# MX269028A
# WLAN (802.11) Measurement Software
# Operation Manual
# Operation

**Sixth 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) or MS2830A Signal Analyzer Operation Manual (Mainframe Operation). Please also refer to this document before using the equipment.**
- **Keep this manual with the equipment.**

**ANRITSU CORPORATION**

Document No.: M-W3528AE-6.0

# 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.

MX269028A
WLAN (802.11) Measurement Software
Operation Manual Operation

24 June 2011 (First Edition)
30 July 2015 (Sixth Edition)

# Equipment Certificate

Anritsu Corporation guarantees that this equipment was inspected at shipment and meets the published specifications.

# Anritsu Warranty

- During the warranty period, Anritsu Corporation will repair or exchange this software free-of-charge if it proves defective when used as described in the operation manual.
- The warranty period is 6 months from the purchase date.
- The warranty period after repair or exchange will remain 6 months from the original purchase date, or 30 days from the date of repair or exchange, depending on whichever is longer.
- This warranty does not cover damage to this software caused by Acts of God, natural disasters, and misuse or mishandling by the customer.

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

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   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.

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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.

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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.

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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.

## 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.

# 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**

## 1. Product Model

Software: MX269028A WLAN (802.11) Measurement Software

## 2. Applied Directive and Standards

When the MX269028A WLAN (802.11) Measurement Software is installed in the MS2690A/MS2691A/MS2692A or MS2830A, the applied directive and standards of this unit conform to those of the MS2690A/MS2691A/ MS2692A or MS2830A main frame.

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that the MX269028A can be used with.

# C-Tick Conformity Marking

Anritsu affixes the C-Tick mark 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

Software: MX269028A WLAN (802.11) Measurement Software

## 2. Applied Directive and Standards

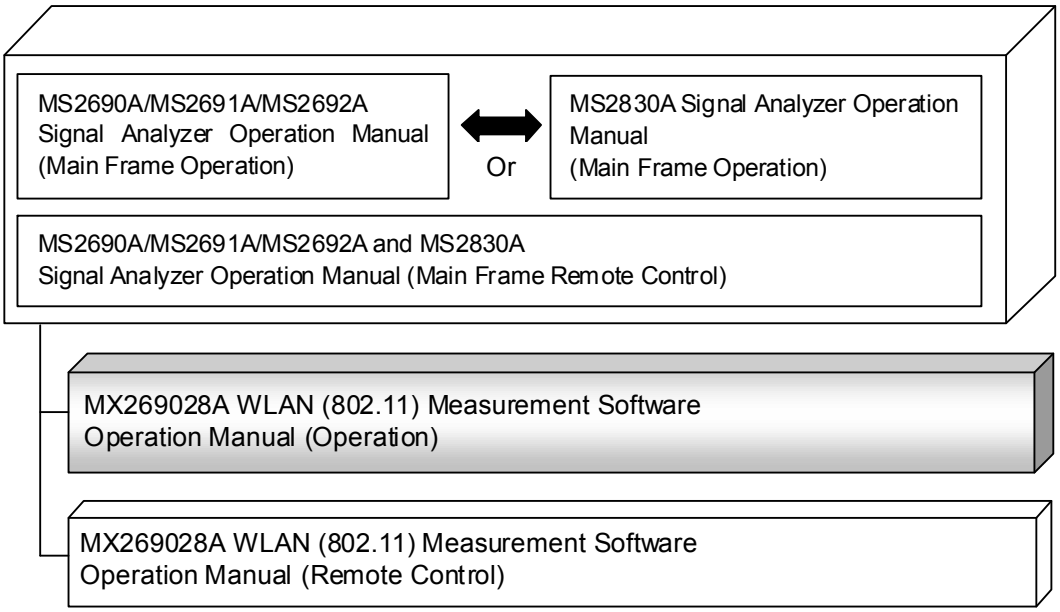
When the MX269028A WLAN (802.11) Measurement Software is installed in the MS2690A/MS2691A/MS2692A or MS2830A, the applied directive and standards of this unit conform to those of the MS2690A/MS2691A/MS2692A or MS2830A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that the MX269028A can be used with.

# About This Manual

■ **Composition of Operation Manuals**

The operation manuals for the MX269028A WLAN (802.11) Measurement Software are comprised as shown in the figure below.



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

These manuals describe basic operating methods, maintenance procedures, common functions, and common remote control of the signal analyzer mainframe.

- WLAN (802.11) Measurement Software Operation Manual (Operation) <This document>

This manual describes basic operating methods, and functions of the WLAN (802.11) Measurement Software.

As for signal analyzer hardware and its basic functions and operation outline, refer to "MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)" or "MS2830A Signal Analyzer Operation Manual (Mainframe Operation)".

- WLAN (802.11) Measurement Software Operation Manual (Remote Control)

This manual describes remote control of the WLAN (802.11) Measurement Software.

As for signal analyzer application's basic remote control functions and its definitions of common commands, refer to "MS2690A/MS2691A/MS2692A and MS2830A Signal Analyzer Operation Manual (Mainframe Remote Control)".

# Convention Used in This Manual

Throughout this document, the use of MS269x Series is assumed unless otherwise specified. If using MS2830A, change MS269xA to read MS2830A.

In this document,  indicates a panel key.

# Table of Contents

# Chapter 1 Overview



This chapter provides an overview of the MX269028A WLAN (802.11) Measurement Software and describes the product configuration.

# 1.1 Product Overview

The MS269xA Series and MS2830A Signal Analyzer enables high-speed, high-accuracy, and simple measurements of transmission characteristics of base stations and mobile stations for various mobile communications types. The MS269xA Series and MS2830A Signal Analyzer is equipped with high-performance signal analyzer and spectrum analyzer functions as standard, with optional measurement software allowing modulation analysis functionality supporting various digital modulation modes.

The MX269028A WLAN (802.11) Measurement Software (hereafter "this application") is a software option for measuring the RF characteristics of WLAN specified by the IEEE 802.11 standard.

***Note:***

In order to use this application for MS2830A, the following are required:

- MS2830A-005/105 Analysis Bandwidth Extension to 31.25 MHz

***Note:***

In MS2830A-040, only measurements up to 3.6 GHz are supported.

This application supports the following measurements.

- Modulation accuracy
- Transmitter power measurement
- Carrier frequency
- Transmitter power vs. time measurement

# 1.2 Product Configuration

## 1.2.1 Standard configuration

Table 1.2.1-1 lists the standard configuration for this application.

**Table 1.2.1-1 Standard configuration**

| Item | Model Name/Symbol | Product Name | Q'ty | Remarks |
|---|---|---|---|---|
| Application | MX269028A | WLAN (802. 11) Measurement Software | 1 | |
| Accessories | — | Installation CD-ROM | 1 | Application software, operation manual CD-ROM |

## 1.2.2 Applicable parts

Table 1.2.2-1 lists the applicable parts for this application.

**Table 1.2.2-1 Applicable parts**

| Model Name/Symbol | Product Name | Remarks |
|---|---|---|
| W3528AE | MX269028A WLAN (802.11) Measurement Software Operation Manual (Operation) | English, Printed Version |
| W3529AE | MX269028A WLAN (802.11) Measurement Software Operation Manual (Remote Control) | English, Printed Version |

## 1.2.3 Options

Table1.2.3-1 shows the options for this application

**Table 1.2.3-1 Option**

| Model/Symbol | Product name | Remarks |
|---|---|---|
| MX269028A-001 | 802.11ac (80MHz) Measurement Software. | Analysis software for IEEE802.11ac signals, software option for MS2830A. |
| MX269028A-002 | 802.11ac (160MHz) Measurement Software | Analysis software for IEEE802.11ac signals, software option for MS269xA Series. |

***Note:***

Even when MX269028A-001 is installed on the machine, the analysis bandwidth is limited to 40MHz if without MS2830A-078/178.

***Note:***

Even when MX269028A-002 is installed on the machine, the analysis bandwidth is limited to 40MHz if without MS269xA-078/178.

# 1.3 Specifications

Table 1.3-1 shows the specifications for this application.

Nominal values are not guaranteed.

When MS2830A is used, this software's specification is specified by the condition below, unless otherwise noted.

Attenuator Mode: Mechanical Atten Only

**Table 1.3-1 Specifications**

| Item | Specification |
|---|---|
| Target signal | IEEE 802. 11a |
| Modulation/Frequency measurement | |
| Measurement frequency range | 5180 to 5320 MHz (Channel No.: 36 to 64)<br>5500 to 5700 MHz (Channel No.: 100 to 140)<br>5745 to 5825 MHz (Channel No.: 149 to 165) |
| Measured level range | -15 dBm to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)<br>-12 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-6 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On) |
| Carrier frequency accuracy | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz |
| Residual vector error | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≤ 1.5% (rms)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.6% (rms) |
| Transmitter power accuracy | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 1.9 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11g (ERP-OFDM) |
| Modulation/Frequency measurement | |
| Measurement frequency range | 2412 to 2472 MHz (Channel No.: 1 to 13)<br>2484 MHz (Channel No.: 14) |
| Measured level range | -15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-15 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-9 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On) |
| Carrier frequency accuracy | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 13 ) Hz<br>MS2830A<br>± (accuracy of reference frequency × carrier frequency + 13 ) Hz |
| Residual vector error | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≤1.2% (rms)<br>MS2830A (at Pre-Amp Off):<br>≤1.2% (rms) |
| Transmitter power accuracy | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802. 11b, IEEE 802. 11g (ERP-DSSS/CCK) |
| Modulation/Frequency measurement | |
| Measurement frequency range | 2412 to 2472 MHz (Channel No.: 1 to 13)<br>2484 MHz (Channel No.: 14) |
| Measured level range | -15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-15 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-9 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On) |
| Carrier frequency accuracy | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 400 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 21 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 21 ) Hz |
| Residual vector error | To burst signal, after CAL execution at 18º to 28ºC<br>MS269xA series:<br>≤ 1.2% (rms)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.9% (rms)<br>A filter that has the same characteristics as the filter used for the measured signal must be specified. |
| Transmitter power accuracy | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11n HT Mixed, HT Greenfield, Non-HT<br>(supports Direct Mapping), corresponds to MCS = 0 to 76 |
| Modulation/Frequency measurement | |
| Measurement frequency range | (2.4 GHz band)<br>2412 to 2472 MHz (Channel No.: 1 to 13)<br>2484 MHz (Channel No.: 14)<br>(5 GHz band)<br>5180 to 5320 MHz (Channel No.: 36 to 64)<br>5500 to 5700 MHz (Channel No.: 100 to 140)<br>5745 to 5825 MHz (Channel No.: 149 to 165) |
| Measured level range | (2.4 GHz band)<br>-15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-15 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-9 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On)<br>(5 GHz band)<br>-15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-12 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-6 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On) |
| Carrier frequency accuracy<br>20 MHz channel | After CAL execution at 18º to 28ºC, for a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 13) Hz<br>(2. 4 GHz band)<br>± (accuracy of reference frequency × carrier frequency + 16) Hz<br>(5 GHz band)<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 13) Hz<br>(2. 4 GHz band)<br>± (accuracy of reference frequency × carrier frequency + 16) Hz<br>(5 GHz band) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Carrier frequency accuracy<br>40 MHz channel | After CAL execution at 18º to 28ºC, for a signal of Burst Length ≥ 250 µs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 62) Hz<br>(2. 4 GHz band)<br>± (accuracy of reference frequency × carrier frequency + 102) Hz<br>(5 GHz band)<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 62) Hz<br>(2. 4 GHz band)<br>± (accuracy of reference frequency × carrier frequency + 102) Hz<br>(5 GHz band) |
| Residual vector error<br>20 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≤ 1.2% rms (2.4 GHz band)<br>≤ 1.6% rms (5 GHz band)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.2% rms (2.4 GHz band)<br>≤ 1.6% rms (5 GHz band) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Residual vector error<br>40 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≤ 1.5% rms (2.4 GHz band)<br>≤ 1.9% rms (5 GHz band)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.6% rms (2.4 GHz band)<br>≤ 2.0% rms (5 GHz band) |
| Transmitter power accuracy<br>20 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (2. 4 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (2. 4 GHz band) (at Pre-Amp On)<br>± 0.6 dB (5 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (5 GHz band) (at Pre-Amp On)<br>MS2830A:<br>± 0.6 dB (2. 4 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.9 dB (5 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Transmitter power accuracy<br>40 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.7 dB (2.4 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (2. 4 GHz band) (at Pre-Amp On)<br>± 0.7 dB (5 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (5 GHz band) (at Pre-Amp On)<br>MS2830A:<br>± 0.8 dB (2.4 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 2.0 dB (5 GHz band) (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤–50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11j |
| Modulation/Frequency measurement | |
| Measurement frequency range | 4920 to 4980 MHz |
| Measured level range | -15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-12 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-6 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On) |
| Carrier frequency accuracy | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 1 ms (5 MHz channel), ≥ 500 µs (10 MHz channel), or ≥ 250 µs (20 MHz channel)<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz |
| Residual vector error | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≤ 1.5% (rms)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.6% (rms) |
| Transmitter power accuracy | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 1.9 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11p |
| Modulation/Frequency measurement | |
| Measurement frequency range | 5835 to 5925 MHz (Channel No.: 167 to 185)<br>300 to 862 MHz |
| Measured level range | 5835 to 5925 MHz (Channel No.: 167 to 185)<br>-15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-12 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-6 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On)<br><br>300 to 862 MHz<br>－15dBm to +30 dBm（at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.）<br>－15dBm to +30 dBm（at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045）<br>－9dBm to +30 dBm（at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045）<br>－30dBm to +10 dBm（at Pre-Amp On） |
| Carrier frequency accuracy | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 1 ms (5 MHz channel), ≥ 500 μs (10 MHz channel), or ≥ 250 μs (20 MHz channel)<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz |
| Residual vector error | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>5835 to 5925 MHz（Channel No.: 167 to 185）<br>MS269xA series:<br>≤ 1.5% (rms)<br>MS2830A (at Pre-Amp Off):<br>≤ 1.6% (rms)<br><br>300 to 862 MHz<br>MS269xA series:<br>≦0.5 %(rms)<br>MS2830A(at Pre-Amp On)<br>≦0.8 %(rms) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11p (Continued) |
| Modulation/Frequency measurement | |
| Transmitter power accuracy | After CAL execution at 18° to 28°C, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>300 to 862 MHz<br>±0.7 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>5835 to 5925 MHz (Channel No.: 167 to 185)<br>± 1.9 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11ac |
| Modulation/Frequency measurement | |
| Measurement frequency range | 20MHz channel / 40MHz channel<br>5180 to 5320 MHz（Channel No: 36 to 64）<br>5500 to 5700 MHz（Channel No: 100 to 140）<br>5745 to 5825 MHz（Channel No: 149 to 165）<br>80MHz channel / 160MHz channel<br>5180 to 5825 MHz (Channel No.: 36 to 165) |
| Measured level range | 20MHz channel / 40MHz channel<br>-15 dBm to +30 dBm (at MS269xA Series Pre-Amp Off, or Pre-Amp not installed.)<br>-15 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045)<br>-9 dBm to +30 dBm (at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045)<br>-30 dBm to +10 dBm (at Pre-Amp On)<br>80MHz channel / 160MHz channel<br>－10dBm to +30 dBm（at MS269xA Series Pre-Amp Off,or Pre-Amp not installed.）<br>－10dBm to +30 dBm（at MS2830A Pre-Amp Off, or Pre-Amp not installed, and without MS2830A-045）<br>－4dBm to +30 dBm（at MS2830A Pre-Amp Off, or Pre-Amp not installed, and with MS2830A-045）<br>－20dBm to +10 dBm（at Pre-Amp On） |
| Carrier frequency accuracy 20 MHz channel | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 16 ) Hz |
| Carrier frequency accuracy 40 MHz channel | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 102 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 102 ) Hz |
| Carrier frequency accuracy 80 MHz channel | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 μs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 102 ) Hz<br>MS2830A:<br>± (accuracy of reference frequency × carrier frequency + 102 ) Hz |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11ac |
| Modulation/Frequency measurement | |
| Carrier frequency accuracy<br>160 MHz channel | After CAL execution at 18º to 28ºC<br>For a signal of Burst Length ≥ 250 µs<br>MS269xA series:<br>± (accuracy of reference frequency × carrier frequency + 102 ) Hz |
| Residual vector error<br>20 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≦0.7 % (rms) (at Pre-Amp Off)<br>≦0.9 % (rms) (at Pre-Amp On)<br>MS2830A (at Pre-Amp Off):<br>≦0.9 % (rms) |
| Residual vector error<br>40 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≦0.8 % (rms) (at Pre-Amp Off)<br>≦1.0 % (rms) (at Pre-Amp On)<br>MS2830A (at Pre-Amp Off):<br>≦1.0 % (rms) |
| Residual vector error<br>80 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≦0.9 % (rms) (at Pre-Amp Off)<br>≦1.1 % (rms) (at Pre-Amp On)<br>MS2830A (at Pre-Amp Off):<br>≦1.1 % (rms) |
| Residual vector error<br>160 MHz channel | To burst signal, after CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF<br>MS269xA series:<br>≦1.5 % (rms) (at Pre-Amp Off)<br>≦1.7 % (rms) (at Pre-Amp On) |
| Transmitter power accuracy<br>20 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.6 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 1.9 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |

**Table 1.3-1 Specifications (Continued)**

| Item | Specification |
|---|---|
| Target signal | IEEE 802.11ac |
| Modulation/Frequency measurement | |
| Transmitter power accuracy 40 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 0.7 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.1 dB (at Pre-Amp On)<br>MS2830A:<br>± 2.0 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Transmitter power accuracy 80 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 1.2 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.6 dB (at Pre-Amp On)<br>MS2830A:<br>± 3.2 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Transmitter power accuracy 160 MHz channel | After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB,<br>The signal measured is within the measurement level range and less than or equal to Input Level.<br>MS269xA series:<br>± 1.3 dB (at Pre-Amp Off, or Pre-Amp not installed.)<br>± 1.7 dB (at Pre-Amp On)<br>The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics. |
| Center frequency leak floor | ≤ –50 dBc (Nominal) |

# 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)* or *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)* for common features not included in this manual.

# 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)* or *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*.

## 2.1.1 Front panel

This section describes the front-panel keys and connectors.

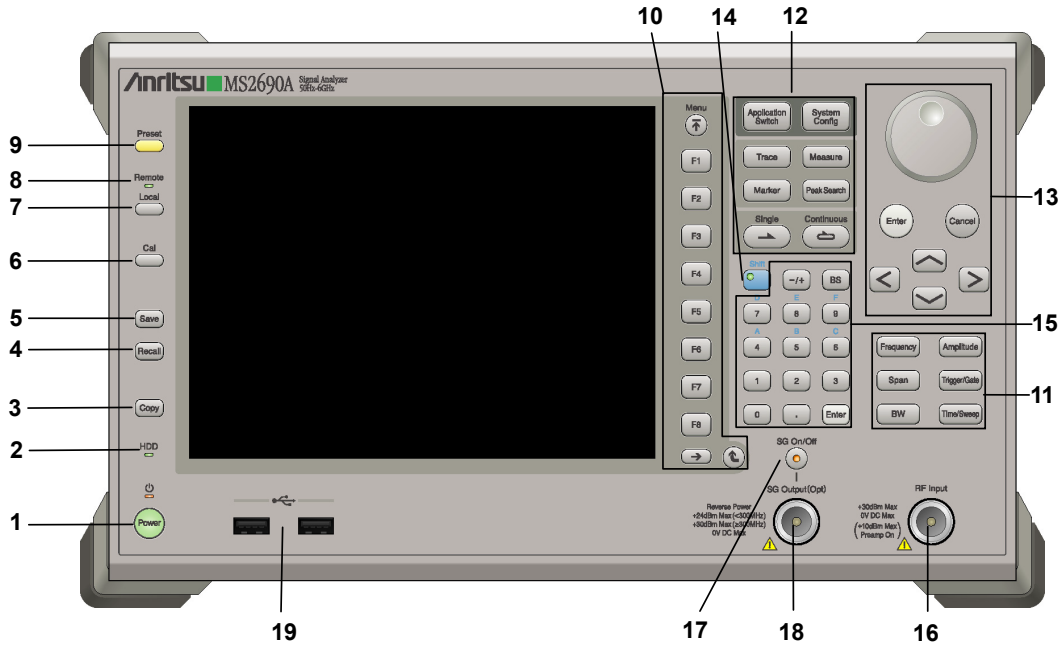



**Figure 2.1.1-1 MS269x series front panel**

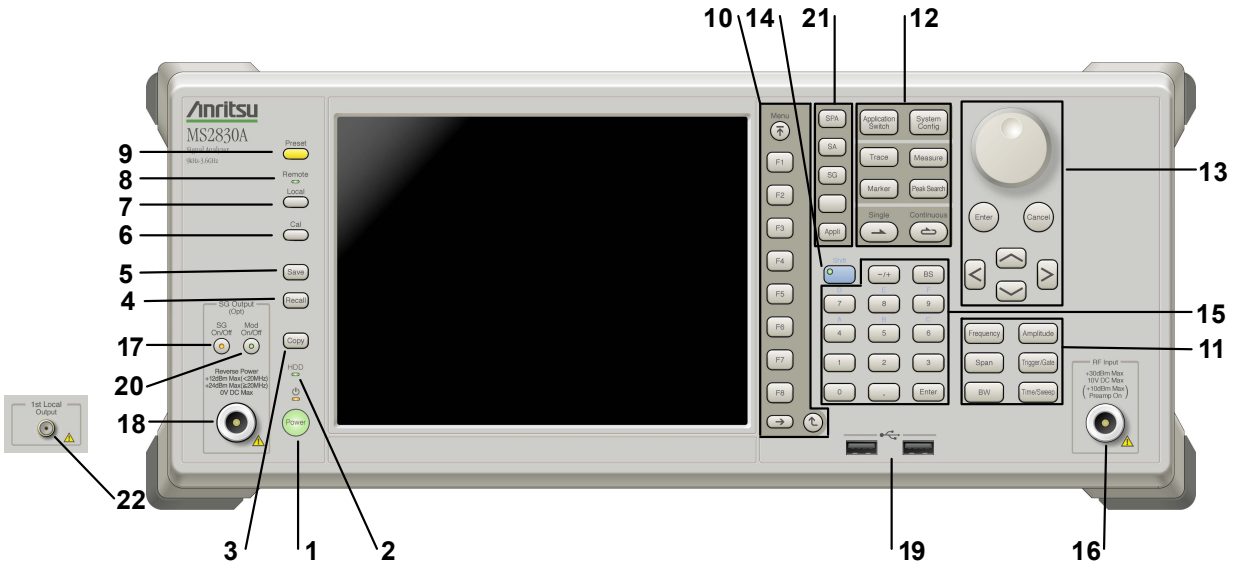



**Figure 2.1.1-2 MS2830A front panel**

**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

Lights when accessing the internal hard disk.

**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**

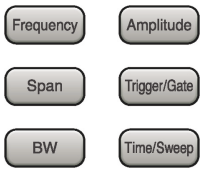

Function keys

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.

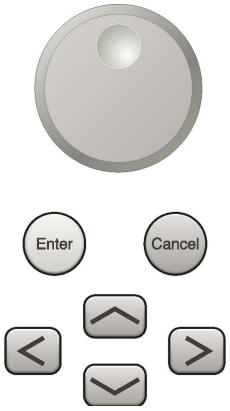
Marker Use when switching graph marker operation.

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.

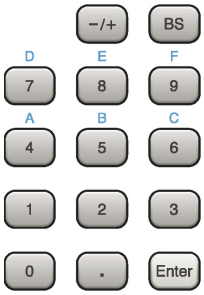
Press Cancel to cancel input or selected data.

**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 connector

Inputs RF signal. This is an N type input connector.

**17**


RF Output Control key

Press SG On/Off 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.

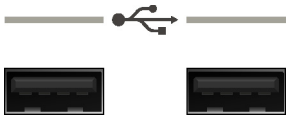
This is not available when the Option 044/045 is installed. (Only for MS2830A)

**18**


RF Output connector (when Option 020 installed)

Outputs RF signal, when the Vector Signal Generator option is installed.
This is an N type output connector.
This is not available when the Option 044/045 is installed. (Only for MS2830A)

**19**



USB connector (type A)

Connect the accessory USB keyboard, mouse or USB memory.

**20**


Modulation control key (MS2830A only)

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 is not available when the Option 044/045 is installed.

**21**


Application key (MS2830A only)

Press to switch between applications.


Press to display the Spectrum Analyzer main screen.


Press to display the Signal Analyzer main screen, when Option 005/105 and 006/106 are installed.


Press to display the Signal Generator main screen, when Vector Signal Generator option is installed.

This is a blank key. Not used.


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)*.

**22**


1st Local Output connector (Only for MS2830A)

This is available when the Option 044/045 is installed.
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.

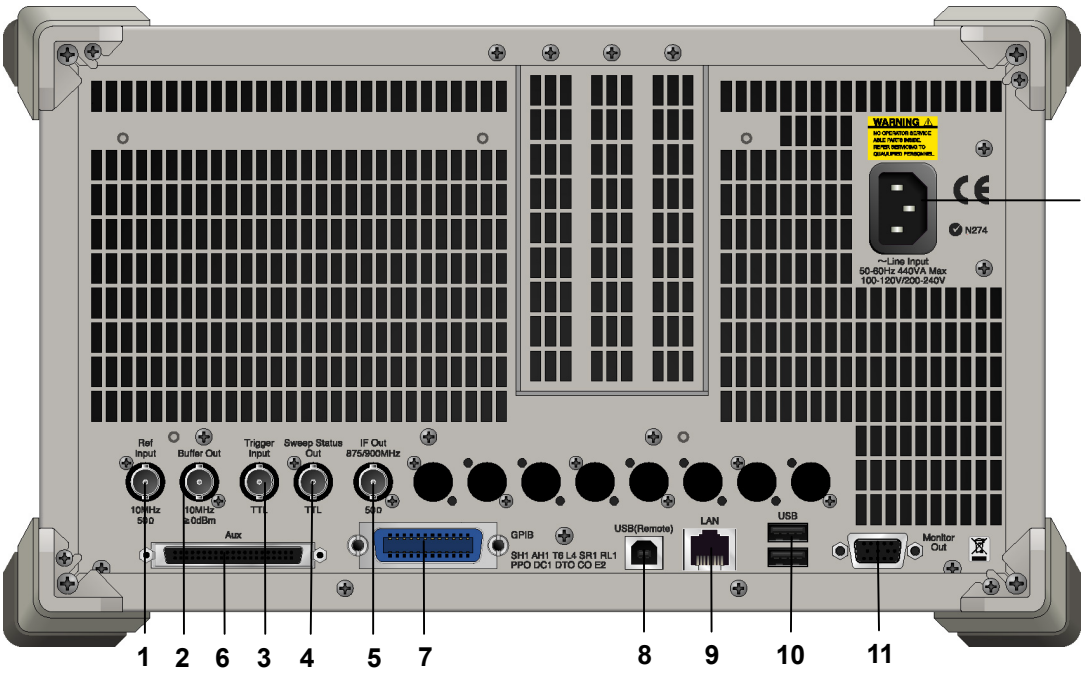



**Figure 2.1.2-1 MS269x series rear panel**

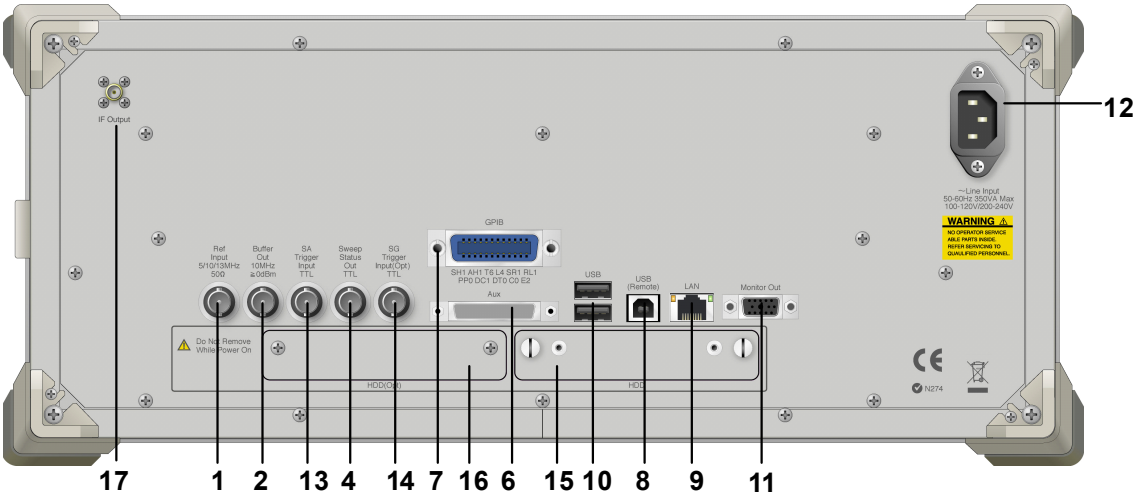
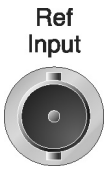



**Figure 2.1.2-2 MS2830A rear panel**

**1**




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 or MS2830A to that of other equipment. The following frequencies are supported:

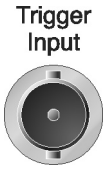
MS269x series: 10 MHz/13 MHz
MS2830A: 5 MHz/10 MHz/13 MHz

**2**


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 or MS2830A.

**3**




Trigger Input connector (MS269x series only)

Inputs trigger signal from external device.

**4**


Sweep Status Out connector

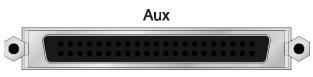
Outputs signal when internal measurement is performed or measurement data is obtained.

**5**


IF Out connector (MS269x series only)

Not used.

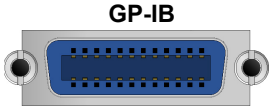
**6**




AUX connector

Not used.

**7**




GPIB connector

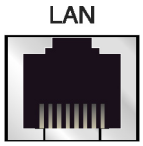
For external control via GPIB.

**8**


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 only)

This is a BNC connector for inputting external trigger signal (TTL) for SPA and SA applications.

**14**


SG Trigger Input connector (MS2830A only)

This is a BNC connector for inputting external trigger signal (TTL) for Vector Signal Generator option.

**15 HDD**

HDD slot (MS2830A only)

This is a standard hard disk slot.

**16 HDD(Opt)**

HDD slot for Option (MS2830A only)

This is a hard disk slot for the options.

**17**


IF output connector (Only for MS2830A)

Monitor output of the internal IF signal.

This is available when the Option 044/045 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.

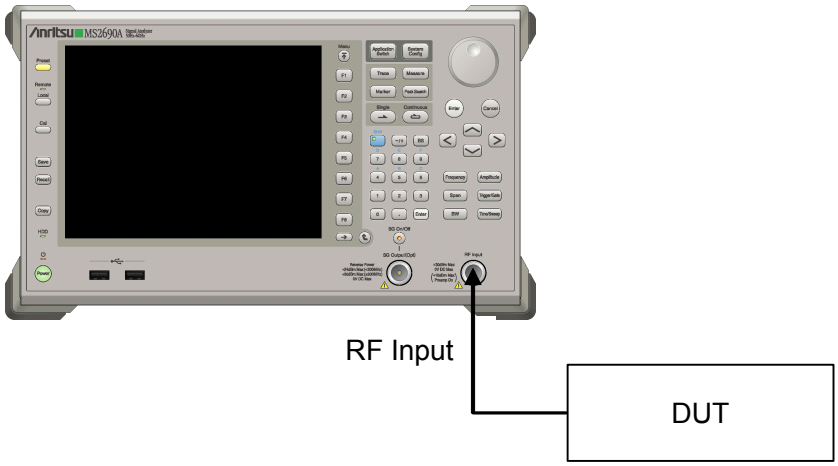



**Figure 2.2-1 Signal path setup example**

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

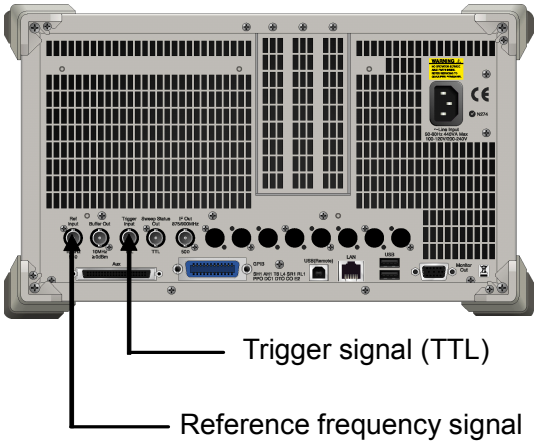



**Figure 2.2-2 External signal input**

# 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)* or *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*.

# Chapter 3 Measurement

This chapter describes the measurement function, the parameter contents and the setting methods for this application.

# 3.1 Basic Operation

## 3.1.1 Screen layout

This subsection describes the screen layout of this application.

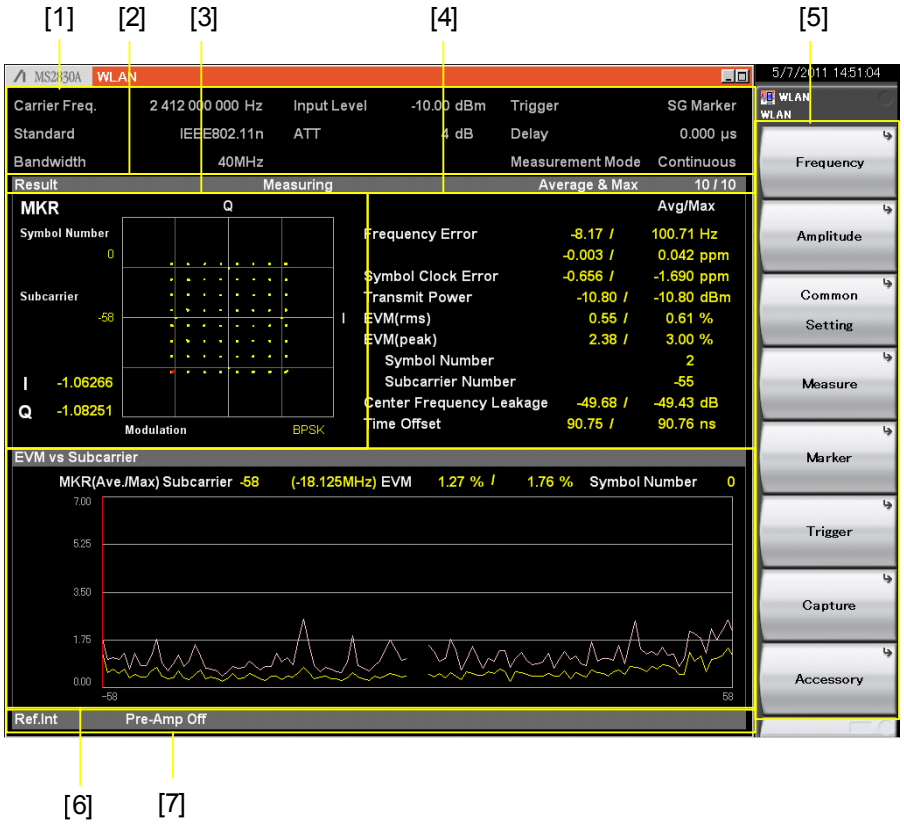



**Figure 3.1.1-1 Screen Layout**

[1] Measurement parameter

Displays the specified parameter.

[2] Status message

Displays signal status.

[3] Constellation

Displays the constellation of the selected symbol.

[4] Result window

Displays the measurement results.

[5] Function menu

Displays the functions executable with function keys.

[6] Graph window

Displays the graph of the measurement results.

[7] Status

Displays the settings and status of the measuring instrument.

## 3.1.2 Main function menu

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

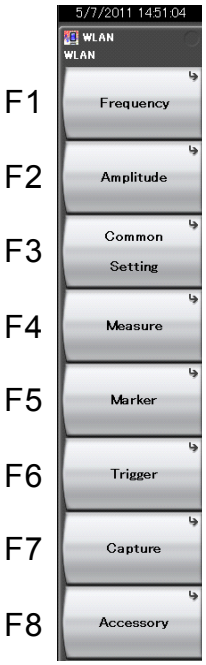



**Figure 3.1.2-1 Main Function Menu**

**Table 3.1.2-1 Main Function Menu**

| Menu Display | Function |
|---|---|
| Frequency | Sets a frequency<br>3.2 “Setting Frequency” |
| Amplitude | Sets level.<br>3.3 “Setting Level” |
| Common Setting | Sets common items.<br>3.5 “Setting Common Items” |
| Measure | Sets measurement items.<br>3.6 “Setting Measurement Items” |
| Marker | Sets a marker.<br>3.7 “Setting Marker” |
| Trigger | Sets a trigger.<br>3.8 “Setting Trigger” |
| Capture | Configures settings for IQ data capture.<br>3.4 “Capturing IQ Data and Parameter of WLAN IQproducer” |
| Accessory | Sets other functions.<br>6.1 “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 Measurement
Items are measured only for the measurement count (Storage Count) before measurement is stopped. The input signal is captured once for each measurement.

<Procedure>

1. Press Single.

Continuous Measurement
The selected measurement items are continuously measured for the measurement count (Storage Count). The input signal is captured once for each measurement. Measurement will continue even if parameters are changed or the window display is changed. Measurement will be stopped if another application is selected or if the Replay function is executed.

<Procedure>

1. Press Continuous.

***Note:***

The two measurement modes are not available when the Replay function is executed. For the Replay function, analysis starts when the IQ data file is specified.

☞ 4.2 “Replay Function”

# 3.2 Setting Frequency

This section describes how to configure the settings related to frequency. Pressing F1 (Frequency) on the main function menu displays the Frequency function menu. Pressing Frequency displays the Frequency function menu and opens the Carrier Frequency dialog box.

***Note:***

You cannot set a frequency when the Replay function is executed.



Carrier Frequency

■Summary

Sets a carrier frequency.

■Setting range:

100 MHz to the upper limit of the main unit

Channel Map

■Summary

Displays the Channel Map selection window.

■Options

| | |
|---|---|
| None | Directly sets a frequency. |
| 2.4GHz band | Sets a channel map of 2.4 GHz band. |
| 5GHz Band | Sets a channel map of 5 GHz band. |

***Note:***

5GHz Band cannot be set when MS2830A-040 is installed.

Channel Number

■Summary

Sets the carrier frequency by channel number. Displayed when 2.4 GHz Band or 5 GHz Band is selected in the Channel Map.

■Setting range

When Channel Map is 2.4GHz Band:

1 to 14

When Channel Map is 5GHz Band:

0 to 200

**Table 3.2-1 Relationship Between Channel Numbers and Carrier Frequencies (When Channel Map is 2.4 GHz Band)**

| Channel Number | Carrier frequency (MHz) | Channel Number | Carrier frequency [MHz] |
|---|---|---|---|
| 1 | 2412 | 8 | 2447 |
| 2 | 2417 | 9 | 2452 |
| 3 | 2422 | 10 | 2457 |
| 4 | 2427 | 11 | 2462 |
| 5 | 2432 | 12 | 2467 |
| 6 | 2437 | 13 | 2472 |
| 7 | 2442 | 14 | 2484 |

**Table 3.2-2 Relationship Between Channel Numbers and Carrier Frequencies (When Channel Map is 5GHz Band) Carrier Frequency = 5 GHz + (5 MHz * n) (where n is a Channel Number)**

| Channel Number | Carrier frequency (MHz) |
|---|---|
| 0 | 5000 |
| 1 | 5005 |
| ・・・ | ・・・ |
| 199 | 5995 |
| 200 | 6000 |

RF Spectrum

■Summary

Sets whether to measure with IQ spectrum reversed.

■Selection options

| | |
|---|---|
| Norm. | Measures without IQ spectrum reversed. |
| Rvs. | Measures with IQ spectrum reversed. |

***Note:***

This function is not available when 160MHz is set for Channel Bandwidth1.

# 3.3 Setting Level

This section describes how to configure the settings related to level. Pressing F2 (Amplitude) on the main function menu displays the Amplitude function menu. Pressing Amplitude displays the Amplitude function menu and opens the Input Level dialog box.

***Note:***

You cannot set a level when the Replay function is executed.



### Input Level

■Summary

Sets the input level from the target DUT.

■Setting range

When Pre-Amp is On:
(–80.00 + Offset Value) to (10. 00 + Offset Value) dBm
When Pre Amp is Off:
(–60.00 + Offset Value) to (30. 00 + Offset Value) dBm

### Lowest ATT Setting

■Summary

Changes the lower limit of the attenuator that is automatically set according to the Input Signal setting.

■Setting range

4dB: Sets the lower limit of the attenuator to 4 dB.
0dB: Sets the lower limit of the attenuator to 0 dB.

### Auto Range

■Summary

Sets an optimal Input Level automatically according to the input signal.

### Pre-Amp

■Summary

Sets the Pre-Amp Mode On/Off.

■Selection options

| | |
|---|---|
| On | Enables Pre-Amp. |
| Off | Disables Pre-Amp. |

Offset

■Summary

Turns on/off the Offset function.

■Selection options

| | |
|---|---|
| On | Enables the offset function. |
| Off | Disables the offset function. |

Offset Value

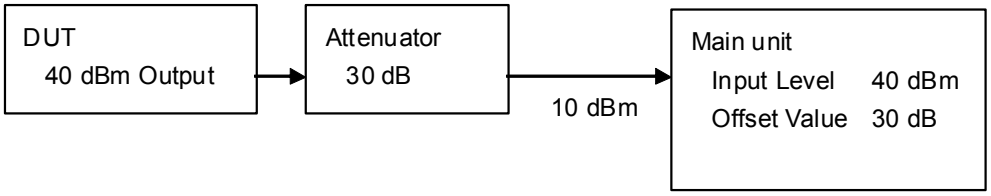
■Summary

This sets the level correction coefficient.

■Setting range

–99.99 to 99.99 dB

■Setting example



# 3.4 Capturing IQ Data and Parameter of WLAN IQproducer

This section describes the settings of IQ data and Parameter of WLAN IQproducer.

Pressing F7 (Capture) on the main function menu displays the Capture function menu.

When Channel Bandwidth is set to 160MHz, IQ data cannot be saved and replayed.



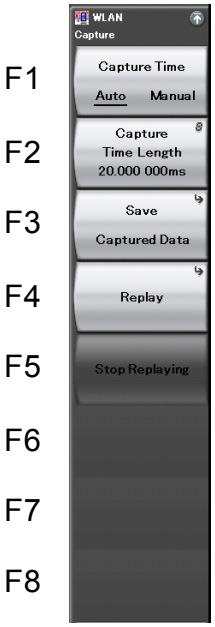



**Figure 3.4-1 Capture Function Menu**

**Table 3.4-1 Capture Function Menu**

| Menu Display | Function |
|---|---|
| Capture Time (Auto/Manual) | Switches between the two capture modes of IQ data (auto setting and manual setting). |
| Capture Time Length | Sets the capture time length of IQ data. |
| Save Captured Data | Saves the captured IQ data. ☞Chapter 4 “Digitize Function” |
| Replay | Replays the captured IQ data. ☞Chapter 4 “Digitize Function” |
| Stop Replaying | Stops replaying the captured IQ data. ☞Chapter 4 “Digitize Function” |

### 3.4.1 Setting capture time

This subsection describes how to set the capture mode from Capture Time and the Capture Time Length from Capture Time Length.

- Auto

The data necessary to measure one burst for each one measurement is always captured. The Auto mode is set by default for this application.

- Manual

In this mode, the capture length of each measurement can be specified manually.

If Capture Time Length is specified, the Manual mode is automatically used.

When using the Replay function, this application cannot call the Spectrum Analyzer's Adjacent Channel Leakage Power (ACP), Occupied Bandwidth (OBW), or Spurious Emission measurements.

### 3.4.2 Averaging IQ data

The averaging method differs according to the capture time mode.

Capture of the signal starts at the trigger timing according to the Capture Time settings. After the measurement is completed, capture of another signal starts at the next trigger timing. The average and maximum values are calculated from the measurement results at each storage count. The data captured in multiple measurements are not necessarily consecutive.

The storage count and the capture count are the same in single measurement. In continuous measurement, the average and maximum values are calculated from the last data of the storage count after measurement has been performed the number of times corresponding to the storage count.

## 3.4.3 Reading WLAN IQproducer Parameter File

The parameters are set automatically by reading WLAN IQproducer Parameter File. The only files (XML files) stored in the folder below can be read. Start reading after storing the parameter files saved in WLAN IQproducer or the parameter files created with wave patterns by WLAN IQproducer.
:\Anritsu Corporation\Signal Analyzer\User Data\IQproducer\WLAN

Press Recall (Recall) to display the Recall menu. Then, press F4 (Recall IQproducer Parameter) in the Recall menu, and the IQproducer Parameter File List dialog box appears.

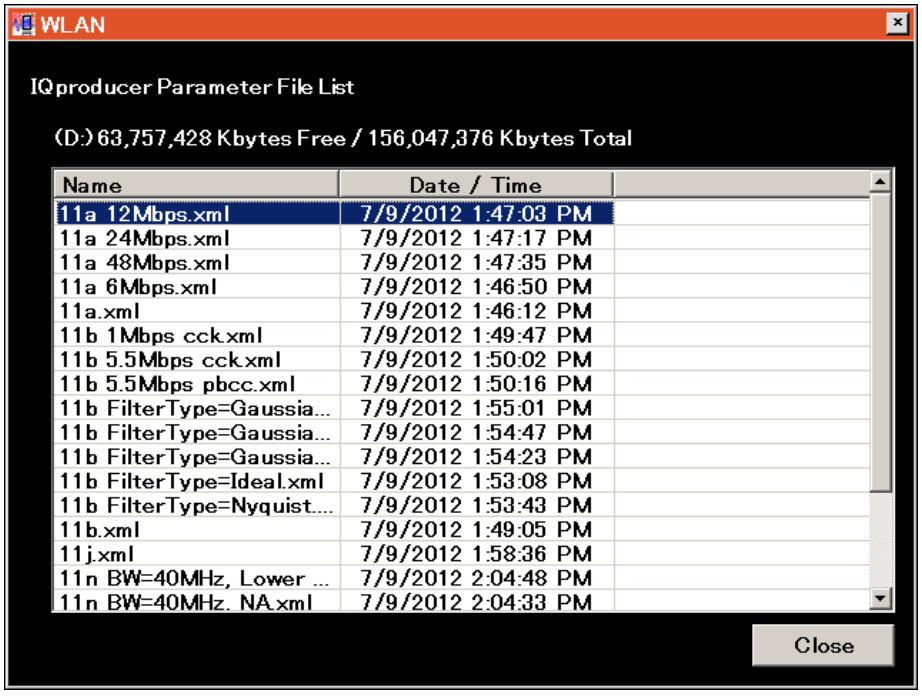



**Figure 3.4.3-1 IQproducer Parameter File List**

# 3.5 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.

### WLAN Standard

■Summary

Selects the WLAN Standard to be measured.

■Selection options

The input signals are analyzed as the following signals:
IEEE802.11a
IEEE802.11b
IEEE802.11g (ERP-DSSS/CCK)
IEEE802.11g (ERP-OFDM)
IEEE802.11g (DSSS-OFDM)
IEEE802.11n
IEEE802.11j
IEEE802.11p
IEEE802.11ac (MX269028A-x01 or MX269028A-x02 is installed)

### Measuring Object

■Summary

Selects whether the measurement target signal is burst or continuous signal.

■Selection options

| | |
|---|---|
| Burst | Analyzes the input signal as a burst signal. |
| Cont. | Analyzes an input signal as a continuous signal. |

***Note:***

When the WLAN Standard is IEEE802.11ac, this is fixed to Burst and cannot be changed.

Channel Bandwidth

■Summary

Sets Channel Bandwidth of the measurement target signal.

■Selection options

WLAN Standard: 802.11j, 802.11p

5MHZ Analyzes signal as a 5-MHz band.

10MHZ Analyzes signal as a 10-MHz band.

20MHZ Analyzes signal as a 20-MHz band.

WLAN Standard: 802.11n

20MHZ Analyzes signal as a 20-MHz band.

40MHZ Analyzes signal as a 40-MHz band.

40MHz (Upper)

Analyzes the measurement target signal as 40 MHz Upper 20 MHz. The center frequency matches the center of 40 MHz.

40MHz (Lower)

Analyzes the measurement target signal as 40 MHz Lower 20 MHz. The center frequency matches the center of 40 MHz.

WLAN Standard: 802.11ac

・ With MS269xA-078/178 installed

20MHz Analyzes signal as a 20-MHz band.
40MHz Analyzes signal as a 40-MHz band.
80MHz Analyzes signal as an 80-MHz band.
160MHz Analyzes signal as a 160-MHz band (MS269xA only

・ Others

20MHz Analyzes signal as a 20-MHz band.
40MHz Analyzes signal as a 40-MHz band.

***Note:***

- This is not available when the selected WLAN Standard is: 802. 11a, 802. 11b, 802. 11g (ERP-OFDM), 802. 11g (DSSS-OFDM), or 802. 11g (ERP-DSSS/CCK).
- Automatically set to 10 MHz when WLAN Standard is changed to 802. 11j or 802. 11p.
- Automatically set to 20 MHz when WLAN Standard is changed to 802. 11n.
- Automatically set to 20 MHz when Measuring Object is changed to Continuous.
- 40MHz (Upper) and 40MHz (Lower) is not selectable when Measuring Object is set to Continuous.
- MS269xA-004/104 are not usable for MX269028A-001/-002.

PPDU Format

■Summary

Sets the PPDU format of the measurement target signal.

■Selection options

WLAN Standard: 802.11n

| | |
|---|---|
| Non-HT | Analyzes the format of the signal as Non-HT. |
| HT-Mixed | Analyzes the format of the signal as HT–Mixed. |
| HT-Greenfield | Analyzes the format of the signal as HT-Greenfield. |

WLAN Standard: 802.11ac

| | |
|---|---|
| VHT | Analyzes the format of the signal as VHT. |

***Note:***

- This is not available when the selected WLAN Standard is set other than 802. 11n. The format is fixed to VHT for 802.11ac.
- This is not available when Measuring Object is Continuous; it is fixed to HT-Mixed.
- You cannot set to Non-HT when Channel Bandwidth is 40 MHz (Upper) or 40 MHz (Lower).
- When Non-HT is selected, if the Channel Bandwidth is changed to 40 MHz (Upper) or 40 MHz (Lower), the setting is automatically changed to HT-Mixed.

Detail Setting

■Summary

Sets the more detailed modulation analysis parameters. For details, refer to 3.6.1 “Modulation Analysis”.

Burst Interval

■Summary

Sets the burst interval of the measurement target signal. The burst interval is the time interval between one burst rising and the next one.

■Setting range

0.3 ms to 1000 ms, or ≤Capture Time Length/2, whichever smaller.

◆ IEEE802.11ac is selected as WLAN Standard

- Channel Bandwidth is set to 20MHz, 40MHz
  0.3 ms to 1000 ms or ≤ Capture Time Length/2, whichever smaller.
- When Channel Bandwidth is set to 80MHz, 160MHz
  0.3 ms to 250 ms or ≤ Capture Time Length/2, whichever smaller.

***Note:***

This command is not available when Measuring Object is Continuous.

Burst Threshold

■Summary

Sets the threshold to detect the burst of the measurement target signal.

■Setting range

0 dB to 60 dB

***Note:***

This command is not available when Measuring Object is Continuous.

# 3.6 Setting Measurement Items

This section describes how to set the measurement items. Pressing F4 (Measure) on the main function menu or Measure displays the Measure function menu.

**Table 3.6-1 Measure Function Menu**

| Position | Menu Display | Function |
|---|---|---|
| Page 1 [F1] | Modulation Analysis | Displays the Modulation Analysis function menu.<br>☞ 3.6.1 "Modulation Analysis" |
| Page 1 [F2] | Power vs Time | Displays the Power vs Time function menu.<br>☞ 3.6.2 "Power vs Time measurement" |
| Page 1 [F4] | ACP(Swept) | Measures the Adjacent Channel leakage Power.<br>☞ 3.6.3 "Adjacent Channel Leakage Power measurement (ACP)" |
| Page 1 [F6] | OBW(Swept) | Measures the Occupied Bandwidth.<br>☞ 3.6.4 "Occupied Bandwidth measurement (OBW)" |
| Page 1 [F7] | Spurious Emission Mask(Swept) | Measures the Spectrum Emission Mask.<br>☞ 3.6.5 "Spectrum Emission Mask (SEM)" |
| Page 1 [F8] | Spurious Emission(Swept) | Measures the Spurious Emissions.<br>☞ 3.6.6 "Spurious Emission measurement" |

## 3.6.1 Modulation Analysis

This subsection describes how to set the Modulation Analysis items. Pressing F1 (Modulation Analysis) on the Measure function menu displays the Modulation Analysis function menu.

The Modulation Analysis function menu consists of two pages that are toggled by pressing →.

**Table 3.6.1-1 Modulation Analysis Function Menu**

| Position | Menu Display | Function |
|---|---|---|
| Page 1 [F1] | Analysis Time | Sets measurement position. |
| Page 1 [F2] | WLAN Standard | Sets WLAN standard. |
| Page 1 [F3] | Measuring Object | Sets the switching between burst/continuous signals.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F4] | Channel Bandwidth | Sets Channel Bandwidth.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F5] | PPDU Format | Sets the PPDU format.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F6] | Detail Setting | Sets details of measured signal. |
| Page 1 [F8] | Save Captured Data | Recalls the Save Captured Data function menu. |
| Page 2 [F1] | Trace | Sets Trace.<br>☞ 3.6.1.1 “Trace (other than Summary)” |

Analysis Length Setup

■Summary

Sets whether the symbol length to be measured is set manually or automatically. The automatic setting decodes the SIGNAL field to get the burst length, and then analyzes the burst to the end.

■Selection options

| | |
|---|---|
| Manual | Sets the target signal's symbol (chip) length automatically. |
| Auto | Sets the target signal's symbol (chip) length manually. |

***Note:***

- This command is not available when Measuring Object is Continuous.
- When 802.11b or 802.11g is selected (ERP-DSSS/CCK), this is not available when Target Field is set to Preamble. However, it is available when WLAN Standard is 802.11ac.

Analysis Length

■Summary

Sets the Modulation Analysis length.

■Setting range

When WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j, or 802.11p:

2 to (1367 – Analysis Offset) or (the maximum number of symbols in the Burst Interval* – Analysis Offset), whichever smaller.

When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), and Target Field is PSDU:

11 to (220000 – Analysis Offset) or (the maximum number of chips in the Burst Interval* – Analysis Offset), whichever smaller.

When WLAN Standard is 802.11n or 802.11ac:

2 to (5000 – Analysis Offset) or (the maximum number of symbols in the Burst Interval* – Analysis Offset), whichever smaller.

***Note:***

This is not available when Analysis Length Setup is Auto.

*: The maximum number of symbols (chips) in the Burst Interval is:

((Burst Interval × 10e3) – $T_{preamble}$) / $L_{dataunit}$

where the unit for the Burst Interval is ms. The values of $T_{preamble}$ and $L_{dataunit}$ are:

When using 802.11a, 802.11g (ERP-OFDM), 802.11j (Channel Bandwidth = 20 MHz), or 802.11p (Channel Bandwidth = 20 MHz):
$T_{preamble}$ =20 µs, $L_{dataunit}$ =4 µs

When using 802.11j (Channel Bandwidth = 10 MHz) or 802.11p (Channel Bandwidth = 10 MHz):
$T_{preamble}$ =40 µs, $L_{dataunit}$ =8 µs

When using 802.11j (Channel Bandwidth = 5 MHz) or 802.11p (Channel Bandwidth = 5 MHz):
$T_{preamble}$ =80 µs, $L_{dataunit}$ =16 µs

When using 802.11b or 802.11g (ERP-DSSS/CCK):
$T_{preamble}$ =192 µs, $L_{dataunit}$ =0.0909 µs

When using 802.11g (DSSS-OFDM):
$T_{preamble}$ =204 µs, $L_{dataunit}$ =4 µs

When using 802.11n and other than Non-HT:
$T_{preamble}$ =48 µs, $L_{dataunit}$ =4 µs

When using 802.11n and Non-HT:

$T_{preamble}$ =20 µs, $L_{dataunit}$ =4 µs

When using 802.11ac:

$T_{preamble}$ =68 µs, $L_{dataunit}$ =4 µs

Analysis Offset

■Summary

Sets the measurement start position of Modulation Analysis.

- If WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11n, or 802.11ac, the analysis start position is based on the start of the PSDU.
- If WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), and Target Field is Preamble, the analysis start position is based on the start of the PLCP preamble.
- If WLAN Standard is 802.11b or 802.11g (EPR-DSSS/CCK), and Target Field is PSDU, the analysis start position is based on the start of the PSDU.

■Setting range

When WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j, or 802.11p:

0 to (1367 or the maximum number of symbols in the Burst Interval*), whichever smaller – 2

When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), and Target Field is PSDU:

0 to (220000 or the maximum number of chips in the Burst Interval*), whichever smaller – 11

When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), and Target Field is Preamble:

0 to 1300 or (the maximum number of chips in the Burst Interval* ), whichever smaller – 11

When WLAN Standard is 802.11n or 802.11ac:

0 to (5000 or the maximum number of symbols in the Burst Interval*), whichever smaller – 2

***Note:***

This command is not available when Measuring Object is Continuous.

* For the maximum number of symbols (chips) in the Burst Interval, see Analysis Length.

Detail Setting: Data Rate & Modulation

■Summary

Sets the data rate and the modulation method of the measurement target signal.

■Selection options

**Table 3.6-1 Selection Options for Data Rate & Modulation When WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j (Channel Bandwidth=20 MHz), or 802.11p (Channel Bandwidth=20 MHz), or When WLAN Standard is 802.11n, PPDU Format is Non-HT, and Channel Bandwidth is 20 MHz or 40 MHz**

| Selection options | Description |
|---|---|
| Auto | Automatically sets data rate and modulation mode. |
| 6Mbps-BPSK | Sets the data rate to 6Mbps, and the modulation mode to BPSK. |
| 9Mbps-BPSK | Sets the data rate to 9Mbps, and the modulation mode to BPSK. |
| 12Mbps-QPSK | Sets the data rate to 12Mbps, and the modulation mode to QPSK. |
| 18Mbps-QPSK | Sets the data rate to 18Mbps, and the modulation mode to QPSK. |
| 24Mbps-16QAM | Sets the data rate to 24Mbps, and the modulation mode to 16QAM. |
| 36Mbps-16QAM | Sets the data rate to 36Mbps, and the modulation mode to 16QAM. |
| 48Mbps-64QAM | Sets the data rate to 48Mbps, and the modulation mode to 64QAM. |
| 54Mbps-64QAM | Sets the data rate to 54Mbps, and the modulation mode to 64QAM. |

**Table 3.6-2 Selection Options for Data Rate & Modulation When WLAN Standard is 802.11j (Channel Bandwidth=10 MHz) or 802.11p (Channel Bandwidth=10 MHz)**

| Selection options | Description |
|---|---|
| Auto | Automatically sets data rate and modulation mode. |
| 3Mbps-BPSK | Sets the data rate to 3Mbps, and the modulation mode to BPSK. |
| 4.5Mbps-BPSK | Sets the data rate to 4.5Mbps, and the modulation mode to BPSK. |
| 6Mbps-QPSK | Sets the data rate to 6Mbps, and the modulation mode to QPSK. |
| 9Mbps-QPSK | Sets the data rate to 9Mbps, and the modulation mode to QPSK. |
| 12Mbps-16QAM | Sets the data rate to 12Mbps, and the modulation mode to 16QAM. |
| 18Mbps-16QAM | Sets the data rate to 18Mbps, and the modulation mode to 16QAM. |
| 24Mbps-64QAM | Sets the data rate to 24Mbps, and the modulation mode to 64QAM. |
| 27Mbps-64QAM | Sets the data rate to 27Mbps, and the modulation mode to 64QAM. |

**Table 3.6-3 Selection Options for Data Rate & Modulation When WLAN Standard is 802.11j (Channel Bandwidth=5 MHz) or 802.11p (Channel Bandwidth=5 MHz)**

| Selection options | Description |
|---|---|
| Auto | Automatically sets data rate and modulation mode. |
| 1.5Mbps-BPSK | Sets the data rate to 1.5Mbps, and the modulation mode to BPSK. |
| 2.25Mbps-BPSK | Sets the data rate to 2.25Mbps, and the modulation mode to BPSK. |
| 3Mbps-QPSK | Sets the data rate to 3Mbps, and the modulation mode to QPSK. |
| 4.5Mbps-QPSK | Sets the data rate to 4.5Mbps, and the modulation mode to QPSK. |
| 6Mbps-16QAM | Sets the data rate to 6Mbps, and the modulation mode to 16QAM. |
| 9Mbps-16QAM | Sets the data rate to 9Mbps, and the modulation mode to 16QAM. |
| 12Mbps-64QAM | Sets the data rate to 12Mbps, and the modulation mode to 64QAM. |
| 13.5Mbps-64QAM | Sets the data rate to 13.5Mbps, and the modulation mode to 64QAM. |

**Table 3.6-4 Selection Options for Data Rate & Modulation When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK)**

| Selection options | Description |
|---|---|
| Auto | Automatically sets data rate and modulation mode. |
| 1Mbps-DBPSK | Sets the data rate to 1Mbps, and the modulation mode to DBPSK. |
| 2Mbps-DQPSK | Sets the data rate to 2Mbps, and the modulation mode to DQPSK. |
| 5.5Mbps-CCK | Sets the data rate to 5.5Mbps, and the modulation mode to CCK. |
| 11Mbps-CCK | Sets the data rate to 11Mbps, and the modulation mode to CCK. |

***Note:***

- This is not available when WLAN Standard is 802.11n, and PPDU Format is HT-Mixed or HT-Greenfield.
- Auto setting is not available when Measuring Object is Continuous.
- When Auto is set and Measuring Object is switched to Continuous, Data Rate (Modulation) is automatically set to the value at the bottom of the table.
- When Measuring Object is Burst, and switching the WLAN Standard setting, Auto is set automatically.
- When Measuring Object is Continuous, and switching the WLAN Standard setting, the value at the bottom of the table is set automatically.
- This is not available when WLAN Standard is 802.11ac.

Detail Setting: MCS

■Summary

Selects whether to set the signal's MCS (Modulation and Coding Scheme) automatically or manually by decoding the HT-SIG field.

■Selection options

| | |
|---|---|
| Auto | Sets the MCS automatically. |
| Manual | Sets the MCS manually. |

***Note:***

- When the Measuring Object is Continuous, this is fixed to Manual.
- This is not available when WLAN Standard is 802.11n, and PPDU Format is not HT-Mixed or HT-Greenfield.

Detail Setting: MCS Index

■Summary

Sets the MCS Index.

■Setting range

0 to 76

**Table 3.6-5 The Number of Transmission Streams and the Modulation Method for MCS Index**

| MCS Index | Band | Number of transmission stream | Modulation method |
|---|---|---|---|
| 0 to 7 | 20M/40M | 1 | — |
| 8 to 15 | 20M/40M | 2 | Same between different streams |
| 16 to 23 | 20M/40M | 3 | Same between different streams |
| 24 to 31 | 20M/40M | 4 | Same between different streams |
| 32 | 40M | 1 | — |
| 33 to 38 | 20M/40M | 2 | Different between different streams |
| 39 to 52 | 20M/40M | 3 | Different between different streams |
| 53 to 76 | 20M/40M | 4 | Different between different streams |

***Note:***

- Only 0 to 7 is available when Measuring Object is Continuous.
- This is not available when MCS is set to Auto.

When WLAN Standard is 802.11ac, the setting range of the MCS index depends on the channel bandwidth and number of spatial stream as below.

■Setting range

0 to 9

**Table 3.6-6 MCS Index for 802.11ac**

| Number of Spatial Stream | Channel Bandwidth | | | |
|---|---|---|---|---|
| | 20MHz | 40MHz | 80MHz | 160MHz |
| 1 | 0 to 8 | 0 to 9 | 0 to 9 | 0 to 9 |
| 2 | 0 to 8 | 0 to 9 | 0 to 9 | 0 to 9 |
| 3 | 0 to 9 | 0 to 9 | 0 to 5, 7 to 9 | 0 to 8 |
| 4 | 0 to 8 | 0 to 9 | 0 to 9 | 0 to 9 |
| 5 | 0 to 8 | 0 to 9 | 0 to 9 | 0 to 9 |
| 6 | 0 to 9 | 0 to 9 | 0 to 8 | 0 to 9 |
| 7 | 0 to 8 | 0 to 9 | 0 to 5, 7 to 9 | 0 to 9 |
| 8 | 0 to 8 | 0 to 9 | 0 to 9 | 0 to 9 |

If the MSC index exceeds the range when WLAN Standard is changed, return it to the default.

Detail Setting: Number of Spatial Stream

■Summary

Sets the stream number of the measurement target.

■Setting range

1 to 8

***Note:***

It is forcibly set to Auto when MCS is Auto.

Detail Setting: Stream ID

■Summary

Sets the stream ID of the measurement target.

■Setting range

Auto, 1 to 4

***Note:***

- This is not available when MCS is set to Auto.
- When Stream ID is set to Auto, switching Measuring Object to

Continuous automatically sets the Stream ID to 1.

**Table 3.6-7 Setting Range According to MCS Index Settings**

| MCS Index | Setting range |
|---|---|
| 0 to 7 | Auto / 1 |
| 8 to 15 | Auto / 1 / 2 |
| 16 to 23 | Auto / 1 / 2 / 3 |
| 24 to 31 | Auto / 1 / 2 / 3 / 4 |
| 32 | Auto / 1 |
| 33 to 38 | Auto / 1 / 2 |
| 39 to 52 | Auto / 1 / 2 / 3 |
| 53 to 76 | Auto / 1 / 2 / 3 / 4 |

When IEEE802.11ac is WLAN Standard, the setting range of Stream ID is as below.

■Setting range

1 to 8

It is forcibly set to Auto when Number of Spatial Stream is set to Auto.

Detail Setting: Preamble Format

■Summary

Sets the preamble format of the measurement target signal.

■Selection options

| | |
|---|---|
| Auto | Analyzes the preamble format automatically. |
| Long | Analyzes the preamble format as Long. |
| Short | Analyzes the preamble format as Short. |

***Note:***

- This is available only when WLAN Standard is 802.11b, 802.11g (ERP-DSSS/CCK), or 802.11g (DSSS-OFDM).
- This command is not available when Measuring Object is Continuous.

Detail Setting: Guard Interval

■Summary

Sets the guard interval of the measurement target signal.

■Selection options

| | |
|---|---|
| Auto | Analyzes the guard interval automatically. |
| Long | Analyzes the guard interval as Long. |
| Short | Analyzes the guard interval as Short. |

***Note:***

- This is only available when WLAN Standard is 802.11n, and PPDU Format is HT-Mixed or HT-Greenfield. However, it is available when WLAN Standard is 802.11ac.
- This command is not available when Measuring Object is Continuous.

Detail Setting: EVM Calculation Method

■Summary

Sets the calculation method for EVM when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

■Selection options

IEEE Std 802.11-1999
: Calculates EVM based on IEEE Std 802. 11-1999.

IEEE Std 802. 11-2007
: Calculates EVM based on IEEE Std 802. 11-2007.

***Note:***

This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Detail Setting: Target Field

■Summary

Selects whether to measure in Preamble or PSDU when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

■Selection options

| | |
|---|---|
| PSDU | Starts the measurement at the beginning of PSDU. |
| Preamble | Starts the measurement at the beginning of Preamble. |

***Note:***

- This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).
- This command is not available when Measuring Object is Continuous.

Detail Setting: Channel Estimation

■Summary

Sets the target of the channel estimation.

■Selection options

| | |
|---|---|
| Seq only | Channel estimation is made for long training sequences. |
| Seq & Data | Channel estimation is made for all packets. |

***Note:***

- This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).
- This is not available when Measuring Object is Continuous; in that case, the setting is fixed to Seq & Data.

Detail Setting: Amplitude Tracking

■Summary

Sets the amplitude tracking On/Off.

■Selection options

| | |
|---|---|
| Off | Disables the amplitude correction. |
| On | Enables the amplitude correction. |

***Note:***

This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Detail Setting: Phase Tracking

■Summary

Sets the phase tracking On/Off.

■Selection options

| | |
|---|---|
| Off | Disables the phase correction. |
| On | Enables the phase correction. |

***Note:***

This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Detail Setting: Symbol Timing Adjustment

■Summary

Sets the FFT window position when measuring Modulation Analysis. FFT window start position can be set within the range of the guard interval. It is based on the center of the guard interval.

■Setting range

When WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11n, 802.11j, or 802.11p (when it is 802.11n or 802.11ac , Guard Interval should be set to Long):

–16 to 16

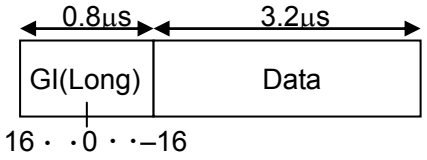



**Figure 3.6-1 FFT Window Start Position When Guard Interval = Long**

When WLAN Standard is 802.11n, 802.11ac (Guard Interval is set to Short):

–8 to 8

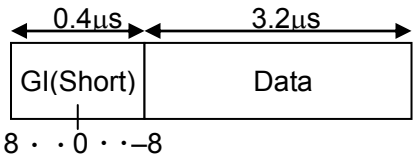



**Figure 3.6-2 FFT Window Start Position When Guard Interval = Short**

***Note:***

- This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).
- This is not available when WLAN Standard is 802.11n and Guard Interval is Auto.

Detail Setting: Filter Type

■Summary

Sets the reference filter used for EVM calculation. This setting applies if WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

■Selection options

| | |
|---|---|
| No Filter | Analysis is performed on the assumption that the reference filter does not exist. |
| Gaussian | Analysis is performed with the Gaussian filter as the reference filter. |
| Root Nyquist | Analysis is performed with the Root Nyquist filter as the reference filter. |

***Note:***

This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Detail Setting: Alpha/BT

■Summary

Sets the alpha value of the Root Nyquist filter or the bandwidth time product of the Gaussian filter used as the reference filter for EVM calculation.

■Setting range

0.3 to 1.0

***Note:***

- This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).
- This is not available when Filter Type is No Filter.

### 3.6.1.1 Trace (other than Summary)

How to set the Trace function items is described below. Pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace displays the Trace function menu.

**Table 3.6.1.1-1 Trace Function Menu**

| Position | Menu display | Function |
|---|---|---|
| Page 1 [F1] | Trace Mode | Sets the result type to be displayed on the graph window. |
| Page 1 [F2] | Storage | Sets the storage mode. |
| Page 1 [F3] | EVM Unit | Sets the display unit of EVM. |
| Page 1 [F4] | Constellation Symbol View | Selects how to show the Constellation screen. |
| Page 1 [F5] | View Select | Selects the view of the Constellation screen. |
| Page 1 [F6] | Constellation Zoom | Zooms in the Constellation (On). |

Trace Mode

■Summary

Sets the result type to be displayed on the graph window.

***Note:***

Setting this function switches the structure of the Trace function menu.

■Selection options

EVM vs Subcarrier

Displays EVM vs Subcarrier in the graph window.

EVM vs Symbol

Displays EVM vs Symbol in the graph window.

Spectral Flatness

Displays Spectral Flatness in the graph window.

EVM vs Chip

Displays EVM vs Chip in the graph window.

Phase Error vs Chip

Displays Phase Error vs Chip in the graph window.

Eye Diagram

Displays Eye Diagram in the graph window.

Summary

Displays numeric results such as EVM or SIGNAL field decoding results in the graph window.

***Note:***

Constellation is not displayed when Trace Mode is set to Summary.

Scale: EVM Scale

■Summary

Sets vertical scale of an EVM graphical result.

■Setting range

Sets the upper limit for the EVM scale.

in %: 0.1 to 100.0%, in dB: – 60 to 0 dB

***Note:***

This setting is not available when Trace Mode is set to Summary or Eye Diagram.

Scale: Flatness Scale

■Summary

Sets a scale of Spectral Flatness.

■Setting range

| | |
|---|---|
| Amplitude | Sets the upper and lower limit values of Amplitude in Spectral Flatness (1.0 to 100.0 dB). |
| Phase | Sets the upper and lower limit values of Phase in Spectral Flatness (1.0 to 180.0 degrees). |
| Group Delay | Sets the upper and lower limit values of Group Delay in Spectral Flatness (1 ns to 1 μs). |

Scale: Phase Error vs Chip

■Summary

Sets the scale of the Phase Error vs Chip.

■Setting range

1.0 degree to 180.0 degree

EVM vs Subcarrier Symbol View

■Summary

Selects how to show the EVM vs Subcarrier graph.

■Selection options

| | |
|---|---|
| Each | Show a subcarrier EVM for each symbol. |
| Averaged | Show the subcarrier EVM for the average of all symbols. |

***Note:***

This is only available when Trace Mode is set to EVM vs Subcarrier.

Graph View

■Summary

Selects how to show the average and maximum values of the graph.

■Selection options

| | |
|---|---|
| Ave. | Displays only the average EVM. |
| Ave.&Max | Displays the average and maximum EVMs. |

***Note:***

This is only available when Storage Mode is set to Average & Max.

Storage

■Summary

Sets the storage mode.

■Selection options

| | |
|---|---|
| Mode | Sets the storage mode. |
| Count | Sets the measurement count. |

Storage: Mode

■Summary

Sets the storage mode.

■Selection options

| | |
|---|---|
| Off | Updates the data every time it measures. |
| Average | Displays the average value every time it measures. |
| Average & Max | Displays the average value and maximum value every time it measures. |

Storage: Count

■Summary

Sets the measurement count.

■Setting range

2 to 9999

EVM Unit

■Summary

Sets the unit of EVM.

■Selection options

| | |
|---|---|
| % | Sets the unit of EVM to %. |
| dB | Sets the unit of EVM to dB. |

Constellation Symbol View

■Summary

Selects how to show the Constellation screen.

■Selection options

| | |
|---|---|
| Each | Displays Constellation for each symbol. Displays the Constellation for the symbol specified in the Symbol Number of Marker. |
| All | Displays Constellation for all symbols. |

***Note:***

This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

View Select

■Summary

Selects the view of the Constellation screen.

■Selection options

| | |
|---|---|
| Total | Displays all subcarriers |
| Data | Displays data subcarriers only |
| Pilot | Displays pilot subcarriers only |
| One Subcarrier | Displays the marked subcarriers only |
| OutSide Pair | Displays the subcarriers at both ends only |

***Note:***

This is not available when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Spectral Flatness Type

■Summary

Sets the display type for the spectral flatness graph.

■Selection options

| | |
|---|---|
| Amplitude | Displays Amplitude of Spectral Flatness. |
| Phase | Displays Phase of Spectral Flatness. |
| Group Delay | Displays Group Delay of Spectral Flatness. |

Constellation Zoom

■Summary

Selects whether to zoom in the Constellation screen.

■Selection options

| | |
|---|---|
| On | Zooms in the Constellation screen. |
| Off | Does not zoom in the Constellation screen. |

### 3.6.1.2 Trace (Summary)

How to set the Trace function items is described below. Pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace displays the Trace function menu.

**Table 3.6.1.2-1 Trace Function Menu**

| Position | Menu display | Function |
|---|---|---|
| Page 1 [F1] | Trace Mode | Sets the result type to be displayed on the graph window. |
| Page 1 [F2] | Storage | Sets the storage mode.<br>☞ 3.6.1.1 “Trace (other than Summary)” |
| Page 1 [F3] | EVM Unit | Sets the unit of EVM.<br>☞ 3.6.1.1 “Trace (other than Summary)” |

Trace Mode

■Summary

Sets the result type to be displayed on the graph window.

***Note:***

Setting this function switches the structure of the Trace function menu.

■Selection options

EVM vs Subcarrier

Displays EVM vs Subcarrier in the graph window.

EVM vs Symbol

Displays EVM vs Symbol in the graph window.

Spectral Flatness

Displays Spectral Flatness in the graph window.

EVM vs Chip

Displays EVM vs Chip in the graph window.

Phase Error vs Chip

Displays Phase Error vs Chip in the graph window.

Eye Diagram

Displays Eye Diagram in the graph window.

Summary

Displays numeric results such as EVM or SIGNAL field decoding results in the graph window.

***Note:***

Constellation is not displayed when Trace Mode is set to Summary.

## 3.6.2 Power vs Time measurement

This subsection describes how to set the Power vs Time items. Pressing F2 (Power vs Time) in the Measure menu displays the Power vs Time function menu.

The Power vs Time function menu consists of two pages. Press → to toggle between the pages.

Power vs Time is not available when WLAN Standard is 802.11ac.

**Table 3.6.2-1 Power vs Time Function Menu**

| Position | Menu display | Function |
|---|---|---|
| Page 1 [F1] | Analysis Time | Sets measurement position. |
| Page 1 [F2] | WLAN Standard | Sets WLAN Standard.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F3] | Measuring Object | Sets the switching between burst/continuous signals.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F4] | Channel Bandwidth | Sets Channel Bandwidth.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F5] | PPDU Format | Sets the PPDU format.<br>☞ 3.5 “Setting Common Items” |
| Page 1 [F6] | Signal Setup | Sets the synchronization method of the target signal. |
| Page 2 [F1] | Trace | Sets the trace. |

Analysis Length

■Summary

Displays the range of the Power vs Time measurement. When Preamble Search and Ramp Down Detection are both Off, the Power vs Time waveform for the range specified in Analysis Length is displayed.

■Setting range

0.02 ms to 50 ms or Burst Interval, whichever smaller.

***Note:***

This is not available when either Preamble Search or Ramp-down Detection is On.

Signal Setup

■Summary

Sets the synchronization method of the burst signal.

■Selection options

Preamble Search Sets whether to detect the burst start position by synchronizing with the Preamble.

Ramp-down Detection

Sets whether to adjust the burst end point detection by detecting the burst falling.

Detection Level

Sets the threshold of the Ramp-down Detection.

Detection Offset

After the synchronization, displays the waveform with offsets added to the synchronization timing.

Signal Setup: Preamble Search

■Summary

Sets whether to detect the burst start position by synchronizing with the Preamble.

■Selection options

On Detects the burst start position by synchronizing with the Preamble. Also, gets the burst length by decoding the SIGNAL field.

Off Detects the start position from the burst power without synchronizing with the Preamble.

***Note:***

This is not available when Measuring Object is Continuous; in that case, it is automatically set to Off.

Signal Setup: Ramp-down Detection

■Summary

Sets whether to adjust the burst end point detection by detecting the burst falling.

■Selection options

| | |
|---|---|
| On | Adjusts the burst end point detection by detecting the burst falling. |
| Off | Does not adjust the burst end point detection by detecting the burst falling. The end point shown by Power vs Time depends on the settings for Analysis Length and Preamble Search. |

***Note:***

This is not available when Measuring Object is Continuous; in that case, it is automatically set to Off.

Signal Setup: Detection Level

■Summary

Sets the threshold of the Ramp-down Detection.

■Setting range

–20 to 0 dBm

Signal Setup: Detection Offset

■Summary

After the synchronization, displays the waveform with offsets added to the synchronization timing.

■Setting range

–2.0 to 2.0 μs

### 3.6.2.1 Trace

How to set the Trace function items is described below. Pressing F1 (Trace Trace) on page 2 of the Power vs Time function menu or Trace displays the Trace function menu.

**Table 3.6.2.1-1 Trace function menu**

| Position | Menu Display | Function |
|---|---|---|
| Page 1 [F1] | Trace Mode | Sets type of result displayed in a graph window. |
| Page 1 [F2] | Storage | Sets the storage mode. ☞ 3.5 "Setting Common Items" |
| Page 1 [F3] | Display Reference Level | Changes the reference value of the waveform display. |
| Page 1 [F4] | Transient Time Scale | Sets the display range for the horizontal axis. |
| Page 1 [F5] | Transient Ref. Power | Sets the reference transmission power. |
| Page 1 [F6] | Smoothing Filter | Sets whether to perform smoothing against the waveform display. |

Trace Mode

■Summary

Sets type of result displayed in a graph window.

■Selection options

Burst

Displays the waveform of one burst. One burst may not be displayed when Analysis Length is not set correctly, or Preamble Search and Ramp-Down Detection are set to Off.

Transient

Zooms in the burst rising and falling.
The burst length is (analysis length + preamble length).
The burst falling may not be displayed when Analysis Length is not set correctly, or Preamble Search and Ramp-Down Detection are set to Off.

Display Reference Level

■Summary

Sets the reference value of the waveform display.

■Selection options

Max Sets the reference value of the waveform display to the maximum instantaneous power.

Ave. Sets the reference value of the waveform display to the average power.

### Transient Time Scale

■Summary

Sets the reference value of the waveform display.

■Setting range

8.0 µs to 40.0 µs

***Note:***

- This command is not available when Measuring Object is Continuous.
- This is not available when Trace Mode is Burst.

### Transient Ref. Power

■Summary

Sets the range for calculating the reference value of the waveform display.

■Selection options

| | |
|---|---|
| Total | Sets the reference value to the transmission power of the whole burst. |
| Ramp | Sets the reference value to the transmission power within the range of rising/falling waveform display. |

***Note:***

- This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).
- This command is not available when Measuring Object is Continuous.
- This is not available when Trace Mode is Burst.

### Smoothing Filter

■Summary

Sets whether to perform smoothing against the waveform display.

■Selection options

| | |
|---|---|
| On | Enables smoothing. |
| Off | Disables smoothing. |

### 3.6.3 Adjacent Channel Leakage Power measurement (ACP)

This subsection describes the ACP function key. Pressing F4 (ACP (Swept)) in the Measure menu recalls the ACP function of the Spectrum Analyzer function. Settings of Carrier Frequency, Input level, Offset, Offset Value and Pre-Amp are automatically reflected on the corresponding parameters. Recall Current Application described in Section 3.6.2 "Recalling parameters" of the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* or *MS2830A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* cannot be executed when this function is being recalled.

ACP (Swept)

■Summary

The ACP function of the Spectrum Analyzer function is called, and the adjacent channel leakage power is measured according to the handed over parameter settings.

### 3.6.4 Occupied Bandwidth measurement (OBW)

This subsection describes the OBW function key. Pressing F6 (OBW (Swept)) in the Measure menu recalls the OBW function of the Spectrum Analyzer function. Settings of Carrier Frequency, Input level, Offset, Offset Value and Pre-Amp are automatically reflected on the corresponding parameters. Recall Current Application described in Section 3.6.2 "Recalling parameters" of the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* or *MS2830A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* cannot be executed when this function is being recalled.

OBW (Swept)

■Summary

The OBW function of the Spectrum Analyzer function is called, and the occupied bandwidth is measured according to the handed over parameter settings.

## 3.6.5 Spectrum Emission Mask (SEM)

This subsection describes the SEM function key. Pressing F7 (Spurious Emission Mask (Swept)) in the Measure menu recalls the Spectrum Emission Mask function of the Spectrum Analyzer function. Settings of Carrier Frequency, Input level, Offset, Offset Value and Pre-Amp are automatically reflected on the corresponding parameters. Recall Current Application described in Section 3.6.2 “Recalling parameters” of the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* or *MS2830A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* cannot be executed when this function is being recalled.

Spectrum Emission Mask (Swept)

■Summary

Recalls the Spectrum Emission Mask function of the Spectrum Analyzer function and measures the spectrum emission mask for the reflected parameter settings.

## 3.6.6 Spurious Emission measurement

This subsection describes the Spurious Emission function key. Pressing F8 (Spurious Emission (Swept)) in the Measure menu recalls the Spurious Emission function of the Spectrum Analyzer function. Settings of Carrier Frequency, Input level, Offset, Offset Value and Pre-Amp are automatically reflected on the corresponding parameters. Recall Current Application described in Section 3.6.2 “Recalling parameters” of the *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* or *MS2830A Signal Analyzer Operation Manual (Signal Analyzer Function Operation)* cannot be executed when this function is being recalled.

Spurious Emission (Swept)

■Summary

Recalls the Spurious Emission function of the Spectrum Analyzer function and measures the spurious emissions for the reflected parameter settings.

# 3.7 Setting Marker

This section describes how to configure the marker-related settings. Pressing F5 (Marker) on the main function menu or Marker displays the page 1 of the Marker function menu. Also, pressing Peak Search displays page 2 of the Marker function menu.

The Marker function menu consists of 2 pages that are toggled by pressing →.

***Note:***

You cannot configure marker settings when Trace Mode is set to Summary.

## 3.7.1 Setting markers for Modulation Analysis

Marker

■Summary

Sets the Marker On/Off.

■Selection options

| | |
|---|---|
| On | Enables the marker function. |
| Off | Disables the marker function. |

Subcarrier Number

■Summary

Sets the position of the subcarrier targeted for the marker.

■Setting range

When the Trace Mode is EVM vs Subcarrier, EVM vs Symbol, or Spectral Flatness:

When WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j, or 802.11p:

–26 to 26

When WLAN Standard is 802.11n:

–26 to 26 (Channel Bandwidth = 20 MHz, PPDU Format = Non-HT)

–28 to 28 (Channel Bandwidth = 20 MHz, PPDU Format ≠ Non-HT)

–58 to 58 (Channel Bandwidth = 40 MHz, PPDU Format = Non-HT)

–58 to 58 (Channel Bandwidth = 40 MHz, PPDU Format ≠ Non-HT)

–60 to 60 (Channel Bandwidth = 40 MHz Upper or 40 MHz Lower)

When WLAN Standard is 802.11ac:

–28 to 28 (Channel Bandwidth = 20 MHz)

–58 to 58 (Channel Bandwidth = 40 MHz)

–122 to 122 (Channel Bandwidth = 80 MHz)

–250 to 250 (Channel Bandwidth = 160 MHz)

***Note:***

This is available only when WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j, 802.11n, 802.11p or 802.11ac.

Symbol Number

■Summary

Sets the position of the symbol targeted for the marker.

■Setting range

0 to Analysis Length – 1

3.6.1 “Modulation Analysis"

***Note:***

This is available only when WLAN Standard is 802.11a, 802.11g (ERP-OFDM), 802.11g (DSSS-OFDM), 802.11j, 802.11n, or 802.11p.

Chip Number

■Summary

Sets the position of the chip targeted for the marker.

■Setting range

0 to Analysis Length – 1

☞ 3.6.1 “Modulation Analysis"

***Note:***

This is available only when WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK).

Eye Diagram Chip Number

■Summary

Sets the position of the chip targeted for the marker in eye diagram.

■Setting range

0 to Analysis Length – 0. 1 or 999. 9, whichever smaller

☞ 3.6.1 “Modulation Analysis"

***Note:***

This is available only when Trace Mode is set to Eye Diagram.

Peak Search

■Summary

Moves the marker to the maximum level point within the measurement range. When there are multiple maximum level points, the point corresponding to the smallest value (left side of the scale) on the horizontal axis (Subcarrier, or Symbol) is selected.

Next Peak

■Summary

Moves the marker to the next largest level point after the current marker level within the measurement range. When there are multiple points, the point corresponding to the smallest value (left side of the scale) on the horizontal scale is selected. However, if the point is the same value as the marker level, the marker is moved to the next maximum point to the horizontal axis position of the marker.

Dip Search

■Summary

Moves the marker to the minimum level position within the measurement range. When there are multiple points, the point corresponding to the greatest value (right side of the scale) on the horizontal axis is selected.

Next Dip

■Summary

Moves the marker to the next smallest level point after the current marker level within the measurement range. When there are multiple points, the point corresponding to the greatest value (right side of the scale) on the horizontal axis is selected. However, if the point is the same value as the marker level, the marker is moved to the next minimum point to the horizontal axis position of the marker.

## 3.7.2 Setting markers for Power vs Time measurement

Marker

■Summary

Sets the Marker On/Off.

■Selection options

| | |
|---|---|
| On | Enables the marker function. |
| Off | Disables the marker function. |

Marker Number

■Summary

Sets the position targeted for the marker.

■Setting range

Can be set to the ranges shown in the following table.

**Table 3.7.1.2-1 Setting range of Marker Number**

| Trace Mode | Preamble Search / Ramp-down Detection | Marker NumberSetting range | |
|---|---|---|---|
| | | Rise Select | Fall Select |
| Burst | Either or both On | –20.0 µs to the detected burst length + 20.0 µs | |
| | Both Off | –20.0 µs to $L_{AL}$ + 20.0 µs | |
| Transient | Either or both On | – $T_{TTS}$ /2 to $T_{TTS}$ /2 | The detected burst length – $T_{TTS}$ /2 to the detected burst length + $T_{TTS}$ /2 |
| | Both Off | – $T_{TTS}$ /2 to $T_{TTS}$ /2 | $L_{AL}$ – $T_{TTS}$ /2 to $L_{AL}$ + $T_{TTS}$ /2 |

* TTTS is the setting for Transient Time Scale, and LAL is the setting for Analysis Length.

☞ 3.6.2 “Power vs Time measurement”

Rise Select

■Summary

Sets the marker target to the window that displays burst rising.

***Note:***

This is available only when Trace Mode is set to Transient.

Fall Select

■Summary

Sets the marker target to the window that displays burst falling.

***Note:***

This is available only when Trace Mode is set to Transient.

# 3.8 Setting Trigger

This subsection describes how to configure the trigger-related settings. Pressing F6 (Trigger) on the main function menu or Trigger/Gate displays the Trigger function menu.

***Note :***

You cannot set a trigger when the Replay function is executed.

4.2 "Replay Function"

### Trigger Switch

■Summary

This sets the trigger synchronization On/Off.

■Selection options

| | |
|---|---|
| On | Enables the trigger function. |
| Off | Disables the trigger function. |

### Trigger Source

■Summary

Sets the trigger source.

■Selection options

| | |
|---|---|
| Wide IF Video | An IF signal with a wide passing band of about 50 MHz is detected, and measurement starts in synchronization with the rise or fall of the detected signal. |
| External | Measurement starts with external trigger signal input. |
| SG Marker | Starts measurement by the timing of internal Vector Signal Generator option. |

### Trigger Slope

■Summary

Sets the trigger polarity.

■Selection options

| | |
|---|---|
| Rise | Synchronizes with rising edge of the trigger. |
| Fall | Synchronizes with falling edge of the trigger. |

### Wide IF Video Trigger Level

■Summary

Sets the level threshold for detecting the slot.

■Setting range

(-60 + Level Offset Value) to (+50 + Level Offset Value) dBm

Trigger Delay

■Summary

Sets the trigger delay.

■Setting range

−2 to +2 s

# 3.9 EVM

This section describes how EVM analysis results are displayed. According to the storage mode specified, the results in a single measurement are displayed for Off, the averages of the results in the specified number of measurements for Average, and the averages and the maximums of the results in the specified number of measurements for Average & Max, respectively.

☞ 3.6.1 “Modulation Analysis"

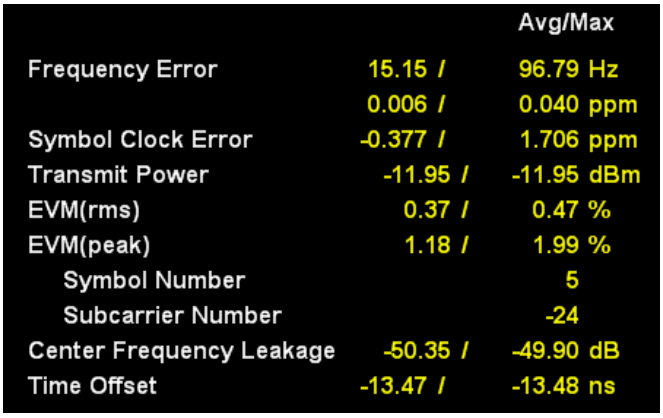



**Figure 3.9-1 Result Window**

Frequency Error (Hz)

■Summary

Displays the average frequency error in the range set in Analysis Length Setup and Analysis Length.

☞ 3.6.1 “Modulation Analysis"

Frequency Error (ppm)

■Summary

Displays the average frequency error in the range set in Analysis Length Setup and Analysis Length.

☞ 3.6.1 “Modulation Analysis"

Symbol Clock Error

■Summary

Displays the symbol clock error.

Chip Clock Error

■Summary

Displays the chip clock error.

Transmit Power

■Summary

Displays the average RF level in the range set in Analysis Length Setup and Analysis Length.

☞ 3.6.1 “Modulation Analysis"

EVM (rms)

■Summary

Displays the average EVM level in the range set in Analysis Length Setup and Analysis Length.

Switches between % and dB according to settings of EVM Unit.

☞ 3.6.1 “Modulation Analysis"

EVM (peak)

■Summary

Displays the maximum EVM of all subcarriers and all symbols (chips) in the range set in Analysis Length Setup and Analysis Length.

Switches between % and dB according to settings of EVM Unit.

☞ 3.6.1 “Modulation Analysis"

Symbol Number

■Summary

Displays the symbol number of EVM (peak).

Chip Number

■Summary

Displays the chip number of EVM (peak).

Subcarrier Number

■Summary

Displays the subcarrier number of EVM (peak).

Center Frequency Leakage

■Summary

Displays the average center frequency leakage in the range set in Analysis Length Setup and Analysis Length.

☞ 3.6.1 “Modulation Analysis"

IQ Origin Offset

■Summary

Displays the average IQ Origin Offset in the range set in Analysis Length Setup and Analysis Length.

☞ 3.6.1 “Modulation Analysis"

Time Offset

■Summary

Displays the time offset between the trigger input and the head of the frame.

This is enabled when the trigger function is On.

# 3.10 Constellation Display

In this application, the constellation parameters differ depending on the Trace Mode settings. The constellation is displayed when EVM vs Subcarrier, EVM vs Symbol, EVM vs Chip, Phase Error vs Chip, Eye Diagram, or Spectral Flatness is selected for Trace Mode.

The constellations in the range specified in View Select are displayed.

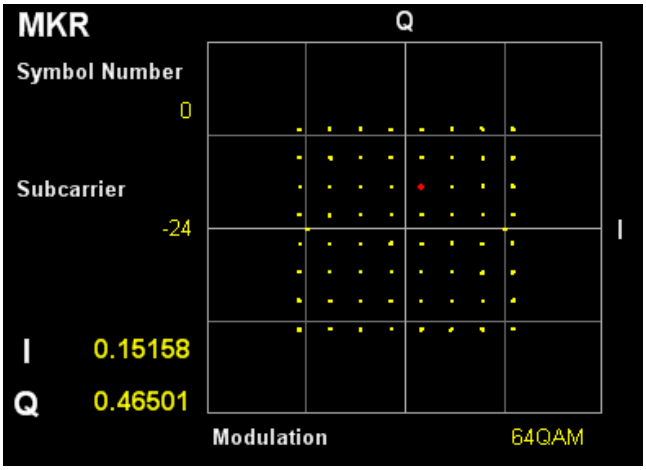



**Figure 3.10-1 Constellation Display**

Graph display

■Summary

When WLAN Standard is not 802.11b or 802.11g (ERP-DSSS/CCK), and Constellation Symbol View is set to Each, constellations of all subcarriers for the symbol set in Marker Symbol Number are displayed overlapping each other.
When WLAN Standard is not 802.11b or 802.11g (ERP-DSSS/CCK), and Constellation Symbol View is set to All, constellations of all subcarriers for all symbols in the range set by Analysis Length Setup and Analysis Length are displayed overlapping each other.
When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), constellations in the range set by Analysis Length Setup and Analysis Length are displayed overlapping each other.

The marker-selected subcarrier is displayed in red.

☞ 3.6.1.1 “Trace (other than Summary)”

MKR Subcarrier

■Summary

Displays the marker-selected subcarrier number. The marker can be moved with the cursor key or the rotary knob.

MKR Symbol Number

■Summary

Displays the marker-selected symbol number.

MKR Chip Number

■Summary

Displays the marker-selected chip number.

MKR I/Q

■Summary

Displays the amplitude value of I/Q of the marker-selected subcarrier. The marker can be moved with the cursor key or the rotary knob.

When WLAN Standard is not 802.11b or 802.11g (ERP-DSSS/CCK), the amplitude value is normalized in the value in which that of Pilot Subcarrier is set to 1.0. When WLAN Standard is 802.11b or 802.11g (ERP-DSSS/CCK), it is normalized in the value in which the average amplitude value of all samples is set to 1.0.

MKR Modulation

■Summary

Displays the modulation method for the marked subcarrier (chip).

# 3.11 EVM vs Subcarrier Display

This section describes how EVM for each subcarrier is displayed.

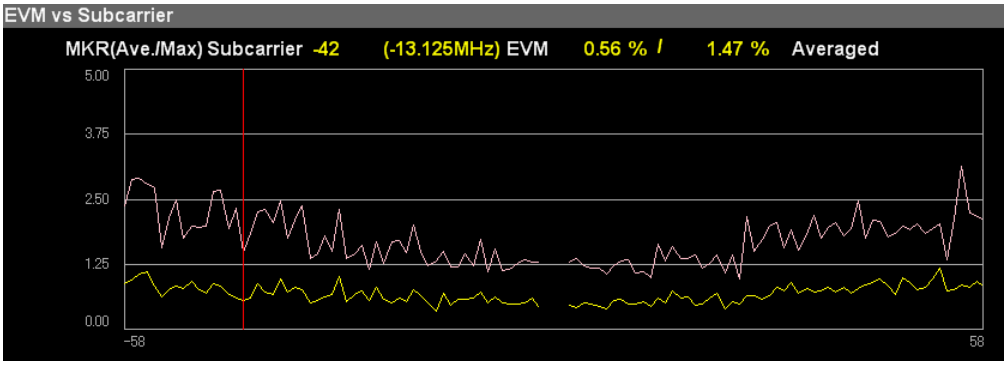



**Figure 3.11-1 EVM vs Subcarrier Display**

Graph display

■Summary

Displays EVM for each subcarrier.
The marker-selected subcarrier is displayed in red. The displayed contents depend on the settings in EVM vs Subcarrier Symbol View and Graph View.

☞ 3.6.1.1 “Trace (other than Summary)”

MKR Subcarrier

■Summary

Displays the number for the marker-selected subcarrier and the offset frequency from the center frequency. The marker can be moved with the cursor key or the rotary knob.

MKR EVM

■Summary

Displays the average and maximum EVM values of the marker-selected subcarriers.

MKR Symbol Number

■Summary

Displays the symbol number set in Symbol Number.

# 3.12 EVM vs Symbol Display

This section describes how EVM for each Symbol is displayed.

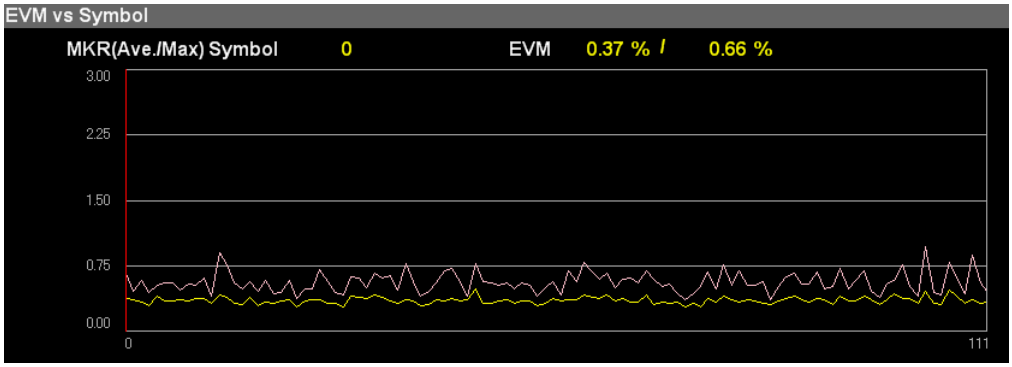



**Figure 3.12-1 EVM vs Symbol Display**

Graph display

■Summary

Displays EVM for each Symbol. The displayed contents depend on the settings in Graph View.

The marker-selected Subcarrier is displayed in red.

☞ 3.6.1.1 “Trace (other than Summary)”

MKR Symbol

■Summary

Displays the marker-selected symbol number. The marker can be moved with the cursor key or the rotary knob.

MKR EVM

■Summary

Displays the average and maximum EVMs of the symbol selected by the marker.

# 3.13 EVM vs Chip Display

This section describes how EVM for each chip is displayed.

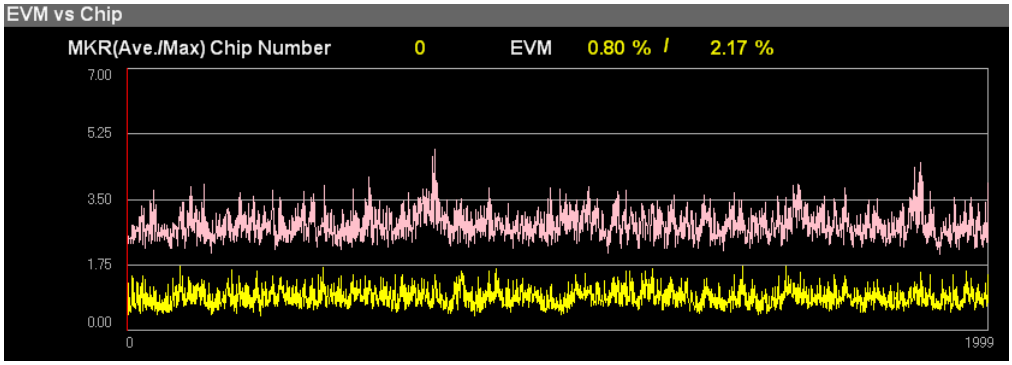



**Figure 3.13-1 EVM vs Chip Display**

Graph display

■Summary

Displays EVM for each chip. The displayed contents depend on the settings in Graph View.

The marker-selected Subcarrier is displayed in red.

3.6.1.1 “Trace (other than Summary)”

MKR Chip Number

■Summary

Displays the marker-selected chip number. The marker can be moved with the cursor key or the rotary knob.

MKR EVM

■Summary

Displays the average and maximum EVMs of the chip selected by the marker.

# 3.14 Phase Error vs Chip Display

This section describes how Phase Error for each chip is displayed.

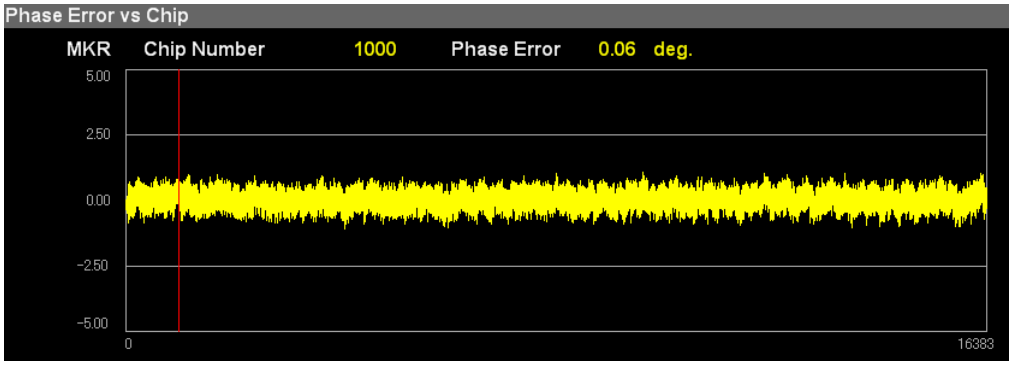



**Figure 3.14-1 Phase Error vs Chip Display**

Graph display

■Summary

Displays Phase Error for each chip.

The symbol selected by the marker is displayed in red.

☞ 3.6.1.1 “Trace (other than Summary)”

MKR Chip Number

■Summary

Displays the marker-selected chip number. The marker can be moved with the cursor key or the rotary knob.

MKR Phase Error

■Summary

Displays the average Phase Error of the chip selected by the marker.

# 3.15 Spectral Flatness Display

This section describes how the measurement results of Spectral Flatness are displayed.

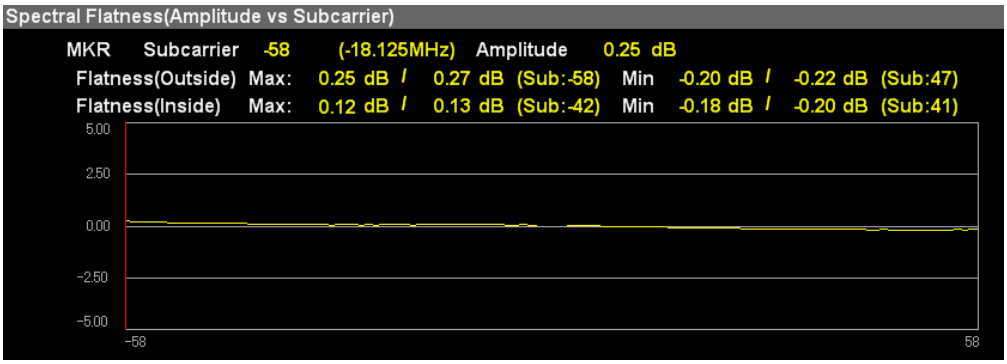



**Figure 3.15-1 Amplitude of Spectral Flatness Display**

Graph display

■Summary

Displays the Spectral Flatness value of an input signal. This Spectral Flatness value is based on the average in the range set in Analysis Length Setup and Analysis Length.
The marker-selected subcarrier is displayed in red.

3.6.1.1 “Trace (other than Summary)”

MKR Subcarrier

■Summary

Displays the number for the marker-selected subcarrier and the offset frequency from the center frequency. The marker can be moved with the cursor key or the rotary knob.

MKR Amplitude

■Summary

Displays amplitude of Spectral Flatness in the marker-selected subcarrier.

MKR Phase

■Summary

Displays phase of Spectral Flatness in the marker-selected subcarrier.

MKR Group Delay

■Summary

Displays group delay of Spectral Flatness in the marker-selected subcarrier.

Flatness (Outside) Max

■Summary

Displays the maximum value of the amplitude for the subcarrier belonging to Outside and its subcarrier number.

**Table 3.15-1 Subcarrier Numbers Displayed in Spectral Flatness**

| WLAN Standard | Subcarrier number | |
|---|---|---|
| | Inside* | Outside* |
| 802.11a,<br>802.11g (ERP-OFDM),<br>802.11g (DSSS-OFDM),<br>802.11j,<br>802.11p,<br>802.11n (PPDU Format = Non-HT, Channel Bandwidth = 20MHz) | –16 to –1,<br>+1 to +16 | –26 to –17,<br>+17 to +26 |
| 802.11n (PPDU Format ≠ Non-HT Channel Bandwidth = 20MHz),<br>802.11ac (Channel Bandwidth = 20MHz) | –16 to –1,<br>+1 to +16 | –28 to –17,<br>+17 to +28 |
| 802.11n (PPDU Format ≠ Non-HT, Channel Bandwidth = 40MHz Lower) | –48 to –33,<br>–31 to –16 | –60 to –49,<br>–15 to –4 |
| 802.11n (PPDU Format ≠ Non-HT, Channel Bandwidth = 40MHz Upper) | +16 to +31,<br>+33 to +48 | +4 to +15,<br>+49 to +60 |
| 802.11n (Channel Bandwidth = 40MHz, MCS ≠ 32)<br>802.11ac (Channel Bandwidth = 40MHz) | –42 to –2,<br>+2 to +42 | –58 to –43,<br>+43 to +58 |
| 802.11n (Channel Bandwidth = 40MHz, MCS=32) | –42 to –33,<br>–31 to –6,<br>+6 to +31,<br>+33 to +42 | –58 to –43,<br>+43 to +58 |
| 802.11ac (Channel Bandwidth = 80MHz) | –84 to –2,<br>+2 to +84 | –122 to –85,<br>+85 to +122 |
| 802.11ac (Channel Bandwidth = 160MHz) | –172 to –130,<br>–126 to –44,<br>+44 to +126,<br>+130 to +172 | –250 to –173,<br>–43 to –6,<br>+6 to +43,<br>+173 to +250 |

*: Subcarriers are classified into Inside and Outside, as follows:

Inside: Subcarriers with the maximum deviation of ±4 dB.

Outside: Subcarriers with the maximum deviation from –6 dB to +4 dB.

Flatness (Outside) Min

■Summary

Displays the minimum value of the amplitude for the subcarrier belonging to Outside and its subcarrier number.

☞ Table 3.15-1 Subcarrier Numbers Displayed in Spectral Flatness

Flatness (Inside) Max

■Summary

Displays the maximum value of the amplitude for the subcarrier belonging to Inside and its subcarrier number.

☞ Table 3.15-1 Subcarrier Numbers Displayed in Spectral Flatness

Flatness (Inside) Min

■Summary

Displays the minimum value of the amplitude for the subcarrier belonging to Inside and its subcarrier number.

☞ Table 3.15-1 Subcarrier Numbers Displayed in Spectral Flatness

# 3.16 Eye Diagram Display

This section describes how the measurement results of Eye Diagram are displayed.

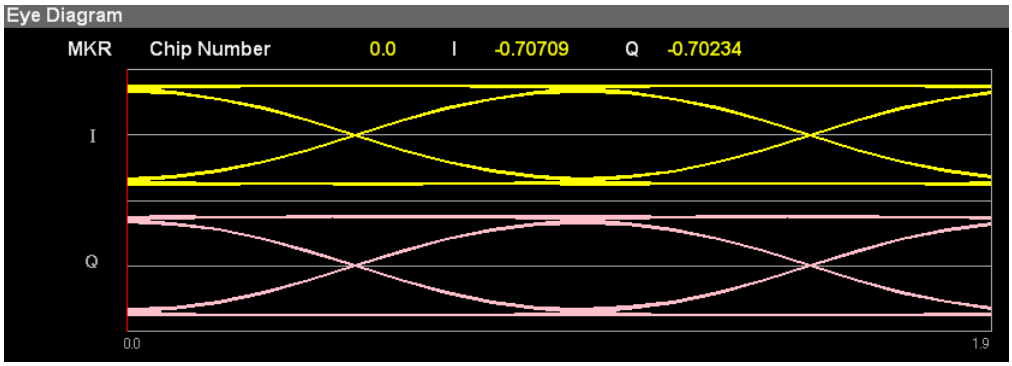



**Figure 3.16-1 Eye Diagram Display**

Graph display

■Summary

Displays the Eye Diagram value of an input signal. In this Eye Diagram, the range set in Analysis Length Setup and Analysis Length is displayed. However, if Analysis Length is more than 1000 chips, the 1000 chips range is displayed. For Storage measurements, the last measurement result is displayed.
The marker-selected subcarrier is displayed in red.

3.6.1.1 “Trace (other than Summary)”

MKR Chip Number

■Summary

Displays the marker-selected chip number. The marker can be moved with the cursor key or the rotary knob.

MKR I, Q

■Summary

Displays the amplitude value of I/Q of the marker-selected chip. The amplitude value is normalized in the value in which the average amplitude value of all samples is set to 1.0.

# 3.17 Summary Display

This section describes how numeric results such as EVM or SIGNAL field decoding results are displayed.

EVM (rms)

■Summary

Displays the average EVM level in the range set in Analysis Length Setup and Analysis Length.

☞ 3.9 “EVM”

Data EVM

■Summary

Displays the average EVM of data subcarrier in the range set in Analysis Length Setup and Analysis Length.

Pilot EVM

■Summary

Displays the average EVM of pilot subcarrier in the range set in Analysis Length Setup and Analysis Length.

EVM (peak)

■Summary

Displays the maximum EVM of all subcarriers and all symbols (chips) in the range set in Analysis Length Setup and Analysis Length.

☞ 3.9 “EVM”

SIG EVM(rms)

■Summary

Displays the EVM of signal field. Switches between % and dB according to settings of EVM Unit.
Displays only when WLAN Standard is 802.11a.

☞ 3.6.1 “Modulation Analysis”

L-SIG EVM(rms)

■Summary

Displays the EVM of L_SIG. Switches between % and dB according to settings of EVM Unit.
Displays only when WLAN Standard is 802.11n or 802.11ac.

☞ 3.6.1 “Modulation Analysis”

HT-SIG EVM(rms)

■Summary

Displays the EVM of L_SIG. Switches between % and dB according to settings of EVM Unit.

Displays only when WLAN Standard is 802.11n and PPDU Format is HT-Mixed or HT-Greenfield.

☞ 3.6.1 “Modulation Analysis”

VHT-SIG-A EVM(rms)

■Summary

Displays the EVM of VHT-SIG-A. Displays only when WLAN Standard is 802.11ac.

Displays only when WLAN Standard is 802.11ac.

☞ 3.6.1 “Modulation Analysis”

VHT-SIG-B EVM(rms)

■Summary

Displays the EVM of VHT-SIG-B. Switches between % and dB according to settings of EVM Unit.

Displays only when WLAN Standard is 802.11ac.

☞ 3.6.1 “Modulation Analysis”

Symbol Number

■Summary

Displays the symbol number of EVM (peak).

Chip Number

■Summary

Displays the chip number of EVM (peak).

Subcarrier Number

■Summary

Displays the subcarrier number of EVM (peak).

Quadrature Error

■Summary

Displays the Quadrature Error in the range set in Analysis Length Setup and Analysis Length.

Does not display when Channel Bandwidth is 160MHz.

IQ Gain Imbalance

■Summary

Displays the IQ Gain Imbalance in the range set in Analysis Length Setup and Analysis Length.
Does not display when Channel Bandwidth is 160MHz.

Center Frequency Leakage

■Summary

Displays the average center frequency leakage in the range set in Analysis Length Setup and Analysis Length.

IQ Origin Offset

■Summary

Displays the average IQ Origin Offset in the range set in Analysis Length Setup and Analysis Length.

Phase Error

■Summary

Displays the average phase error in the range set in Analysis Length Setup and Analysis Length.

Magnitude Error

■Summary

Displays the average magnitude error in the range set in Analysis Length Setup and Analysis Length.

Detect Parameter

■Summary

Displays information obtained by decoding SIGNAL field or HT-SIG field. For Storage measurements, the last measurement result is displayed.

Detect Parameter: Data Rate

■Summary

Displays data rate obtained by decoding SIGNAL field or HT-SIG field.

Detect Parameter: Modulation

■Summary

Displays modulation method obtained by decoding SIGNAL field or HT-SIG field.

Detect Parameter: Length

■Summary

Displays the symbol (chip) length for the PSDU field obtained by decoding SIGNAL field or HT-SIG field.

Detect Parameter: GI

■Summary

Displays whether the Guard Interval obtained by decoding HT-SIG field is Long or Short.

Detect Parameter: MCS Index

■Summary

Displays information for MCS obtained by decoding HT-SIG field.

Detect Parameter: Stream ID

■Summary

Displays information for Stream ID obtained by analysis.

Detect Parameter: Preamble

■Summary

Displays whether the Preamble obtained by decoding SIGNAL field is Long or Short.

# 3.18 Power vs Time Setting

This section describes how the time fluctuations of power of the measured signal are displayed.


**Figure 3.18-1 Power vs Time Setting Screen (Transient)**

Transmit Power

■Summary

Displays the average RF level in the range set in Analysis Length Setup and Analysis Length.

3.6.2 “Power vs Time measurement“

Power Flatness Max

■Summary

Displays the maximum RF level in the range set in Analysis Length Setup and Analysis Length.

3.6.2 “Power vs Time measurement“

Carrier Off Power

■Summary

Displays the average power when the transmission is Off.

On/Off Ratio

■Summary

Displays the ratio of the average power between transmission On and Off in dB.

Peak PSD

■Summary

Displays the maximum value of the power spectrum density for 1 MHz band.

Transient Time

■Summary

Displays the burst transition time when WLAN Standard is 802.11b and 802.11g (ERP-DSSS/CCK).

Transient Time: Power-on Ramp

■Summary

Displays the time that the signal transitions from 10% to 90% of the maximum value at the burst rising. The maximum value here means the maximum value among all bursts when Transient Ref. Power is set to Total. It means the maximum value in the range displayed in Transient when Transient Ref. Power is set to Ramp.

Transient Time: Power-down Ramp

■Summary

Displays the time that the signal transitions from 90% to 10% of the maximum value at the burst falling. The maximum value here means the maximum value among all bursts when Transient Ref. Power is set to Total. It means the maximum value in the range displayed in Transient when Transient Ref. Power is set to Ramp.

# 3.19 Saving Measurement Results

This section describes how to save measurement results to the internal hard disk or USB memory. Press Save with the WLAN screen open to display the Save function menu.

***Note :***

Use the USB memory supplied. Other USB memory may malfunction due to incompatibilities.


**Figure 3.19-1 Save Function Menu**

**Table 3.19-1 Save Function Menu**

| Menu Display | Function |
|---|---|
| Device | Sets the save destination drive. |
| Save as Type | This sets the type of file to save. |
| Save All Results | Saves measurement results. |
| Save Application | Saves measurement parameters.<br>☞*MS2690A/MS2691A/MS2692A Signal Analyzer operation manual* or *MS2830A Signal Analyzer operation manual* |
| Close | Closes the Save function menu. |

Device

■Summary

Sets the save destination drive.

■Selection options

D, E, F, …

All drives except for C

Save as Type

■Summary

This sets the type of file to save.

■Selection options

| | |
|---|---|
| xml | Saves in xml format. |
| csv | Saves in csv format. |

Save All Results

■Summary

This saves the measurement results.

The measurement results that can be read by the `:FETCh:EVM[n]?`, `:READ:EVM[n]?`, and `:MEASure:EVM[n]?` remote commands are saved. For details on measurement results, see Table 2.7-2 "Responses to Modulation Measurement Results" in the *MX269028A WLAN Measurement Software Operation Manual (Mainframe Remote Control)*.The saved file is output under the name format of "WLANdate_sequence number.xml". When measurement results are saved several times on the same date, the sequence number starting from "00" is suffixed to each file name, like "WLAN*date*_00.xml," "WLAN*date*_01.xml," "WLAN*date*_02.xml," …, up to "WLAN*date*_99.xml."

The sequential numbers suffixed to a file name are 0 to 99. Since the file number returns to 00 after 99, files with the same name are overwritten.

Files are saved to the following directory of the target drive specified using F1 (Device).

\Anritsu Corporation\Signal Analyzer\User Data\Measurement Results\WLAN

There can be up to 100 XML files and 100 CSV files among the files.

Close

■Summary

Closes the Save function menu.

# Chapter 4 Digitize Function

This chapter describes how to save IQ data to an external memory and replay the stored IQ data.

# 4.1 Saving IQ Data

After pressing F7 (Capture) on the Main function menu, press F3 (Save Captured Data) to display the Save Captured Data function menu.

***Note :***

This function is not available when 160MHz is set for Channel Bandwidth.

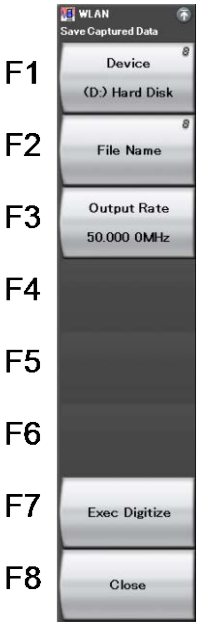



**Figure 4.1-1 Save Captured Data Function Menu**

**Table 4.1-1 Save Captured Data Function Menu**

| Menu Display | Function |
|---|---|
| Device | Selects the location of the file to be saved. |
| File Name | Sets the name of the file to be saved. |
| Output Rate | Sets the rate of the output data. |
| Exec Digitize | Executes saving. |
| Close | Closes the Save Captured Data function menu. |

The IQ data stored in the internal memory at the time of execution of this function is saved to the external memory.

Example: To save IQ data

<Procedure>

1. Press Capture (F7) on the main function menu.
2. Press F3 (Save Captured Data).
3. Press Device (F1) on the Save Captured Data function menu to select a data file for saving the IQ data.
4. Press F2 (File Name) to set the file name.
5. Press F7 (Exec Digitize) to save the IQ data.

When save processing is executed, the following files are created.

- "[File Name].dgz" Data file (binary format)
- "[File Name].xml" Data information file (XML format)

The IQ data row is saved to the data file. The information on the saved data is saved to the data information file.

If the file name is not specified, a file name with the following format is used: Digitizedate_consecutive-numberHere, consecutive-number is a value in the range from 0 to 99.

Files are saved to the following directory of the target drive specified using Device (F1).
\Anritsu Corporation\Signal Analyzer\User Data\Digitized Data\WLAN
Up to 100 files can be saved in a folder.

## 4.1.1 Format of data information file

The information on the saved IQ data is recorded in the data information file. Table 4.1.1-1 shows the details of the recorded parameters.

**Table 4.1.1-1 Format of Data Information File**

| Items | Description |
|---|---|
| CaptureDate | Day/Month/Year of the captured data in the "DD/MM/YYYY" format. |
| CaptureTime | Data captured time in "HH/MM/SS" format |
| FileName | Data file name |
| Format | Data format, fixed to "Float" |
| CaptureSample | Number of samples of the recorded data [Sample] |
| Condition | Error status of the recorded data<br>"Normal":Normal status<br>"OverLoad":Level over |
| TriggerPosition | Trigger occurrence position [Sample]<br>The start point of the recorded data is 0. |
| CenterFrequency | Center frequency [Hz] |
| SpanFrequency | Frequency span [Hz] |
| SamplingClock | Sampling rate [Hz] |
| PreselectorBandMode | Frequency band switch mode<br>"Normal":Normal mode (fixed) |
| ReferenceLevel | Reference level [dBm]<br>Note that this value does not include the reference level offset. |
| AttenuatorLevel | Attenuator value [dB] |
| InternalGain | Internal gain value [dB]<br>This is an internal parameter. |
| PreAmp | Gain value obtained by 6 GHz PreAmp [dB] |
| IQReverse | IQ reverse setting, fixed to "Normal" |
| TriggerSwitch | Trigger On/Off setting<br>"FreeRun":Trigger is not used<br>"Triggered":Trigger is used |

**Table 4.1.1-1 Format of Data Information File (Continued)**

| Items | Description |
|---|---|
| TriggerSource | Trigger source<br>"External": External trigger<br>"SGMarker": SG marker trigger |
| TriggerLevel | Trigger level [dBm]<br>Note that this value does not include the reference level offset. It is in dBm units, even if the scale mode is Lin. |
| TriggerDelay | Trigger delay time [s]<br>It is the relative time from the trigger input position to the start point of the recorded data. |
| IQReference0dBm | Reference IQ amplitude value that indicates 0 dB<br>Fixed to "1". |
| ExternalReferenceDisp | Reference signal information<br>"Ref.Int":Internal reference signal<br>"Ref.Ext":External reference signal<br>"Ref.Int Unlock":Internal reference signal is unlocked.<br>"Ref.Ext Unlock":External reference signal is unlocked. |
| Correction Factor | Correction value of correction function [dB]<br>The correction factor is added to the IQ data in a data file.<br>0.000 is automatically set when the Correction function is set to Off. |
| Terminal | Signal input terminal<br>"RF": RF terminal |
| ReferencePosition | 0-second reference position<br>Indicates the 0-second reference position using the digitized data point position. During Replay function execution, the reference position is displayed as 0 s. |
| Trigger Slope | Selects the edge where the trigger is generated (rise or fall).<br>"Rise": Rising edge<br>"Fall": Falling edge |

## 4.1.2 Format of data file

The data file is created in binary format. From the beginning of the file, I-phase data and Q-phase data are recorded by 4 bytes. The I-phase data and Q-phase data are recorded as a float type (IEEE real*4).

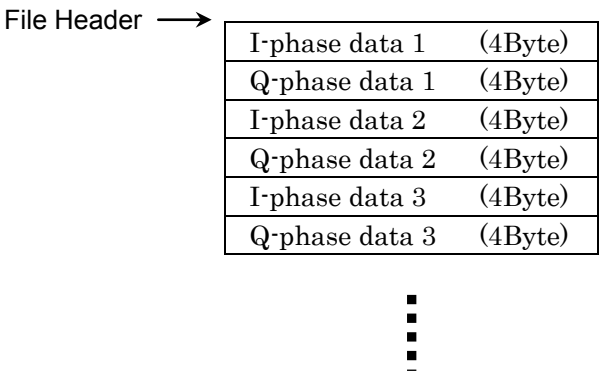



**Figure 4.1.2-2 Format of Data File**

The IQ data can be converted to power based on the following formula:

$$P = 10Log_{10}\left(I^2 + Q^2\right)$$

P: Power [dBm]
I: I-phase data
Q: Q-phase data

# 4.2 Replay Function

The Replay function enables the saved IQ data to be reanalyzed. After pressing F7 (Capture) on the main function menu, press F4 (Replay) to display the Replay function menu.

***Note :***

This function is not available when 160MHz is set for Channel Bandwidth.

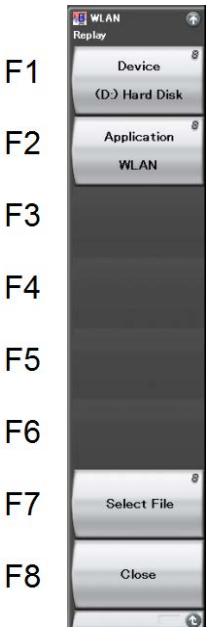



**Figure 4.2-1 Replay Function Menu**

**Table 4.2-1 Replay Function Menu**

| Menu Display | Function |
|---|---|
| Device | Selects the drive in which the target file is stored. |
| Application | Selects the name of the application used to save the target file. |
| Select File | Selects the target file. After selecting the file, the Replay function is executed. |
| Close | Closes the Replay function menu. |

### 4.2.1 Starting Replay Function

Start the Replay function using the following procedure:

<Procedure>

1. Press Capture (F7) on the main function menu.
2. Press Replay (F4) on the Capture function menu.
3. Press Device (F1) on the Replay function menu and select the drive in which the target file is stored.
4. Press F2 (Application) and select the application used to save the target file.
5. Press F7 (Select File) to display the file selection dialog box. The Replay function starts after selecting a file. Then, Replaying is displayed on the screen.

***Note:***

1 This function is executed only for an IQ data file whose sampling rate is 50 MHz.

2 Once Replay starts, the settings are initialized except for the parameters specified in Table 4.1.1-1.

### 4.2.2 Display During Replay Function Execution

Replay Error Info. is displayed if the target IQ data file meets the following conditions:

- Frequency reference is Unlocked when IQ data is saved.
- Level Over occurs when IQ data is saved

### 4.2.3 Restriction During Replay Function Execution

The functions shown in Table 4.2.3-1 are disabled when Replay is executed.

**Table 4.2.3-1 Functions Restricted During Replay**

| Function |
|---|
| Center Frequency |
| Input Level |
| Pre Amp |
| Trigger Switch |
| Trigger Source |
| Trigger Slope |
| Trigger Delay |
| Continuous Measurement |
| Single Measurement |
| Capture Time Auto/Manual |
| Capture Time Length |
| Wide IF Video Trigger Level |
| Channel Map |
| Channel Number |
| Auto Range |
| Recalling of Spectrum Analyzer using this application. |



### 4.2.4 Conditions for IQ Data Files That Can Be Replayed

Table 4.2.4-1 shows the conditions for IQ data files for which replay analysis can be performed.

**Table 4.2.4-1** IQ Data File That Can Be Replayed

| Items | Value |
|---|---|
| Format | I, Q (32-bit Float Binary format) |
| Sampling rate | 50 MHz |
| Number of samples | Modulation Analysis: 130000 or more |

### 4.2.5 Stopping Replay

Stop the Replay function using the following procedure:

<Procedure>

1. Press Capture (F7) on the main function menu.
2. Press F5 (Stop Replaying) to stop the Replay function.

# Chapter 5 Performance Test

This chapter describes measurement devices, setup methods, and performance test procedures required for performing performance tests as preventive maintenance.

# 5.1 Overview of Performance Test

## 5.1.1 Performance test

Performance tests are performed as part of preventive maintenance in order to prevent degradation of the performance of the main frame.

Use performance tests when required for acceptance inspection, routine inspection and performance verification after repairs. Use performance tests when necessary for acceptance inspection, routine inspection and performance verification after repairs. Also perform the following performance tests for acceptance inspection, routine inspection and performance verification after repairs of the main frame.

- Carrier frequency accuracy
- Residual vector error

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

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.

# 5.2 Performance Test Items

Warm up the device to be tested and the measuring instruments for at least 30 minutes except if specified otherwise, in order to stabilize them sufficiently before running performance tests. Maximum measurement accuracy requires, in addition to the above, conducting performance tests under ambient temperatures and with little AC power supply voltage fluctuations, as well as the absence of noise, vibrations, dust, humidity and other problems.

## 5.2.1 Testing methods

(1) Test target standards

- Carrier frequency accuracy
- Residual vector error

(2) Measuring instrument for tests

- Vector signal generator
- Frequency standard device — Unnecessary if signal source has sufficient frequency accuracy
- Power meter — Unnecessary if signal source has sufficient transmitter power accuracy

(3) Setups

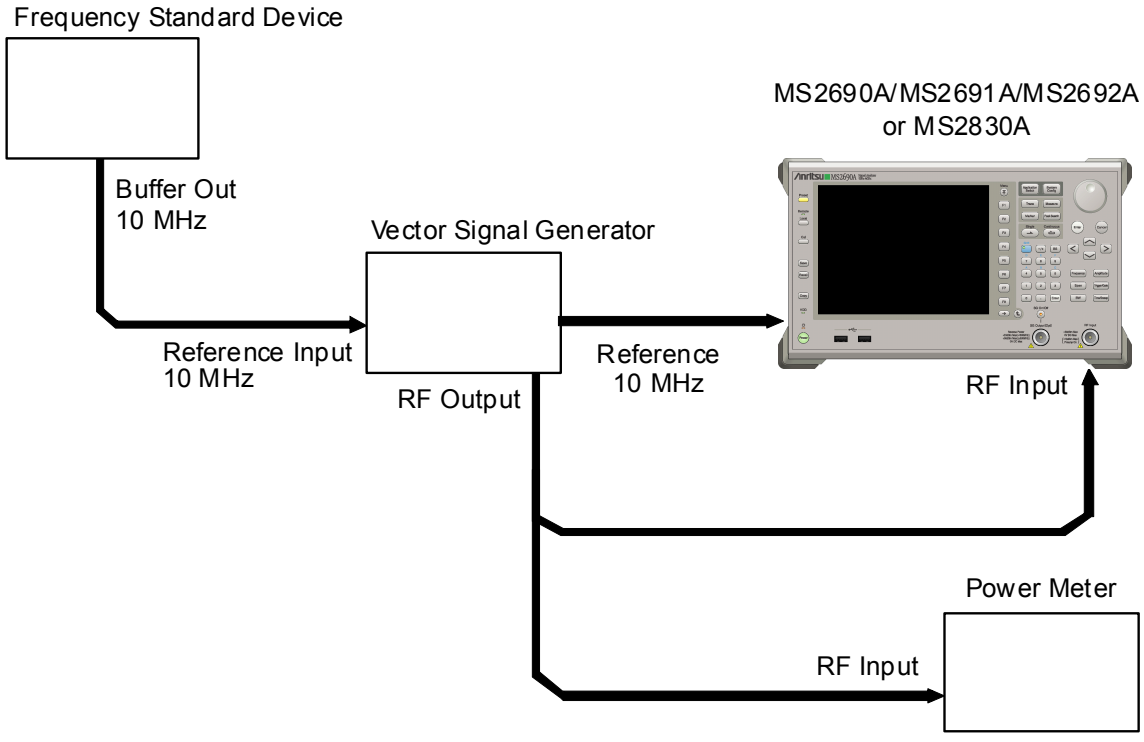



**Figure 5.2.1-1 Performance Test**

(4) Test Procedure

(a) Signal source adjustment

1. Input the 10 MHz reference signal output from the frequency standard device to the Reference Input connector of the vector signal generator.
2. Input the 10 MHz reference signal output from the signal generator to the Reference Input connector.
3. Output an WLAN modulation signal from the vector signal generator.
4. Input the vector signal generator output signal into the power meter and measure the power.

(b) Settings of the main unit

1. Turn on the power switch on the front panel and then wait until the internal temperature stabilizes (approx. 1.5 hours after the temperature in the thermostatic bath stabilizes).
2. Press the menu function key displaying “WLAN”.
3. Press Preset.
4. Press F1 (Preset) to initialize.
5. Press Cal.
6. Press F1 (SIGANA All) to perform calibration.
7. Press F8 (Close).
8. Press Frequency, enter the frequency output by the vector signal generator using the numeric keypad, then press Enter.
9. Press Amplitude, enter the power meter measurement result using the numeric keypad, then press Enter.
10. Press Trace then press F4 (Storage) and press F1 (Mode) to choose Average using the cursor key or the rotary knob , then press Enter.
11. Press F2 (Count), enter the measurement count, using the numeric keypad, then press Enter.

12. Press Single to measure.

    When measuring the carrier frequency accuracy, select **Auto** for **Reference Signal**. When measuring the residual vector error, select **Fixed to Internal**.

    Press System Config (System Settings) after pressing F3 to display the System Settings screen. Select and set Reference Signal with cursor key, and then press F7 (Set).

13. Confirm that the Frequency Error (carrier frequency accuracy) value is within the specifications.
14. Confirm that the EVM (rms) (residual vector error) value is within the specifications.

(5) Test results

**Table 5.2.1-1 Carrier Frequency Accuracy (WLAN Standard: 802.11a)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 5180 MHz | MS269xA −16.0 Hz MS2830A −16.0 Hz | | MS269xA +16.0 Hz MS2830A +16.0 Hz | ±1.0 Hz | |
| 5825 MHz | | | | | |

**Table 5.2.1-2 Carrier Frequency Accuracy (WLAN Standard: 802.11b)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 2412 MHz | MS269xA −21.0 Hz MS2830A −21.0 Hz | | MS269xA +21.0 Hz MS2830A +21.0 Hz | ±1.0 Hz | |
| 2484 MHz | | | | | |

**Table 5.2.1-3 Carrier Frequency Accuracy (WLAN Standard: 802.11g OFDM)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 2412 MHz | MS269xA −13.0 Hz MS2830A −13.0 Hz | | MS269xA +13.0 Hz MS2830A +13.0 Hz | ±1.0 Hz | |
| 2484 MHz | | | | | |

**Table 5.2.1-4 Carrier Frequency Accuracy (WLAN Standard: 802.11n 40 MHz)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 2412 MHz | MS269xA –62.0 Hz MS2830A –62.0 Hz | | MS269xA +62.0 Hz MS2830A +62.0 Hz | ±1.0 Hz | |
| 2484 MHz | | | | | |
| 5180 MHz | MS269xA –102.0 Hz MS2830A –102.0 Hz | | MS269xA +102.0 Hz MS2830A +102.0 Hz | | |
| 5825 MHz | | | | | |

**Table 5.2.1-5 Carrier Frequency Accuracy (WLAN Standard: 802.11p 10MHz)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 300 MHz | MS269xA –16.0 Hz MS2830A –16.0 Hz | | MS269xA +16.0 Hz MS2830A +16.0 Hz | ±1.0 Hz | |
| 862 MHz | | | | | |

**Table 5.2.1-6 Carrier Frequency Accuracy (WLAN Standard: 802.11ac 20MHz)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 5180 MHz | MS269xA –16.0 Hz MS2830A –16.0 Hz | | MS269xA +16.0 Hz MS2830A +16.0 Hz | ±1.0 Hz | |
| 5825 MHz | | | | | |

**Table 5.2.1-7 Carrier Frequency Accuracy (WLAN Standard: 802.11ac 40MHz)**

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 5180 MHz | MS269xA –16.0 Hz MS2830A –16.0 Hz | | MS269xA +16.0 Hz MS2830A +16.0 Hz | ±1.0 Hz | |
| 5825 MHz | | | | | |

Table 5.2.1-8 Carrier Frequency Accuracy (WLAN Standard: 802.11ac 80MHz)

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 5180 MHz | MS269xA<br>–102.0 Hz<br>MS2830A<br>–102.0 Hz | | MS269xA<br>+102.0 Hz<br>MS2830A<br>+102.0 Hz | ±1.0 Hz | |
| 5825 MHz | | | | | |

Table 5.2.1-9 Carrier Frequency Accuracy (WLAN Standard: 802.11ac 160MHz)

| Frequency | Min. value | Deviation (Hz) | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|---|
| 5180 MHz | MS269xA<br>–102.0 Hz<br>MS2830A<br>–102.0 Hz | | MS269xA<br>+102.0 Hz<br>MS2830A<br>+102.0 Hz | ±1.0 Hz | |
| 5180 MHz | | | | | |

Table 5.2.1-10 Residual Vector Error (WLAN Standard: 802.11a)

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 5180 MHz | | MS269xA<br>1.5 %(rms)<br>MS2830A<br>1.6 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

Table 5.2.1-11 Residual Vector Error (WLAN Standard: 802.11b)

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 2412 MHz | | MS269xA<br>1.2 %(rms)<br>MS2830A<br>1.9 %(rms) | 0.1 %(rms) | |
| 2484 MHz | | | | |

Table 5.2.1-12 Residual Vector Error (WLAN Standard: 802.11g OFDM)

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 2412 MHz | | MS269xA<br>1.2 %(rms)<br>MS2830A<br>1.2 %(rms) | 0.1 %(rms) | |
| 2484 MHz | | | | |

**Table 5.2.1-13 Residual Vector Error (WLAN Standard: 802.11n 40 MHz)**

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 2412 MHz | | MS269xA 1.5 %(rms) MS2830A 1.6 %(rms) | 0.1 %(rms) | |
| 2484 MHz | | | | |
| 5180 MHz | | MS269xA 1.9 %(rms) MS2830A 2.0 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

**Table 5.2.1-14 Residual Vector Error (WLAN Standard: 802.11p 10 MHz)**

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 300 MHz | | MS269xA 0.5 %(rms) MS2830A 0.8 %(rms) | 0.1 %(rms) | |
| 862 MHz | | | | |

**Table 5.2.1-15 Residual Vector Error (WLAN Standard: 802.11ac 20 MHz)**

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 5180 MHz | | MS269xA 0.7 %(rms) MS2830A 0.9 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

**Table 5.2.1-16 Residual Vector Error (WLAN Standard: 802.11ac 40 MHz)**

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 5180 MHz | | MS269xA 0.8 %(rms) MS2830A 1.0 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

**Table 5.2.1-17 Residual Vector Error (WLAN Standard: 802.11ac 80 MHz)**

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 5180 MHz | | MS269xA 0.9 %(rms) MS2830A 1.1 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

Table 5.2.1-18 Residual Vector Error (WLAN Standard: 802.11ac 160 MHz)

| Frequency | Measured value [% (rms)] | Max. value | Uncertainty | Pass/Fail |
|---|---|---|---|---|
| 5180 MHz | | MS269xA<br>1.5 %(rms) | 0.1 %(rms) | |
| 5825 MHz | | | | |

# Chapter 6 Other Functions

This chapter describes other functions of this application.

# 6.1 Selecting Other Functions

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

**Table 6.1-1 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. |

# 6.2 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.

# 6.3 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 Messages

**Table A-1 Error Messages**

| Message | Description |
|---|---|
| Invalid Operation. | — |
| Out of range. | — |
| Not available when Channel Map is set to None. | — |
| Not available when WLAN Standard is set to 802.11b or 802.11g(ERP-DSSS/CCK). | — |
| Not available when Channel Bandwidth is set to 40MHz(Upper) or 40MHz(Lower). | — |
| Not available when WLAN Standard is not set to 802.11n. | — |
| Not available when Measuring Object is set to Continuous. | — |
| Not available when Target Field is set to Preamble. | When the selected WLAN standard is IEEE802. 11b or IEEE802. 11g (ERP-DSSS/CCK): this is not available when Target Field is set to Preamble. |
| Not available when Analysis Length Setup is set to Auto. | — |
| Not available when PPDU Format is set to HT-Mixed or HT-Greenfield. | — |
| Not available when PPDU Format is set to Non-HT. | This is not available when the selected WLAN standard is IEEE802.11n, and PPDU Format is set to HT-Mixed or HT-Greenfield. |
| Not available when MCS Setup is set to Auto. | — |
| Not available when WLAN Standard is not set to 11b or 11g(ERP-DSSS/CCK) or 11g(DSSS-OFDM). | — |
| Not available when WLAN Standard is not set to 802.11b or 802.11g(ERP-DSSS/CCK). | — |
| Not available when Guard Interval is set to Auto. | This is not available when the selected WLAN standard is IEEE802.11n, and Guard Interval is set to Auto. |
| Not available when Filter Type is not set to Gaussian or Root Nyquist. | — |
| Not available when Trace Mode is set to Eye Diagram. | — |
| Not available when Preamble Search is set to On and Ramp-down Detection is set to Off. | — |
| Not available when Trace Mode is set to Burst. | — |
| Not available while executing replay function. | — |
| Not available when Trace Mode is set to Summary. | — |

**Table A-1 Error Messages (Continued)**

| Message | Description |
|---|---|
| Not available when WLAN Standard is not set to 802.11n or 802.11j or 802.11p. | — |
| Not available when WLAN Standard is set to 802.11j or 802.11p. | — |
| Not available when WLAN Standard is set to 802.11n. | — |
| Not available when WLAN Standard is set to 802.11b or 802.11g. | — |
| Not available when Channel Bandwidth is set to 5MHz or 10MHz. | — |
| Not available when Channel Bandwidth is set to 5MHz. | — |
| Not available when Storage Mode is not set to Average and Max. | — |
| Not available when Ramp-down Detection is set to On. | — |
| Not available when is set to 040 Option. | — |
| Not available when Preamble Search is set to On. | — |
| The specified MCS Index cannot be used with the current Channel Bandwidth and Number of Spatial Streams. | — |

# Appendix B Default Value List

| | |
|---|---|
| Frequency | |
| Carrier Frequency | 2.412 GHz |
| Channel Map | 2.4 GHz Band |
| Channel Number | 1Channel |
| RF Spectrum | Norm. |
| Amplitude | |
| Input Level | –10.00 dBm |
| Pre-Amp | Off |
| Offset | Off |
| Offset Value | 0.00 dB |
| Common Setting | |
| Standard | IEEE802.11n |
| Measuring Object | Burst |
| Channel Bandwidth | 20MHz |
| PPDU Format | HT-Mixed |
| Burst Interval | 10.000000ms |
| Burst Threshold | 30 dB |
| Modulation Analysis | |
| Analysis Time | |
| Analysis Length Setup | Auto |
| Analysis Offset | 0 Symbol |
| Analysis Length | 10 Symbol |
| Capture Time | Auto |
| Capture Time Length | 20.000000 ms |
| Detail Setting | |
| Data Rate & Modulation | Auto |
| MCS | Auto |
| MCS Index | 0 |
| Stream ID | Auto |
| Preamble Format | Auto |
| Guard Interval | Auto |
| EVM Calculation Method | IEEE Std 802.11-2007 |
| Target Field | PSDU |
| Channel Estimation | Seq only |
| Amplitude Tracking | Off |
| Phase Tracking | On |
| Symbol Timing Adjustment | 0 |
| Filter Type | Gaussian |
| Alpha/BT | 0.5 |

| | |
|---|---|
| Trace (Modulation Analysis) | |
| Trace Mode | EVM vs Subcarrier |
| Scale | 1.0% |
| EVM vs Subcarrier Symbol View | Averaged |
| Storage | |
| Mode | Off |
| Count | 10 |
| EVM Unit | % |
| Constellation Symbol View | All |
| View Select | Total |
| Constellation Zoom | Off |
| Spectral Flatness Type | Amplitude |
| Scale | 10.0 dB |
| Marker (Modulation Analysis) | |
| Marker | On |
| Subcarrier Number | –28 Subcarrier |
| Symbol Number | 0 Symbol |
| Power vs Time | |
| Analysis Time | |
| Analysis Length | 1.000000 ms |
| Capture Time | Auto |
| Capture Time Length | 20.000000 ms |
| Signal Setup | |
| Preamble Search | On |
| Ramp-down Detection | On |
| Detection Level | –10 dB |
| Detection Offset | 0s |
| Trace (Power vs Time) | |
| Trace Mode | Burst |
| Display Reference Level | Ave. |
| Transient Time Scale | 8.0 µs |
| Transient Ref. Power | Ramp |
| Smoothing Filter | Off |
| Marker (Power vs Time) | |
| Marker | On |
| Marker Number | 0 s |

| | |
|---|---|
| Trigger | |
| Trigger Switch | Off |
| Trigger Source | External |
| Trigger Slope | Rise |
| Wide IF Video Trigger Level | –20 dBm |
| Trigger Delay | 0 s |
| Capture | |
| Capture Time | Auto |
| Capture Time Length | 20.000000 ms |
| | |
| Accessory | |
| Title | On,<br>“WLAN” |

# Index

References are to page numbers.

## R



## S



## T



## U



## V



## W