MS2690A/MS2691A/MS2692A
and
MS2830A/MS2840A/MS2850A
Signal Analyzer
Operation Manual
Phase Noise Measurement Function
Operation

14th Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation), MS2830A Signal Analyzer Operation Manual (Mainframe Operation), MS2840A Signal Analyzer Operation Manual (Mainframe Operation), or MS2850A Signal Analyzer Operation Manual (Mainframe Operation). Please also refer to them before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W3117AE-14.0

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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 and MS2830A/MS2840A/MS2850A
Signal Analyzer
Operation Manual Phase Noise Measurement Function Operation

25 April 2008 (First Edition)
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Revision History:

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

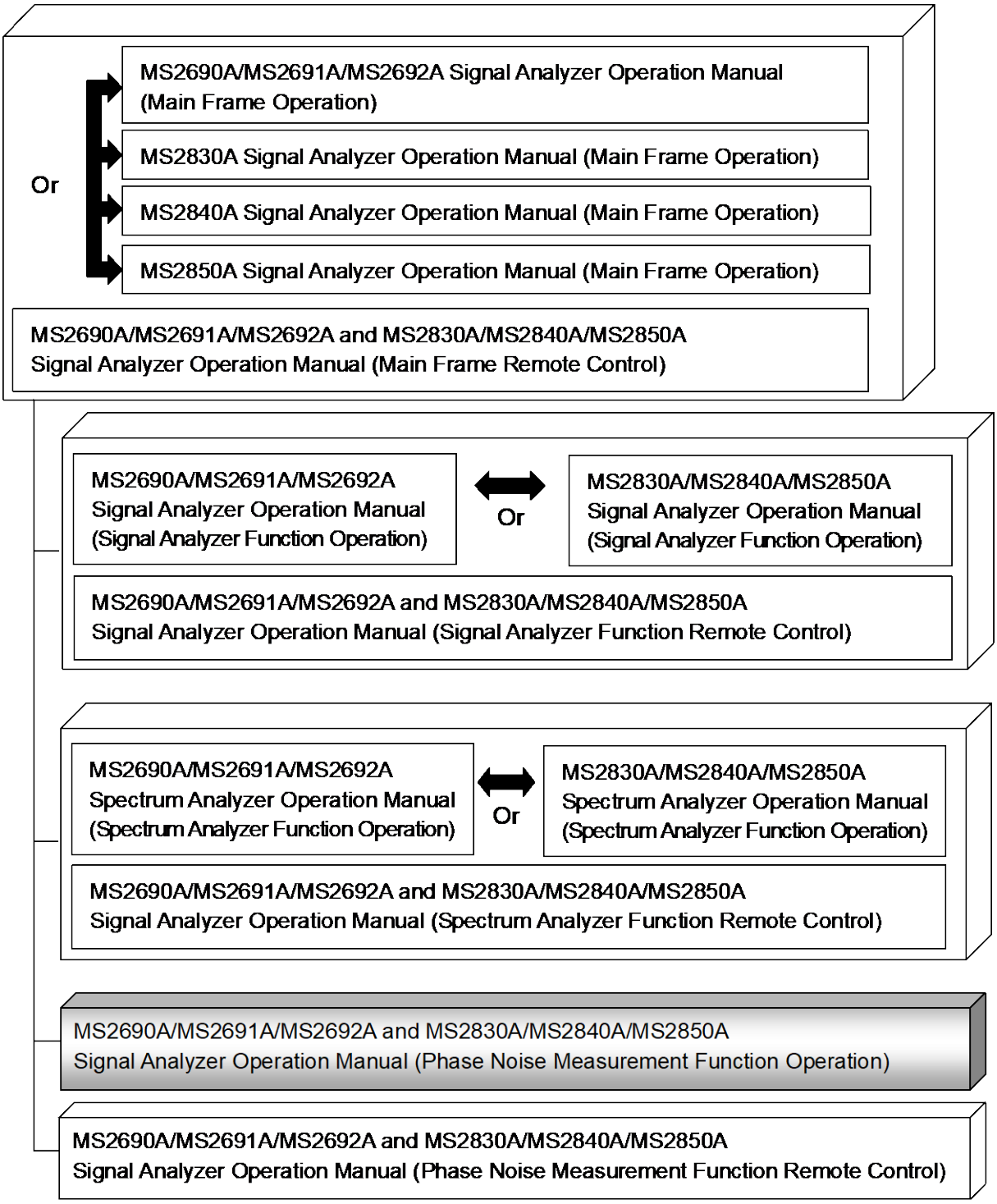
Cautions Against Computer Virus Infection

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

About This Manual

■ Associated Documents

The operation manual configuration of the MS2690A/MS2691A/MS2692A, MS2830A, MS2840A and MS2850A Signal Analyzer is shown below.



- Signal Analyzer Operation Manual (Mainframe)
- 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, common functions and common 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, common functions and common remote functions of the spectrum analyzer

- Signal Analyzer Operation Manual (Phase Noise Measurement Function) <This document>
- Signal Analyzer Operation Manual (Phase Noise Measurement Function Remote Control)

  Description of basic operations, common functions and common remote functions of the Phase Noise Measurement function

Convention Used in This Manual

Throughout this document, the use of MS269x Series is assumed unless otherwise specified.

If using MS2830A, MS2840A or MS2850A change MS269xA to read MS2830A, MS2840A or MS2850A.

In this document, indicates a panel key.

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Chapter 1 Overview

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1.1 Overview of Phase Noise Measurement function

The MS2690A/MS2691A/MS2692A, MS2830A, MS2840A or MS2850A Signal Analyzer enables high-speed, high-accuracy, and simple measurements of transmission characteristics of base stations and mobile stations for various types of mobile communications.

The phase noise measurement function is provided for measuring phase noise, which is an important factor for evaluating the short-term stability of signals. With this application, the MS2690A/MS2691A/MS2692A, MS2830A, MS2840A or MS2850A can be used in various applications, including design verification, troubleshooting, and testing on production lines.

This function has following features:

- High speed, high accuracy phase noise measurement

1.2 Specification

Table 1.2-1 shows the specifications for Phase Noise Measurement Function Option.

Table 1.2-1 Phase Noise Measurement Function Option Specifications

Item	Specification
Function	Displays the phase noise characteristics on a logarithmic scale.
Frequency	
Range	10 MHz to Upper frequency limit
Offset frequency range	10 Hz to 10 MHz
Marker Mode	Normal, Integral Noise, RMS Noise, Jitter, Residual FM, Off

1.2.1 External Mixer Connection Function (MX284090A)

Table 1.2.1 1 lists the specifications for the External Mixer Connection Function (MX284090A).

The revision information of the SA RF Board can be checked at "Board Revision View". Refer to 3.4.6, "System Information" in the *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*, *MS2840A Signal Analyzer Operation Manual (Mainframe Operation)*, or *MS2850A Signal Analyzer Operation Manual (Mainframe Operation)*.

Table 1.2.1-1 Specifications for External Mixer Connection Function

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Intended Use</td><td>To enable the connection of 3rd-party external mixers to the MS2830A, MS2840A, or MS2850A.
The software is available when the Signal Analyzer and its optional hardware are combined as follows:
MS2830A: MS2830A-044/-045
MS2840A: MS2840A-044/-046
MS2850A: No optional hardware required.</td></tr>
<tr><td>Function</td><td></td></tr>
<tr><td>3rd Party Mixer</td><td>Select the characteristics of the external mixer to be connected.
Polarity is '–' if the local frequency is higher than the input frequency, and '+' if it is lower than the input frequency.
<table>
<tr><th></th><th>Start Freq</th><th>Stop Freq</th><th>Mixing Order</th><th>Polarity</th></tr>
<tr><td>40 to 60 GHz/8–</td><td>40 GHz</td><td>60 GHz</td><td>8</td><td>–</td></tr>
<tr><td>50 to 75 GHz/8+</td><td>50 GHz</td><td>75 GHz</td><td>8</td><td>+</td></tr>
<tr><td>60 to 90 GHz/12–</td><td>60 GHz</td><td>90 GHz</td><td>12</td><td>–</td></tr>
<tr><td>75 to 110 GHz/12+</td><td>75 GHz</td><td>110 GHz</td><td>12</td><td>+</td></tr>
<tr><td>90 to 140 GHz/16+</td><td>90 GHz</td><td>140 GHz</td><td>16</td><td>+</td></tr>
<tr><td>110 to 170 GHz/18+</td><td>110 GHz</td><td>170 GHz</td><td>18</td><td>+</td></tr>
<tr><td>120 to 170 GHz/24–</td><td>120 GHz</td><td>170 GHz</td><td>24</td><td>–</td></tr>
<tr><td>140 to 220 GHz/24+</td><td>140 GHz</td><td>220 GHz</td><td>24</td><td>+</td></tr>
<tr><td>150 to 220 GHz/24+</td><td>150 GHz</td><td>220 GHz</td><td>24</td><td>+</td></tr>
<tr><td>170 to 240 GHz/24+</td><td>170 GHz</td><td>240 GHz</td><td>24</td><td>+</td></tr>
<tr><td>240 to 325 GHz/48–</td><td>240 GHz</td><td>325 GHz</td><td>48</td><td>–</td></tr>
<tr><td>220 to 325 GHz/36+</td><td>220 GHz</td><td>325 GHz</td><td>36</td><td>+</td></tr>
</table>
The local frequency to be output is as follows:
Local Frequency = (Input Frequency – Polarity × IF Frequency) / Mixing Order
IF Frequency:
1875 MHz When the revision number of the SA RF Board on the MS2830A is 5 or earlier.
1875.5 MHz When the revision number of the SA RF Board on the MS2830A, MS2840A, or MS2850A is 6 or later.</td></tr>
</table>

Table 1.2.1-2 Specifications for External Mixer Connection Function (Cont'd)

Item	Specifications
Load User-Defined Conversion Loss File	Loads a user-defined conversion loss file.
Optional Applications	Spectrum Analyzer Function, Signal Analyzer Function, Phase Noise Measurement Function (When the MS2830A-010/110, MS2840A-010/110, or MS2850A-010/110 is installed)

Chapter 2 Preparation

This chapter describes the preparations required for using the application you are using. Refer to the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)*, *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*, *MS2840A Signal Analyzer Operation Manual (Mainframe Operation)*, or *MS2850A Signal Analyzer Operation Manual (Mainframe Operation)* for common features not included in this manual.

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2.1 Part Names

This section describes the panel keys for operating the instrument and connectors used to connect external devices. For general points of caution, refer to the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)*, *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*, *MS2840A Signal Analyzer Operation Manual (Mainframe Operation)*, *or MS2850A Signal Analyzer Operation Manual (Mainframe Operation)*.

2.1.1 Front panel

This section describes the front-panel keys and connectors.

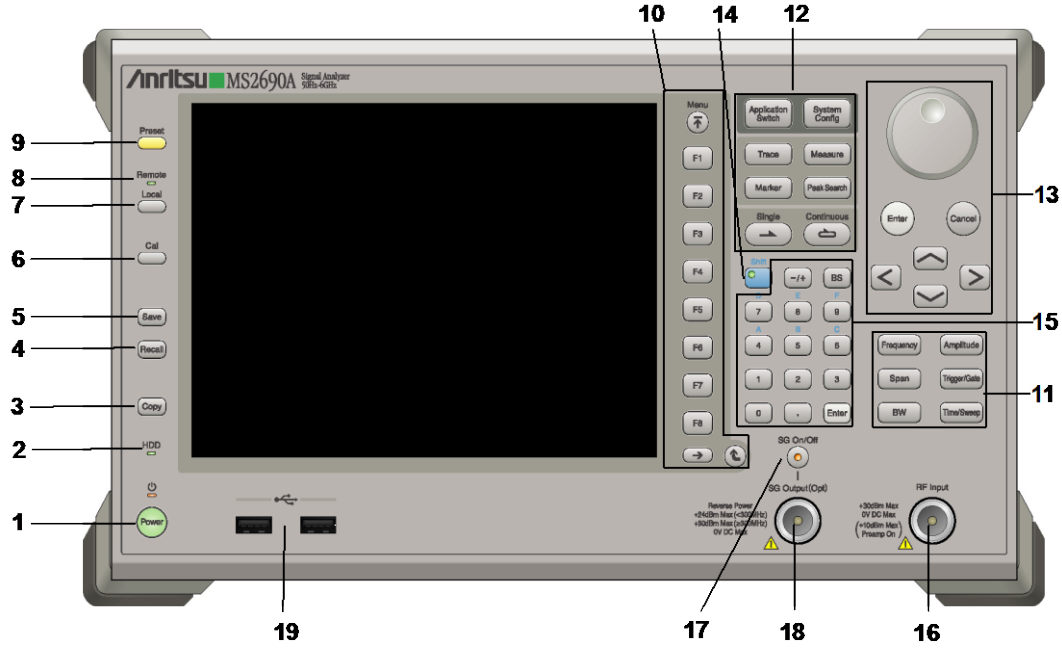


Figure 2.1.1-1 MS269x series front panel

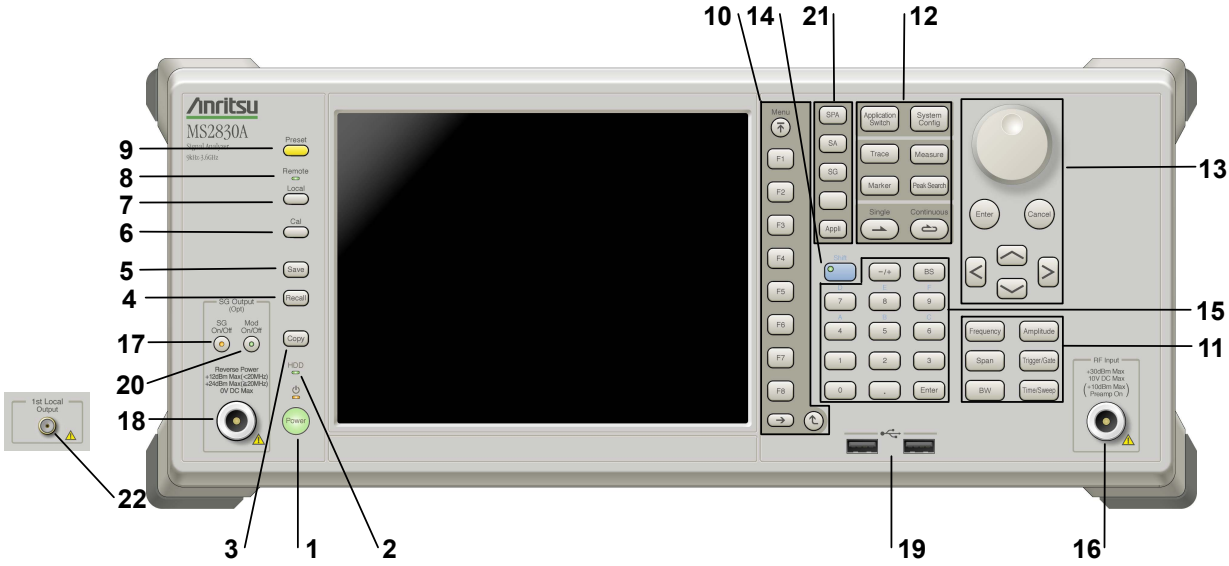
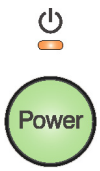


Figure 2.1.1-2 MS2830A/MS2840A/MS2850A front panel (MS2830A Example)

1 

Power Switch

Press to switch between the standby state (AC power supplied) and power-on state. The Power lamp lights orange at Standby and green at Power On. Press the power switch for about 2 seconds.

2

Hard disk access lamp (MS269x series, MS2830A)

Lights up when accessing the internal hard disk.

SSD access lamp (MS2840A, MS2850A)

Lights up when accessing the internal SSD.

3

Copy key

Press to capture display screen and save to file.

4

Recall key

Press to recall parameter file.

5

Save key

Press to save parameter file.

6

Cal key

Press to display the Calibration menu.

7

Local key

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

8

Remote lamp

Lights when in remote-control state.

9

Preset key

Resets parameters to initial settings.

10

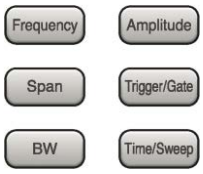
Function keys

Selects or configures function menu displayed on the right of the screen. The function menu is provided in multiple pages and layers.

Press → to fetch next function menu page. The current page number is displayed at the bottom of the function menu, as in "1 of 2".

Sub-menus may be displayed when a function menu is pressed. Press ↩ to go back to the previous menu. Press Menu to go back to the top menu.

11



Main function keys 1

Press to set or execute main functions.

Executable functions vary with the current application. When nothing happens with the press, it indicates that the application in use does not support the key.

Frequency Press to set frequency parameters.

Amplitude Press to set level parameters.

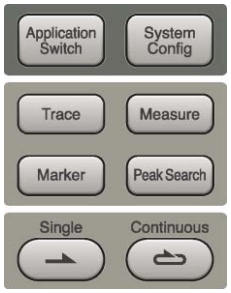
Span No function is assigned to this key.

Trigger/Gate Press to set trigger parameters.

BW No function is assigned to this key.

Time/Sweep Press to set measurement item parameters.

12



Main function keys 2

Press to set or execute main functions.

Executable functions vary with the current application. When nothing happens with the press, it indicates that the application in use does not support the key.

Application Switch Press to switch application.

System Config Press to display Configuration screen.

Trace Press to set the trace items or to switch the operation window.

Measure Press to set measurement item parameters.

Marker Use when switching graph marker operation.

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

Single Press to start single measurement.

Continuous Press to start continuous measurements.

13

Rotary knob/Cursor key/Enter key/Cancel key

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

Press Enter to set the entered or selected data.

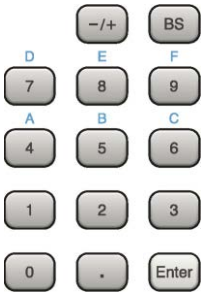
Press Cancel to cancel input or selected data.

14

Shift key

Operates keys with functions in blue characters on panel. Press the Shift key so the key lamp is green and then press the target key.

15



Numeric keypad

Enters numbers on parameter setup screens.

Press BS to delete the last entered digit or character.

[A] to [F] can be entered by pressing keys 4 to 9 while the Shift key lamp Shift is green.

16 RF Input

RF Input connector

Inputs RF signal. This is an N type input connector.
This is a K type input connector when MS2830A-045, MS2840A-046 is installed or MS2850A.

17 SG On/Off

RF Output Control key (when MS269xA-020/120, MS2830A-020/120/021/121, MS2840A-020/120/021/121 is installed)

Press SG On/Of to switch on/off the modulation of RF signal when the Vector Signal Generator option is installed. The RF output control key lamp lights orange when the RF signal output is set to On.
This cannot be installed on any of these models: the MS2830A with MS2830A-044/045, the MS2840A with MS2840A-044/046, or the MS2850A.

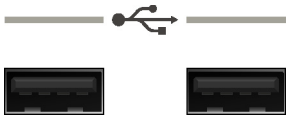
18 SG Output(Opt)

RF Output connector (when MS269xA-020/120, MS2830A-020/120/021/121, MS2840A-020/120/021/121 is installed)

Outputs RF signal, when the Vector Signal Generator option is installed. This is an N type output connector.

This cannot be installed on any of these models: the MS2830A with MS2830A-044/045, the MS2840A with MS2840A-044/046, or the MS2850A.

19



USB connector (type A)

Connect the accessory USB keyboard, mouse or USB memory.

20 Mod On/Off

Modulation control key (when MS2830A-020/120/021/121, MS2840A-020/120/021/121 is installed)

Press to switch on/off the modulation of RF signal when the Vector Signal Generator option is installed. The lamp on the key lights up in green in the modulation On state.

This cannot be installed on any of these models: the MS2830A with MS2830A-044/045, the MS2840A with MS2840A-044/046, or the MS2850A.

21

Application key (MS2830A, MS2840A, MS2850A)

Press to switch between applications.

Press to display the Spectrum Analyzer main screen.

Press to display the Signal Analyzer main screen, when MS2830A-005/105/007/006/106/009/109/077/078 or MS2840A-005/105/006/106/009/109/077/177/078/178 is installed or MS2850A.

Press to display the Signal Generator main screen, when Vector Signal Generator option is installed. (MS2830A, MS2840A)

This is a blank key. Not used. (MS2830A, MS2840A)

Displays the main screen of the application that is selected using the Application Switch (Auto), or displays that of the pre-selected application (Manual).
For details, refer to 3.5.4 “Changing application layout” in *MS2830A Signal Analyzer Operation Manual (Mainframe Operation), MS2840A Signal Analyzer Operation Manual (Mainframe Operation),* or *MS2850A Signal Analyzer Operation Manual (Mainframe Operation)*.

22

1st Local Output connector (MS2830A, MS2840A, MS2850A)

This is available when MS2830A-044/045, MS2840A-044/046 is installed, or MS2850A.
Supplies local signal and bias current to the external mixer, and receives the IF signal with its frequency converted.

2.1.2 Rear panel

This section describes the rear-panel connectors.

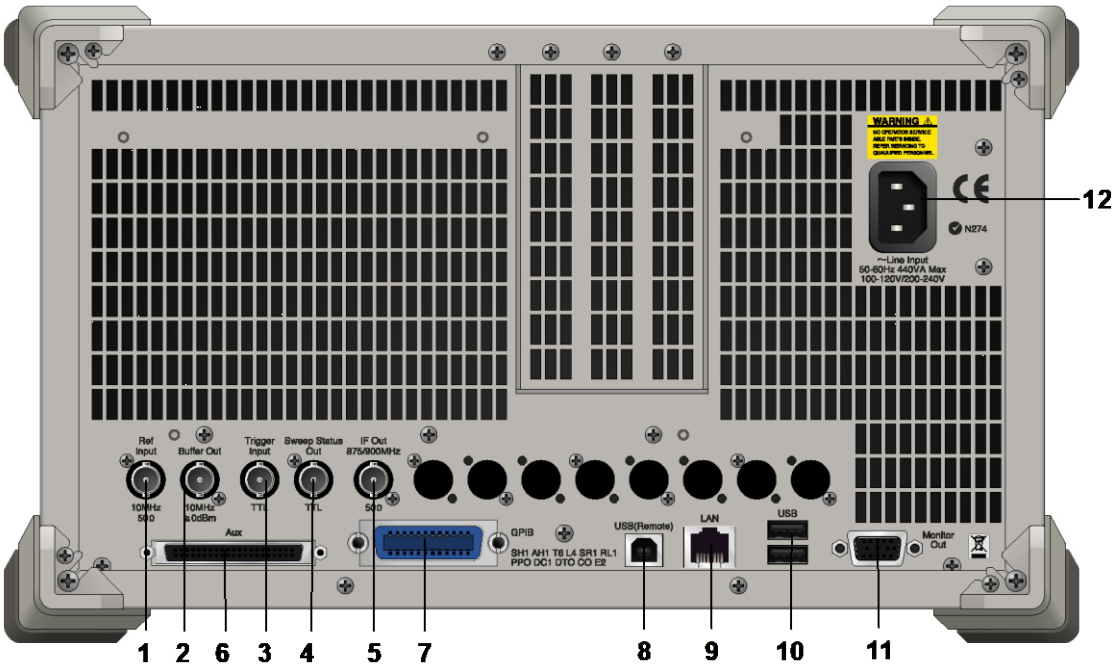


Figure 2.1.2-1 MS269x series rear panel

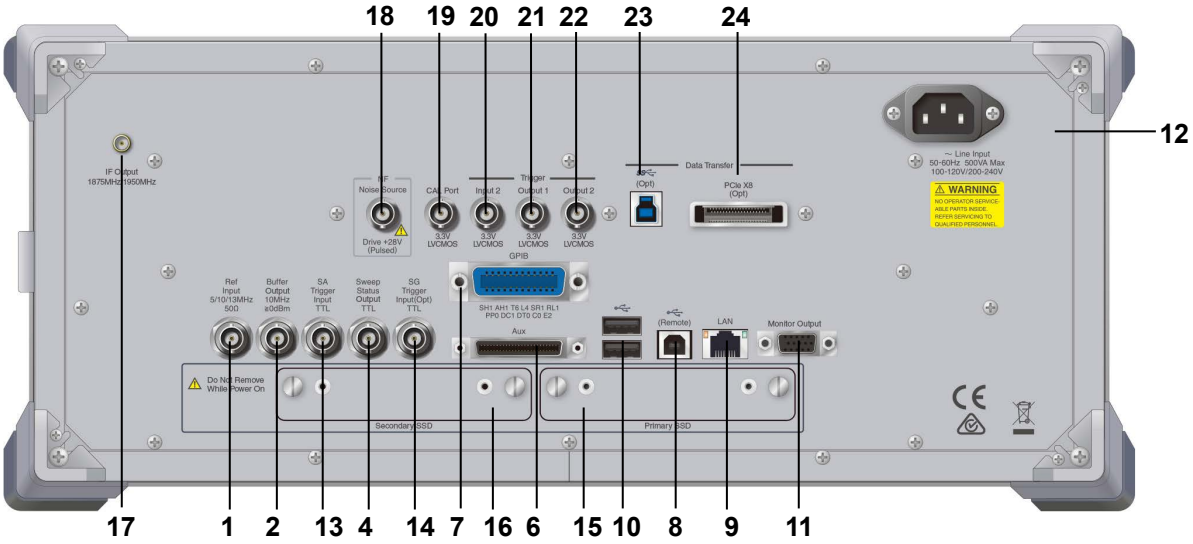


Figure 2.1.2-2 MS2830A/MS2840A/MS2850A rear panel (MS2850A Example)

1 Ref Input

Ref Input connector (reference frequency signal input connector)

Inputs external reference frequency signal. It is for inputting reference frequency signals with higher accuracy than the instrument's internal reference signal, or for synchronizing the frequency of the MS2690A/MS2691A/MS2692A, MS2830A, MS2840A, or MS2850A to that of other equipment. The following frequencies are supported:

MS269x series:	10 MHz/13 MHz
MS2830A, MS2840A, MS2850A:	5 MHz/10 MHz/13 MHz

2 Buffer Out

Buffer Out connector (reference frequency signal output connector)

Outputs the internal reference frequency signal (10 MHz). It is for synchronizing frequencies between other equipment and the MS2690A/MS2691A/MS2692A, MS2830A, MS2840A, or MS2850A.

3 Trigger Input

Trigger Input connector (MS269x series only)

Inputs trigger signal from external device.

4 Sweep Status Out

Sweep Status Out connector

Outputs signal when internal measurement is performed or measurement data is obtained.

5 IF Out 875/900MHz

IF Out connector (MS269x series only)

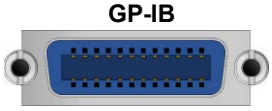
Not used.

6

AUX connector

Not used.

7



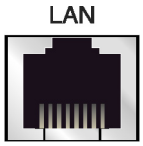
GPIB connector

For external control via GPIB.

8 USB(Remote)

USB connector (type B)

For external control via USB.

9 

Ethernet connector
Connects PC or Ethernet network.

10

USB connector (type A)
Used to connect a USB keyboard or mouse or the USB memory supplied.

11

Monitor Out connector
Connects external display.

12

AC inlet
Supplies power.

13

SA Trigger Input connector (MS2830A, MS2840A, MS2850A)
This is a BNC connector for inputting external trigger signal (TTL) for SPA and SA applications.

14

SG Trigger Input connector (MS2830A, MS2840A)
This is a BNC connector for inputting external trigger signal (TTL) for Vector Signal Generator option.

15	**HDD** or **Primary HDD/SSD**	HDD slot (MS2830A) SSD slot (MS2840A, MS2850A)	This is a standard HDD This is a standard SSD slot.
16	**HDD(Opt)** or **Secondary HDD/SSD**	HDD slot for Option (MS2830A) SSD slot (MS2840A, MS2850A)	This is a HDD slot for the options. This is a SSD slot for the options.

17

IF output connector (MS2830A, MS2840A, MS2850A)
Monitor output of the internal IF signal.
This is installed when MS2830A-044/045, MS2840A-044/046 is installed or MS2850A.

18

Noise Source connector
Supply (+28 V) of the Noise Source Drive.
This is available when the Option 017/117 is installed.

19

CAL Port connector (Future extensions) (MS2850A)

20

Trigger Input 2 connector (MS2850A)
Input the trigger signal (3.3 V LVCMOS) for SPA and SA applications.

21

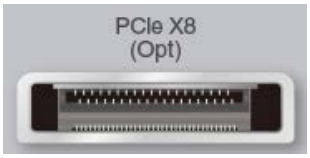
Trigger Output 1 connector (MS2850A)
Output the trigger signal (3.3 V LVCMOS).

22

Trigger Output 2 connector (MS2850A)
Output the trigger signal (3.3 V LVCMOS).

23

USB 3.0 connector (MS2850A)
This is available when the MS2850A-054/154 is installed.

24 

PCIe X8 connector (MS2850A)

This is available when the MS2850A-053/153 is installed.

2.2 Signal Path Setup

As shown in Figure 2.2-1, connect the instrument and the DUT using an RF cable, so that the signal to be tested is input to the RF Input connector. To prevent an excessive level signal from being input, do not input the signal before setting the input level using this application.

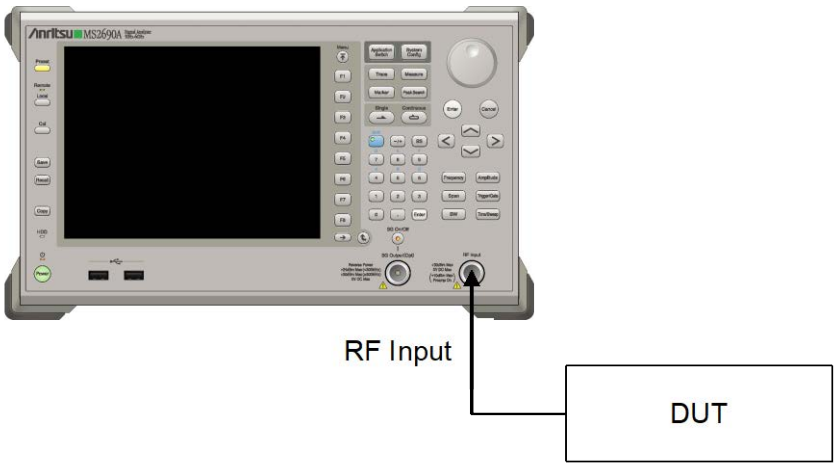


Figure 2.2-1 Signal path setup example

Set the reference signal and/or trigger signal paths from external sources, as required.

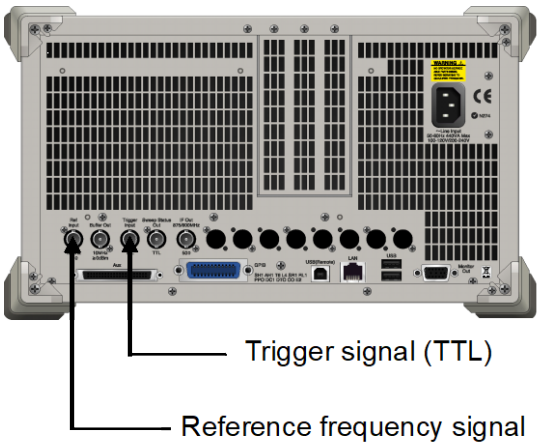


Figure 2.2-2 External signal input

2.3 Application Startup and Selection

To use this application, it is necessary to load (start up) and select the application.

2.3.1 Launching application

The application startup procedure is described below.

Note:

The XXX indicates the application name currently in use.

<Procedure>

1. Press System Config to display the Configuration screen.
2. Press F4 (Application Switch Settings) to display the Application Switch Registration screen.
3. Press F1 (Load Application Select), and move the cursor to "XXX" in the **Unloaded Applications** list.
   If "XXX" is displayed in the **Loaded Applications** list, this means that the application is already loaded.
   If "XXX" appears in neither the **Loaded Applications** nor **Unloaded Applications** list, this means that the application has not been installed.
4. Press F7 (Set) to load the application. If "XXX" is displayed in the **Loaded Applications** list, this means that the application is already loaded.

2.3.2 Selecting application

The selection procedure is described below.

<Procedure>

1. Press Application Switch to display the Application Switch menu.
2. Press the menu function key displaying "XXX".

The application can also be selected with mouse, by clicking "XXX" on the task bar.

2.4 Initialization and Calibration

This section describes the parameter settings and the preparations required before starting measurement.

2.4.1 Initialization

After selecting this application, first perform initialization. Initialization returns the settable parameters to their default value in order to clear the measurement status and measurement results.

Note:

When another software application is switched to or this application is unloaded (ended), the application keeps the parameter settings at that time. The parameter values that were last set will be applied when this application is selected next time.

The initialization procedure is as follows.

<Procedure>

1. Press Preset to display the Preset function menu.
2. Press F1 (Preset).

2.4.2 Calibration

Perform calibration before performing measurement. Calibration sets the level accuracy frequency characteristics for the input level to flat, and adjusts level accuracy deviation caused by internal temperature fluctuations. Calibration should be performed when first performing measurement after turning on power, or if beginning measurement when there is a difference in ambient temperature from the last time calibration was performed.

<Procedure>

1. Press Cal to display the Application Cal function menu.
2. Press F1 (SIGANA All).

For details on calibration functionality only executable with this instrument, refer to the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)* ,*MS2830A Signal Analyzer Operation Manual (Mainframe Operation), MS2840A Signal Analyzer Operation Manual (Mainframe Operation), or MS2850A Signal Analyzer Operation Manual (Mainframe Operation).*

Chapter 3 Measurement

This chapter describes the measurement function, the parameter contents and the setting methods for the MS2690A/MS2691A/MS2692A, MS2830A, MS2840A, or MS2850A.

3.1 Basic Operation 3-2
3.1.1 Screen layout 3-2
3.1.2 Function menu 3-3
3.1.3 Performing Measurement 3-4
3.2 Setting Frequency 3-5
3.3 Setting Level 3-8
3.3.1 Setting Reference Level 3-9
3.3.2 Setting Input Attenuator 3-9
3.3.3 Pre-Amp 3-10
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3.6.3 Marker List 3-18
3.7 Saving Measurement Results 3-19

3.1 Basic Operation

3.1.1 Screen layout

This section describes the screen layout of the phase noise measurement function.

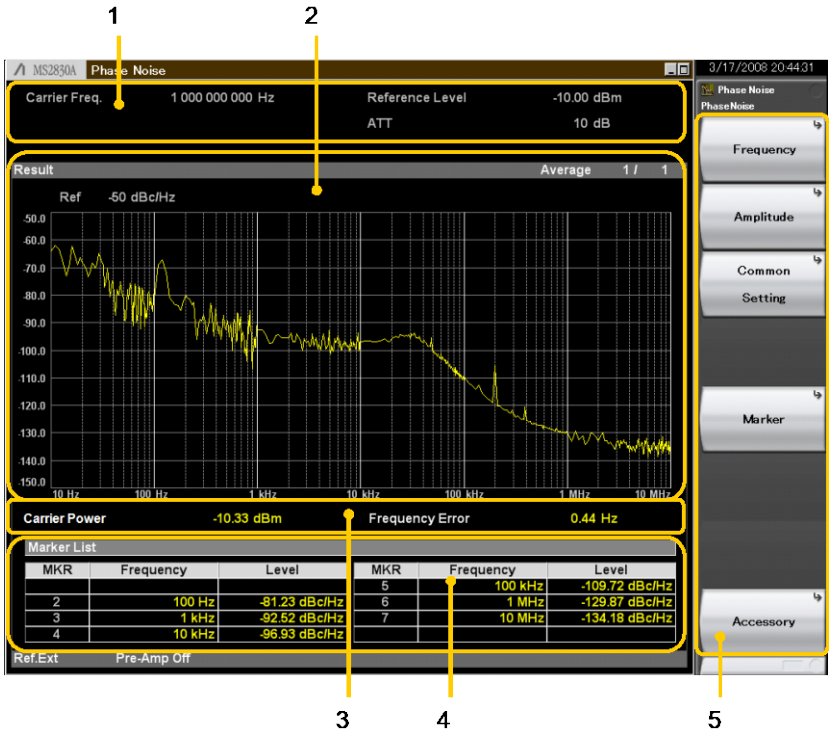

Figure 3.1.1-1 Screen Layout

1. Measurement parameter window
   Displays the currently set measurement parameters.
2. Graph window
   Displays the results in a log plot graph.
3. Numeric result window
   Displays the numeric results.
4. Marker list window
   Displays the numeric results at each marker.
5. Function menu
   Displays the functions executable with function keys.

3.1.2 Function menu

This section describes the main function menu on the main screen.

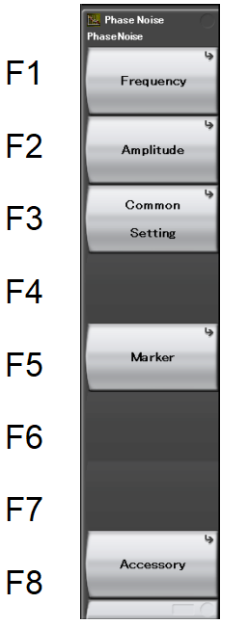

Figure 3.1.2-1 Main function menu

Table 3.1.2-1 Main function menu

Menu Display	Function
Frequency	Sets frequency 3.2 “Setting Frequency”
Amplitude	Sets level. 3.3 “Setting Level”
Common Setting	Sets common items. 3.4 “Setting Common Items”
Marker	Sets a marker. 3.5 “Setting Markers”
Accessory	Sets other functions. 4.1 “Selecting Other Functions”

3.1.3 Performing Measurement

There are two measurement modes: single and continuous. Measurement is performed once in the single measurement mode, and continuously in the continuous measurement mode.

Single

The selected measurement items are measured only once before measurement is stopped.

<Procedure>

Press

.

Continuous

The selected measurement items are measured continuously. Measurement will continue even if parameters are changed or the window display is changed. Measurement stops if other applications are selected.

<Procedure>

Press

.

3.2 Setting Frequency

Configures settings related to frequency. Pressing F1 (Frequency) on the main function menu displays the Frequency function menu and opens the Carrier Frequency dialog box.

Carrier Frequency

- Summary
  Sets a carrier frequency.
- Setting range
  10 MHz to the upper limit, depending on the main unit

Start Offset

- Summary
  Sets an offset lower limit.
- Setting range
  10 Hz to 1 kHz

Stop Offset

- Summary
  Sets an offset upper limit.
- Setting range
  100 kHz to 10 MHz

External Mixer On/Off

- Summary
  Enables the High Performance Waveguide Mixer or a third-party mixer.
- Options
  On Enables the External Mixer function.
  Off Disables the External Mixer function.
- Remarks
  This parameter is always set to Off when the MS2830A, MS2840A, or MS2850A is powered on.

  External Mixer function is MS2830A-044/045, MS2840A-044/046, MS2850A dedicated function. MA2806A and MA2808A are products designed for exclusive use with MS2830A or MS2840A or MS2850A.

  Additionally, when the MX284090A is installed and a third-party mixer is connected, the Signal Analizer becomes ready for a variety of functions the same as when the MA2806A or MA2808A is used.

Table 3.2-1 High Performance Waveguide Mixer

Model	Name	Frequency Range	Waveguide Flange
MA2806A	High Performance Waveguide Mixer (50 to 75 GHz)	50 to 75 GHz	UG385/U
MA2808A	High Performance Waveguide Mixer (60 to 90 GHz)	60 to 90 GHz	UG387/U

The parameter settings for the High Performance Waveguide Mixer or a third-party mixer follow the settings for the Spectrum Analyzer function of the Signal Analyzer.
For details, refer to Chapter 8 "External Mixer" in the *MS2830A/MS2840A/MS2850A Signal Analyzer Operation Manual (Spectrum Analyzer Function Operation)*.

3rd Party Mixer

- Summary

  Turns On when using a third-party mixer. This function is available when the Signal Analyzer and its optional hardware are combined as follows: MS2830A: MS2830A-044/045, MS2840A: MS2840A-044/046, or MS2850A: No optional hardware required. This function is available when External Mixer is On and the MX284090A is installed.

- Options

  Off — Connects the external mixer selected in the Ext Band Select menu.

  On — Connects the external mixer selected in the 3rd Party menu.

External Mixer Band Select

- Summary

  Opens the Ext Band Select menu. In the Ext Band Select menu, select the band for the High Performance Waveguide Mixer.

- Options

  Band V+ High Performance 50 to 75 GHz

  Band E– High Performance 60 to 90 GHz

3rd Party Mixer Band Select

■ Summary

Opens the 3rd Party menu. This function is available when the MX284090A is installed. In the 3rd Party menu, select the band for the measurement frequency.

■ Options

40-60 GHz Mixing order 8–	Third-party mixer with frequency range of 40 to 60 GHz and mixing order (n) 8–
50-75 GHz Mixing order 8+	Third-party mixer with frequency range of 50 to 75 GHz and mixing order (n) 8+
60-90 GHz Mixing order 12–	Third-party mixer with frequency range of 60 to 90 GHz and mixing order (n) 12–
75-110 GHz Mixing order 12+	Third-party mixer with frequency range of 75 to 110 GHz and mixing order (n) 12+
90-140 GHz Mixing order 16+	Third-party mixer with frequency range of 90 to 140 GHz and mixing order (n) 16+
110-170 GHz Mixing order 18+	Third-party mixer with frequency range of 110 to 170 GHz and mixing order (n) 18+
120-170 GHz Mixing order 24–	Third-party mixer with frequency range of 120 to 170 GHz and mixing order (n) 24–
140-220 GHz Mixing order 24+	Third-party mixer with frequency range of 140 to 220 GHz and mixing order (n) 24+
150-220 GHz Mixing order 24+	Third-party mixer with frequency range of 150 to 220 GHz and mixing order (n) 24+
170-240 GHz Mixing order 24+	Third-party mixer with frequency range of 170 to 240 GHz and mixing order (n) 24+
240-325 GHz Mixing order 48–	Third-party mixer with frequency range of 240 to 325 GHz and mixing order (n) 48–
220-325 GHz Mixing order 36+	Third-party mixer with frequency range of 220 to 325 GHz and mixing order (n) 36+

3.3 Setting Level

Configures settings related to level. Pressing F2 (Amplitude) on the main function menu, or pressing Amplitude displays the Amplitude function menu.

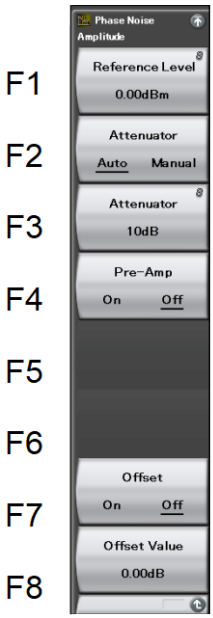

Figure 3.3-1 Amplitude function menu

Table 3.3-1 Amplitude function menu

Menu Display	Function
Reference Level	Sets reference level. 3.3.1 “Setting Reference Level”
Attenuator (Auto/Manual)	Selects whether to set input attenuator automatically or manually. 3.3.2 “Setting Input Attenuator”
Attenuator	The input attenuator can be set. 3.3.2 “Setting Input Attenuator”
Pre-Amp (On/Off)	Sets Pre-Amp function On/Off. 3.3.3 “Pre-Amp”
Scale	Sets scale. 3.3.4 “Setting scale”
Offset (On/Off)	Sets reference level offset function On/Off. 3.3.5 “Setting Reference Level Offset”
Offset Value	Sets reference level offset value. 3.3.5 “Setting Reference Level Offset”

3.3.1 Setting Reference Level

Reference Level

■ Summary

Sets the input level from the target DUT.

■ Setting range

For Pre-Amp: On :

(–120.00 + Offset Value) to (30.00 + Offset Value) dBm

For Pre-Amp: Off:

(–120.00 + Offset Value) to (50.00 + Offset Value) dBm

3.3.2 Setting Input Attenuator

1 Auto

Sets the input attenuator automatically according to the reference level setting. When a signal having the same level as the reference level is input, the input attenuator is automatically set so that the input level to the internal mixer is –10 dBm or less.

2 Manual setting

When measuring a minute-level signal, select Manual and set the input attenuator manually.

The setting range of the input attenuator in Manual setting is as follows.

Setting range and resolution for input attenuator

Input attenuator setting range: Refer to Table 3.3.2-1 or Table 3.3.2-2.

Input attenuator minimum resolution: 2 dB

Table 3.3.2-1 Input attenuator setting range (When Pre-Amp is set to Off)

Attenuator Manual	
Lower Limit	**Upper Limit**
Logic* (αa = 0, β = 1, γ = 2) The minimum value is 0 dB.	60 dB

Table 3.3.2-2 Setting range for input attenuator (When Pre-Amp is set to On)

Attenuator Manual	
Lower Limit	**Upper Limit**
Logic* (α = 20, β = 21, γ = 22) The minimum value is 0 dB.	60 dB

*: Can be obtained as follows, according to the setting condition.

[1] When the reference level can be divided by 2:
Attenuator (dB) = RL*1+α

[2] Other than [1] above, and when INT (RL)*2 is an odd number:
Attenuator (dB) = INT (RL)*2 + β

[3] Other than [1] above, and when INT (RL)*2 is an even number:
Attenuator (dB) = INT (RL)*2+γ

*1: Reference level (dBm)

*2: Integer part of reference level

If External Mixer is set to On, the input attenuator cannot be set.

3.3.3 Pre-Amp

Pre-Amp

■ Summary

Turns the Pre-Amp function On/Off. This is available when MS2830A-008/108/068/168, MS2840A-008/108/068/168/069/169, or MS2850A-068/168 is installed.

■ Selection options

On Enables the Pre-Amp function.

Off Disables the Pre-Amp function.

■ Remarks

If External Mixer is set to On, Pre-Amp is fixed to Off.

3.3.4 Setting scale

Log Scale Line (10/16)

■ Summary

Sets the number of log scale lines.

■ Selection options

10 10 scale lines (–150 dBc/Hz to Reference Value)

16 16 scale lines (–180 dBc/Hz to Reference Value)

Reference Value

■ Summary

Sets the upper limit value of vertical graph axis.

■ Selection options

Log Scale Line: 10

–140 to –50 dBc/Hz

Log Scale Line: 16

–170 to –20 dBc/Hz

3.3.5 Setting Reference Level Offset

Offset

■ Summary

Turns the Offset function On/Off.

■ Selection options

On Enables the offset function.

Off Disables the offset function.

Offset Value

■ Summary

Sets the level offset coefficient.

■ Setting range

–99.99 to + 99.99 dB

■ Setting example

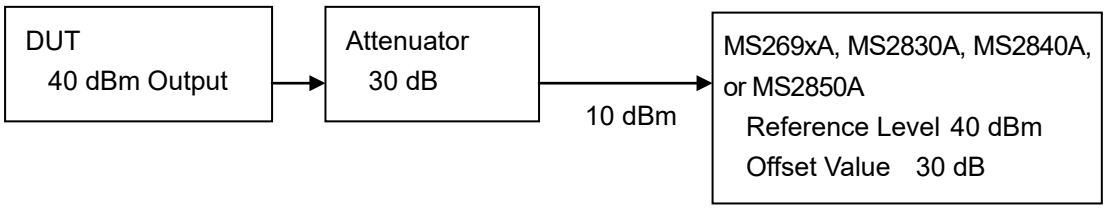

Figure 3.3.5-1 Reference Level and Offset Value setting example

3.4 Setting Common Items

This section describes the settings for the common items. Pressing F3 (Common Setting) on the main function menu displays the Common Setting function menu.

Average

■ Summary

Sets the averaging count (the number of times to repeat measurements internally per one measurement result).

■ Setting range

1 to 999

Phase Noise Optimization

■ Summary

Selects the optimization mode of the phase noise measurement.
Only MS2840A, MS2850A is displayed.

■ Options

Auto	Performs measurement by automatically switching the best loop filters for the phase noise measurement near and far from the carrier respectively.
Best Close-in	Performs measurement by using the best close-in loop filter for the phase noise measurement near the carrier.
Best Wide-offset	Performs measurement by using the best wide-offset loop filter for the phase noise measurement far from the carrier.
Balance	Performs measurement by using a balanced loop filter for the phase noise measurement both near and far from the carrier.

3.5 Setting Markers

Configures settings related to marker. Pressing F5 (Marker) on the main function menu or Marker displays the Marker function menu.

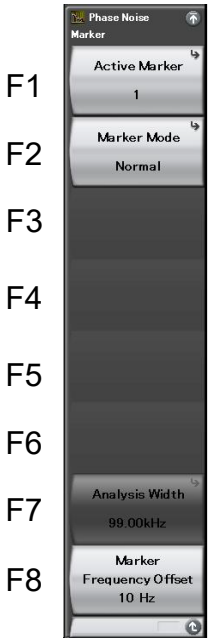

Figure 3.5-1 Marker function menu

Table 3.5-1 Marker function menu

Menu Display	Function
Active Marker	Sets the active marker. 3.5.1 “Setting marker mode”
Marker Mode	Sets the marker mode. 3.5.2 “Setting marker mode”
Analysis Width	Sets the marker range (integral bandwidth). 3.5.2 “Setting marker mode”
Marker Frequency Offset	Sets the marker offset frequency 3.5.2 “Setting marker mode”

3.5.1 Setting Active Marker

Active Marker

■ Summary

Selects the active marker.

■ Setting range

Marker1 to Marker8

3.5.2 Setting marker mode

Maker Mode

■ Summary

Selects the marker function.

■ Options

Normal:	Normal marker. Displays the phase noise level with the specified frequency offset.
Integral Noise:	Calculates the Integral Noise with the specified integral bandwidth.
RMS Noise:	Calculates the RMS Noise with the specified integral bandwidth.
Jitter:	Calculates the Jitter with the specified integral bandwidth.
Residual FM:	Calculates the residual FM with the specified integral bandwidth.
Off:	Turns Off the active marker.

Marker Frequency Offset

■ Summary

Sets the offset frequency of the marker.

■ Resolution

1 Hz (For offset frequency of 10 to 100 Hz)
10 Hz (For offset frequency of 100 Hz to 1 kHz)
100 Hz (For offset frequency of 1 to 10 kHz)
1 kHz (For offset frequency of 10 to 100 kHz)
10 kHz (For offset frequency of 100 kHz to 1 MHz)
100 kHz (For offset frequency of 1 MHz to 10 MHz)

■ Remarks

Enabled for the marker mode of Normal or OFF.

Analysis Width

■ Summary

Displays the integral bandwidth (Start to Stop).
Start and Stop set Analysis Width,

■ Setting range

1 to 9999990 Hz

■ Remarks

Enabled for the marker mode of Integral Noise, RMS Noise, Jitter, or Residual FM.

Start, Stop

■ Summary

Sets Start or Stop frequency of Analysis Width.

■ Setting range

Start Offset to Stop Offset
however, Start < Stop

3.2 “Setting Frequency”

■ Resolution

Same as Marker Frequency Offset.

3.6 Measurement Results

Displays the measurement results of tested signals.

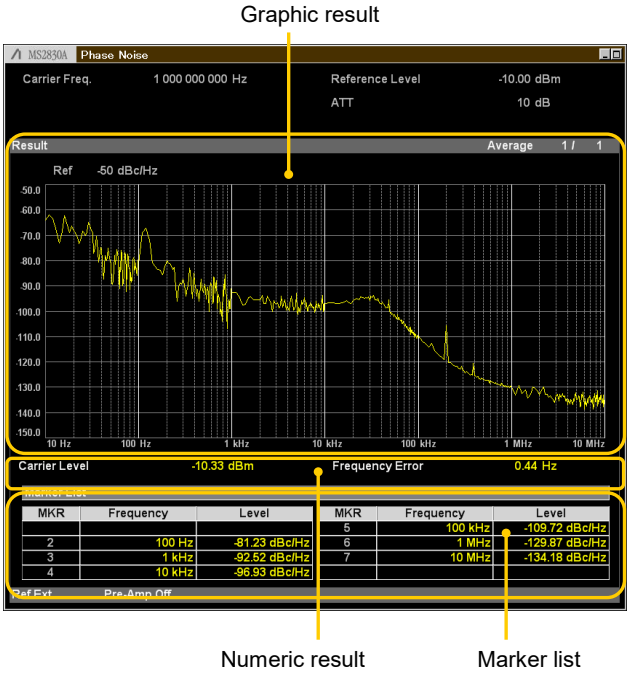

Figure 3.6-1 Marker function menu (Marker mode: Normal and OFF)

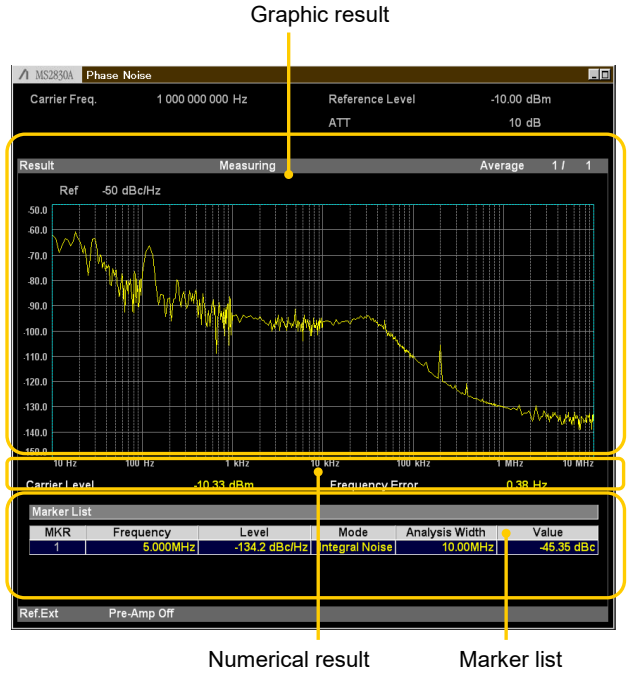

Figure 3.6-2 Marker function menu (Marker mode: Integral Noise, RMS Noise, Jitter, and Residual FM)

3.6.1 Graphical Results

Displays the result of single-sideband phase noise measurement in a log frequency graph.

3.6.2 Numerical Results

Displays the numeric results.

Carrier Power

■ Summary
Displays the carrier power.

Frequency Error

■ Summary
Displays the difference between the set carrier frequency and the measured carrier frequency.

3.6.3 Marker List

For the marker mode: Normal and OFF

Lists the measurement results at each marker. The list contains the marker number, marker offset frequency, and marker phase noise level.

Table 3.6.3-1 Displayed items for marker list

Item	Description
MKR	Displays the marker number.
Frequency	Displays the marker offset frequency.
Level	Displays the marker phase noise level.

For the marker mode: Integral Noise, RMS Noise, Jitter, and Residual FM

Lists the measurement results at each marker. The list contains the marker number, offset frequency of the center of marker range, phase noise level, marker mode, integral bandwidth, and calculation result.

Table 3.6.3-2 Displayed items for marker list

Item	Description
MKR	Displays the marker number.
Frequency	Displays the offset frequency of the center of marker range.
Level	Displays the phase noise level of the offset frequency.
Mode	Displays the marker mode.
Analysis Width	Displays the integral bandwidth.
Value	Displays the calculation result of the set marker mode.

3.7 Saving Measurement Results

This section describes how to save the measurement results to internal hard disk/SSD or USB memory stick.

<Procedure>

1. Press Save in the Phase Noise screen to display the Save menu shown in Figure 3.7-1.
2. Press F1 (Device) to change the save destination.
3. When the Setting window is displayed, select the target drive and then press F7 (Set) to set.
4. With the save destination set, press F6 (Save Waveform CSV DATA).

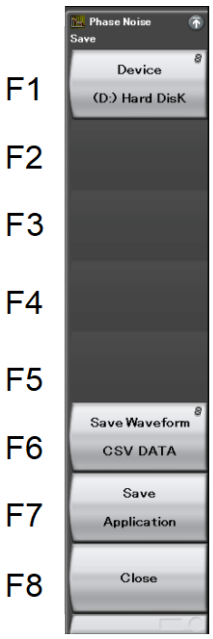

Figure 3.7-1 Save menu

The sequential numbers suffixed to a file name are 0 to 999. No more files can be saved if the sequential numbers up to 999 are all used.

The saved files are stored in a folder according to the application. The application folders are located under the following directory in the saving target drive specified by F1 (Device).

\Anritsu Corporation\Signal Analyzer\User Data\Trace Data\Phase Noise

Up to 1000 files can be saved in one folder.

Chapter 4 Other Functions

This chapter describes other functions of this application.

4.1 Selecting Other Functions 4-2
4.2 Setting Title 4-2
4.3 Erasing Warmup Message 4-2

4.1 Selecting Other Functions

Pressing F8 (Accessory) on the main function menu displays the Accessory function menu.

Table 4.1-1 Accessory function menu

Function Keys	Menu Display	Function
F1	Title	Sets the title character string.
F2	Title (On/Off)	Displays (On) or hides (Off) the title character string.
F4	Erase Warm Up Message	Erases the warmup message display.

4.2 Setting Title

A title of up to 32 characters can be displayed on the screen. (Character strings of up to 17 characters can be displayed on a function menu. The maximum number of characters to be displayed on the top of the function menu varies according to character string.)

<Procedure>

1. Press F8 (Accessory) on the main function menu.
2. Press F1 (Title) to display the character string input screen. Select a character using the rotary knob, and enter it by pressing Enter. Enter the title by repeating this operation. When the title is entered, press F7 (Set).
3. Press F2 (Title) and then select "Off " to hide the title.

4.3 Erasing Warmup Message

The warmup message (⧖ Warm Up), which is displayed upon power-on and indicates that the level and frequency are not stable, can be deleted.

<Procedure>

1. Press F8 (Accessory) on the main function menu.
2. Press F4 (Erase Warm Up Message) to erase the warmup message.

Appendix A Error Message

Table A-1 Message Processing and Status

Message	Description
Out of range	The settable range is exceeded.
No file to read	There is no file that can be read.
File read error	File reading has failed.
File format error	The file format is invalid.
Empty Title Name	The title name is empty.
Empty File Name	The file name is empty.
Invalid character	–
Invalid operation because model names do not match.	–
Not available in External Mixer On.	This operation is not available when External Mixer is On.
Not available in External Mixer Off.	This operation is not available when External Mixer is Off.
Not available in External Mixer Anritsu.	This operation is not available when Mixer Select is Anritsu.
Not available in External Mixer 3rd Party.	This operation is not available when Mixer Select is 3rd Party.
Only available in External Mixer Connection Function option.	This operation is available only when the MX284090A External Mixer Connection Function is installed.

Appendix B Default Value List

Common Parameter

Frequency		
	Carrier Frequency	2.000 GHz
	Start Offset	10 Hz
	Stop Offset	10 MHz
	External Mixer	Off
	3rd Party Mixer	Off
	Band Select	VHP
	3rd Party Mixer Band Select	40-60 GHz Mixing order 8-
Amplitude		
	Reference Level	0.00 dBm
	Attenuator	Auto, 10 dB
	Level Offset On/Off	Off
	Level Offset Value	0.00 dB
	Pre-Amp	Off
Amplitude-Scale		
	Log Scale Line	10
	Reference Value	–50 dBc/Hz

Phase Noise Basic Parameter

Common Setting		
	Average Count	1
	Phase Noise Optimization (MS2840A, MS2850A)	Auto

Marker

Active Marker		1
Marker1	Marker Mode	Normal
	Marker Frequency Offset	10 Hz
Marker2	Marker Mode	Normal
	Marker Frequency Offset	100 Hz
Marker3	Marker Mode	Normal
	Marker Frequency Offset	1 kHz
Marker4	Marker Mode	Normal
	Marker Frequency Offset	10 kHz
Marker5	Marker Mode	Normal
	Marker Frequency Offset	100 kHz
Marker6	Marker Mode	Normal
	Marker Frequency Offset	1 MHz
Marker7	Marker Mode	Normal
	Marker Frequency Offset	10 MHz
Marker8	Marker Mode	Off
	Marker Frequency Offset	10 MHz

	Analysis Width	99 kHz
	Start	1 kHz
	Stop	100 kHz

Accessory

	Accessory	
	Title	On
	Title Entry	Phase Noise

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