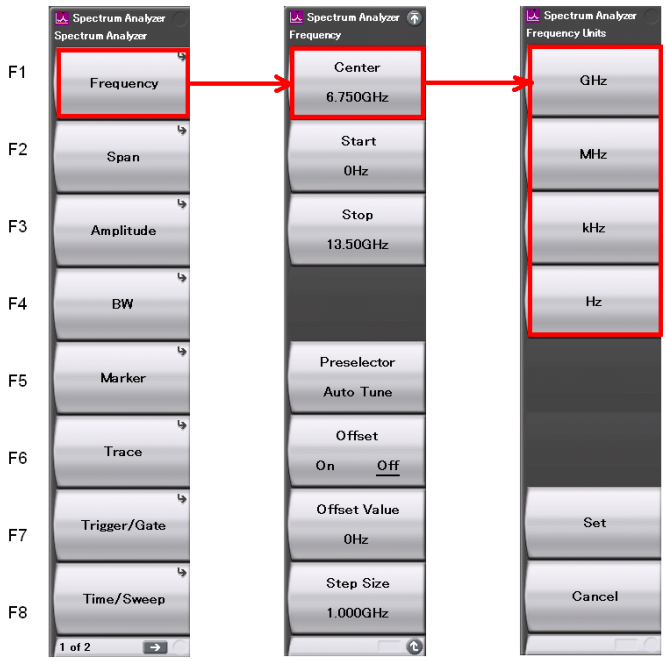


Figure 4.2.1-4 Spectrum analyzer main function menu

9. Return to the main screen of the spectrum analyzer to change frequency span. Press Menu.
10. Press F2 (Span). Enter the desired frequency bandwidth using the numeric keypad.
11. Enter the frequency bandwidth then select the unit of the value.

The waveform of the input signal is now displayed on the screen (see Figure 4.2.1-5).

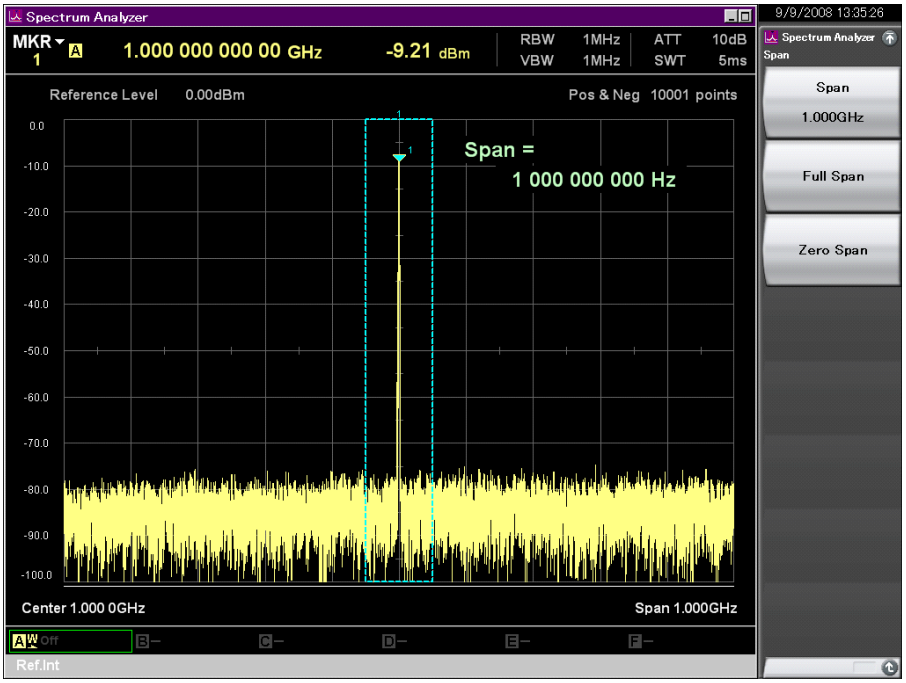


Figure 4.2.1-5 Waveform display using Spectrum Analyzer

Refer to the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Spectrum Analyzer Function Operation)* for how to use the Spectrum Analyzer.

Chapter 5 System

The MS2690A/MS2691A/MS2692A uses Microsoft Windows (hereinafter, referred to as “Windows”) as the operating system. Settings for Windows and the system can be operated by connecting a mouse and a keyboard.

This chapter describes how to perform operations on Windows installed to the MS2690A/MS2691A/MS2692A and general notes.

5.1 Setting Windows

The MS2690A/MS2691A/MS2692A is set to default settings at factory shipment so as to perform optimal measurements. Changing the Windows settings is outside the scope of operation warranty. In addition, performance may drop or functions may not operate correctly when Windows settings are changed. Carefully read the general notes of this section when changes to Windows settings are required.

When the system fails to operate correctly due to Windows operation, execute system recovery functions to restore the MS2690A/MS2691A/MS2692A to its status at factory shipment. See 5.3 “System Recovery Functions” for details.

⚠ WARNING

MS2690A/MS2691A/MS2692A operations are not guaranteed when Windows settings are changed from their default shipment status, or when a program not guaranteed by Anritsu Corporation is installed.

⚠ WARNING

Performing system recovery will cause software installation (including updates) after factory shipment of the MS2690A/MS2691A/MS2692A and application settings to be lost. In addition, data (measurements, parameters, etc.) recorded by the customer may be deleted depending on the method to perform system recovery.

5.1.1 Displaying Windows Desktop

Connect a mouse and a keyboard to operate Windows. Use the USB mouse included as standard equipment and a compatible keyboard (USB).

The following are methods to display the Windows Desktop. To display applications of the MS2690A/MS2691A/MS2692A again, press 

or select an application in the Windows Taskbar.

Mouse

Click the “Minimize” button located in the upper right corner of the application window of the MS2690A/MS2691A/MS2692A. Minimizing all applications displays the Desktop.

Keyboard

Pressing the [Windows] key + [D] key minimizes all windows and displays the Windows Desktop.

5.1.2 Setting Control Panel

Various Windows settings can be configured using the Control Panel. The following describes general notes on each setting. Although each setting can be configured without using the Control Panel, use these within the scope of the following restrictions.

MS2690A/MS2691A/MS2692A may not operate normally when any other Windows settings are changed from the factory defaults.

Program and Hardware

- Do not delete the installed devices or update/delete the drivers.
- MS2690A/MS2691A/MS2692A may not operate normally due to conflicts with device drivers when new hardware is added.
- Do not update or remove programs installed at the factory.
- Anritsu does not warrant operations of MS2690A/MS2691A/MS2692A when programs not guaranteed are installed.

Windows Update

- Automatic updating of Windows is turned off at the factory. Anritsu does not warrant operations of MS2690A/MS2691A/MS2692A when the setting is changed.

Network Connection

- TCP/IP settings may change when MS2690A/MS2691A/MS2692A is remote-controlled through Ethernet. For details, refer to the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Remote Control)*.
- The IP address is set to use DHCP before shipment from the factory. Ensure that the network administrator settings are appropriate when connecting MS2690A/MS2691A/MS2692A to a network.

User Account

- Automatic login with the following settings is enabled at the factory. Do not change the User Account settings shown below.
  Account Name "ANRITSU"
  Password (None)
  Account Type Computer Administrator
- New user accounts can be created. Specify "Computer Administrator" for the account type of the user account to be created. Applications will not start up normally with user accounts created using Limited (Power User).

Security

- Firewall settings are set to Off at the factory. When settings are set to On, Windows Firewall displays a dialog box asking if you want to block the applications of MS2690A/MS2691A/MS2692A at the next startup time. Be sure to click **Unblock**.
- Antivirus software is not installed at the factory. Anritsu strongly recommends installing antivirus software when connecting MS2690A/MS2691A/MS2692A to a network. However, MS2690A/MS2691A/MS2692A may not be remote-controlled through Ethernet if the function blocking external communications works.
- Security warnings are not displayed by factory default.

Date & Time

- You can change the date, time and time zone.
- Internet Time is set to Off by factory default. Operations may be affected; therefore, do not change this setting.

Display

- This setting must be changed when using an external monitor with connected to the VGA connector of MS2690A/MS2691A/MS2692A. Refer to Section 5.1.3 "Using external display" for details.
- Operations may be affected by changing screen resolution, refresh rate or monitor power management or turning on the screen saver.

System

- The Computer Name can be changed. The factory default name is "SA" + "Serial Number".
- Do not change Hardware or Advanced settings.
- Do not enable the System Restore. Otherwise, MS2690A/MS2691A/MS2692A may not operate normally.

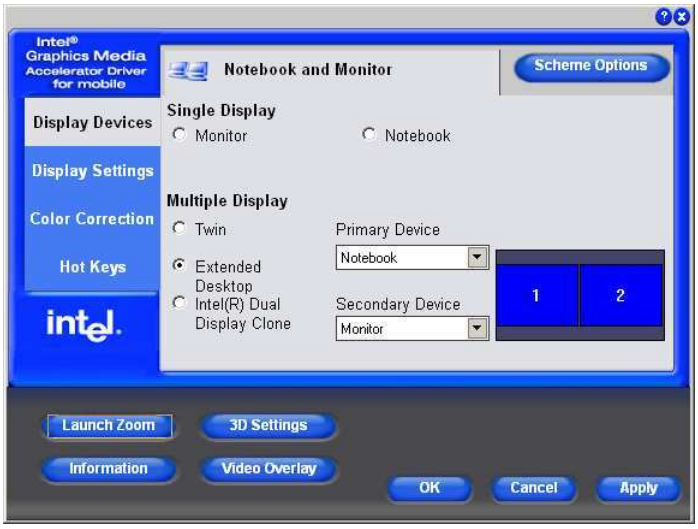
Power Option

- The settings for the Auto Power Off function (Turn off Monitor) of the display can be changed.
- The Power Off function of the hard disk (Turn off Hard Disks) is disabled (Never). Do not change this setting.
- Do not change power option settings other than those described above. MS2690A/MS2691A/MS2692A will not operate normally after recovering from hibernation.

5.1.3 Using external display

An external display can be connected to the VGA connector on the rear side of the MS2690A/MS2691A/MS2692A, to display screens of the MS2690A/MS2691A/MS2692A and show multiple displays. The following describes the operation procedure for this function.

When the OS on MS2690A/MS2691A/MS2692A is Windows XP



<Procedure>

1. Connect the display to the VGA connector on the rear side of the MS2690A/MS2691A/MS2692A.
2. Display the Intel® GMA Driver Settings screen using any of the following methods.
   - Execute “Intel® GMA Driver for Mobile” from the Windows Control Panel.
   - Press [Ctrl] + [Alt] + [F12] on the keyboard.
3. Change the Display Devices settings as shown below:

When not using an external display

- Single Display Notebook

When using only an external display

- Single Display Monitor

When displaying the MS2690A/MS2691A/MS2692A display to an external display

- Multiple Display Twin or Intel® Dual Display Clone
- Primary Device Notebook (MS2690A/MS2691A/MS2692A display)
- Secondary Device Monitor

When displaying with the MS2690A/MS2691A/MS2692A and external display connected

- Multiple Display Extended Desktop
- Primary Device Notebook (MS2690A/MS2691A/MS2692A display)
- Secondary Device Monitor

When the OS on MS2690A/MS2691A/MS2692A is Windows Embedded Standard 7

<Procedure>

1. Connect the display to the VGA connector on the rear of MS2690A/MS2691A/MS2692A.
2. Open the Intel® Graphics and Media Control Panel by one of the following methods:
   - In Control Panel of Windows, launch the Intel® Graphics and Media.
   - Press Ctrl+Alt+F12 on the keyboard.
3. Change the Multiple Displays settings as shown below:

   When not using an external display
   - Operating Mode Single Display
   - Primary Display Built-in Display (MS2690A/MS2691A/MS2692A display)

   When using only an external display
   - Operating Mode Single Display
   - Primary Display (Connected external display)

   When displaying the same content on each of MS2690A/MS2691A/MS2692A display and external display
   - Operating Mode Clone Display
   - Primary Device Built-in Display (MS2690A/MS2691A/MS2692A display)
   - Secondary Device (Connected external display)

When displaying with MS2690A/MS2691A/MS2692A and external display connected

- Operating Mode Extended Desktop
- Primary Device Built-in Display
  (MS2690A/MS2691A/MS2692A display)
- Secondary Device (Connected external display)

⚠ CAUTION

Turning the MS2690A/MS2691A/MS2692A power On when an external display is not connected to the VGA connector initializes to mainframe display only. When continuously using an external display, it is recommended to keep the external monitor connected for use.

⚠ CAUTION

Do not change the resolution, refresh rate or power management settings of the mainframe monitor.

5.1.4 General notes

Besides the general notes on the previous section, note the following operations.

- Operation of the MS2690A/MS2691A/MS2692A is guaranteed at factory shipment status. Operation is not guaranteed when programs, including Windows Update, are added or updated.
- When third party software is installed and/or executed, this may affect MS2690A/MS2691A/MS2692A operations.
- Note that the MS2690A/MS2691A/MS2692A may not operate normally when registries are changed.

5.2 Storage Device Configuration

The MS2690A/MS2691A/MS2692A has a built-in hard disk for storing the operating system, application software, user data, and the like.

The hard disk of the MS2690A/MS2691A/MS2692A consists of the following partitions.

Volume C: System Disk

Windows, application software and files required for operation of the MS2690A/MS2691A/MS2692A are stored. The MS2690A/MS2691A /MS2692A may not operate normally when data required for operating the MS2690A/MS2691A/MS2692A are changed or deleted. Do not operate data of this volume at normal use.

Volume D: Hard Disk

This volume is used mainly for inputting files to and as the output destination for the application software of the MS2690A/MS2691A/ MS2692A. Adding data to this volume or deleting data on it will not affect MS2690A/MS2691A/MS2692A operations.

A USB memory, used for installing application software and inputting or outputting data, is included as standard equipment with the MS2690A/MS2691A/MS2692A. By factory default, the USB memory stick is recognized as the E drive.

Note the following items when operating MS2690A/MS2691A/MS2692A:

- Do not change the partition configuration. Doing so may affect system operation.
- Do not format the hard disk of the MS2690A/MS2691A/MS2692A. Besides the above, data for system recovery is stored within this hard disk. Recovery may become inoperable when the hard disk is formatted.
- The volumes and folders described above are not set to be shared at factory shipment. Although sharing is an effective means for transferring data to and from an external PC, be mindful of security when connecting to a network.

5.3 System Recovery Functions

The MS2690A/MS2691A/MS2692A has system recovery functions to restore data on the hard disk to the factory shipment status. These functions can be used in the event of system instability.

The MS2690A/MS2691A/MS2692A comes with factory-installed recovery software, Phoenix Recover Pro or Paragon Drive Backup. To confirm the installed recovery software, start the MS2690A/MS2691A/MS2692A, and press the **F4** key on the BIOS screen to start the recovery software.

<Procedure>

1. Disconnect the MS2690A/MS2691A/MS2692A from the network if connected.
2. Connect the keyboard and mouse to the mainframe, and then turn the MS2690A/MS2691A/MS2692A power On. The BIOS screen will appear in a few seconds after (The message "Press F2 for System Utilities" appears at the bottom part of the screen).
3. Press the **F4** key (not F4 on the front panel of the mainframe) while the screen in Step 2 is displayed.
4. Only when the screen displays the message "Press F4 to start recovery from Backup Capsule", press the **F4** key again.
5. According to the software instructions on the screen, perform a system recovery.

   Phoenix Always

   Refer to Section 5.3.1 "Phoenix Recover Pro".

   Paragon Drive Backup

   Refer to Section 5.3.2 "Paragon Drive Backup".

⚠ CAUTION

To execute these functions, understand the following items for their use.

- **All applications and updates added after factory shipment will be lost. Additionally, all data recorded to Volume C will be restored to the factory shipment status. Backup important data before executing these functions.**
- **The user data area of Volume D can be restored to the factory shipment status depending on the function to be selected. So as not to lose important user data due to incorrect operations, it is recommended to backup data in Volume D before executing these functions.**
- **Data deleted by these functions cannot be restored.**
- **When the Paragon Drive Backup software is installed, the backup data is saved to an unknown partition on the Disk 0. If the unknown partition is accidentally deleted, the backup data required for system recovery is deleted as well.**

5.3.1 Phoenix Recover Pro

This subsection describes how to perform a system recovery with factory-installed recovery software “Phoenix Recover Pro”.

Restore System drive (partition) only

This function restores only Volume C, in which Windows, application software, and files required for operations of the MS2690A/MS2691A /MS2692A are stored, to the factory shipment status.

Restore entire hard disk

This function restores Volume C and Volume D to the factory shipment status. Although Volume D is mainly used as a storage area for user data, all data on Volume D will be erased.

<Procedure>

1. After the screen displaying “Phoenix Always” appears, the following alternatives are displayed on the screen:

   Restore System drive (partition) only

   Recovers only Volume C.

   Restore entire hard disk

   Recovers Volumes C and D.

   Select one of the two alternatives, and then click [NEXT]. To cancel, press and hold the [Power] button of the mainframe to power off.

2. After clicking [NEXT], the confirmation screen appears. Click [OK] to start a system recovery. Although the required time for recovery varies depending on the conditions, it normally takes between 10 and 30 minutes. The progress of recovery is shown during recovery. Although the progress indicator may close during recovery, this is a normal operation.

   The MS2690A/MS2691A/MS2692A will restart automatically then normal startup will be executed.

5.3.2 Paragon Drive Backup

This subsection describes how to perform a system recovery with factory-installed recovery software “Paragon Drive Backup”.

Type: Partition

This function restores only Volume C, in which Windows, application software, and files required for operations of the MS2690A/MS2691A /MS2692A are stored, to the factory shipment status.

Type: Disk

This function restores Volume C and Volume D to the factory shipment status. Although Volume D is mainly used as a storage area for user data, all data on Volume D will be erased.

<Procedure>

1. After the screen displaying “Drive Backup” appears, the following alternatives are displayed on the screen:

   Normal Mode

   Safe Mode

   Select [Normal Mode] with the arrow keys, and then press the **Enter** key.
2. When the menu screen appears in about a minute, double-click [Simple Restore Wizard].
3. The [Paragon Simple Restore Wizard] appears, so click [Next].
4. The following alternatives are displayed on the screen:

   Type: Partition

   Recovers only Volume C.

   Type: Disk

   Recovers Volumes C and D.

   Double-click either of them, and then click [NEXT].
5. When the confirmation screen appears, click [Yes] to start a system recovery. Then, the [Progress information] dialog box appears, and the recovery process starts.
   Do not click [Cancel] when a system recovery is in progress. Although the required time for recovery varies depending on the conditions, it normally takes between 10 and 30 minutes. The progress of recovery is shown during recovery. Although the progress indicator may close during recovery, this is a normal operation.
6. Upon completion of the recovery process, click [Close]. ([Close] appears after the recovery process is completed.)

7. When the completion screen appears, click [Finish] to return to the menu screen described in Step 5. Click [Reboot the computer] to reboot the MS2690A/MS2691A/MS2692A, or click [Power off] to turn the power Off.

Chapter 6 Performance Test

This chapter describes measurement devices, setup methods, and performance test procedures required for performing performance tests as preventive maintenance of the MS2690A/MS2691A/MS2692A.

6.1 Overview of Performance Test

6.1.1 Performance test

Performance tests are performed as part of preventive maintenance in order to prevent the performance of the MS2690A/MS2691A/MS2692A from being degraded before it occurs.

Use performance tests when required for acceptance inspection, routine inspection and performance verification after repairs. Perform items deemed critical at regular intervals as preventive maintenance. Perform the following performance tests for acceptance inspection, routine inspection and performance verification after repairs of the MS2690A/MS2691A/MS2692A.

- Reference oscillator frequency stability
- Display frequency accuracy
- Frequency span display accuracy
- Single sideband noise level
- RF frequency characteristics
- Display average noise level
- Second harmonic wave distortion

Perform items deemed critical at regular intervals as preventive maintenance. A recommended cycle for routine tests of once or twice a year is desirable.

If items that do not meet the required level are detected during performance testing, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

6.1.2 Performance test items and instruments used

Table 6.1.2-1 lists measuring instruments used or performance tests.

Table 6.1.2-1 List of measuring instruments for performance test

Test Items	Required Performance	Name of Recommended Device (Model Name)
Reference oscillator frequency stability	• Aging rate: ≤ 3×10^{-12}/day or less • 10 MHz measurability • Number of digits displayed: 10 or more	Frequency standard device (HP5071A Option 001) Frequency counter (MF2412A)
Display frequency accuracy	• Frequency range: 500 MHz to 24.5 GHz 1 Hz resolution available • Output level range: –20 to 0 dBm 0.1 dB resolution available	Signal generator (MG3693A/94A) MG3692A is also available for MS2690A and MS2691A. With Option 004 or 005.
Frequency span display accuracy	• Frequency range: 3,000 to 23,850 MHz 1 Hz resolution available • Output level range: –20 to 0 dBm 0.1 dB resolution available	Signal generator (MG3693A/94A)
Single sideband noise level	• Frequency range: 2 GHz, 1 MHz offset 1 Hz resolution available • Output level range: –10 to 10 dBm 0.1 dB resolution available • SSB phase noise: –130 dBc/Hz or less (at 100 kHz offset) • SSB phase noise: –150 dBc/Hz or less (at 1 MHz offset) • External reference input: (10 MHz) available	Signal generator (HP8665B)

Table 6.1.2-1 List of measuring instruments for performance test (Cont'd)

Test Items	Required Performance	Name of Recommended Device (Model Name)
RF frequency characteristics	• Frequency range: 250 kHz to 13.5 GHz 1 Hz resolution available • Output level range: –20 to 0 dBm 0.1 dB resolution available	Signal generator (MG3700A) Less than 6 GHz
		Signal generator (MG3693A/94A) 6 GHz or more MG3692A is also available for MS2691A.
	• Frequency range: 250 kHz to 13.5 GHz • Measurement power range: –30 to +10 dBm (less than 6 GHz) Measurement power range: –67 to +20 dBm (6 GHz or more) • Mainframe accuracy: ±0.02 dB	Power meter (ML2488A)
		Power sensor (MA2421D) Less than 6 GHz
		Power sensor (MA2444D) 6 GHz or more
Display average noise level	• Frequency range: DC to 13.5 GHz • VSWR: 1.2 or less • 50 Ω	Standard terminator (28N50-2)
Second harmonic wave distortion	• Frequency range: 10 MHz to 6 GHz • External reference input: (10 MHz) available • Second harmonic wave: –30 dBc or less • At 2× frequency of SG output: Loss < 40 dB (LPF)	Signal generator (MG3700A)
		Low pass filter SLP-10.7+: fc = 14 MHz SLP-50+: fc = 55 MHz SLP-100+: fc = 108 MHz VLF-400(+): fc = 560 MHz SLP-850+: fc = 850 MHz VLF-1200(+): fc = 1530 MHz VLF-2250(+): fc = 2575 MHz VLF-3000+: fc = 3600 MHz

6.2 Performance Test Items

Warm up the subject testing device and measuring instruments for at least 30 minutes except where directed, in order to stabilize them sufficiently before running performance tests. Demonstrating maximum measurement accuracy requires, in addition to the above, conducting performance tests under ambient temperatures, little AC power supply voltage fluctuations, as well as the absence of noise, vibrations, dust, humidity or other problems.

Figure 6.2-1 Performance test

6.2.1 Reference oscillator frequency stability

This tests the frequency stability of the 10 MHz reference oscillator of the MS2690A/MS2691A/MS2692A.
The frequency stability is tested by measuring at 23°C the frequency changes once after 2 minutes and again after 5 minutes from the elapse of 24 hours after power application, and by measuring the frequency changes at ambient temperatures of 5°C and 45°C.

However, this is applied for this item when Option 001 is not installed.

(1) Test target standards

■ Reference oscillator

- Frequency: 10 MHz
- Aging rate: $\leq 1 \times 10^{-7}$/year, after 24 hours of operation, 23°C
  Aging rate measured at 24 hours is used in this manual.
- Temperature characteristics: $\pm 2 \times 10^{-8}$, 5 to 45°C (23°C reference)

(2) Measuring instrument for tests

- Frequency counter: MF2412A
- Frequency standard device: Devices with stability of $\pm 3 \times 10^{-12}$/day or less

(3) Setup

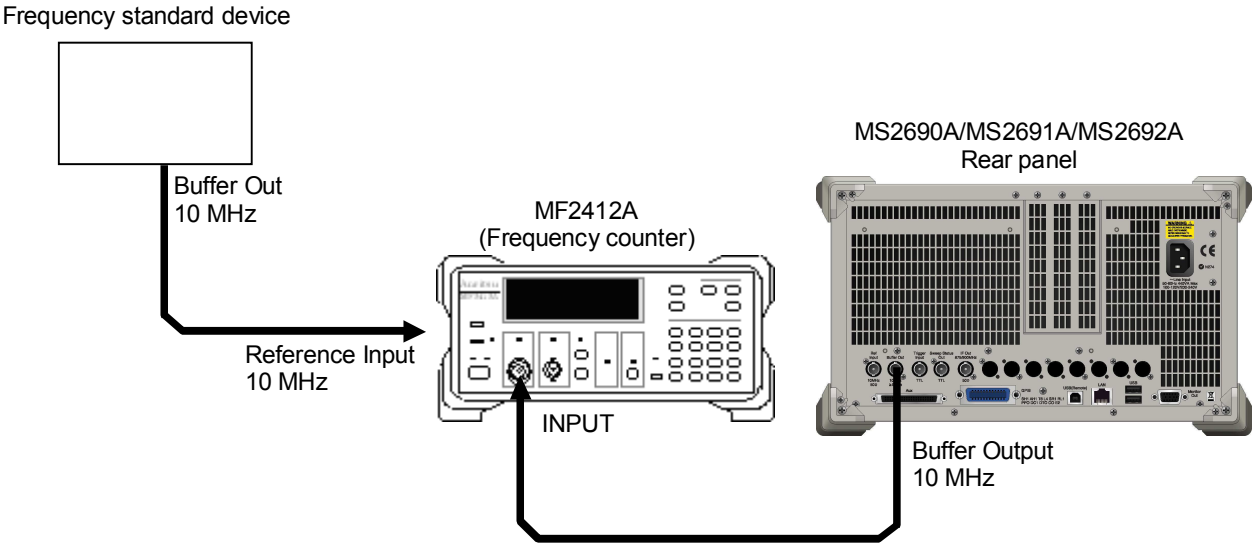


Figure 6.2.1-1 Reference oscillator frequency stability test

(4) Notes on test

Perform tests at frequency stability/day in (5) in locations where ambient temperature changes are at ±2°C, and there are no vibrations.

(5) Test procedure

(a) Temperature stability

1. Set only the MS2690A/MS2691A/MS2692A to a thermostatic bath at the connection in (3) then set to the temperature within the bath.
2. Turn On the power switch on the front panel of the MS2690A/MS2691A/MS2692A then wait until the internal temperature of the MS2690A/MS2691A/MS2692A stabilizes (approx. 1.5 hours after the temperature in the thermostatic bath stabilizes).
3. When the internal temperature is stabilized, measure the frequency with the MF2412A (up to the 0.1 mHz digit).
4. Set the temperature in the bath to 45°C.
5. When the temperature in the bath and the internal temperature of the MS2690A/MS2691A/MS2692A are stabilized, measure the frequency with the MF2412A.
6. Calculate the stability using the following equation.

$$\text{Frequency temperature stability} = \frac{(\text{Counter reading at } 45^\circ\text{C}) - (\text{Counter reading at } 23^\circ\text{C})}{(\text{Counter reading at } 23^\circ\text{C})}$$

7. Set the temperature in the bath to 5°C then perform Steps 5 and 6.

6.2.2 Display frequency accuracy

The known frequency which is the reference for the display frequency, is added to the MS2690A/MS2691A/MS2692A as shown in (3) then the center frequency and frequency span are set from the front panel. The difference between the read value of the marker display frequency (bold arrow in figure below) of the spectrum peak point and the setting value of the center frequency (same value as known reference frequency) is measured at this time.

The Swept Frequency Synthesizer uses the signal source phase-locked using the same accuracy as the 10 MHz reference oscillator of the MS2690A/MS2691A/MS2692A.

(1) Test target standards

■MS2690A/MS2691A/MS2692A

- Display frequency accuracy: ± [Display frequency × Reference frequency accuracy + Span frequency × Span accuracy + RBW × 0.05 + 2 × N + Span Frequency/(No. of trace points – 1)] Hz
  N indicates the mixer harmonic order (Refer to Tables 1.3.1-1 and 1.3.2-1).

(2) Measuring instrument for tests

- Signal generator (MG3693A/94A) (MG3692A is also available for MS2690A and MS2691A)

(3) Setup

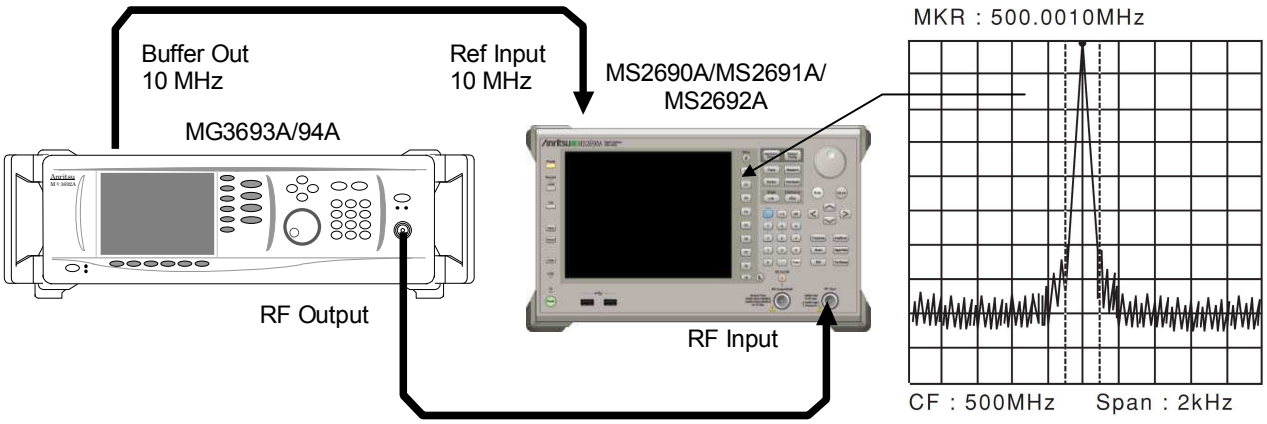


Figure 6.2.2-1 Display frequency accuracy test

(4) Notes on test

Set the output level of the MG3693A/94A to –20 to –10 dBm

(5) Test procedure

1. Press Application Switch of the MS2690A/MS2691A/MS2692A then select the Spectrum Analyzer.
2. Press Preset of the MS2690A/MS2691A/MS2692A.
3. Press F1 (Preset) to perform Preset.
4. Press Frequency of the MS2690A/MS2691A/MS2692A to display the Frequency function menu.
5. Set the output frequency of the MG3693A/94A to the center frequency (500 MHz) shown in the Display Frequency Accuracy table of Appendix A.
6. Set the center frequency shown in the Display Frequency Accuracy table of Appendix A to the MS2690A/MS2691A/MS2692A.
7. Set the frequency span (10 kHz) and the resolution bandwidth (300 Hz) corresponding to the center frequency (500 MHz) shown in the Display Frequency Accuracy table of Appendix A to the MS2690A/MS2691A/MS2692A.
8. Read the marker frequency value (MKR value) shown on the screen, then check whether this value is within the range of the maximum value and minimum value in the specified range shown in the Display Frequency Accuracy table of Appendix A.
9. Repeat Steps 5 to 8 for the center frequency and frequency span according to the center frequency and frequency span combination shown in the Display Frequency Accuracy table of Appendix A.

6.2.3 Frequency span display accuracy

Set to the signal generator the frequencies of the first div and ninth div from the left edge of the screen as shown in (3), and read their frequency difference to obtain the span accuracy.

(1) Test target standards

■ MS2690A/MS2691A/MS2692A

- Frequency span accuracy: ±0.2%

(2) Measuring instrument for tests

- Signal generator (MG3693A/94A) (MG3692A is also available for MS2690A and MS2691A)

(3) Setup

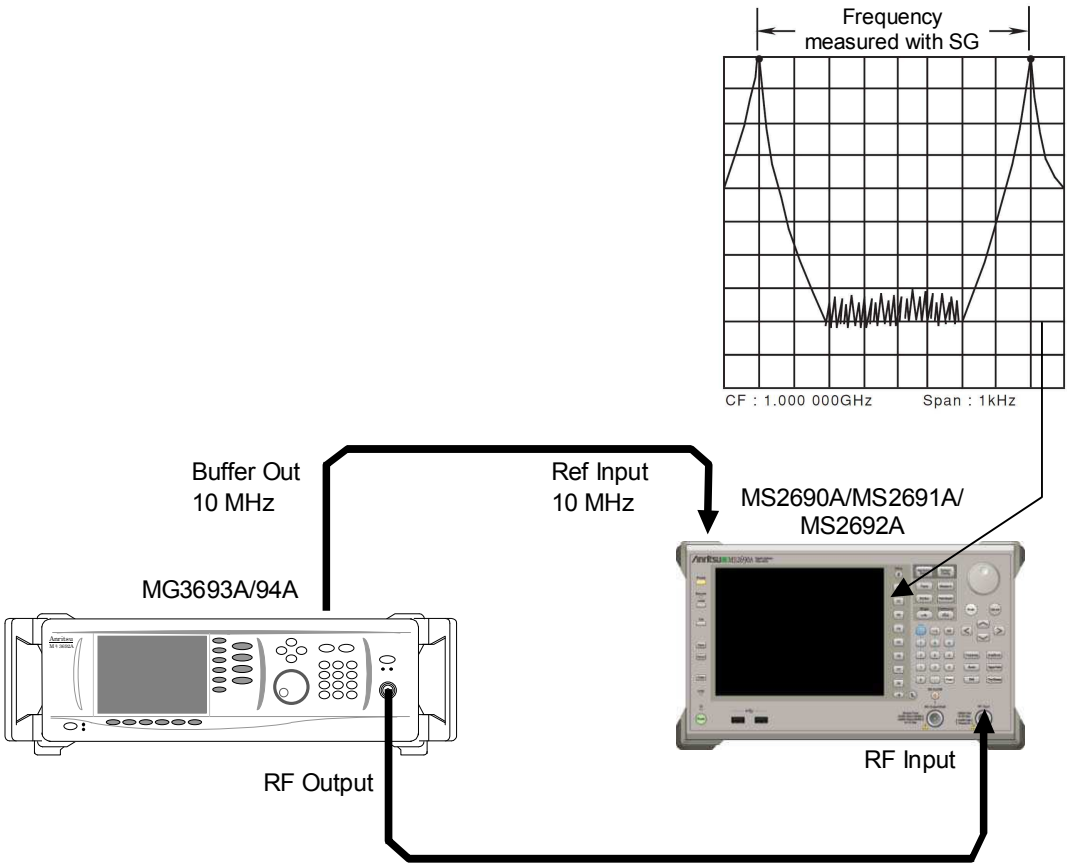


Figure 6.2.3-1 Frequency span display accuracy test

(4) Notes on test

Although the output level of the MG3693A/94A is not specified, set normally to –10 to 0 dBm.

(5) Test procedure

1. Press Application Switch of the MS2690A/MS2691A/MS2692A then select the Spectrum Analyzer.
2. Press Preset of the MS2690A/MS2691A/MS2692A.
3. Press F1 (Preset) to perform Preset.
4. Connect the output of the MG3692A to the RF input of the MS2690A/MS2691A/MS2692A.
5. Set the frequency span (10 kHz) and center frequency (3 GHz) of the MS2690A/MS2691A/MS2692A from the Frequency Span Display Accuracy table of Appendix A.
6. Set the output frequency of the MG3693A/94A to the frequency (2999.996 MHz) for f_1 shown in the Frequency Span Display Accuracy table of Appendix A.
7. Measure the spectrum waveform peak frequency by using the marker function of the MS2690A/MS2691A/MS2692A. This frequency is set to f_1'.
8. Set to the frequency of output frequency f_2 of the MG3692A (3000.004 MHz), and then measure the spectrum waveform peak frequency by using the marker function. This frequency is set to f_2'.
9. Calculate $(f_2' - f_1')/0.8/SPAN \times 100 - 100$ [%] then check whether it satisfies the specified range (minimum value to maximum value) shown in the Frequency Span Display Accuracy table of Appendix A.
10. Repeat Steps 5 to 9 for each frequency span of the center frequency at 3 GHz, 7 GHz, and 6.75 GHz shown in the Frequency Span Display Accuracy table of Appendix A.

Note:

7 GHz, and 6.75 GHz can be specified only with the MS2691A/MS2692A.
13.25 GHz can be specified only for the MS2692A.

6.2.4 Single sideband noise level

Set the resolution bandwidth to a specific value then input a signal with a single sideband noise level far smaller than the subject test device. Test how far the dB drops from the peak point for a noise level which is distanced by a specific frequency from the spectrum waveform peak point at this time.

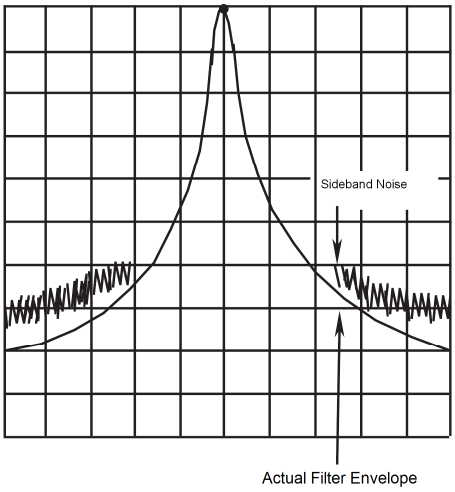


Figure 6.2.4-1 Single sideband noise level

(1) Test target standards

- Single sideband noise: At 18 to 28°C, 2 GHz
  ≤ –116 dBc/Hz (Frequency 2 GHz, 100 kHz Offset)
  ≤ –137 dBc/Hz (Frequency 2 GHz, 1 MHz Offset)

(2) Measuring instrument for tests

- Signal generator (HP8665B)

(3) Setup

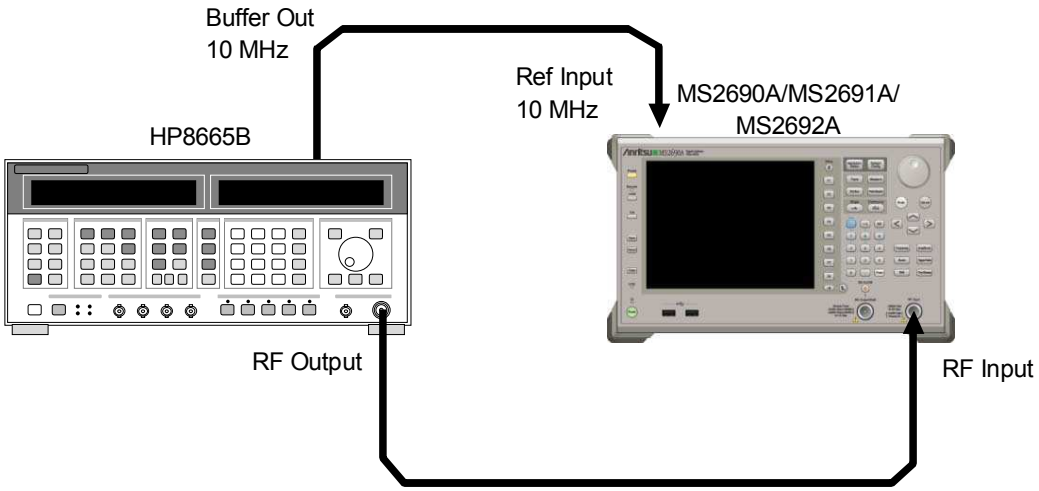


Figure 6.2.4-2 Signal sideband noise level

(4) Notes on test

Perform the test at an ambient temperature of 18 to 28°C and after warming up for at least 30 minutes.

(5) Test procedure

1. Start the application Spectrum Analyzer of the MS2690A/MS2691A/MS2692A.
2. Press Preset.
3. Press F1 (Preset).
4. Press Cal and then F1 (SIGANA All).
5. Set 2 GHz, 0 dBm for the HP8665B.
6. Set as follows for the MS2690A/MS2691A/MS2692A:

Reference level	0 dBm
Attenuator	0 dB
Span frequency	0 Hz
VBW mode	Power
Det mode	Sample
RBW	100 Hz
VBW	1 Hz
Sweep time	1 s
Trace points	1001

7. Set the center frequency of the MS2690A/MS2691A/MS2692A to 2 GHz.

8. Measure the following parameters for the burst average measurement function. Adjust the output level of the MP8665B so that the average measurement value becomes 0 dBm ±0.06 dB, and then measure level [p0].
   Start time 0.1 s
   Stop time 0.9 s
9. For the MS2690A/MS2691A/MS2692A, set the center frequency (2.0001 GHz) corresponding to the offset frequency (100 kHz) shown in the Single Sideband Noise Level table of Appendix A.
   Also, set RBW to 10 kHz according to this table.
10. Measure level [p1] by using the burst average measurement function.
11. Calculate the single sideband noise using the measurement value.
    Single sideband noise = p1 – p0 – 10log10000 [dBc/Hz]
12. In the same way as Step 9, measure level [p2] at the center frequency (2001 MHz).
13. Calculate the single sideband noise using the measurement value.
    Single sideband noise = p2 – p0 – 10log30000 [dBc/Hz]

6.2.5 RF frequency characteristics

Even if multiple signals with different frequencies and the same amplitude are input to a spectrum analyzer, the amplitude of each spectrum must be displayed equally on the screen. This section describes how to obtain the level deviation of the frequency for each band by inputting calibrated signals from an external device.

(1) Test target standards

■ MS2690A

Frequency characteristics

- After CAL execution, at input attenuator = 10 dB, 18 to 28°C
  (Without MS2690A-008 or Preamplifier=OFF)
  ±0.35 dB (9 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)
  (With MS2690A-008 and Preamplifier=ON)
  ±0.65 dB (100 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)

■ MS2691A

Frequency characteristics

- After CAL execution, at input attenuator = 10 dB, 18 to 28°C
  (Without MS2691A-008 or Preamplifier=OFF)
  ±0.35 dB
  (9 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)
  (9 kHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)
  (With MS2691A-008 and Preamplifier=ON)
  ±0.65 dB
  (100 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)
  (100 kHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)
- After CAL execution, at input attenuator = 10 dB, after preselector tuning,
  at 18 to 28°C
  ±1.50 dB
  (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal)
  (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious)

■ MS2692A

Frequency characteristics

- After CAL execution, at input attenuator = 10 dB, 18 to 28°C
  (Without MS2692A-008 or Preamplifier=OFF)
  ±0.35 dB
  (9 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)
  (9 kHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)
  (With MS2692A-008 and Preamplifier=ON)
  ±0.65 dB

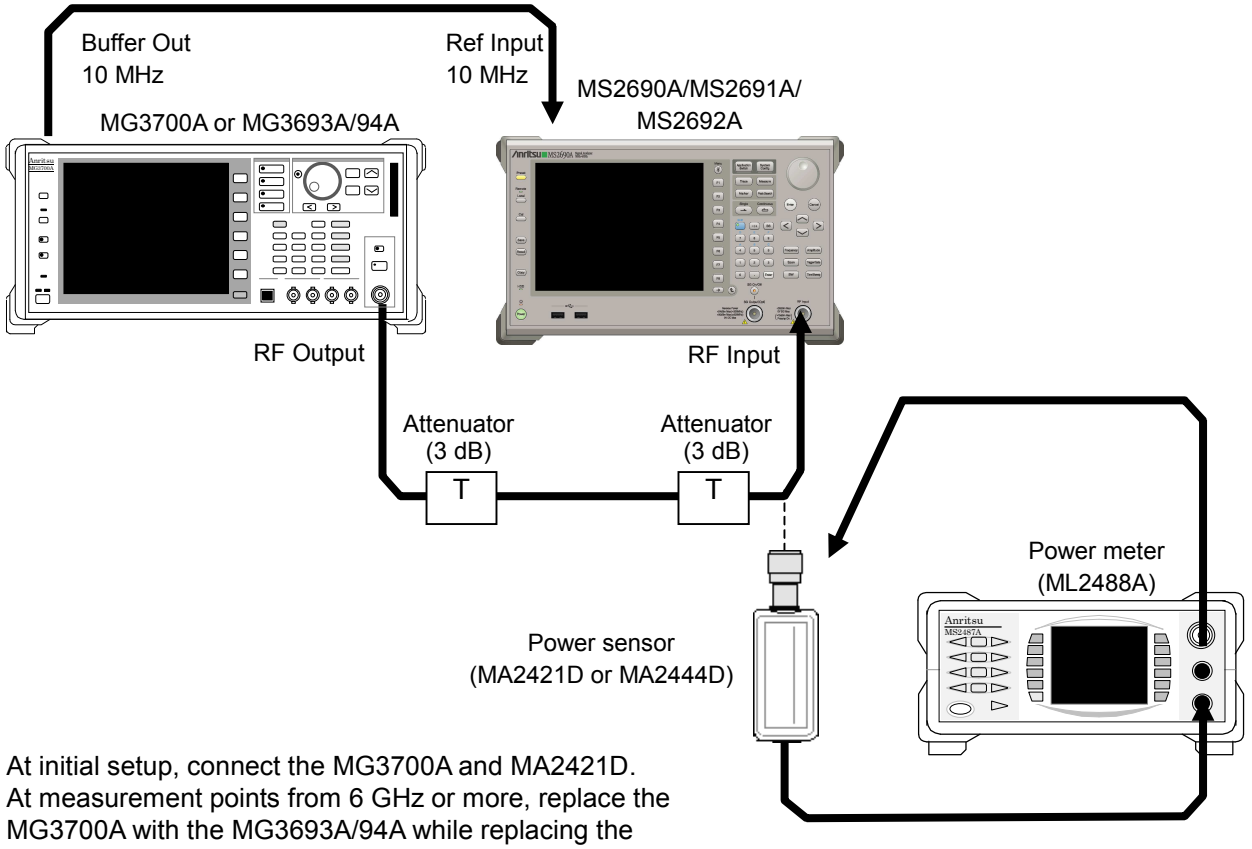
(100 kHz ≤ frequency ≤ 6 GHz, Frequency Band Mode: Normal)
(100 kHz ≤ frequency < 3 GHz, Frequency Band Mode: Spurious)

- After CAL execution, at input attenuator = 10 dB, after preselector tuning,
  at 18 to 28°C
  (Without MS2692A-008 or Preselector Bypass =OFF)
  ±1.50 dB
  (6 GHz < frequency ≤ 13.5 GHz, Frequency Band Mode: Normal)
  (3 GHz ≤ frequency ≤ 13.5 GHz, Frequency Band Mode: Spurious)
  ±2.50 dB
  (13.5 GHz ≤ frequency ≤ 26.5 GHz)
- After CAL execution, at input attenuator = 10 dB,
  (With MS2692A-008 and Preamplifier Bypass =ON)
  ±1.00 dB
  (6 GHz < frequency ≤ 13.5 GHz)
  ±1.50 dB
  (13.5 GHz ≤ frequency ≤ 26.5 GHz)

(2) Measuring instrument for tests

- Signal generator (MG3700A) [Less than 6 GHz]
- Signal generator (MG3693A/MG3694A) [6 GHz or more]
  (MG3692A is also available for MS2690A and MS2691A)
- Power meter (ML2488A)
- Power sensor (MA2421D) [Less than 6 GHz]
- Power sensor (MA2444D) [6 GHz or more]

(3) Setup



* At initial setup, connect the MG3700A and MA2421D.
At measurement points from 6 GHz or more, replace the MG3700A with the MG3693A/94A while replacing the MA2421D with the MA2444D.

Figure 6.2.5-1 RF frequency characteristics test

(4) Notes on test

Perform the test at an ambient temperature of 18 to 28°C and after warming up for at least 30 minutes.

Regarding the cable, attenuator, and conversion adapter, the applied parts below are recommended.

Cable:	J0912 Coaxial cord (for 40 GHz)
Attenuator:	41KC-3 Fixed Attenuator, 3 dB
Conversion adapter:	J1398A N-SMA ADAPTOR

(5) Test procedure

(a) Calibrating the MG3700A (MG3693A/94A) output level

1. Set the MG3700A (MG3693A/94A) as follows:
   OUTPUT FREQ 5 MHz
   OUTPUT LEVEL –4 dBm
2. Connect the MG3700A (MG3693A/94A) output to the power sensor of the power meter via the coaxial cable.
3. Check the power meter display.
4. Change the output frequency of the MG3700A (MG3693A/94A) to the center frequency shown in the RF Frequency Characteristics table of Appendix A. Perform calibration by using the power meter so that the signal level at each frequency becomes –10 dBm ±0.06 dB, and then read the setting value on the MG3700A (MG3693A/94A) and the indicated value (calibration value) on the power meter.

(b) Measuring RF frequency characteristics

1. Connect the MG3700A (MG3693A/94A) RF output to the RF input of the MS2690A/MS2691A/MS2692A using the coaxial cable.
2. Start the application Spectrum Analyzer of the MS2690A/MS2691A/MS2692A.
3. Press Preset of the MS2690A/MS2691A/MS2692A.
4. Press F1 (Preset).
5. Press Cal and then F1 (SIGANA All).
6. Set as follows for the MS2690A/MS2691A/MS2692A:
   Center Freq 5 MHz
   Span 0 Hz
   ATT 10 dB
   Reference Level –10 dBm
   RBW 100 Hz
   Sweep Time 50 ms
   Trace Point 1001
   Det Mode RMS
7. Output the signal (calibration value) of the MG3700A (MG3693A/94A) calibrated in Step (a) 4 to the MS2690A/MS2691A/ MS2692A.
8. Using the burst average measurement function, set the following parameters and measure the level.
   Start Time 5 ms
   Stop Time 45 ms

9. Repeat the measurement, changing the frequency as shown in the RF Frequency Characteristics table of Appendix A.
10. Calculate the RF frequency characteristics, using the calibration value of the MG3700A (MG3693A/94A) and the indicated value on the MS2690A/MS2691A/MS2692A.
    RF frequency characteristics = Indicated value on MS2690A/MS2691A/MS2692A – calibration value (indicated value on power meter)
11. Set this instrument shown as below, only when Option 008 is installed:
    Press Amplitude to display the amplitude menu, and then press F4 (Pre-amp) to set the pre-amplitude settings to On.
    Calculate RF frequency characteristic, according to steps 8 and 9.

Center Freq	50 MHz
Span	0 Hz
ATT	10 dB
Reference Level	–30 dBm
RBW	100 Hz
Sweep Time	50 ms
Trace Point	1001
Det Mode	RMS

6.2.6 Display average noise level

Internal noise evenly distributed in proportion to the resolution bandwidth across the entire measurement frequency band is referred to as the display average noise level.

(1) Test target standards

- Display average noise level
  VBW = 1 Hz (Video Average), detection mode: Sample, input attenuator 0 dB, at 18 to 28°C

■ MS2690A

(Without MS2690A-008)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –155 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –153 dBm/Hz (2.4 GHz ≤ frequency < 4 GHz)
≤ –152 dBm/Hz (4 GHz ≤ frequency ≤ 6 GHz)

(With MS2690A-008 or Preamplifier=ON)
≤ –150 dBm/Hz (100 kHz)
≤ –159 dBm/Hz (1 MHz)
≤ –166 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –165 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –164 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –161 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –159 dBm/Hz (5 GHz ≤ frequency ≤ 6 GHz)

(With MS2690A-008 or Preamplifier=OFF)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –153 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –152 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –151 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –150 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –149 dBm/Hz (5 GHz ≤ frequency ≤ 6 GHz)

■ MS2691A

(Without MS2691A-008)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –155 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –153 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –153 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –152 dBm/Hz (4 GHz ≤ frequency < 6 GHz)
≤ –151 dBm/Hz (6 GHz ≤ frequency < 10 GHz)
≤ –150 dBm/Hz (10 GHz ≤ frequency ≤ 13.5 GHz)

(With MS2691A-008 or Preamplifier=ON)
≤ –150 dBm/Hz (100 kHz)
≤ –159 dBm/Hz (1 MHz)
≤ –166 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –165 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –164 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –161 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –159 dBm/Hz (5 GHz ≤ frequency ≤ 6 GHz)

(With MS2691A-008 or Preamplifier=OFF)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –153 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –152 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –151 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –150 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –149 dBm/Hz (5 GHz ≤ frequency < 6 GHz)
≤ –151 dBm/Hz (6 GHz ≤ frequency < 10 GHz)
≤ –150 dBm/Hz (10 GHz ≤ frequency ≤ 13.5 GHz)

■ MS2692A

(Without MS2692A-008,067)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –155 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –153 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –153 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –152 dBm/Hz (4 GHz ≤ frequency < 6 GHz)
≤ –151 dBm/Hz (6 GHz ≤ frequency < 10 GHz)
≤ –150 dBm/Hz (10 GHz ≤ frequency ≤ 13.5 GHz)
≤ –147 dBm/Hz (13.5 GHz < frequency ≤ 20 GHz)
≤ –143 dBm/Hz (20 GHz < frequency ≤ 26.5 GHz)

(With MS2692A-008 or Preamplifier=ON)
≤ –150 dBm/Hz (100 kHz)
≤ –159 dBm/Hz (1 MHz)
≤ –166 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –165 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –164 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –161 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –159 dBm/Hz (5 GHz ≤ frequency ≤ 6 GHz)

(With MS2692A-008 or Preamplifier=OFF)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –153 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –152 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)

≤ –151 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –150 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –149 dBm/Hz (5 GHz ≤ frequency < 6 GHz)
≤ –151 dBm/Hz (6 GHz ≤ frequency < 10 GHz)
≤ –150 dBm/Hz (10 GHz < frequency ≤ 13.5 GHz)
≤ –147 dBm/Hz (13.5 GHz < frequency ≤ 20 GHz)
≤ –143 dBm/Hz (20 GHz < frequency ≤ 26.5 GHz)

(With MS2692A-067)
≤ –135 dBm/Hz (100 kHz)
≤ –145 dBm/Hz (1 MHz)
≤ –155 dBm/Hz (30 MHz ≤ frequency < 2.4 GHz)
≤ –153 dBm/Hz (2.4 GHz ≤ frequency < 3 GHz)
≤ –153 dBm/Hz (3 GHz ≤ frequency < 4 GHz)
≤ –152 dBm/Hz (4 GHz ≤ frequency < 5 GHz)
≤ –152 dBm/Hz (5 GHz ≤ frequency < 6 GHz)
≤ –146 dBm/Hz (6 GHz ≤ frequency < 10 GHz)
≤ –145 dBm/Hz (10 GHz ≤ frequency ≤ 13.5 GHz)
≤ –142 dBm/Hz (13.5 GHz < frequency ≤ 20 GHz)
≤ –138 dBm/Hz (20 GHz < frequency ≤ 26.5 GHz)

(2) Measuring instrument for tests

- Standard terminator (28N50-2)

(3) Setup

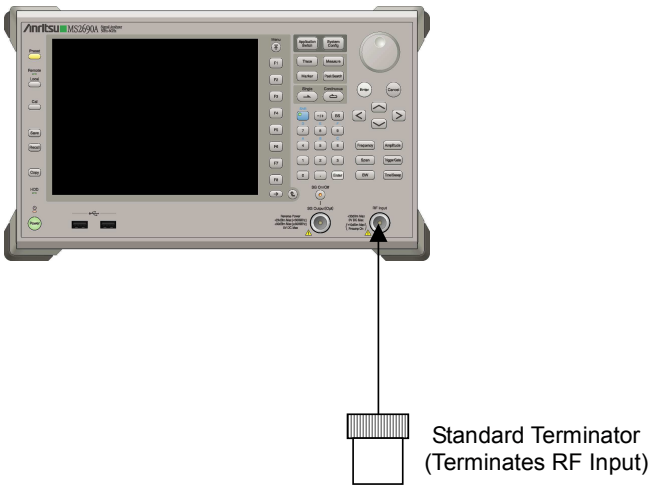


Figure 6.2.6-1 Display average noise level

(4) Notes on test

Perform the test at an ambient temperature of 18 to 28°C and after warming up for at least 30 minutes.

(5) Test procedure

1. Start the application Spectrum Analyzer of the MS2690A/MS2691A/MS2692A.
2. Press Preset of the MS2690A/MS2691A/MS2692A.
3. Press F1 (Preset).
4. Press Cal and then F1 (SIGANA All).
5. Terminate the RF input with the standard terminator.
6. Set as follows for the MS2690A/MS2691A/MS2692A (time domain mode).

Center Freq	100 kHz
Span	0 Hz
Reference Level	–100 dBm
RBW	1 kHz
VBW	1 Hz
VBW Mode	Video
Attenuator	0 dB
Detection	Sample
Sweep Time	1 s

7. Press Trace.
8. Press F4 (Trace-A Storage Mode) then select F4 (Average).
9. Press to return to the original page.
10. Press F7 (Storage Count).
11. Set the average count to 16 times.
12. Press Single (Single) to start averaging then wait until the sweep for an average count of 16 times is completed.
13. Using the burst average measurement function, set the Start Time and Stop Time parameters as follows and measure the level.

Start Time	100 ms
Stop Time	900 ms

14. The (Burst average measurement value [dBm] –30 dB) will be the display average noise level (dBm/Hz).
15. Set the center frequency according to the Display Average Noise Level table in Appendix A, then obtain the display average noise level according to Steps 7 to 14.
16. Set this instrument as shown below, only when Option 008 is installed:
    Press Amplitude to display the amplitude menu, and then press F4 (Pre-amp) to set the pre-amplitude settings to On.
    Calculate the RF frequency characteristic, according to steps 11 to 15.

6.2.7 Second harmonic wave distortion

A harmonic wave is generated and displayed on the screen due to analyzer input mixer nonlinearity even when an input signal without harmonic wave distortion is applied to the spectrum analyzer.

The second harmonic wave level will be the highest among the harmonic waves displayed on this screen.

For the test method point, apply a distortion signal (at least 20 dB) lower than the internal harmonic wave of the MS2690A/MS2691A/MS2692A then measure the level difference between the fundamental wave and the second harmonic wave. In the event a low distortion signal source cannot be obtained, apply a low distortion signal to the MS2690A/ MS2691A/MS2692A after passing through LPF.

(1) Test Target Standards

- Second harmonic wave distortion

■ MS2690A/MS2691A/MS2692A

(Without MS2690A-008/MS2691A-008/MS2692A-008)
At mixer input level –30 dBm
≤ –60 dBc (Input frequency: 10 ≤ frequency ≤ 400 MHz)
≤ –75 dBc (Input frequency: < 0.4 < frequency ≤ 0.8 GHz)
≤ –75 dBc (Input frequency: < 0.8 < frequency ≤ 1 GHz)
≤ –75 dBc (Input frequency: 1 < frequency ≤ 3 GHz)

(With MS2690A-008/MS2691A-008/MS2692A-008)
At Preamplifier input level –45 dBm
≤ –50 dBc (Input frequency: 10 ≤ frequency ≤ 400 MHz)
≤ –55 dBc (Input frequency: < 0.4 < frequency ≤ 0.8 GHz)
≤ –55 dBc (Input frequency: < 0.8 < frequency ≤ 1 GHz)
≤ –55 dBc (Input frequency: 1 < frequency ≤ 3 GHz)

(2) Measuring instrument for tests

- Signal generator (MG3700A)
- LPF: Items capturing an 40 dB attenuator or higher at a frequency 2 times the fundamental wave

(3) Setup

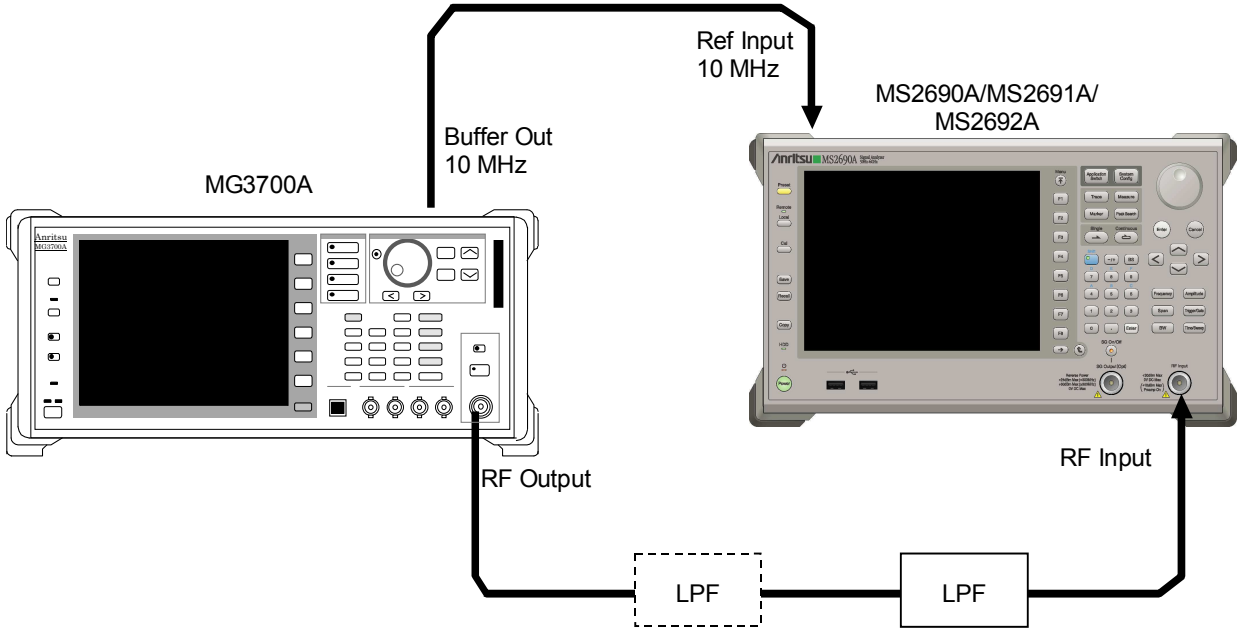


Figure 6.2.7-1 Second harmonic wave distortion test

(4) Notes on test

Perform the test at an ambient temperature of 18 to 28°C and after warming up for at least 30 minutes.

(5) Test procedure

1. Start the application Spectrum Analyzer of the MS2690A/MS2691A/ MS2692A.
2. Press Preset of the MS2690A/MS2691A/MS2692A.
3. Press F1 (Preset).
4. Press Cal then F1 (SIGANA All).
5. Set as follows for the MS2690A/MS2691A/MS2692A:

Span	50 kHz
RBW	1 kHz
VBW	1 kHz
Attenuator	10 dB
Det Mode	Positive
Sweep Time	150 ms

6. Set the output level of the MG3700A to –20 dBm.
7. Connect LPF according to the Second Harmonic Wave Distortion table in Appendix A. If LPF attenuation is insufficient, use LPF in 2 stages.
8. Set the output frequency of the MG3700A and center frequency of the MS2690A/MS2691A/MS2692A, and reference level, according to the Second Harmonic Wave Distortion table in Appendix A.

9. Adjust the output level of the signal generator so as to get the peak point of the spectrum waveform into the range of –20 dBm ±0.06 dB.
10. Press Peak Search to perform a peak search. Set so as to include the signal trace peak point to the zone marker.
11. Press Marker to display the Marker function menu, and then press F2 (Delta) to set to the delta marker.

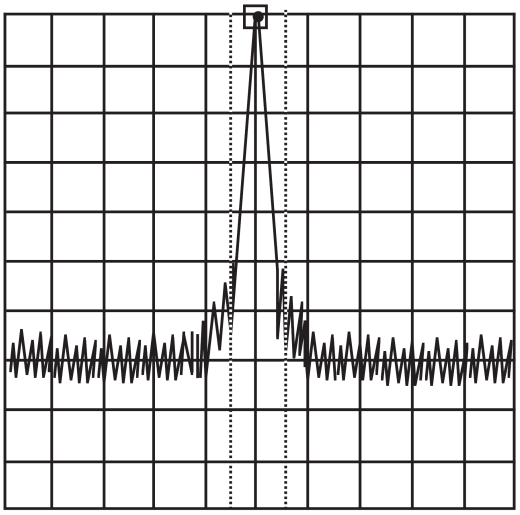


Figure 6.2.7-2 Fundamental wave

12. In order to display the second harmonic wave on the screen, set twice as much frequency as the center frequency. Delta marker level reading indicates the level difference between the fundamental wave and the second harmonic wave.
    In the event the level difference is 80 dB or higher, set the reference level to –50 dBm. Check whether the setting value of the input attenuator is 10 dB.

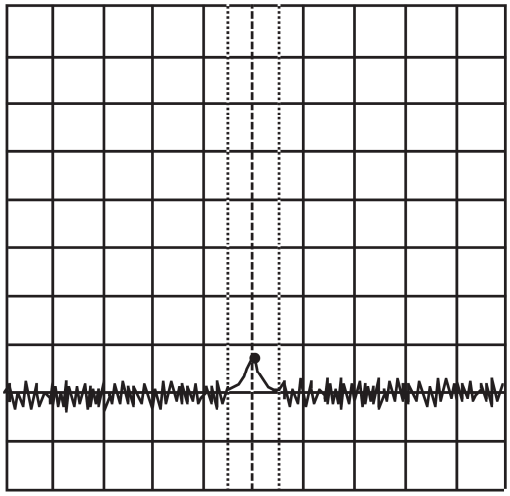


Figure 6.2.7-3 Second harmonic wave

13. Repeat Steps 7 to 12, according to the Second Harmonic Wave Distortion table in Appendix A.

Chapter 7 Power Meter

This chapter describes basic operations of the power meter functions.

7.1 Power Meter

You can connect a USB power sensor to the MS2690A/MS2691A/MS2692A and read the measurement values.

Preparation

For the setup procedure of the application software for this function, refer to Section 3.8 “Installing and Uninstalling” and Section 3.5 “Loading, Unloading, and Switching Applications.”

The MS2690A/MS2691A/MS2692A can accept any USB power sensor in the following table, automatically recognize its model name, and automatically set the COM Port regardless of the USB Port to which the USB power sensor is connected.

Table 7.1-1 shows the models and specifications of compatible power sensors.

Table 7.1-1 USB Power Sensors

Model	Frequency	Resolution	Dynamic Range
MA24104A	600 MHz to 4 GHz	1 kHz	+3 dBm to +51.76 dBm
MA24106A	50 MHz to 6 GHz	1 kHz	–40 dBm to +23 dBm
MA24108A	10 MHz to 8 GHz	100 kHz	–40 dBm to +20 dBm
MA24118A	10 MHz to 18 GHz	100 kHz	–40 dBm to +20 dBm
MA24126A	10 MHz to 26 GHz	100 kHz	–40 dBm to +20 dBm

Follow the procedure below to select a USB power meter function:

<Procedure>

1. Plug in the USB power sensor connector to the USB port of the MS2690A/MS2691A/MS2692A Signal Analyzer.
2. Press 

to display the Application Switch function menu.
3. Press the Power Meter function key.

You can select the application also by clicking the Power Meter icon on the task bar.

7.2 Display Description

Press Application Switch to display the Application Switch function menu. Then, select the Power Meter, and you can display the power meter application main screen and the function menu.

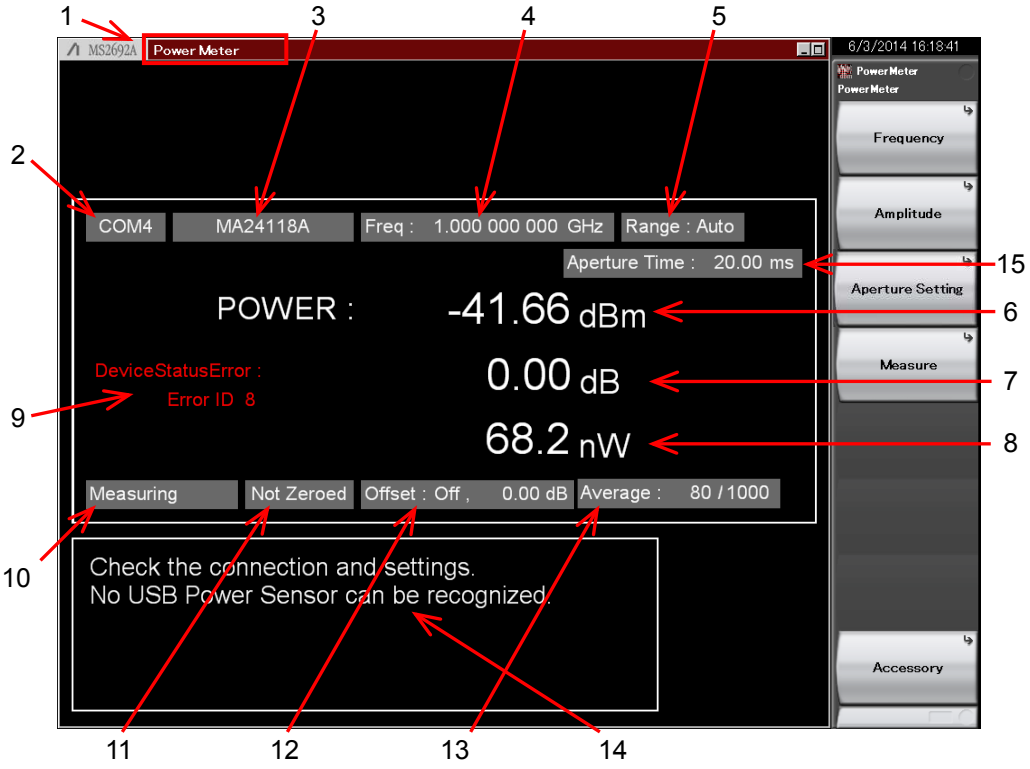


Figure 7.2-1 Power meter application main screen

Table 7.2-1 Parameters on the power meter application main screen

No.	Display	Description
1	Power Meter	Application software name The name of the synchronizing application is displayed in parentheses.
2	COMxx	COM Port number (xx) to which the USB power sensor is connected.
	Port	Appears when no USB power sensor is connected.
3	MAxxxxxA	Model of the connected USB power sensor.
	Model	Appears when no USB power sensor is connected.
4	Frequency	Calibration factor frequency setting.
5	Auto	Input range: Auto
	Low	Input range: Low input level
	High	Input range: High input level
6	Power [dBm]	Measured power with offset level in dBm units. This value is displayed in red in case of a device status error.
7	Relative Power [dB]	Relative power in dB units.
8	Power [W]	Measured power with offset level in W units.
9	Device Status Error	Appears in case of a power sensor error.*
10	Measuring	Measurement is in progress.
	COM Searching	USB power sensor search in progress.
	Stop	USB power sensor search stopped.
11	Not Zeroed	Zeroing not executed.
	Zeroed	Zeroing executed.
12	Offset	Sets the offset level value to be added to the power sensor reading and turns on and off the offset function.
13	Average	Current count / Setting count of averaging. Appears when the Average is turned on. ☞ 7.3.5 “Power Meter”
14	Disconnect Info	Appears when no power sensor is connected or the connected power sensor is not recognized by the mainframe. If the power sensor is connected, disconnect it from the USB port and securely connect again.
15	Aperture Mode	Valid aperture setting value is displayed. ☞ 7.3.6 “Aperture Setting”
	Aperture Time	

*: For detailed information on error causes and Error IDs, refer to Chapter 13-3 “STATUS?” in *“USB Power Sensors MA241xxA and PowerXpert User Guide”*

7.3 Function Menu

Press Menu when the Power Meter function to display the Power Meter function menu.

Table 7.3-1 Power Meter function menu

Function Key	Menu Display	Function
F1	Frequency	Opens the Frequency function menu. 7.3.1 “Setting the frequency”
F2	Amplitude	Opens the Amplitude function menu. 7.3.2 “Level setting”
F3	Aperture Setting	Opens the Aperture Setting function menu. 7.3.6 “Aperture Setting”
F4	Measure	Opens the Measure function menu. 7.3.3 “Measure”
F8	Accessory	Opens the Accessory function menu. 7.3.4 “Accessory”

7.3.1 Setting the frequency

In the Frequency function menu, you can set the calibration factor frequency of the USB power sensor.

Press F1 (Frequency) in the Power Meter function menu to display the Frequency function menu.

Table 7.3.1-1 Frequency function menu

Function Key	Menu Display	Function
F1	Frequency	Sets the calibration factor frequency of the power sensor.

Press F1 (Frequency) in the Frequency function menu or Frequency to display the Frequency dialog box, and then set the measurement frequency.

Table 7.3.1-2 USB Power Sensor

Model	Setting range	Resolution
Disconnected	10 MHz to 26 GHz	1 Hz
MA24104A	600 MHz to 4 GHz	1 kHz
MA24106A	50 MHz to 6 GHz	1 kHz
MA24108A	10 MHz to 8 GHz	100 kHz
MA24118A	10 MHz to 18 GHz	100 kHz
MA24126A	10 MHz to 26 GHz	100 kHz

Note:

The values below resolutions are rounded.

7.3.2 Level setting

Press F2 (Amplitude) or Amplitude in the Power Meter function menu to display the Amplitude function menu.

Table 7.3.2-1 Amplitude function menu

Function Key	Menu Display	Function
F1	Range	Opens the Range function menu.
F7	Offset (On/Off)	Turns on and off the level offset function.
F8	Offset Value	Sets the level offset value.

Setting the range

Press F1 (Range) in the Amplitude function menu to display the Range function menu.

You can select the measurement range of the power sensor among Auto, High, and Low. (High and Low require manually setting.)

Note:

This parameter is always Auto when the model is MA24104A or MA24106A.

Table 7.3.2-2 Range function menu

Function Key	Menu Display	Function
F1	Auto	Automatic setting (Default)
F2	Low	When the model is MA24108A, MA24118A, or MA24126A: Input range:–40 dBm to –7 dBm
F3	High	When the model is MA24108A, MA24118A, or MA24126A: Input range:–7 dBm to +20 dBm

Setting the level offset

An arbitrary offset value is added to the measurement value, and their sum is displayed.

Press F7 (Offset) in the Amplitude function menu to turn on and off the addition of the offset value.

Offset: Level offset

On	Turns on the addition of the offset value.
Off	Turns off the addition of the offset value (Default).

Press F8 (Offset Value) in the Amplitude function menu to display the Offset Value dialog box, and then set the offset value.

Offset Value:

Setting range and minimum resolution of level offset

Setting range	–100.00 to 100.00 dB
Resolution	0.01 dB
Default	0.00 dB

When this function is used, the displayed power sensor value is offset with the value specified in the Offset Value dialog box. It is used when the path loss or gain from the MS2690A/MS2691A/MS2692A to DUT is corrected.

[Power sensor reading after offset]
= [Power sensor reading] + [Offset level]

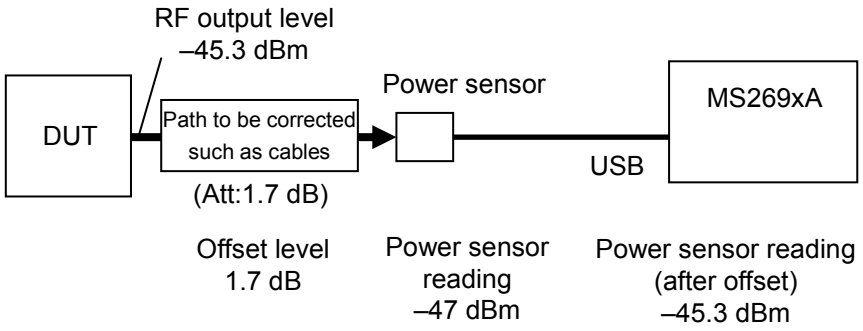


Figure 7.3.2-1 Summary of offset level

7.3.3 Measure

Press F4 (Measure) or Measure in the Power Meter function menu to display the Measure function menu.

The Measure function menu items depend on whether the Power Meter application synchronizes with the other application or not.

When not synchronizing with any applications

Table 7.3.3-1 Measure function menu

Function Key	Menu Display	Function
F1	Power Meter	Opens the Power Meter function menu. 7.3.5 "Power Meter"

When synchronizing with the application

Table 7.3.3-2 Measure function menu

Function Key	Menu Display	Function
F1	Modulation Analysis	Displays the application software that is synchronizing.
F2	Power Meter	Opens the Power Meter function menu. 7.3.5 "Power Meter"

Application synchronization

Application synchronization refers to a state in which the Power Meter application is selected in the Measure function menu of the other measurement application software. In this case, the parameters such as Frequency are shared between 2 applications and do not require setting again when switching the applications.

Table 7.3.3-3 Items to be synchronized between applications

Application Software	Items to be synchronized	
Vector Modulation Analysis	Frequency	Frequency
	Offset	On/off state of the level offset function
	Offset Value	Level offset value

When the application synchronization is enabled, the title bar displays "Power Meter (Application name)."

7.3.4 Accessory

Press F8 (Accessory) in the Power Meter function menu to display the Accessory function menu.

Table 7.3.4-1 Accessory function menu

Function Key	Menu Display	Function
F1	Title	Sets the title character string.
F2	Title (On/Off)	Turns on and off the title character string display.

Setting the title

A title consisting of up to 32 characters can be displayed on the screen. (Up to 17 characters can be displayed on the top of the function menu. The maximum character length depends on characters.)

<Procedure>

1. Press F8 (Accessory) in the Power Meter function menu.
2. Press F1 (Title) to display the character string input dialog box. Use the rotary knob to select the characters, and press Enter to enter them. When the title is entered, press F7 (Set).
3. Press F2 (Title On/Off) to select Off, and the title display is turned off.

7.3.5 Power Meter

Press F1 or F2 (Power Meter) in the Measure function menu.

In the Power Meter menu, you can set the measurement that is performed by using the USB power sensor.

Table 7.3.5-1 Power Meter function menu

Function Key	Menu Display	Function
F1	Average	Turns on and off the function of averaging the measurement results.
F2	Average Count	Sets the number of times the measurement results are averaged.
F3	Set Reference	Sets the "measurement value after offset and averaging" as the reference level of the relative power.
F6	Zero Sensor	Executes the zeroing of the USB power sensor.
F8	Back To Application	Appears only during application synchronization. Activates the synchronizing measurement application software.

Averaging

Press F1 (Average) in the Power Meter function menu to turn on and off the averaging function.

Average: Turns on and off the function of averaging .

On	Turns on the averaging function.
Off	Turns off the averaging function (Default).

Press F2 (Average Count) in the Power Meter function menu to display the Average Count dialog box, and then set the number of averaging times.

Averaging Count: Sets the number of averaging times.

Setting range	2 to 1000
Resolution	1
Default	10

Setting the reference level

Press F3 (Set Reference) in the Power Meter function menu to set the "measurement value after offset and averaging" as the reference level of the relative power.

Zeroing the USB power sensor

Press F6 (Zero Sensor) in the Power Meter function menu to execute the zeroing.

When you execute the function, a progress dialog box appears.

Please do not operate the MS2690A/MS2691A/MS2692A during the zeroing.

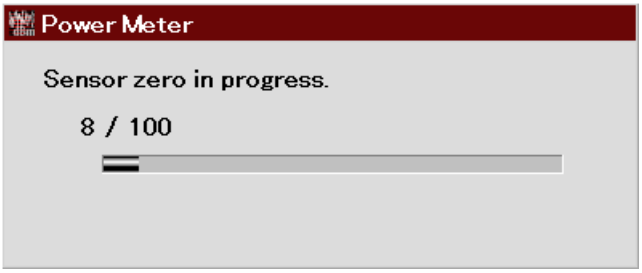


Figure 7.3.5-1 "Power Meter zeroing" dialog box (Progress)

If the zeroing fails, the following dialog box appears.

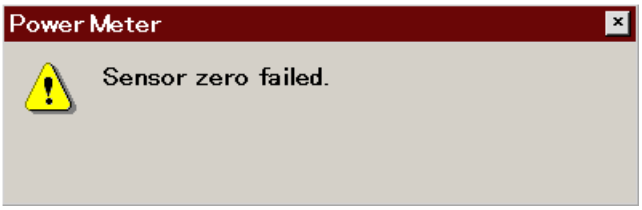


Figure 7.3.5-2 "Power Meter zeroing" dialog box (Zeroing failed)

Zeroing the power sensor

<Procedure>

1. Plug in the USB power sensor connector to the USB port of the MS2690A/MS2691A/MS2692A Signal Analyzer.

2. Turn off the RF output of DUT (device under test) in advance. Connect the RF Input connector of the power sensor to the RF output terminal of DUT.

⚠ CAUTION

Avoid excessive input levels when connecting the power sensor to DUT(device under test). The power sensor may be damaged depending on output levels of DUT.

3. Execute the Zero Sensor menu.

Activating the synchronizing application

Press F8 (Back To Application) in the Power Meter function menu to return to the synchronizing application software.

7.3.6 Aperture Setting

Press F3 (Aperture Setting) in the Power Meter function menu to display the Aperture Setting menu.

Refer to the "Aperture Time" section and the "Measurement Considerations" section of your power sensor chapter in "USB Power Sensors MA241xxA and PowerXpert User Guide" for more details.

Table 7.3.6-1 Aperture Setting function menu

Function Key	Menu Display	Function
F1	Aperture Time	Sets the Aperture Time. Available when MA24108A/MA24118A/MA24126A is connected.
F2	Aperture Mode	Sets the Aperture Mode. Available when MA24104A/MA24106A is connected.

The table below shows the ranges, resolutions, and defaults for Aperture Time.

Table 7.3.6-2 Aperture Time

Model	Range	Resolution	Default
Disconnected	---	---	---
MA24104A	Disabled	Disabled	Disabled
MA24106A	Disabled	Disabled	Disabled
MA24108A	0.01 to 300.00 ms	0.01 ms	20.00 ms
MA24118A	0.01 to 300.00 ms	0.01 ms	20.00 ms
MA24126A	0.01 to 300.00 ms	0.01 ms	20.00 ms

The table below shows the options and defaults for Aperture Mode.

Table 7.3.6-3 Aperture Mode

Model	Options	Default
Disconnected	---	---
MA24104A	LAT, HAT	LAT
MA24106A	LAT, HAT	LAT
MA24108A	Disabled	Disabled
MA24118A	Disabled	Disabled
MA24126A	Disabled	Disabled

7.4 Initialization

7.4.1 Preset

Power Meter function is a kind of application. For the presetting procedure, refer to Section 3.7.1 “Preset.”

7.4.2 Default value list

This section lists the default values of the Power Meter function.

Frequency	1 GHz
Level Offset State	Off
Level Offset Value	0.00 dB
Average State	Off
Average Count	10
Reference Level	0.00 dBm
Reference Level Set	Off
Range	Auto
Sensor Connected	Disconnected
Sensor Model	Disconnected
Aperture	LAT (MA24104A, MA24106A) 20.00 ms (MA24108A, MA24118A, MA24126A)

7.5 Installing the Driver Software

The Found New Hardware Wizard appears when you first connect a USB power sensor to the MS2690A/MS2691A/MS2692A, when the driver software for the connected USB power sensor is not installed, or when you connect the USB power sensor to a different port.

Follow the wizard to install the driver software for the USB power sensor.

Note:

When the operating system on MS2690A/MS2691A/MS2692A is Windows Embedded Standard 7, the driver software will be installed without displaying the wizard.

1. This wizard appears when the USB power sensor is connected. Select "No, not this time" radio button, and click [Next].

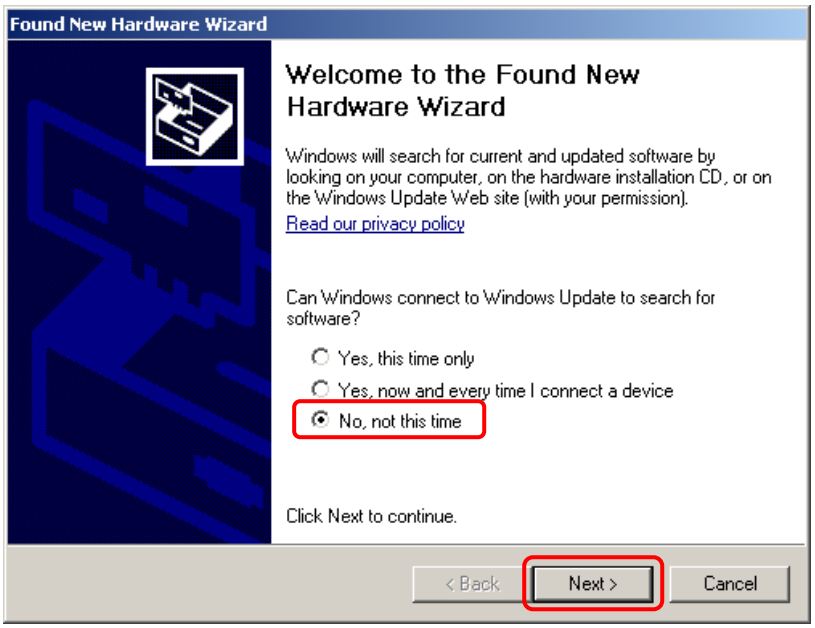


Figure 7.5-1 Found New Hardware Wizard-1

2. Select “Install the software automatically (Recommended),” and click [Next]. “Anritsu MA24108A” in the following example shows the model name of the connected power sensor.

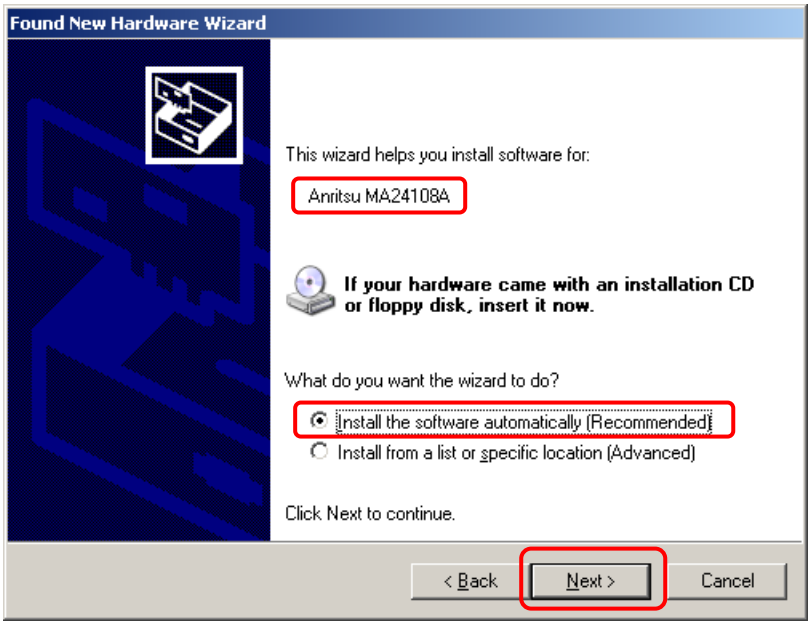


Figure 7.5-2 Found New Hardware Wizard-2

3. Click [Continue Anyway] in the Hardware Installation dialog box.

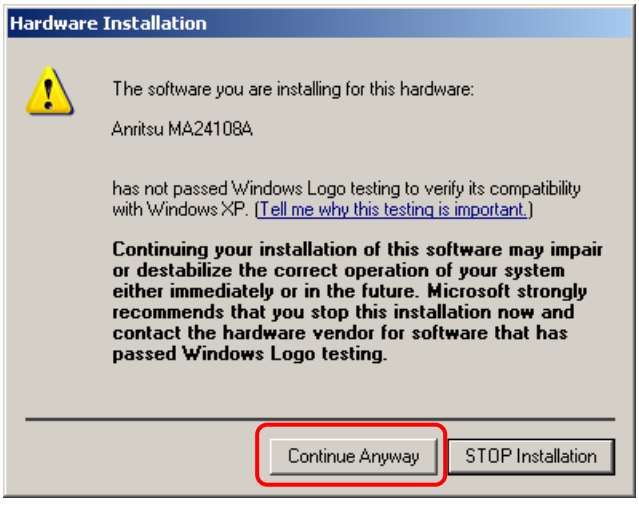


Figure 7.5-3 Hardware Installation dialog box

4. Click [Finish] to complete the installation.

"Anritsu MA24104A" in the following example shows the model name of the connected power sensor.

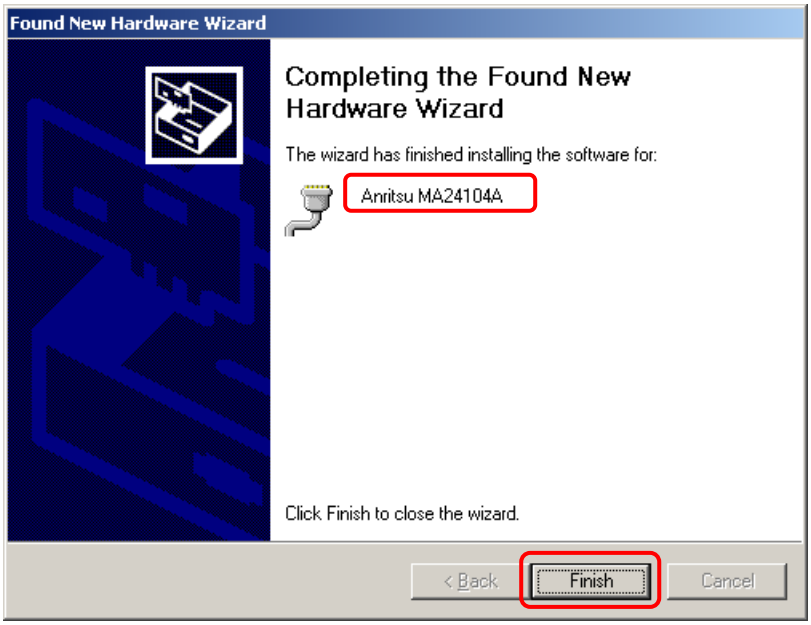


Figure 7.5-4 Found New Hardware Wizard-3

Chapter 8 Maintenance

This chapter describes cautions related to daily maintenance, storage, and shipping of the MS2690A/MS2691A/MS2692A, as well as the calibration procedure to be used as preventive maintenance.

8.1 Daily Maintenance and Storage

8.1.1 Daily maintenance

Before daily maintenance of the MS2690A/MS2691A/MS2692A, be sure to turn the power off and unplug it from the AC outlet.

Panel surface dirt

When surface dirt is noticeable, after the MS2690A/MS2691A/MS2692A has been used in a dusty environment, or when the MS2690A/MS2691A/MS2692A has not been used for an extended period of time, wipe its surface with a cloth moistened in detergent and wrung enough.

Screen surface dirt

If the screen surface is dirty, first wipe it dry with a soft cloth. If the dirt persists, wipe the surface gently with a cloth dipped in detergent and wrung enough.

Loose screws

Use a Phillips screwdriver to tighten screws.

8.1.2 Cautions on storage MS2690A/MS2691A/MS2692A for extended period

Wipe off dust, fingerprint marks, stains, spots, etc. from the surface of the MS2690A/MS2691A/MS2692A before storing it. Avoid storing the MS2690A/MS2691A/MS2692A in these places:

- Places that are exposed to direct sunlight
- Dusty places
- Damp places where condensation may occur on the MS2690A/MS2691A/MS2692A surface
- Places where there the MS2690A/MS2691A/MS2692A may be corroded by active gases
- Places where the MS2690A/MS2691A/MS2692A may be oxidized
- Places having temperatures and relative humidity in the following ranges:
  Temperature: –20°C or lower, or 60°C or higher
  Humidity: 90% or higher

Recommended storage conditions

It is recommended that the MS2690A/MS2691A/MS2692A be stored in a place that meets the ambient conditions suggested above, plus the following conditions, if it is not to be used for a long period of time:

- Temperature: 5°C to 45°C
- Humidity: 40% to 80%
- Little temperature and humidity fluctuations within one day

8.1.3 Storing USB memory

Store the USB memory at temperatures between 4°C and 53°C and relative humidity between 8% and 90% (no condensation). Avoid storing the USB memory in places that are:

- Dusty or damp
- Close to magnetized items
- Exposed to direct sunlight
- Close to heat sources

8.2 Repackaging and transporting when returning product

The following describes cautions on transporting the MS2690A/MS2691A/MS2692A.

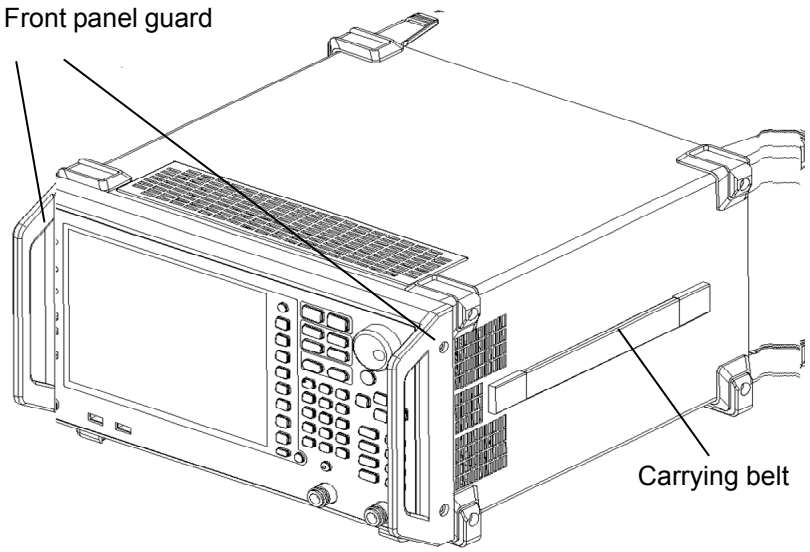


Figure 8.2-1 Guard and Carrying Belt

When carrying the unit, hold tightly the carrying belts on both sides. Do not use the front panel guard for moving. Doing so may loosen the fixing screws and damage the guard. (The guard is provided for protecting front panel connectors.)

8.2.1 Repackaging

Repack the MS2690A/MS2691A/MS2692A in the packing material (box) in which it had been delivered. If the packing material has been scrapped or damaged, repack the MS2690A/MS2691A/MS2692A in the following manner:

1. Wrap the MS2690A/MS2691A/MS2692A in plastic or a similar material.
2. Procure a corrugated cardboard, wooden, or aluminum box large enough to pack in cushioning material around the MS2690A/MS2691A/MS2692A.
3. Place the MS2690A/MS2691A/MS2692A into the box. Then, pack in the cushioning material around the MS2690A/MS2691A/ MS2692A so that the MS2690A/MS2691A/MS2692A does not move around in the box.
4. Secure the outside of the box with packaging cord, adhesive tape, bands, or other such implements.

8.2.2 Transporting

Avoiding as much vibrations as possible and satisfying the recommended storage conditions is recommended for transporting.

8.3 Calibration

8.3.1 Calibration

Perform calibration as preventive maintenance to keep the MS2690A/MS2691A/MS2692A's performance from becoming degraded. Even if the MS2690A/MS2691A/MS2692A is functioning normally, calibrate it periodically to maintain its performance.

Calibrating the MS2690A/MS2691A/MS2692A once or twice a year is recommended. If the MS2690A/MS2691A/MS2692A fails to meet specifications after calibration, contact an Anritsu Service and Sales office.

⚠ CAUTION

Before performing the calibration, allow the MS2690A/MS2691A/MS2692A and the equipment used for the performance test to warm up at least 30 minutes to allow them to fully stabilize. For optimal measuring accuracy, run the MS2690A/MS2691A/MS2692A at the temperature of 23 ±5°C), with low AC voltage fluctuation (100 to 120 Vac or 200 to 240 Vac), in an environment free from noise, vibration, dust, moisture, and other harmful ambient conditions.

8.3.2 Instruments used for calibrating MS2690A/MS2691A/MS2692A

Table 8.3.2-1 lists the measuring instruments used to calibrate the MS2690A/MS2691A/MS2692A.

Table 8.3.2-1 List of measuring instruments for calibration

Name of Recommended Device	Required Performance	Calibration Items
Oscilloscope	Capable of 1 GHz measurement Supports external trigger input	Reference oscillator frequency accuracy
Signal generator	Capable of outputting 1 GHz signal (Resolution: 0.01 Hz or higher)	Reference oscillator frequency accuracy
Frequency standard device	Standard radio receiver or device with equivalent capability (Accuracy: 1×10^{-11} order or better)	Reference oscillator frequency accuracy

8.3.3 Calibrating frequencies using oscilloscope

Use an oscilloscope to calibrate the reference oscillator frequency. Use a frequency standard radio signal (signal synchronized with a standard radio signal or with a rubidium atom standard device) offering enough accuracy higher than the reference oscillator installed in the MS2690A/MS2691A/MS2692A.

Table 8.3.3-1 Calibration specifications

Reference Oscillator	Aging Rate	Temperature Stability
Internal reference oscillator	$\pm 1 \times 10^{-7}$/year	$\pm 2 \times 10^{-8}$ (4 to 45°C)
Rubidium reference oscillator*	$\pm 1 \times 10^{-10}$/month	$\pm 1 \times 10^{-9}$ (5 to 45°C)

*: Only when a rubidium reference oscillator (optional) is installed.

Calibration procedure

The procedure for calibrating the frequency using an oscilloscope is described below.

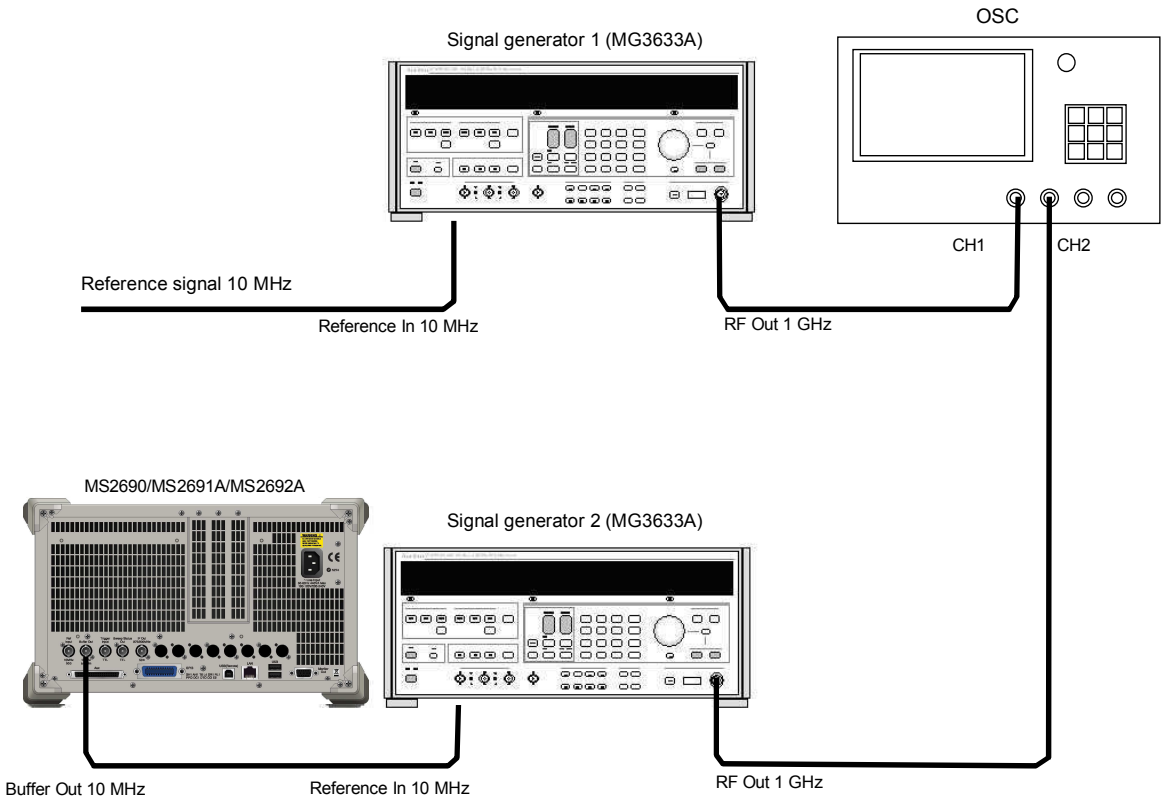


Figure 8.3.3-1 Connections for frequency calibration using oscilloscope

1. Connect a 10 MHz signal output from the frequency standard device to the reference signal input connector (Reference In) of signal generator 1.
2. Connect the reference signal output (Buffer Out) located on the rear panel of the MS2690A/MS2691A/MS2692A to the reference signal input connector (Reference In) of Signal Generator 2.
3. Connect the RF output connector of signal generator 1 to input connector CH1 of the oscilloscope and connect the RF output connector of signal generator 2 to input connector CH2 of the oscilloscope.
4. Set the frequency of signal generators 1 and 2 to 1 GHz for output.
5. Adjust the oscilloscope and set so that the input waveform of each signal generator can be observed.

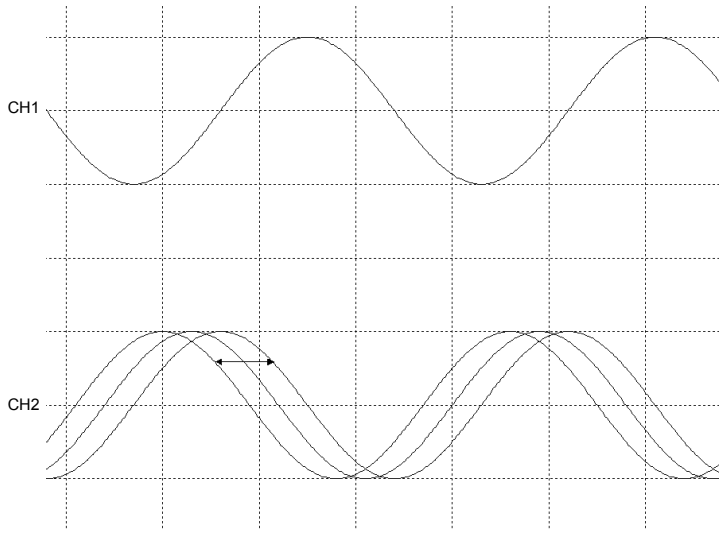


Figure 8.3.3-2 Oscilloscope waveform display

Set the trigger to the signal waveform of CH1 where the reference signal is output as shown in the figure above.

When the display waveform of signal generators 1 and 2 (CH1, CH2) input to the oscilloscope are stationary, it expresses that the frequency of the reference oscillator of the MS2690A/MS2691A/MS2692A and the reference frequency are synchronized, and normal values are acquired.

However, in the event synchronization is not achieved where the display waveform shifts to the right or left, adjust the reference oscillator of the MS2690A/MS2691A/MS2692A.

6. To achieve synchronization, start the Signal Analyzer application. Then press F8 (Accessory) from the Main function menu of the signal analyzer.
7. Press F6 (Reference Clock) from the Accessory function menu.
8. Press F1 (Reference Clock) then input adjustment values. The adjustment value can be set from 0 to 1023.
9. In practice, waveforms of the output frequency and reference frequency cannot be completely matched. Adjust so that phase fluctuations are as small as possible.
10. Perform adjustments, and when the output frequency of the MS2690A/MS2691A/MS2692A and the reference frequency match, the display waveform of the oscilloscope will be stationary.

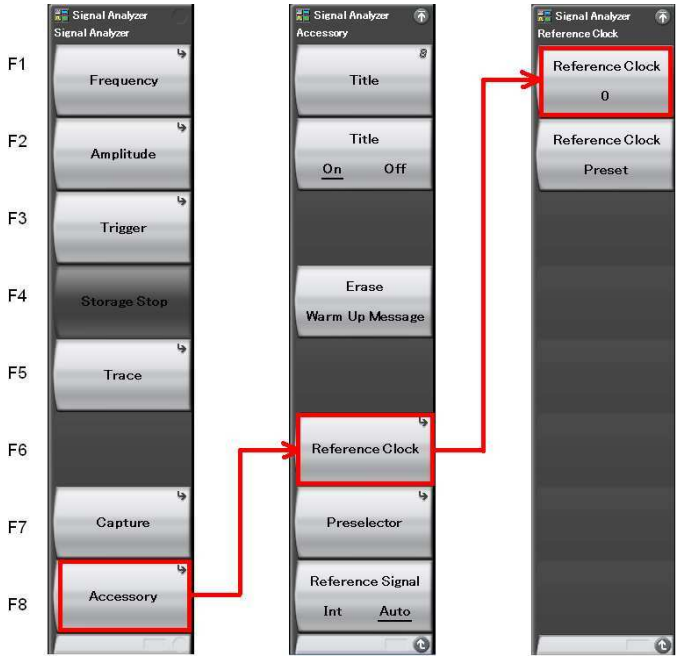


Figure 8.3.3-3 Signal analyzer function menu

Performance Test Result Form

Test Location _____ Report No. _____

Date _____

Test person in charge _____

Equipment Name: MS2690A/MS2691A/MS2692A Signal Analyzer

Serial No. _____ Ambient temperature _____ °C

Power frequency _____ Relative humidity _____ %

Remarks _____

■ Reference Oscillator Frequency Stability

Setting	Results	Frequency Temperature Stability	Frequency Stability Specification Range
Frequency (at 23°C)			$\pm 2 \times 10^{-8}$ 5 to 45°C (Reference 23°C)
Frequency (at 45°C)			

Frequency temperature stability = [Frequency (at 45°C) – Frequency (at 23°C)]/Frequency (at 23°C)

Setting	Results	Frequency Temperature Stability	Frequency Stability Specification Range
Frequency (at 23°C)			$\pm 2 \times 10^{-8}$ 5 to 45°C (Reference 23°C)
Frequency (at 5°C)			

Frequency temperature stability = [Frequency (at 5°C) –Frequency (at 23°C)]/Frequency (at 23°C)

■ Display Frequency Accuracy

MS2690A display frequency accuracy test

Setting for MS2690A			Minimum [Hz]	Reading Frequency	Maximum [Hz]
Frequency [Hz]	Frequency Span [Hz]	Resolution Bandwidth [Hz]			
1.5 G	10 k	300	1499999962		1500000038
	200 k	3 k	1499999420		1500000580
	2 M	30 k	1499994200		1500005800
	5 M	30 k	1499987500		1500012500
	10 M	100 k	1499973000		1500027000
	20 M	100 k	1499952000		1500048000
	3 G	3 M	1493400000		1506600000

MS2691A display frequency accuracy test

Setting for MS2690A			Minimum [Hz]	Reading Frequency	Maximum [Hz]
Frequency [Hz]	Frequency Span [Hz]	Resolution Bandwidth [Hz]			
1.5 G	10 k	300	1499999962		1500000038
	200 k	3 k	1499999420		1500000580
	2 M	30 k	1499994200		1500005800
	5 M	30 k	1499987500		1500012500
	10 M	100 k	1499973000		1500027000
	20 M	100 k	1499952000		1500048000
	3 G	3 M	1493400000		1506600000
7 G	10 k	300	6999999962		7000000038
	50 k	3 k	6999999740		7000000260
	2 M	30 k	6999994200		7000005800
	5 M	30 k	6999987500		7000012500
	10 M	100 k	6999973000		7000027000
	20 M	100 k	6999952000		7000048000
	1600 M	3 M	6996480000		7003520000

MS2692A display frequency accuracy test

Setting for MS2690A			Minimum [Hz]	Reading Frequency	Maximum [Hz]
Frequency [Hz]	Frequency Span [Hz]	Resolution Bandwidth [Hz]			
1.5 G	10 k	300	1499999962		1500000038
	200 k	3 k	1499999420		1500000580
	2 M	30 k	1499994200		1500005800
	5 M	30 k	1499987500		1500012500
	10 M	100 k	1499973000		1500027000
	20 M	100 k	1499952000		1500048000
	3 G	3 M	1493400000		1506600000
7 G	10 k	300	6999999962		7000000038
	50 k	3 k	6999999740		7000000260
	2 M	30 k	6999994200		7000005800
	5 M	30 k	6999987500		7000012500
	10 M	100 k	6999973000		7000027000
	20 M	100 k	6999952000		7000048000
	1600 M	3 M	6996480000		7003520000
17.5 G	10 k	300	17499999962		17500000038
	50 k	3 k	17499999740		17500000260
	2 M	30 k	17499994200		17500005800
	5 M	30 k	17499987500		17500012500
	10 M	100 k	17499973000		17500027000
	20 M	100 k	17499952000		17500048000
	1600 M	3 M	17496480000		17503520000

■ Frequency Span Display Accuracy

Frequency span frequency display verification test

Settings for MS2690A/MS2691A/MS2692A				Minimum [%]	Measurement Results	Maximum [%]
Frequency [Hz]	Frequency Span [Hz]	Signal Generator				
		f_1 [Hz]	f_2 [Hz]		$(f_2' - f_1')/0.8$ /SPAN × 100 – 100 [%]	
3 G	10 k	2999996000	3000004000	–0.2		+0.2
	2 M	2999200000	3000800000	–0.2		+0.2
	30 M	2988000000	3012000000	–0.2		+0.2
	400 M	2840000000	3160000000	–0.2		+0.2
	6 G	600000000	5400000000	–0.2		+0.2
7 G (only for MS2691A and MS2692A)	10 k	6999996000	7000004000	–0.2		+0.2
	2 M	6999200000	7000800000	–0.2		+0.2
	30 M	6988000000	7012000000	–0.2		+0.2
	400 M	6840000000	7160000000	–0.2		+0.2
	2 G	6200000000	7800000000	–0.2		+0.2
6.75 GHz (only for MS2691A and MS2692A)	13.5 G	1350000000	12150000000	–0.2		+0.2
13.25 GHz (only for MS2692A)	26.5 G	2650000000	23850000000	–0.2		+0.2

■ Single Sideband Noise Level

Settings for MS2690A/MS2691A/MS2692A			Measurement Results	Maximum [dBc/Hz]	Uncertainty [dB]
Offset Frequency [Hz]	Center Frequency [Hz]	Resolution Bandwidth [Hz]			
100 k	2.0001 G	10 k		–116	+0.5
1 M	2.001 G	30 k		–137	+0.5

■ RF Frequency Characteristics

Frequency Band Mode: Normal (MS2690A/MS2691A/MS2692A) Without Preamplifier or Preamplifier=OFF

Frequency [Hz]	Calibration Value [dBm]	Measured Value [dBm]	Minimum [dB]	Measurement Results: Measured Value−Calibration Value [dB]	Maximum [dB]	Uncertainty [dB]
5 M			–0.35		+0.35	±0.11
10 M			–0.35		+0.35	±0.11
20 M			–0.35		+0.35	±0.11
50 M			–0.35		+0.35	±0.11
100 M			–0.35		+0.35	±0.11
200 M			–0.35		+0.35	±0.11
500 M			–0.35		+0.35	±0.11
1 G			–0.35		+0.35	±0.11
2 G			–0.35		+0.35	±0.11
3 G			–0.35		+0.35	±0.11
4 G			–0.35		+0.35	±0.11
5 G			–0.35		+0.35	±0.11
6 G			–0.35		+0.35	±0.11

Frequency Band Mode: Normal (MS2690A/MS2691A/MS2692A) With Preamplifier and Preamplifier=ON

Frequency [Hz]	Calibration Value [dBm]	Measured Value [dBm]	Minimum [dB]	Measurement Results: Measured Value−Calibration Value [dB]	Maximum [dB]	Uncertainty [dB]
50 M			–0.65		+0.65	±0.15
100 M			–0.65		+0.65	±0.15
200 M			–0.65		+0.65	±0.15
500 M			–0.65		+0.65	±0.15
1 G			–0.65		+0.65	±0.15
2 G			–0.65		+0.65	±0.15
3 G			–0.65		+0.65	±0.15
4 G			–0.65		+0.65	±0.15
5 G			–0.65		+0.65	±0.15
6 G			–0.65		+0.65	±0.15

Frequency Band Mode: Normal (only for MS2691A/MS2692A)

Frequency [Hz]	Calibration Value [dBm]	Measured Value [dBm]	Minimum [dB]	Measurement Results: Measured Value—Calibration Value [dB]	Maximum [dB]	Uncertainty [dB]
6.01 G			–1.50		+1.50	±0.30
8 G			–1.50		+1.50	±0.30
10 G			–1.50		+1.50	±0.30
12 G			–1.50		+1.50	±0.30
13.5 G			–1.50		+1.50	±0.30

Frequency Band Mode: Normal (only for MS2692A)

Frequency [Hz]	Calibration Value [dBm]	Measured Value [dBm]	Minimum [dB]	Measurement Results: Measured Value—Calibration Value [dB]	Maximum [dB]	Uncertainty [dB]
13.51 G			–2.50		+2.50	±0.70
16 G			–2.50		+2.50	±0.70
20 G			–2.50		+2.50	±0.70
20.01 G			–2.50		+2.50	±0.70
23 G			–2.50		+2.50	±0.70
26.5 G			–2.50		+2.50	±0.70

Frequency Band Mode: Spurious (only when Option 003 is installed)

Frequency [Hz]	Calibration Value [dBm]	Measured Value [dBm]	Minimum [dB]	Measurement Results: Measured Value—Calibration Value [dB]	Maximum [dB]	Uncertainty [dB]
3.01 G			–1.50		+1.50	±0.30
4 G			–1.50		+1.50	±0.30
5 G			–1.50		+1.50	±0.30
6 G			–1.50		+1.50	±0.30

■ Display Average Noise Level

Frequency Band Mode: Normal Without Preamplifier

Center Frequency [Hz]	Display Average Noise Level (dBm/Hz)	Specification Value
100 k		–135
1 M		–145
30 M		–155
99 M		
999 M		
1999 M		
2399 M		
2999 M		–153
3999 M		
4999 M		–152
5999 M		
6001 M		–151
8001 M		
9999 M		
11499 M		–150
13499 M		
13501 M		–147
16999 M		
19999 M		
20001 M		–143
22999 M		
26499 M		

Note:

9 kHz to 5999 MHz for the MS2690A
9 kHz to 13500 MHz for the MS2691A
9 kHz to 26500 MHz for the MS2692A

Frequency Band Mode: Normal With Preamplifier and Preamplifier=ON

Center Frequency [Hz]	Display Average Noise Level (dBm/Hz)	Specification Value
100 k		–150
1 M		–159
30 M		–166
99 M		
999 M		
1999 M		
2399 M		
2999 M		–165
3999 M		–164
4999 M		–161
6000 M		–159

Note:

100 kHz to 6000 MHz for the MS2690A
100 kHz to 6000 MHz for the MS2691A
100 kHz to 6000 MHz for the MS2692A

Frequency Band Mode: Normal With Preamplifier and Preamplifier=OFF

Center Frequency [Hz]	Display Average Noise Level (dBm/Hz)	Specification Value
100 k		–135
1 M		–145
30 M		–153
99 M		
999 M		
1999 M		
2399 M		
2999 M		–152
3999 M		–151
4999 M		–150
5999 M		–149
6001 M		–151
8001 M		
9999 M		
11499 M		–150
13499 M		
13501 M		–147
16999 M		
19999 M		
20001 M		–143
22999 M		
26499 M		

Note:

9 kHz to 5999 MHz for the MS2690A
9 kHz to 13500 MHz for the MS2691A
9 kHz to 26500 MHz for the MS2692A

Frequency Band Mode: Spurious (Only when Option 003 is installed)

Center Frequency [Hz]	Display Average Noise Level (dBm/Hz)	Specification Value
100 k		–135
1 M		–145
30 M		–155
99 M		
999 M		
1999 M		
2399 M		
2999 M		–153
3001 M		–148
4999 M		
5999 M		
6001 M		–151
8001 M		
9999 M		
11499 M		–150
13499 M		
13501 M		–147
16999 M		
19999 M		
20001 M		–143
22999 M		
26499 M		

Note:

9 kHz to 13500 MHz for the MS2691A
9 kHz to 26500 MHz for the MS2692A

■ Second Harmonic Wave Distortion

Second harmonic wave measurement — Without Preamplifier

Settings for MS2690A/MS2691A/MS2692A			Measurement Results [dBc]	Maximum [dBc] (Mixer Input Level=–30 dBm)	Uncertainty [dB]
Frequency [MHz]	Ref_Level [dBm]	Applicable LPF			
10	–10	SLP-10.7 (2-stage series)		–60	+1.5
51	–10	SLP-50+			+1.5
101	–10	SLP-100+			+1.5
401	–10	VLF-400(+)		–75	+1.5
801	–10	SLP-850+			+1.5
1001	–10	VLF-1200(+)			+1.5
1801	–10	VLF-2250(+) (2-stage series)			+1.5
2999	–10	VLF-3000(+) (2-stage series)			+1.5

Second harmonic wave measurement — With Preamplifier

Settings for MS2690A/MS2691A/MS2692A			Measurement Results [dBc]	Maximum [dBc] (Mixer Input Level=–30 dBm)	Uncertainty [dB]
Frequency [MHz]	Ref_Level [dBm]	Applicable LPF			
10	–10	SLP-10.7 (2-stage series)		–50	+1.5
51	–10	SLP-50+			+1.5
101	–10	SLP-100+			+1.5
401	–10	VLF-400(+)		–55	+1.5
801	–10	SLP-850+			+1.5
1001	–10	VLF-1200(+)			+1.5
1801	–10	VLF-2250(+) (2-stage series)			+1.5
2999	–10	VLF-3000(+) (2-stage series)			+1.5

Appendix B Panel Keys and Keyboard Operations

Table B-1 Correspondences between panel keys and keyboard operations

Panel Key	USB Keyboard
Preset [Preset]	[Ctrl]+[Shift]+[R]
Menu [Top]	[Ctrl]+[Shift]+[↑]
F1 [F1]	[F1]
F2 [F2]	[F2]
F3 [F3]	[F3]
F4 [F4]	[F4]
F5 [F5]	[F5]
F6 [F6]	[F6]
F7 [F7]	[F7]
F8 [F8]	[F8]
[Back]	[Ctrl]+[Shift]+[←]
[More]	[Ctrl]+[Shift]+[→]
Trace [Trace]	[Ctrl]+[Alt]+[V]
Measure [Measure]	[Ctrl]+[Alt]+[X]
Encoder [Right rotation]	Mouse wheel [Scroll for above]
Encoder [Left rotation]	Mouse wheel [Scroll for below]
[↑]	[↑]
[→]	[→]
[↓]	[↓]
[←]	[←]
Enter [Enter]	[Enter]

Table B-1 Correspondences between panel keys and keyboard operations (Cont'd)

Panel Key	USB Keyboard
[0]	[0]
[1]	[1]
[2]	[2]
[3]	[3]
[4]	[4]
[5]	[5]
[6]	[6]
[7]	[7]
[8]	[8]
[9]	[9]
[.]	[.]
[+/-]	[-]
[Shift]	[Shift]+
[Cancel]	[Esc]
[BS]	[Back Space]
[Single]	[Ctrl]+[Shift]+[F1]
[Continuous]	[Ctrl]+[Shift]+[F2]
[Frequency]	[Ctrl]+[Shift]+[0]
[Span]	[Ctrl]+[Shift]+[1]
[Amplitude]	[Ctrl]+[Shift]+[2]
[Marker]	[Ctrl]+[Shift]+[3]
[BW]	[Ctrl]+[Shift]+[4]
[Trigger/Gate]	[Ctrl]+[Shift]+[5]
[Time/Sweep]	[Ctrl]+[Shift]+[6]
[Peak Search]	[Ctrl]+[Shift]+[7]
[Save]	[Ctrl]+[S]
[Recall]	[Ctrl]+[O]
[Copy]	[Ctrl]+[Shift]+ [8]
[Cal]	[Ctrl]+[Shift]+[9]

Note:

The figure in [Ctrl]+[Shift]+"figure" cannot be entered by the numeric keypad.

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Symbol and Numbers

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