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ADVANTEST CORPORATION

R3681 Series OPT57
Bluetooth
Modulation Analysis Software
User's Guide

MANUAL NUMBER FOE-8440191A00

Applicable Models
R3681
R3671

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1. INTRODUCTION

This chapter describes the outline of this manual and the product overview of the R3681 series signal analyzer option 57 Bluetooth Modulation Analysis.

1.1 Outline of This Manual

The outline of each chapter is shown below:

For basic operating methods, functions and the remote programming method of the signal analyzer, refer to "1.3 Other Manuals Relating to This Instrument."

Chapter 1. INTRODUCTION	Describes the outline of this manual and the product overview.
Chapter 2. BEFORE OPERATING	Provides preliminary tips on using this instrument. Read this chapter before using this instrument.
Chapter 3. SETUP	Describes how to set up this instrument. After installing this instrument in position, switch it on to make sure that it starts successfully.
Chapter 4. MEASUREMENT EXAMPLES	Describes example measurements.
Chapter 5. MENU MAP, FUNCTIONAL EXPLANATION	Describes the menu configuration and functions of the soft keys.
Chapter 6. SCPI COMMAND REFERENCE	SCPI command reference. The command reference describes the commands in order of function. The following items are described: • Command format • Function description • Parameters • Query response
Chapter 7. PERFORMANCE VERIFICATION	Describes the performance verification test procedures for option 57.
Chapter 8. SPECIFICATIONS	Shows the specifications of option 57.
APPENDIX	Describes operation principles and the error code table.

1.2 Product Overview

The Bluetooth modulation analysis option is software that performs the modulation analysis of the Bluetooth signal.
This option includes the following features:

- Initial Carrier Frequency Torelance, Modulation Characteristics, Frequency Drift, and Tx Power, which are compliant with the standard, can be measured.

1.3 Other Manuals Relating to This Instrument

Manuals which relate to this instrument include:

- User's Guide (Part Code: {ER3681SERIES/U}, English)

  Describes how to setup the R3681 Series Signal Analyzer, how to perform procedures such as, basic operations, applied measurements, and maintenance, and describes the functions, specifications of the R3681 Series Signal Analyzer.

- Programming Guide (Part Code: {ER3681SERIES/P}, English)

  Describes how to program the R3681 Series Signal Analyzer to automate measurement sequences and includes a remote control overview, SCPI command references, and sample application programs.

- Performance Test Guide (Part Code: {ER3681SERIES/T}, English)

  Describes how to check the performance of the R3681 Series Signal Analyzer and includes performance test procedures and specifications of the R3681 Series Signal Analyzer.

1.4 Conventions of Notation Used in This Document

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

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

Sample	Indicates a hard key labeled "Sample."
	Example: **START**, **STOP**

Touch-screen system menus

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

Touch-screen function buttons

{Sample}	Indicates a touch-screen button labeled "Sample."
	Example: **{FREQ}** button, **{SWEEP}** button

Touch-screen side menu

Sample	Indicates a touch-screen side menu labeled "Sample."
	Example: **Center** key, **Span** key

Touch-screen system menu key operation

[File]→[Save As...]	Indicates that you need to touch the **[File]** menu and then select **[Save As...]**.

Sequential key operation

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

Toggle key operation

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

*NOTE: **Screen displays and diagrams such as external view of the main unit in this manual are those of the R3681 in the R3681 series.***

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2. BEFORE OPERATING

This chapter describes important information on using this instrument. Read this chapter before using this instrument.

2.1 If a Fault Should Occur

If smoke, strange smells, or strange noises are detected, switch off the power, disconnect the power cable and contact either your dealer or Advantest immediately.

2.2 Removing the Case

The case should not be opened except by qualified Advantest service personnel.

WARNING: ***This instrument contains high-voltage and high-temperature parts. Electrical shocks or burns may result if handled incorrectly.***

2.3 Overcurrent Protection

This instrument is protected from overcurrent flow by a power breaker. Located on the rear panel, the power breaker automatically interrupts the power supply when an overcurrent flows through this instrument. When the power breaker has turned off, turn off the power supply and disconnect the power cable from the AC power. Then, call upon your dealer or us for repair services to fix a possible fault that has occurred in this instrument.

2.4 Hard Disk Drive

This instrument has a built-in hard disk drive. When handling the hard disk drive, take notice of these instructions.

- Do not cause impact or vibration damage to the hard disk drive.
  Damaging the disk increasing the chances of the disk malfunctioning or failing during operation.
- Do not switch off this instrument while the HDD access lamp is lit.
  The data being accessed may become corrupt.

CAUTION: ***We do not assume any responsibility for the loss or corruption of data stored on the hard disk drive that might result from the disk becoming damaged.***

2.5 Handling the Touch Screen

This instrument has a touch screen. When handling the touch screen, take notice of these instructions.

- Do not give apply excessive force to the screen. The screen is made from glass and may crack.
- Use the stylus pen included with this instrument to operate the screen. Using a tool with a hard-point (such as a mechanical pencil or ballpoint) may scratch the screen surface.

2.6 Getting the Software Running with Stability

The R3681 Series Signal Analyzer has Microsoft Windows XP pre-installed.

The measuring function of this instrument is dependent on the Windows environment. Do not alter the Windows operating environment in any way other than as described in this manual.
This instrument is not a data processor. Operate it only as described in this manual.

1. Prohibited actions
   - Installing other application programs.
   - Changing or deleting items in the control panel (except as described in "A.2 Installing the Printer Driver" and "A.3 Setting up the Network" of R3681 Series User's Guide).
   - Creating new files or editing existing files on the C drive.
   - Operating other application programs during the measurement.
   - Upgrading the Windows operating system.
   - If this instrument functions incorrectly because of any of the above, re-install the system using the system recovery disk.
     For more information on the system recovery procedure, refer to section 8.7, "System Recovery Procedure" in the R3681 Series User's Guide.
2. Computer viruses

   Depending on the operating environment, the system may become infected by a computer virus. To protect the system, we recommended taking the following countermeasures:
   - Perform a virus check before loading any file or inserting any media from an outside source.
   - Make sure that any network used has safety measures against computer viruses before connecting this instrument.

   [If infected with a computer virus:]
   - Delete all files on the D drive. Re-install the system using the recovery disk.
     For more information on the system recovery procedure, refer to section 8.7, "System Recovery Procedure" of R3681 Series User's Guide.

2.7 Transporting

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

- This instrument is heavy and must be carried by two or more persons, or on a transportation cart.
- If using a cart to move this instrument, ensure the instrument is secure.

2.8 Electromagnetic Interference

This instrument may cause electromagnetic interference and affect television and radio reception.
If the electromagnetic interference is reduced when this instrument's is turned off, then this instrument is the cause of the problem.
Electromagnetic interference may be prevented by doing the following:

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

2.9 Limitations Imposed when Using Windows XP

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3. SETUP

This chapter describes how to set up this instrument. Topics included in this chapter are:

3.1 Unpacking Inspection

When the product is delivered, check the condition of it and its accessories included by following these steps:

1. Check that the box and the padding in which the product was shipped has not been damaged during transit.

   IMPORTANT: ***If the box or the padding is damaged, leave them in their original condition until the inspection described below is complete.***

2. Check the product surfaces for any damage.

   WARNING: ***Do not supply any power to this instrument if the cover, panels (front and rear), LCD display, power switch, connector or any other key component are damaged. Electrical shocks may result from using damaged components.***

3. Referring to the standard accessory list of the OPT57 in Table 3-1, check that all standard accessories have been supplied and that no accessories are damaged.

   Contact your dealer or Advantest in any of the following situations:

   - The box or the padding in which the product was shipped was damaged during transit.
   - The product surfaces are damaged.
   - Any of the standard accessories are missing or damaged.
   - Faults are detected in any subsequent product verification test.

Table 3-1 Standard Accessories

Name	Model	Quantity	Remarks
R3681 Series OPT57 User's Guide	ER3681OPT57	1	English version

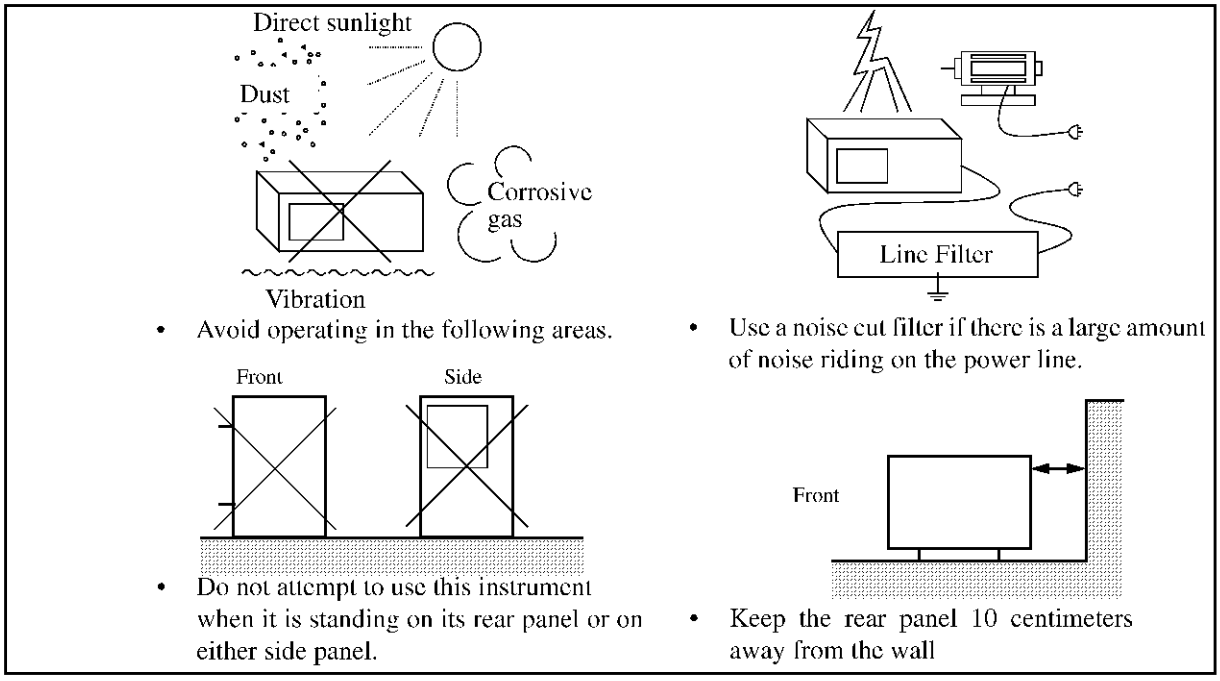
3.2 Locating This Instrument

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

3.2.1 Operating Environment

This instrument should only be used in an environment that satisfies the following conditions:

- Ambient temperature: +5 °C to +40 °C (operating temperature)
  -20 °C to +60 °C (Storage temperature range)
- Relative humidity: RH80% or less (no condensation)
- An area free from corrosive gas
- An area away from direct sunlight
- A area free from dust
- An area free from vibrations
- A low noise area
  Although this instrument has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise. Use a noise filter if ambient noise is unavoidable.
- An area allowing unobstructed airflow
  There is an exhaust-cooling fan on the rear panel and exhaust vents on both sides and the bottom (toward the front) of this instrument. Do not block these vents. The resulting internal temperature rise will affect measurement accuracy. Keep the rear panel 10 centimeters away from the wall. In addition, do not attempt to use this instrument when it is standing on its rear panel or lying on either side.



- Avoid operating in the following areas.
- Use a noise cut filter if there is a large amount of noise riding on the power line.
- Do not attempt to use this instrument when it is standing on its rear panel or on either side panel.
- Keep the rear panel 10 centimeters away from the wall

Figure 3-1 Operating Environment

3.2.2 Prevention of Electrostatic Buildup

To prevent electrostatic discharge (ESD) from damaging components in this instrument, the precautions described below should be taken. We recommend that two or more countermeasures are combined to provide adequate protection from ESD.
(Static electricity can easily be generated when a person moves or an insulator is rubbed.)

Table 3-2 ESD Countermeasures

Operator	Use a wrist strap (see Figure 3-2).
Floor in the work area	Install a conductive mat, use conductive shoes, and connect both to ground (see Figure 3-3).
Workbench	Install a conductive mat and connect it to ground (see Figure 3-4).

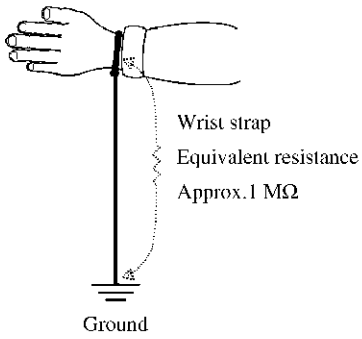


Figure 3-2 Countermeasures against Static Electricity from the Human Body

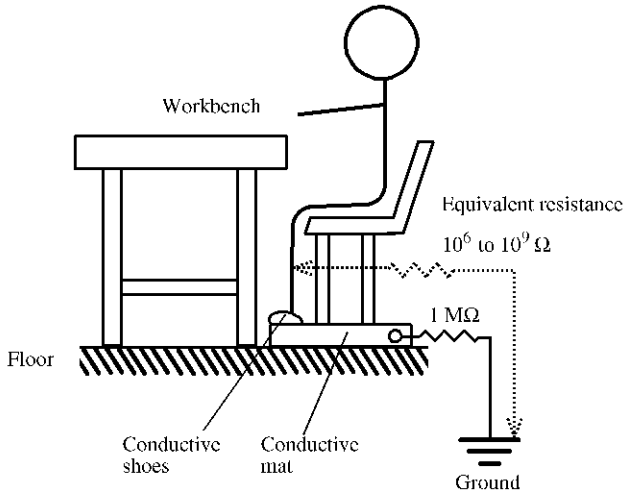


Figure 3-3 Countermeasures against Static Electricity from the Work Floor

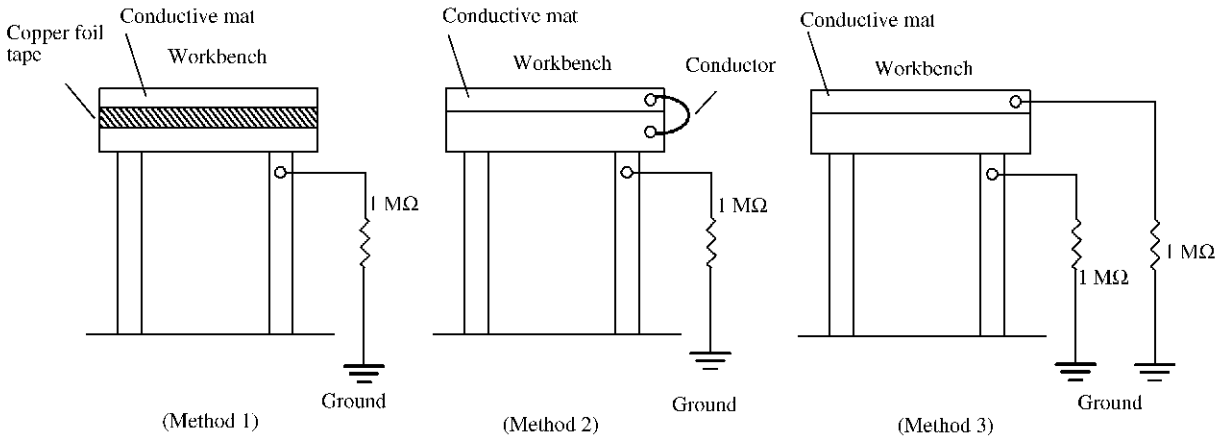


Figure 3-4 Countermeasures against Static Electricity from the Workbench

3.3 Connecting Accessories

This section describes how to connect accessories to this instrument and run it.

3.3.1 Connecting the Keyboard and Mouse

Plug the keyboard and mouse into their respective front-panel connectors before turning on this instrument.

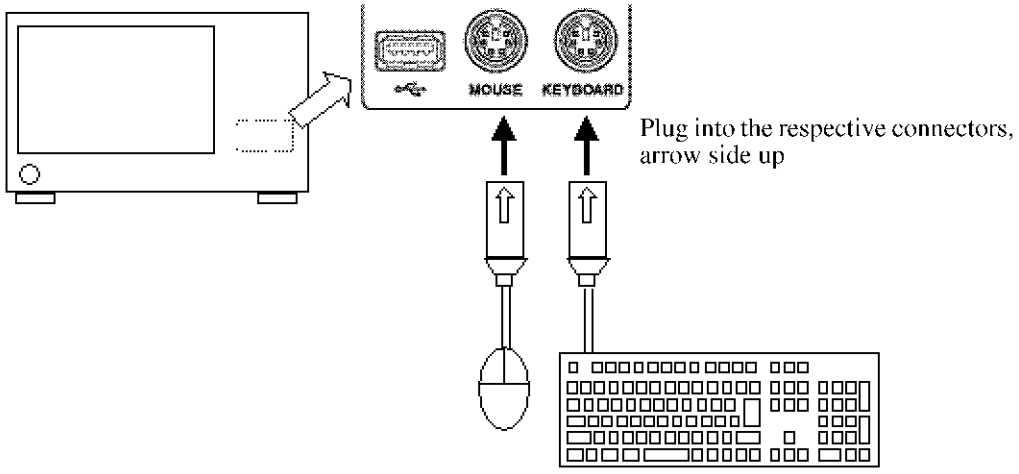


Figure 3-5 Connecting the Keyboard and Mouse

3.4 Supply Description

This section describes how to check the power supply specifications and connect the power cable.

3.4.1 Check the Supply Power

Table 3-3 summarizes the power supply specifications for this instrument. Make sure that the power supply available to this instrument meets these specifications.

Table 3-3 Power Supply Specifications

	100 V AC Operation	200 V AC Operation	Remarks
Input voltage range	90 V to 132 V	198 V to 250 V	Automatically switches between input levels of 100 V AC and 200 V AC.
Frequency range	47 Hz to 63 Hz		
Power consumption	450 VA or below		

WARNING: ***Be sure to provide a power supply that meets the specified power supply specifications for this instrument. Failure to meet the specifications could cause damage to this instrument.***

3.4.2 Connecting the Power Cable

This instrument comes with a three-core power cable with a ground conductor. To prevent electrical shock hazards, ground this instrument by plugging the power cable into a three-pole power outlet.

1. Check the power cable included with this instrument for any damage.

   WARNING: ***Never use a damaged power cable. Electrical shock could result.***

2. Plug one end of the power cable included with this instrument into the AC power connector on this instrument rear panel and the other into a three-pin power outlet that has a ground pin (see Figure 3-6).

3.4.2 Connecting the Power Cable

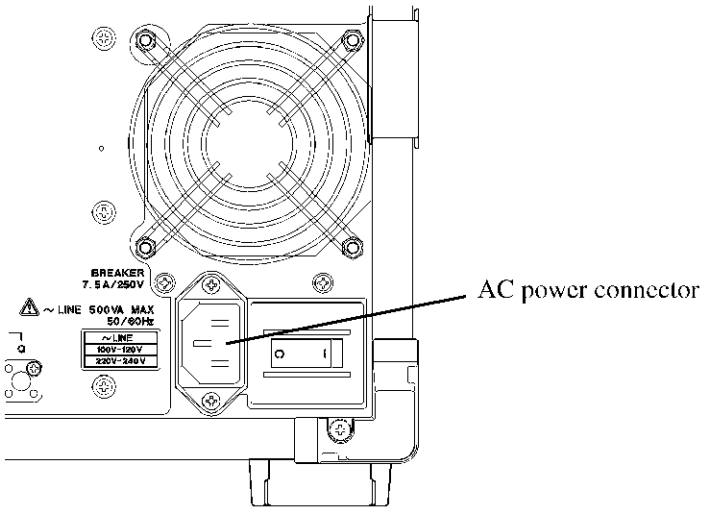


Figure 3-6 Connecting the Power Cable

WARNING:

1. *Use a power cable rated for the voltage being used. Be sure, however, to use a power cable that conforms to the safety standards of your country when using this instrument (Refer to "Safety Summary").*
2. *Plug the power cable into a three-pin power outlet that has a ground pin to prevent electrical shocks. Using an extension cable that has no ground pin would negate having a ground.*

3.5 Operation Check

This section describes how to make a simple operation check on this instrument by using its built-in autocalibration feature. To verify that this instrument runs correctly, follow these steps:

Starting up this instrument

1. Connect the power cable as instructed in 3.4.2 "Connecting the Power Cable."
2. Switch on the power breaker on the rear panel and wait for 3 seconds or more.
3. Press the **POWER** switch to switch on the power.

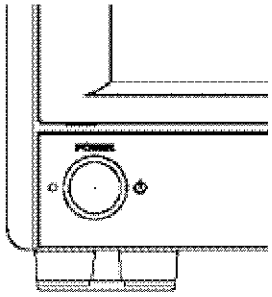


Figure 3-7 **POWER** Switch

CAUTION:

1. ***If the power to this instrument is suddenly interrupted while the unit is in operation, such as is the power cable is disconnected, the hard disk drive could be damaged. Even if the hard disk drive does not fail, Scandisk launches to check for possible data corruption the next time this instrument starts up.***
2. ***About Scandisk***
   If this instrument has been switched off without being shut down, Scandisk will automatically launch to check for any corrupt data. Do not abort Scandisk while it is running. If Scandisk locates any corrupt data, take appropriate action by following the displayed messages. The software in this instrument resumes automatically when Scandisk ends.

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4. The power-on diagnostic program launches to carry out self-diagnostics.
   The self-diagnostic program take about 1 minute to complete.
5. The initial screen shown in Figure 3-8 is displayed unless this instrument is faulty. The initial screen may give look differently from Figure 3-8, depending on the settings in effect the last time this instrument was switched off.

NOTE: ***Refer to Chapter 8, "MAINTENANCE" of R3681 Series User's Guide if any error messages are displayed as a result of the self-diagnostic program.***

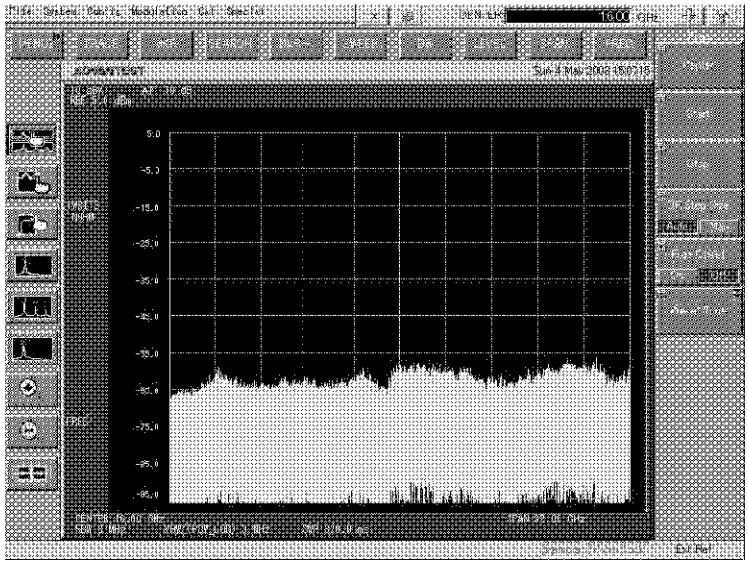


Figure 3-8 Initial Setup Screen

Running autocalibration

6. <R3681>
Install this instrument as shown in Figure 3-9 by using the SMA (f)-SMA (f) adapter, SMA (m)-BNC (f) adapter, and input cable (A01261-30) that come with this instrument as standard.

<R3671>
Hook up this instrument as shown in Figure 3-9 by using the N (m)-BNC (f) adapter, and input cable (A01261-30) that come with this instrument as standard.

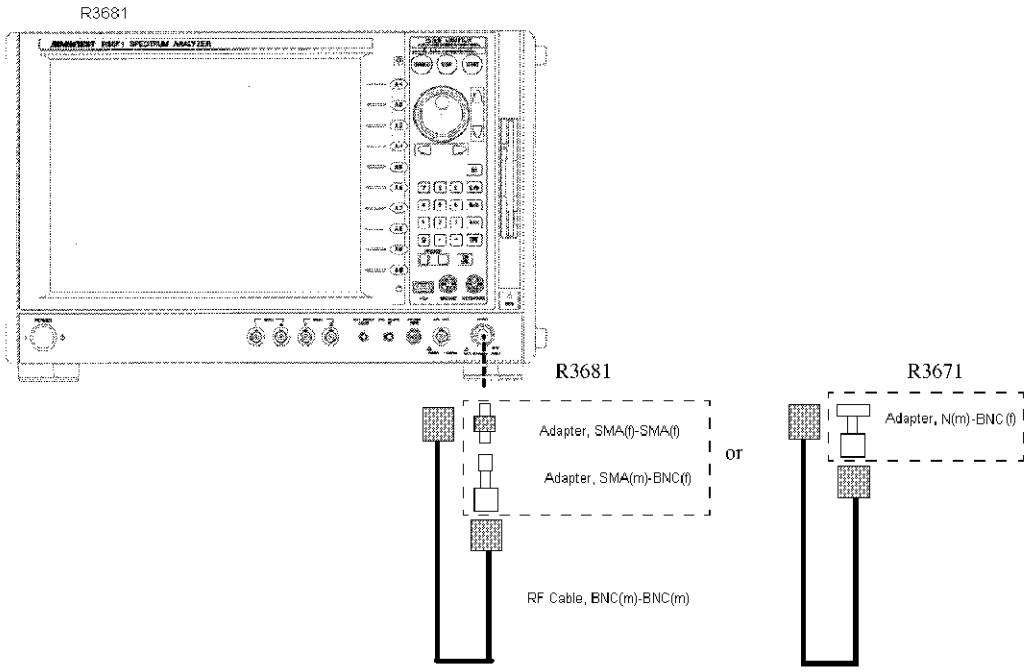


Figure 3-9 Autocalibration

IMPORTANT: Allow this instrument to warm up for at least 30 minutes before running the autocalibration. For more information on how to use the autocalibration, refer to Section 4.3.1, "Autocalibration" of the R3681 Series User's Guide.

7. Touch the **[Cal]** button on this instrument's menu bar to select **[SA Cal]** from the dropdown menu.
8. Autocalibration runs.
   The autocalibration takes about 1 minute to complete.
9. Make sure that no error messages are displayed as a result of the autocalibration.

MEMO: Refer to Chapter 8, "MAINTENANCE" of the R3681 Series User's Guide if error messages are displayed as a result of the autocalibration.

Switching off power

10. Press **POWER** to switch off this instrument.
    The final procedure is complete and the power is automatically turned off.

4. MEASUREMENT EXAMPLES

This chapter describes how to use this option by using specific measurement examples.

4.1 Bluetooth Signal Measurement

4.1.1 Burst Signal (PN) Measurement

Specifications of the signal to be measured

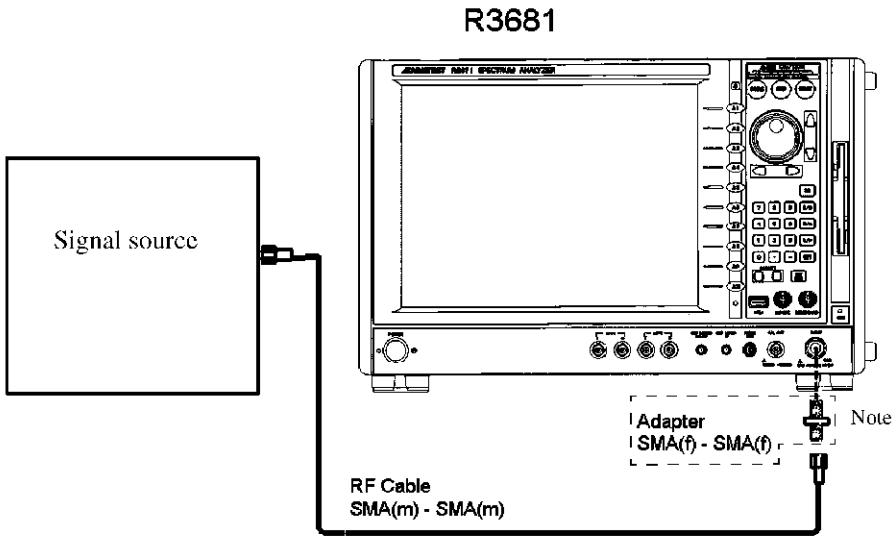
The signal to be measured is a Bluetooth signal with the following specifications:

Table 4-1 Specifications of the Signal to be Measured (PN)

Input	RF input
Carrier frequency	2450 MHz
LAP	0x123456
Payload data	PN9
Burst length	2870 bit

The following shows an example of the burst measurement:

Connection



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

Figure 4-1 Connection Diagram

Measurement condition settings

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[Bluetooth]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **4**, **5**, and **0** on the keypad and then press **M/n**.
   The center frequency is set to 2450 MHz.
6. Touch the **{LEVEL}** button on the function bar.
7. Touch the **Auto Level Set** key on the soft menu bar.
   The Ref Level is automatically set to the optimum value.
8. Touch the **{TRIGGER}** button on the function bar.
9. Touch the **Trigger Source** key on the soft menu bar.
10. Touch the **Free Run** key on the soft menu bar.
11. Touch the **{Input}** button on the function bar.
12. Touch the **Input Setup** key on the soft menu bar.
    The **[Input Setup]** dialog box appears.
13. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
    The Input mode is set to RF.
14. Touch the close button ✕ in the **[Input Setup]** dialog box to close the dialog box.

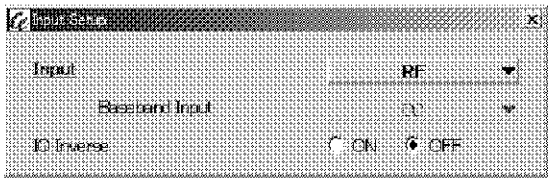


Figure 4-2 **[Input Setup]** Dialog Box

15. Touch the **{MEAS SETUP}** button on the function bar.
16. Touch the **Meas Parameters** key on the soft menu bar.
    The **[Measurement Parameters Setup]** dialog box appears.
17. Set the **[Meas Signal]** option button to **[BURST]**.
18. Touch the **[Burst Length]** text box and press **2**, **8**, **7**, **0**, and **ENT** on the keypad.
19. Touch the **[Search Length]** text box and press **1**, **5**, and **ENT** on the keypad.

20. Set the **[Burst Search]** option button to **[ON]**.
21. Touch the **[Search Threshold]** text box and press [-], [2], [0], and [ENT] on the keypad.
22. Set the **[Sync Type]** option button to **[LAP]**.
23. Touch the **[LAP]** option button and press [1], [2], [3], [4], [5], [6], and [ENT] on the keypad.
24. Set the **[Bit Sequence]** option button to **[RANDOM]**.
25. Set the **[Freq Error Method]** option button to **[PREAMBLE]**.
26. Set the **[Freq Error]** option button to **[OFF]**.

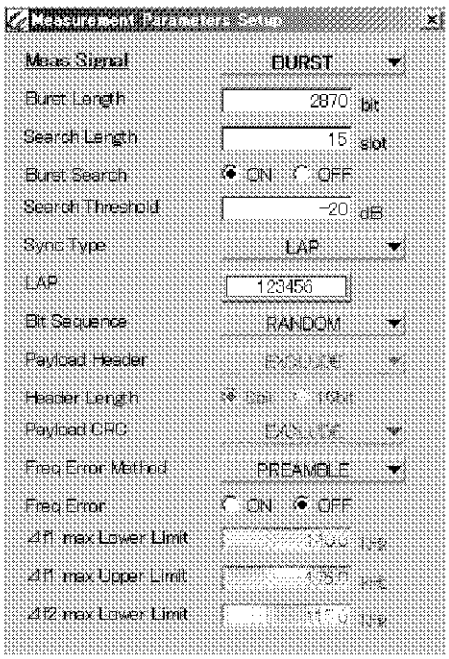


Figure 4-3 **[Measurement Parameters Setup]** Dialog Box

27. Touch the close button [×] in the **[Measurement Parameters Setup]** dialog box to close the dialog box.
28. Touch the Average key on the soft menu bar and set **Average** to Off.
29. Touch the **{DISPLAY}** button on the function bar.
30. Touch the **Quad Display** key on the soft menu bar.
    Four windows are displayed on the screen.
31. Touch the upper-left window and touch **Window Format** on the soft menu bar.
    The **[Window Format]** dialog box appears.

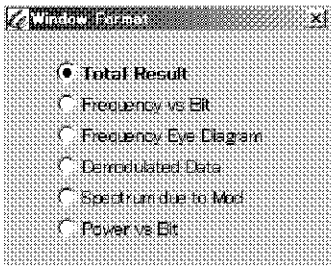


Figure 4-4 **[Window Format]** Dialog Box

32. Select the **[Total Result]** option button.

33. Touch the close button to close the dialog box.

34. Select **[Frequency Eye Diagram]**, **[Demodulated Data]**, and **[Spectrum due to Mod]** in the other three windows.

35. Press the **SINGLE** button on the front panel.

    The Single measurement is performed and the measurement results are displayed.

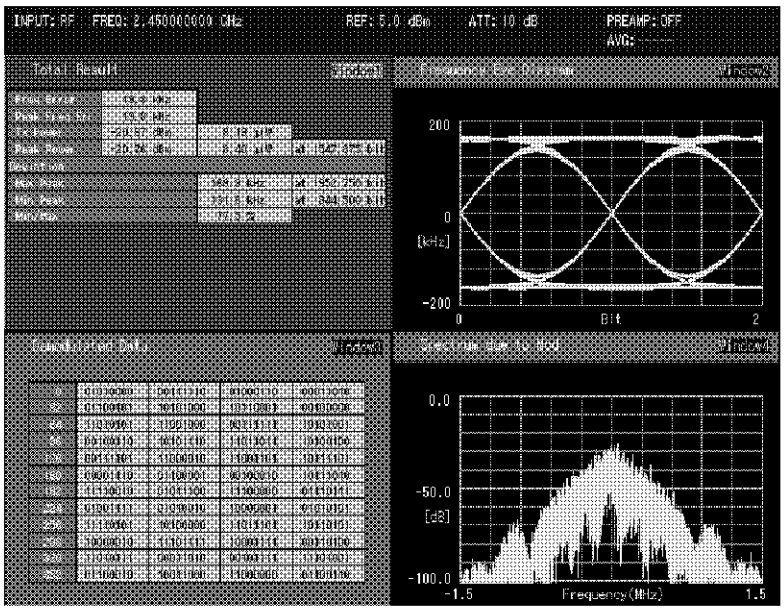


Figure 4-5 Measurement Result

Total Result

Freq Error	Average value of the carrier frequency error (kHz) in the burst period
Peak Freq Err	Maximum value of the frequency error (kHz) in the averaging process that is performed when AVERAGE

	is set to On.
Tx Power	Average power in the burst period (dB, W)
Peak Power	Peak power in the burst period (dB, W, bit position)
Max Peak	Maximum value of the frequency deviation (kHz, bit position)
Min Peak	Minimum value of the frequency deviation at symbol point (kHz, bit position)
Min/Max	(Min Peak / Max Peak) * 100 (%)

4.1.2 Burst Signal (F0) Measurement

Specifications of the signal to be measured

Table 4-2 Specifications of the Signal to be Measured (F0)

Input	RF input
Carrier frequency	2450 MHz
LAP	0x123456
Payload data	0xF0(11110000)
Burst length	2870 bit

Measurement condition settings

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[Bluetooth]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press [2], [4], [5], and [0] on the keypad and then press [M/n]. The center frequency is set to 2450 MHz.
6. Touch the **{LEVEL}** button on the function bar.
7. Touch the **Auto Level Set** key on the soft menu bar.
   Ref Level is automatically set to the optimum value.
8. Touch the **{TRIGGER}** button on the function bar.
9. Touch the **Trigger Source** key on the soft menu bar.
10. Touch the **Free Run** key on the soft menu bar.
11. Touch the **{INPUT}** button on the function bar.
12. Touch the **Input Setup** key on the soft menu bar.
    The **[Input Setup]** dialog box appears.

13. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
    The RF Input mode is set.
14. Touch the close button ⊠ in the **[Input Setup]** dialog box to close the dialog box.
15. Touch the **{MEAS SETUP}** button on the function bar.
16. Touch the **Meas Parameters** key on the soft menu bar.
    The **[Measurement Parameters Setup]** dialog box appears.
17. Set the **[Meas Signal]** option button to **[BURST]**.
18. Touch the **[Burst Length]** text box and press 2, 8, 7, 0, and ENT on the keypad.
19. Touch the **[Search Length]** text box and press 1, 5, and ENT on the keypad.
20. Set the **[Burst Search]** option button to **[ON]**.
21. Touch the **[Search Threshold]** text box and press -, 2, 0, and ENT on the keypad.
22. Set the **[Sync Type]** option button to **[LAP]**.
23. Touch the **[LAP]** option button and press 1, 2, 3, 4, 5, 6, and ENT on the keypad.
24. Set the **[Bit Sequence]** option button to **[STD(0xF0)]**.
25. Set the **[Payload Header]** option button to **[EXCLUDE]**.
26. Set the **[Payload CRC]** option button to **[EXCLUDE]**.
27. Set the **[Freq Error Method]** option button to **[PREAMBLE]**.
28. Set the **[Freq Error]** option button to **[OFF]**.
29. Touch the **[Δf1 max Lower Limit]** option button and press 1, 4, 0, and k/μ on the keypad.
30. Touch the **[Δf1 max Lower Limit]** option button and press 1, 7, 5, and k/μ on the keypad.

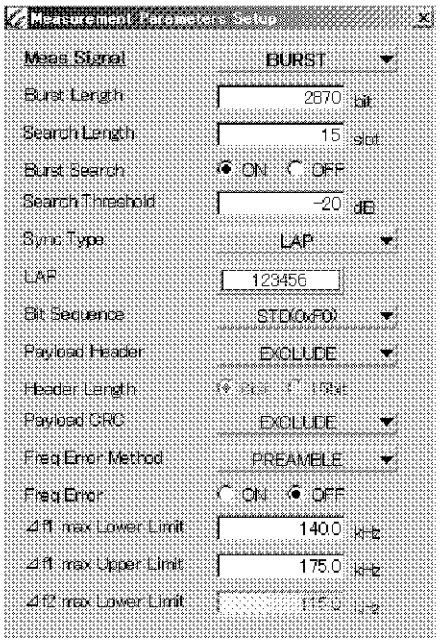


Figure 4-6 **[Measurement Parameters Setup]** Dialog Box

31. Touch the close button ✕ in the **[Measurement Parameters Setup]** dialog box to close the dialog box.

32. Touch the **Average** key on the soft menu bar and set AVERAGE to Off.

33. Touch the **{DISPLAY}** button on the function bar.

34. Touch the **Quad Display** key on the soft menu bar.
    The screen is divided into four windows.

35. Touch **Window Format** after each window is selected and select **[Total Result]**, **[Frequency vs Bit]**, **[Demodulated Data]**, and **[Power vs Bit]** in the four windows.

36. Press the **SINGLE** button on the front panel.
    The Single measurement is performed, and the measurement results are displayed.

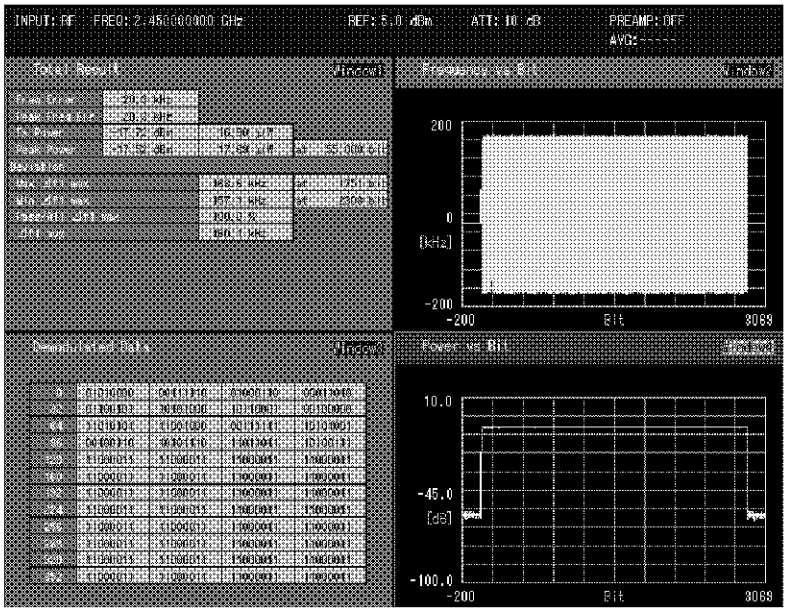


Figure 4-7 Measurement Result

Total Result

Deviation	The following Δf1 max indicates the frequency deviation which is defined in Modulation Characteristics of the Bluetooth specification.
Max Δf1 max	Maximum value of Δf1 max (kHz, bit position)
Min Δf1 max:	Minimum value of Δf1 max (kHz, bit position)
Pass/All Δf1 max:	A percentage of bits which satisfy Δf1 max Lower Limit < Δf1 max < Δf1 max Upper Limit (%)
Δf1 avg:	Average value of Δf1 max (kHz)

5. MENU MAP, FUNCTIONAL EXPLANATION

This chapter describes the configurations and functions of the soft keys displayed on the touch screen of the Bluetooth modulation analysis software.

MEMO:

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

5.1 Menu Index

5.2 Switching Communication Systems

The menu bar of this option is arranged as follows:

[File]	[System]	[Config]	[Modulation]	[Cal]	[Special]

The menu bar consists of the same items as those of Spectrum Analyzer.

Select **[Modulation Analyzer]** from **[Config]** on the menu bar to select a modulation analysis function.

Select **[Bluetooth]** from **[Modulation]** on the menu bar to select the Bluetooth modulation analysis function.

5.3 Function Bar

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

When you click a function button on the function bar, the associated soft keys are displayed on the soft menu bar.

5.4 Soft Menu Bar

The area located on the right-hand side of the screen and in which soft keys are displayed is called the soft menu bar.

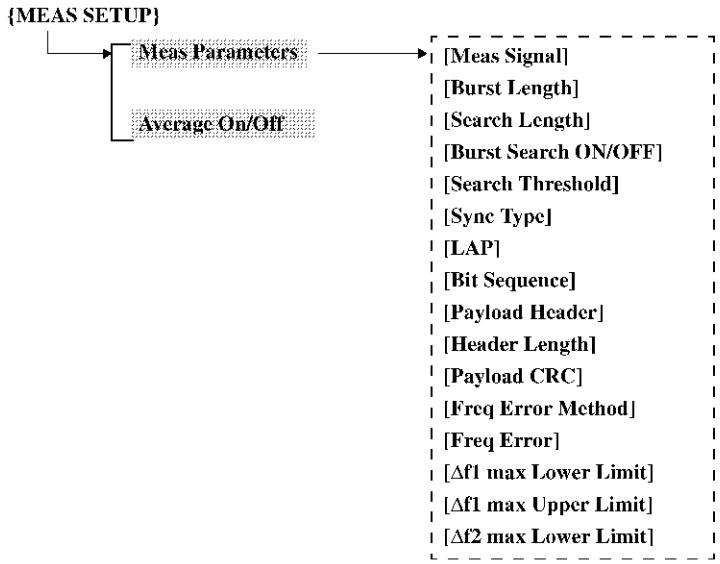
When you touch a button on the function bar, the associated soft keys are displayed on the soft menu bar.

5.5 Description of the Function of Each Key

This section describes the function of each key.

5.5.1 {MEAS SETUP}

When you touch the **{MEAS SETUP}** button, the soft keys related to the analysis parameter setting are displayed on the soft menu bar.



Meas Parameters — The dialog box used to set the measurement conditions appears.

[Meas Signal] — Selects the type of the signal.

BURST: Selected when the BURST signal is measured.

CONTINUOUS:
Selected when the continuous signal is measured.

[Burst Length] — Sets the bitwise length of the signal to be measured.

[Burst Search ON/OFF] — Selects whether to search for the burst in the acquired data by software.

ON: Searches for the burst by software.

OFF: Does not search for the burst by software.

If BURST is selected in **[Meas Signal]** and Free Run is selected in **Trigger Source**, ON is automatically set when the analysis is performed.

[Search Length] — The number of search slots of the signal to be measured. (1 slot: 625 µsec)

[Search Threshold] Sets the threshold that is used when the software searches for the burst.

[Sync Type] Sets whether to perform a measurement synchronized with Sync Word.

MEMO:	*LAP:*	*Synchronize*
	NO SYNC WORD:	*Does not synchronize*

[LAP] Sets LAP (lower address part) in hexadecimal.
48-bit device-specific addresses are assigned to Bluetooth transceiver.
24 bits from the LSB in the 48-bit addresses are called the LAP (lower address part).
The LAP starts after the 38th bit of the Bluetooth burst.
In this instrument, the LAP is set from the MSB. However, the signal is transmitted from the LSB.

[Bit Sequence] Selects the measurement algorithm.

RANDOM:
Performs the measurement assuming that the payload includes random data.

STD(0xF0):
Performs the standard measurement assuming that the payload includes the binary data, 11110000, which is repeated.

STD(0xAA):
Performs the standard measurement assuming that the payload includes the binary data, 10101010, which is repeated.

[Payload Header] Sets whether to calculate the payload header.

INCLUDE:
Does not calculate it. Select when the payload of the signal to be measured includes the payload header.

EXCLUDE:
Calculates it. Select when the payload of the signal to be measured does not include the payload header.

[Header Length] Sets the payload header length.

8bit: Sets the payload header length to 8 bits.

16bit: Sets the payload header length to 16 bits.

[Payload CRC] Sets whether to calculate the payload CRC.

INCLUDE:
Does not calculate it. Select when the payload of the signal to be measured includes the payload CRC.

EXCLUDE:
Calculates it. Select when the payload of the signal to be measured does not include the payload CRC.

[Freq Error Method]

Selects the frequency error measurement algorithm that is used when RANDOM is selected in Bit Sequence.

PEAK DEVIATION:
Displays the frequency error that is the average of the maximum and minimum values of the frequency deviation.

PREAMBLE:
Displays the frequency error that is the average of the preamble.

[Freq Error]

Sets whether to correct for the frequency error when displaying the frequency deviation graph.

ON: Displays the graph without correcting for the frequency error.

OFF: Displays the graph correcting for the frequency error.

[Δf1 max Lower Limit]

Sets the lower limit value, which is used when STD (0xF0) is calculated, in kHz.

[Δf1 max Upper Limit]

Sets the upper limit value, which is used when STD (0xF0) is calculated, in kHz.

[Δf2 max Lower Limit]

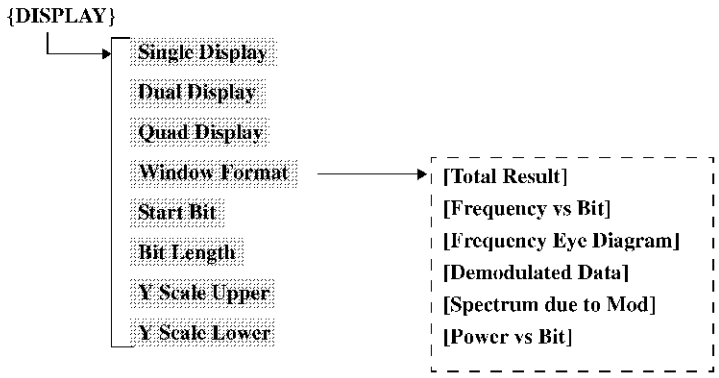
Sets the lower limit value, which is used when STD (0xAA) is calculated, in kHz.

Average On/Off

If **Average On/Off** is touched, the dialog box, in which the measurement conditions are set, is displayed.

5.5.2 {DISPLAY}

If the **{DISPALY}** button is touched, soft keys, which are used to set the scale settings of the X axis and Y axis of the active window, are displayed on the soft menu bar.



Single Display — Enlarges the upper-left window when the screen is in the four-window display mode.

Dual Display — Enlarges the two upper windows when the screen is in the four-window display mode.

Quad Display — Displays four windows on the screen.

Window Format — Selects display data.

Total Result:
Displays numerical results.

Frequency vs Bit:
Displays the frequency-bit graph.

Frequency Eye Diagram:
Displays the frequency-bit data on the Eye graph.

Demodulated Data:
Displays demodulation data.

Spectrum due to Mod:
Displays the spectrum which does not include the rising and falling edges of the burst.

Power vs Bit:
Displays the power envelope.

Start Bit — Sets the bit from which the X axis is displayed.

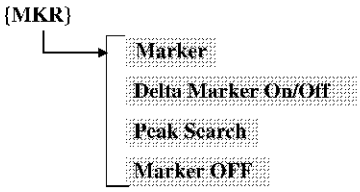
Bit Length — Sets the bit length by which the X axis is displayed.

Y Scale Upper — Sets the maximum value on the Y axis.

Y Scale Lower — Sets the minimum value on the Y axis.

5.5.3 {MKR}

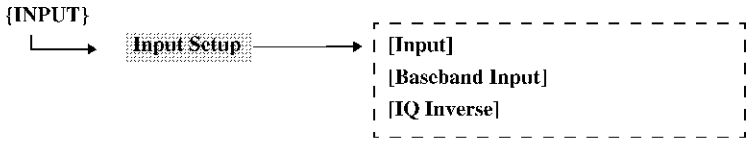
When you touch the **{MKR}** button, the soft keys related to the marker setup are displayed on the soft menu bar.



Marker	Sets the X-axis position of the nomal marker.
Delta Marker On/Off	Sets the Δ marker.
Peak Search	Searches for the peak.
Marker OFF	Hides the marker.

5.5.4 {INPUT}

When you touch the **{INPUT}** key, the soft keys related to the setting up of the input format for the measuring instrument are displayed on the soft menu bar.



Input Setup The dialog box for setting up the input format for the measuring instrument appears. Set up in accordance with the measurement signal.

[Input] Sets the input channel for the signal.

RF: Sets the RF signal input.

Baseband (I&Q):
Sets the IQ signal (baseband) input.

[Baseband Input] Sets the coupling for the IQ signal input.

AC: Selects the AC coupling.

DC: Selects the DC coupling.

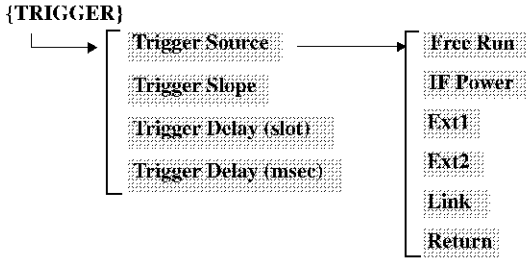
[IQ Inverse] Selects whether or not to invert the phase of the signal to be measured.

ON: Inverts the signal.

OFF: Does not invert the signal.

5.5.5 {TRIGGER}

When you touch the **{TRIGGER}** button, the soft keys related to the trigger setup are displayed on the soft menu bar.



Trigger Source

The soft keys related to the trigger setup appear on the soft menu bar.

Free Run

Obtains and analyzes data according to the internal timing of the measuring instrument.

IF Power

Obtains and analyzes data synchronized with the IF signal.

Ext1

Synchronizes the data reading with the external signal and analyzes the data entered into the EXT TRIG IN 1 connector. The threshold level for Ext1 is fixed to the TTL level.

Ext2

Synchronizes the data reading with the external signal and analyzes the data entered into the EXT TRIG IN 2 connector. The threshold level for Ext2 can be set.

Link

Obtains and analyzes data synchronizing with the trigger of an optional function.

MEMO: ***For information on how to the directions for use of the link trigger, refer to the manual of the option in which the link trigger is used.***

Return

Returns to the previous soft key array on the soft menu bar.

Trigger Slope

Switches the polarity of the trigger slope.
Available only for IF Power, Ext1, and Ext2.

+: Starts sweeping at the rise of a trigger.

-: Starts sweeping at the fall of a trigger.

Trigger Delay (slot)

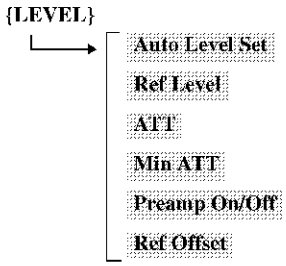
Sets the delay time from the trigger point in units of slot.
The set amount of delay is converted into time and is set to Trigger Delay (msec). Valid only for IF Power, Ext1, and Ext2.
The acquisition of A/D data, which is used for analysis, is delayed by the delay time.

Trigger Delay (msec)

Sets the delay time from the trigger point. Is available only for IF Power, Ext1, and Ext2. When analyzing, the start position of AD data acquisition is shifted to the delay time.

5.5.6 {LEVEL}

When you touch the **{LEVEL}** button, the soft keys related to the setup of the attenuator and reference level are displayed on the soft menu bar.



Auto Level Set

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

IMPORTANT: While Auto Level Set is being executed, the level of the signal measured must remain constant.

Ref Level

Sets the reference level.

ATT

Sets the attenuator.

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

Man: Sets the attenuator value.

Min ATT

Sets the Min ATT function ON and OFF.

On: Sets the minimum attenuator value and implements control regardless of whether ATT is Auto or Manual.

Off: Cancels the Min ATT limitation.

Preamp On/Off

Sets the preamplifier function ON and OFF.

Ref Offset

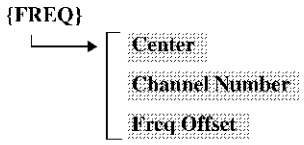
Switches the reference level offset function ON and OFF.

On: Sets the offset value and changes only the displayed reference level by the offset value.
(Displayed reference level = Set value + Offset value)

Off: Cancels the offset function.

5.5.7 {FREQ}

When you touch the **{FREQ}** button, the soft keys related to the measurement frequency setup are displayed on the soft menu bar.



Center

Sets the center frequency of the measurement signal.

IMPORTANT: Set the center frequency correctly. If it is set incorrectly, an error may occur in the center frequency error measurement and the measurement may be incorrect.

Channel Number

When the channel number is set, the center frequency is automatically set by using the following formula.

(Center frequency) = (Channel interval) × (Channel number + Channel offset) + (Start frequency)

The parameters such as the channel interval and the channel number setting range depend on the Standard selected by **[Special]** → **[STD...]**. For more information, refer to the R3681 Series User's Guide.

Freq Offset

Switches the center frequency offset function ON and OFF.

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

Off: Cancels the offset function.

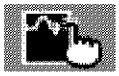
5.5.8 Measurement Tool Bar

Functions such as waveform range selection and active window selection are displayed as icons.

The following functions can be used by touching the icons.

 :Active window switching icon

Used to make one of the split windows active.

 :Range specification icon (X-axis mode)

Used to specify a range in the window in which the waveform is displayed. After touching the icon, touch both sides of the range to be specified.

 :Range specification icon (range mode)

Used to specify a range in the window in which the waveform is displayed. After touching the icon, touch the upper left corner and the lower right corner of the range to be specified.

 :Peak search icon

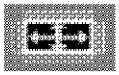
Used to place a marker on the peak after searching for the peak of the waveform.

 :Zoom in icon

Used to zoom in on the waveform displayed in the window. If you touch this icon after specifying the range by using the range specification icon, the range zooms in.

 :Zoom out icon

Used to zoom out from the waveform displayed in the window.

 :Range shift icon

Used to scroll the display without changing the scale.

6. SCPI COMMAND REFERENCE

This chapter describes the SCPI command reference for this instrument.

6.1 Command Reference Format

This section describes the format and layout used to describe commands in this chapter.

Each description includes the following items:

Function description

SCPI command

Parameter

Query reply

- |Function description|

  The usage of commands and operations in this instrument.

- |SCPI command|

  The SCPI command displays the syntax of a command sent from the external controller to this instrument. The syntax consists of a command and a number of parameters. The command and the parameters are separated by a space.

  If a command has multiple parameters, they are separated by commas (,). The three points (...) displayed between commas represent the parameter(s) omitted at that position.

  For example, the description <numeric value 1>,..., <numeric value 4> shows that four parameters, <numeric value 1>, <numeric value 2>, <numeric value 3>, and <numeric value 4>, are required.

  If the parameter is a character string type such as <character string>,<character string 1>, the parameter must be enclosed in double quotation marks (" "). If the parameter is <block>, it shows the block format data.

  Text written in lowercase alphabetic characters in the syntax can be omitted.

  For example, ":CALibration:CABLe" can be abbreviated to ":CAL:CABL."

  The marks used in the syntax are defined as follows:

< >:	Shows a parameter required for sending a command
[ ] :	Shows that the command is optional It can be omitted
{ }:	Shows that only one item is required to be selected from multiple items
|:	Used as a delimiter for multiple items written in curly brackets {..}
<ch>:	Written in the command header and shows the target input channel number of the command The channel number can be omitted. However, when it is written, channel number 1 is selected
<screen>:	Written in the command header and shows the target screen number of the command The screen number can be omitted. However, when it is written, a value from 1 to 4 can be selected [{1|2|3|4}]

For example, If the syntax below is specified, :CALC:CORR:EDEL:TIME 0.1 and : CALCULATE1:SELECTED:CORR:EDEL:TIME 25E-3 are valid.

Syntax: CALCulate{[1|2|3|4]}:SELected]:CORRection:EDELay:TIME <numeric value>

- [Parameter]

  Describes a parameter required for sending a command.

  If the parameter is numeric type or alphabetic, it is enclosed in angle brackets (< >).

  If the parameter is optional, it is enclosed in curly brackets ({ }).

  In this manual, parameter types are described in the following formats:

  < int >: A numeric value that can be input in the format NR1, NR2, or NR3 and rounded to an integer in this instrument

  < real >: A numeric value that can be input in the format NR1, NR2, or NR3 and rounded to a valid-digit real number in this instrument

  < bool >: Either OFF or ON can be entered.

  < str >: A character string enclosed in quotation (' ') or double quotation (" ") marks.

  <block>: Block data type
  The data content is an 8-bit binary data array

  < type >: Character data selected from multiple types

- [Query reply]

  When there is a query reply to the command, the data format used for reading the query is described.

  Each parameter to be read is enclosed in curly brackets ({ }). If multiple items, which are delimited by a vertical bar (|), exist in curly brackets ({ }), only one of those items is read out. If parameters are delimited by commas (,) multiple parameters can be read out. The three points (...) displayed between commas represent data omitted from that position. For example, the description {numeric value 1},...., {numeric value 4} shows that four parameters {numeric value 1}, {numeric value 2}, {numeric value 3}, and {numeric value 4} are read.

  If the parameter to be read is enclosed in square brackets ([ ]), the parameter may be omitted, depending on the measurement result, etc.

  If the parameter to be read is a value in a unit, a description such as "Unit: dBm" is added to display the unit of the parameter value. However, only when the parameter is described in a level unit "dBm", the level unit selected at that time will be applied to the parameter.

6.2 Common Commands

This section describes common IEEE commands.

Function description	SCPI Command	Parameter	Query reply	Remarks
Clears the status byte and related data	*CLS	-	-	
Macro definition for GET	*DDT	<block>	<block>	*1
Sets the standard event status enable register	*ESE	<int>	<int>	
Reads the standard event status register	*ESR?	-	<int>	
Device inquiry	*IDN?	-	<str>	*2
Notifies when all running operations are complete	*OPC	-	1	
Loads the device settings	*RCL	<int> | POFF	-	*3
Resets the device	*RST	-	-	
Saves the device settings	*SAV	<int>	<int>	
Sets the service request enable register	*SRE	<int>	<int>	
Reads the status byte register	*STB?	-	<int>	
Triggers the device	*TRG	-	-	
Waits until all running operations are complete	*WAI	-	-	

*1: If the *DDT? command is executed when the macro is undefined, a zero-length block data (#10) is returned.
*2: <str> is output in the following format: maker name, model name, serial number and version number.
*3: POFF indicates the parameter settings when the power was last switched off.

6.3 List of Commands

6.3.1 Subsystem-SYSTem

Function description	SCPI command	Parameter	Query reply	Remarks
Config				
Measurement system selection	:SYSTem:SELect	SANalyzer|MANalyzer	SAN|MAN	
Modulation				
Modulation analysis system selection	:SYSTem:SELect:MODulation	BLUETOOTH	BLUETOOTH	
Preset				
Each measurement system parameter initialization	:SYSTem:PRESet	–	–	
All measurement systems initialization	:SYSTem:PRESet:ALL	–	–	
Log				
Inquiry about the error that occurred last	:SYSTem:ERRor?	–	<int>,<str>	
Inquiry about the details of the error log	:SYSTem:ERRor:ALL?	–	<int>,<str>	

6.3.2 Subsystem-INPut

Function description	SCPI command	Parameter	Query reply	Remarks
ATT/Preamp				
ATT setting (Manual)	:INPut:ATTenuation	<real>	<real>	
ATT (Auto/Manual)	:INPut:ATTenuation:AUTO	OFF|ON	OFF|ON	
Min ATT setting	:INPut:ATTenuation:MINimum	<real>	<real>	
Min ATT ON/OFF	:INPut:ATTenuation:MINimum:STATe	OFF|ON	OFF|ON	
Preamp ON/OFF	:INPut:GAIN:STATe	OFF|ON	OFF|ON	
Input Setup				
Input Signal RF/Baseband	:INPut:SIGNal	RF|BASeband	RF|BAS	
Baseband Input AC/DC	:INPut:BASeband	AC|DC	AC|DC	
IQ Inverse ON/OFF	:INPut:IQ:INVerse	OFF|ON	OFF|ON	

6.3.3 Subsystem-SENSe

Function description	SCPI command	Parameter	Query reply	Remarks
FREQuency				
Center Freq setting	[:SENSe]:FREQuency:CENTer	<real>	<real>	
Freq Offset setting	[:SENSe]:FREQuency:OFFSet	<real>	<real>	
Freq Offset ON/OFF	[:SENSe]:FREQuency:OFFSet:STATe	OFF|ON	OFF|ON	
Channel Number setting	[:SENSe]:FREQuency:CHANnel:NUMBer	<int>	<int>	
Auto Level Set				
Auto Level Set execution	[:SENSe]:POWer:LEVel:AUTO	–	–	
Meas Parameters				
Meas Signal setting	[:SENSe]:CONDition:MSIGnal	BURSt|CONTinuous	BURS|CONT	
Burst Length setting	[:SENSe]:CONDition:BLENgth	<int>	<int>	
Search Length setting	[:SENSe]:CONDition:SLENgth	<int>	<int>	
Burst Search ON/OFF	[:SENSe]:CONDition:BSEarch	OFF|ON	OFF|ON	
Search Threshold setting	[:SENSe]:CONDition:STHReshold	<int>	<int>	
Sync Type setting	[:SENSe]:CONDition:STYPe	LAP|NO	LAP|NO	
LAP setting	[:SENSe]:CONDition:LAP	#H***** (Hexadecimal)	#H***** (Hexadecimal)	
Bit Sequence setting	[:SENSe]:CONDition:BSEQuence	RANDom| STDFZero|STDAA	RAND|STDFZ| STDAA	
Payload Header setting	[:SENSe]:CONDition:PHEader	INCLude|EXCLude	INCL|EXCL	
Header Length setting	[:SENSe]:CONDition:HLENgth	BIT8|BIT16	BIT8|BIT16	
Payload CRC setting	[:SENSe]:CONDition:PCRC	INCLude|EXCLude	INCL|EXCL	
Freq Error Method setting	[:SENSe]:CONDition:FEMethod	PDEViation| PREamble	PDEV|PRE	
Freq Error ON/OFF	[:SENSe]:CONDition:FERRor	OFF|ON	OFF|ON	
Δf1 max Lower Limit setting	[:SENSe]:CONDition:STDFZero:LOWer	<real>	<real>	
Δf1 max Upper Limit setting	[:SENSe]:CONDition:STDFZero:UPPer	<real>	<real>	
Δf2 max Lower Limit setting	[:SENSe]:CONDition:STDAA:LOWer	<real>	<real>	
Average ON/OFF	[:SENSe]:CONDition:AVERage[:STATe]	OFF|ON	OFF|ON	
Average setting	[:SENSe]:CONDition:AVERage:COUNt	<int>	<int>	

6.3.4 Subsystem-TRIGger

Function description	SCPI command	Parameter	Query reply	Remarks
SEQuence				
Trigger Source	:TRIGger[:SEQuence]:SOURce	IMMediate|IF| EXTernal1| EXTernal2|LINK	IMM|IF|EXT1| EXT2|LINK	
Trigger Slope	:TRIGger[:SEQuence]:SLOPe	POSitive| NEGative	POS|NEG	
Trigger Delay (slot)setting	:TRIGger[:SEQuence]:DELay:SLOT	<int>	<int>	
Trigger Delay (msec)setting	:TRIGger[:SEQuence]:DELay	<real>	<real>	
IF Power setting	:TRIGger[:SEQuence]:LEVel:IF	<real>	<real>	
Ext2 Trigger Level setting	:TRIGger[:SEQuence]:LEVel:EXTernal	<real>	<real>	

6.3.5 Subsystem-INITiate

Function description	SCPI command	Parameter	Query reply	Remarks
INITiate				
Single measurement execution	:INITiate:MEASure:SINGle	–	–	
Repeat measurement execution	:INITiate:MEASure:REPeat	–	–	
Stop execution (measurement stop)	:INITiate:ABORt	–	–	

6.3.6 Subsystem-CALCulate

Function description	SCPI command	Parameter	Query reply	Remarks
MARKer				
Marker ON/OFF	:CALCulate:MARKer<scrn=1|2|3|4>[:STATe]	OFF|ON	OFF|ON	
Marker X setting	:CALCulate:MARKer<scrn=1|2|3|4>:X	<real>	<real>	
Marker Y reading	:CALCulate:MARKer<scrn=1|2|3|4>:Y	–	<real>	
Delta Marker ON/OFF	:CALCulate:DELTamarker<scrn=1|2|3|4>[:STATe]	OFF|ON	OFF|ON	
Peak Search execution	:CALCulate:MARKer<scrn=1|2|3|4>:MAXimum	-	-	

6.3.7 Subsystem-DISPlay

Function description	SCPI command	Parameter	Query reply	Remarks
Level				
Ref Level setting	:DISPlay:TRACe:Y[:SCALe]:RLEVel	<real>	<real>	
Level Offset setting	:DISPlay:TRACe:Y[:SCALe]:RLEVel:OFFSet	<real>	<real>	
Level Offset ON/OFF	:DISPlay:TRACe:Y[:SCALe]:RLEVel:OFFSet:STATe	OFF|ON	OFF|ON	
Window Format				
Analysis format selection	:DISPlay:WINDow<scrn=1|2|3|4>:FORMat	TRESult|FBIT| FEYE|DDATa| SPECtrum|POWer	TRES|FBIT| FEYE|DDAT| SPEC|POW	
SCALe				
Multi Screen setting	:DISPlay	SINGle|DUAL| QUAD	SING|DUAL| QUAD	
Start Bit setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:BIT:STARt	<int>	<int>	
Bit Length setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:BIT:LENGth	<int>	<int>	
Y Scale Upper setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:Y[:SCALe]:UPPer	<real>	<real>	
Y Scale Lower setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:Y[:SCALe]:LOWer	<real>	<real>	

6.3.8 Subsystem-MMEMory

Function description	SCPI command	Parameter	Query reply	Remarks
Save/Recall				
Saving the settings of this instrument	:MMEMory:STORe:STATe	<int>	–	*1
Loading the settings of this instrument	:MMEMory:LOAD:STATe	<int>	–	*1
Measurement condition Save selection	:MMEMory:SELect:ITEM:BT:SETup	OFF|ON	OFF|ON	

*1: A number, which is a maximum of 4-digit and is added to the file name of the data to be saved or loaded, must be specified in <int>.

6.3.9 Subsystem-MEASure

Function description	SCPI command	Parameter	Query reply	Remarks
MEASure				
Frequency Error reading	:MEASure:TRESult:FERRor	–	<real>	
Peak Frequency Error reading	:MEASure:TRESult:PFERror	–	<real>	
Tx Power reading	:MEASure:TRESult:POWer	–	<real>,<real>	*2
Peak Power reading	:MEASure:TRESult:PPOWer	–	<real>,<real>,<real>	*3
Deviation (Random) reading	:MEASure:TRESult:RANDom:DEViation	–	<real>,<real>,<real>,<real>,<real>	*4
Deviation (STD 0xF0) reading	:MEASure:TRESult:STDFZero:DEViation	–	<real>,<real>,<real>,<real>,<real>,<real>	*5
Deviation (STD 0xAA) reading	:MEASure:TRESult:STDAA:DEViation	–	<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>	*6

*2: Outputs the Tx Power in order of [dBm] and [W].
*3: Outputs the Peak Power in order of [dB], [W], and [bit].
*4: Outputs the Deviation (Random) in order of Max Peak[Hz], [bit], Min Peak[Hz], [bit], and Min/Max[%].
*5: Outputs the Deviation (STD 0xF0) in order of Max Δf1 max[Hz], [bit], Min Δf1 max[Hz], [bit], Pass/All Δf1 max[%], and Δf1 avg[Hz].
*6: Outputs the Deviation (STD 0xAA) in order of Max Δf2 max[Hz], [bit], Min Δf2 max[Hz], [bit], Pass/All Δf2 max[%], Δf2 avg[Hz], Max Carrier Freq Drift[Hz], and [Hz/50us].

6.3.10 Subsystem-READ

Function description	SCPI command	Parameter	Query reply	Remarks
READ				
Frequency Error reading	:READ:TRESult:FERRor	–	<real>	
Peak Frequency Error reading	:READ:TRESult:PFERror	-	<real>	
Tx Power reading	:READ:TRESult:POWer	-	<real>,<real>	*2
Tx Peak Power reading	:READ:TRESult:PPOWer	-	<real>,<real>,<real>	*3
Deviation (Random) reading	:READ:TRESult:RANDom:DEViation	-	<real>,<real>,<real>,<real>,<real>	*4
Deviation (STD 0xF0) reading	:READ:TRESult:STDFZero:DEViation	-	<real>,<real>,<real>,<real>,<real>,<real>	*5
Deviation (STD 0xAA) reading	:READ:TRESult:STDAA:DEViation	-	<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>	*6

*2: Outputs the Tx Power in order of [dBm] and [W].
*3: Outputs the Peak Power in order of [dB], [W], and [bit].
*4: Outputs the Deviation (Random) in order of Max Peak[Hz], [bit], Min Peak[Hz], [bit], and Min/Max[%].
*5: Outputs the Deviation (STD 0xF0) in order of Max Δf1 max[Hz], [bit], Min Δf1 max[Hz], [bit], Pass/All Δf1 max[%], and Δf1 avg[Hz].
*6: Outputs the Deviation (STD 0xAA) in order of Max Δf2 max[Hz], [bit], Min Δf2 max[Hz], [bit], Pass/All Δf2 max[%], Δf2 avg[Hz], Max Carrier Freq Drift[Hz], and [Hz/50us].

6.3.11 Subsystem-FETCh

Function description	SCPI command	Parameter	Query reply	Remarks
FETCh				
Frequency Error reading	:FETCh:TRESult:FERRor	–	<real>	
Peak Frequency Error reading	:FETCh:TRESult:PFERror	-	<real>	
Tx Power reading	:FETCh:TRESult:POWer	-	<real>,<real>	*2
Tx Peak Power reading	:FETCh:TRESult:PPOWer	-	<real>,<real>,<real>	*3
Deviation (Random) reading	:FETCh:TRESult:RANDom:DEViation	-	<real>,<real>,<real>,<real>,<real>	*4
Deviation (STD 0xF0) reading	:FETCh:TRESult:STDFZero:DEViation	-	<real>,<real>,<real>,<real>,<real>,<real>	*5
Deviation (STD 0xAA) reading	:FETCh:TRESult:STDAA:DEViation	-	<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>,<real>	*6

*2: Outputs the Tx Power in order of [dBm] and [W].
*3: Outputs the Peak Power in order of [dB], [W], and [bit].
*4: Outputs the Deviation (Random) in order of Max Peak[Hz], [bit], Min Peak[Hz], [bit], and Min/Max[%].
*5: Outputs the Deviation (STD 0xF0) in order of Max Δf1 max[Hz], [bit], Min Δf1 max[Hz], [bit], Pass/All Δf1 max[%], and Δf1 avg[Hz].
*6: Outputs the Deviation (STD 0xAA) in order of Max Δf2 max[Hz], [bit], Min Δf2 max[Hz], [bit], Pass/All Δf2 max[%], Δf2 avg[Hz], Max Carrier Freq Drift[Hz], and [Hz/50us].

6.4 Status Register

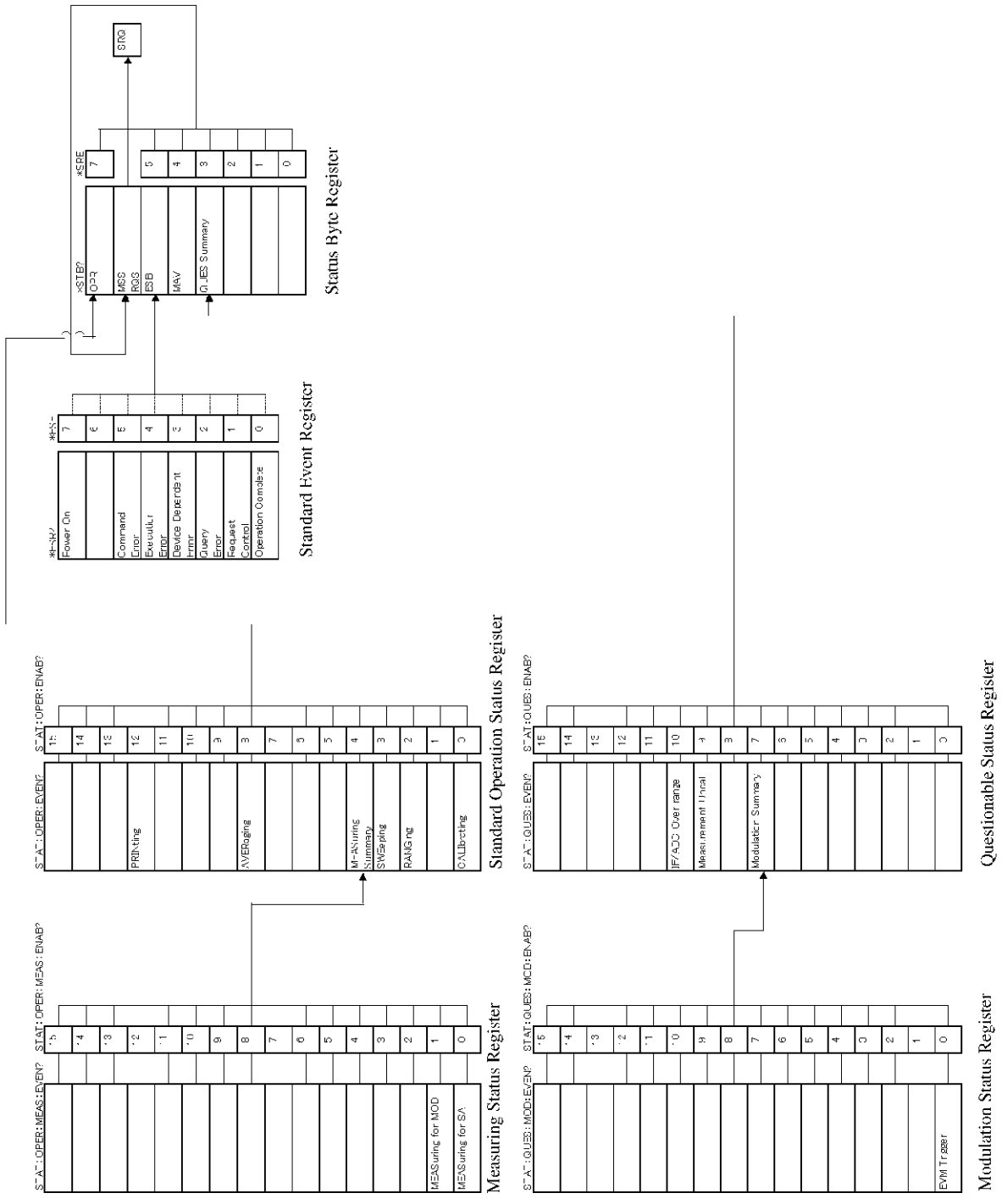


Figure 6-1 Status Registers

7. PERFORMANCE VERIFICATION

This chapter describes how to check whether the performance of this instrument meets the specifications.

It is recommended that you copy the test data record sheet included at the end of this chapter and save it as a record of the performance test.

IMPORTANT: Before verifying the performance, warm-up and completely calibrate the instrument.

7.1 Test Procedures

Connect the sinal source as shown below:

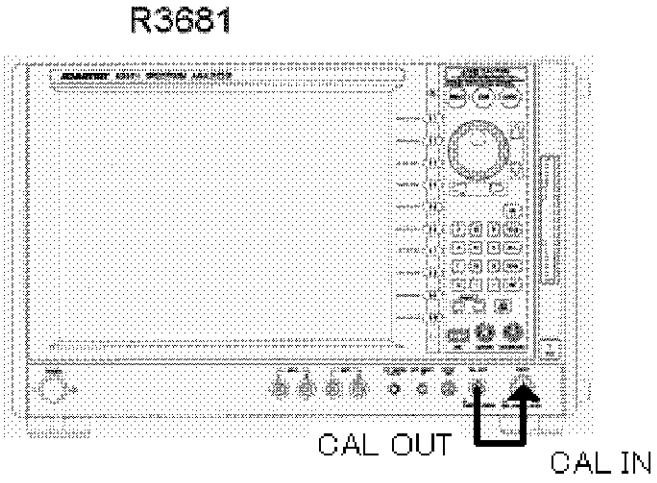


Figure 7-1 Connection Diagram of Signal Source

7.1.1 Measurement of Frequency Error and Frequency Deviation

1. Set this instrument as follows:

{MEAS SETUP}:	**Meas Parameters**		
	[Meas Signal]:		CONTINUOUS
	[Burst Length]:		3000
	[Search Length]:		15
	[Bit Sequence]:		RANDOM
	{INPUT}:	**Input**	RF
	IQ Inverse	OFF	
{TRIGER}:	**Trigger Source**	Free Run	
{FREQ}:	**Center**	50.15 MHz	
{LEVEL}:	Execute **Auto Level Set**.		

2. Press the **SINGLE** button on this instrument to perform measurements.
3. Write the measurement results in the test data record sheet.

7.2 Test Data Record Sheet

Test data record sheet

Model name:

Serial number:

Test item	Specifications			Pass / Fail
	Minimum value	Measured value	Maximum value	
Frequency error	-160.0 kHz		-140.0 kHz	
Max Peak	0.0 kHz		+10.0 kHz	
Min Peak	0.0 kHz		+10.0 kHz	

8. SPECIFICATIONS

8.1 Bluetooth Modulation Analysis Performance

Item		Specifications
Temperature range		+20°C ~ +30°C
Input level range	RF input	-30 dBm to +30 dBm
	IQ input	< 1.0 V_{p-p}
Carrier frequency error	Measurement range	< ±75.0 kHz
	Measurement accuracy PREAMBLE	< ± (Reference frequency accuracy × Center frequency + 1.0 kHz)
	PEAK DEVIATION	< ± (Reference frequency accuracy × Center frequency + 10.0 kHz)
Power measurement	Accuracy (-10 dBm input)	< ± (0.3 dB + Frequency response + calibration signal level accuracy)
	Frequency response 50 MHz to 2.5 GHz	< ±0.4 dB
	20 MHz to 3.5 GHz	< ±1.0 dB
	3.5 GHz to 6 GHz (Band 1 MHz)	< ±1.0 dB
Frequency deviation measurement error *		< ±10.0 kHz

*: Difference between the theoretical frequency deviation of the signal that enters into a filter, which is compliant with the standard, and the measured frequency deviation of the signal that leaves the filter.

APPENDIX

This section describes the following supplemental information:

A.1 Technical Data

A.2 Error Message List

A.1 Technical Data

LAP

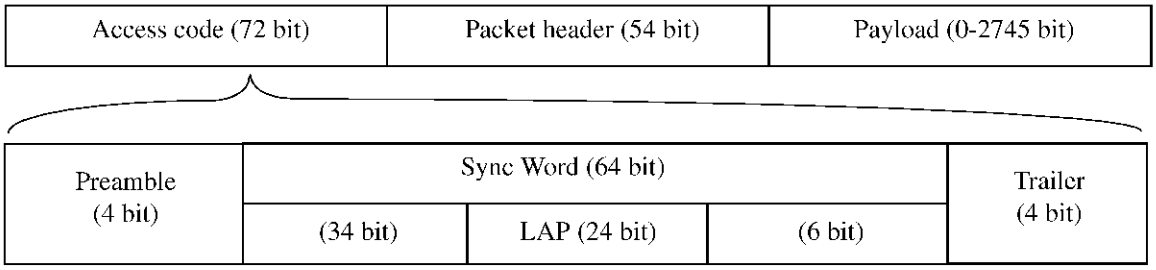
48-bit device-specific addresses are assigned to Bluetooth transceiver. 24 bits from the LSB in these 48-bit addresses are called the LAP (lower address part).

The LAP starts from the 39th bit of the Bluetooth burst.

The 34 bits before the LAP and 6 bits after the LAP are calculated based on the LAP and the 64 bits that include the LAP are called Sync Word.

The 4 bits before Sync Word and 4 bits after Sync Word, which are called the preamble and trailer, are calculated based on Sync Word and the total of 72 bits are called the access code.

By setting the **[Sync Type]** option button to **[LAP]**, this is how this instrument performs the measurement synchronized with the access code which is calculated by using the LAP.



FM Deviation frequency measurement

If RANDOM is selected in Bit Sequence and PEAK DEVIATION is selected in Freq Error Method, the frequency error (ferror) is found by the frequency deviation maximum value (fmax) and frequency deviation minimum value (fmin) as shown in the following equation:

ferror = (fmax + fmin) / 2

If PREAMBLE is selected in Freq Error Method, the frequency error is found by averaging the preamble frequency deviation.

How to measure FM DEVIATION Max Deviation / Min Deviation (When Bit Sequence is set to RANDOM)

Max Deviation shows the maximum value from the frequency deviation of all sampling points.

Min deviation shows the minimum value from the frequency deviation of all bit points.

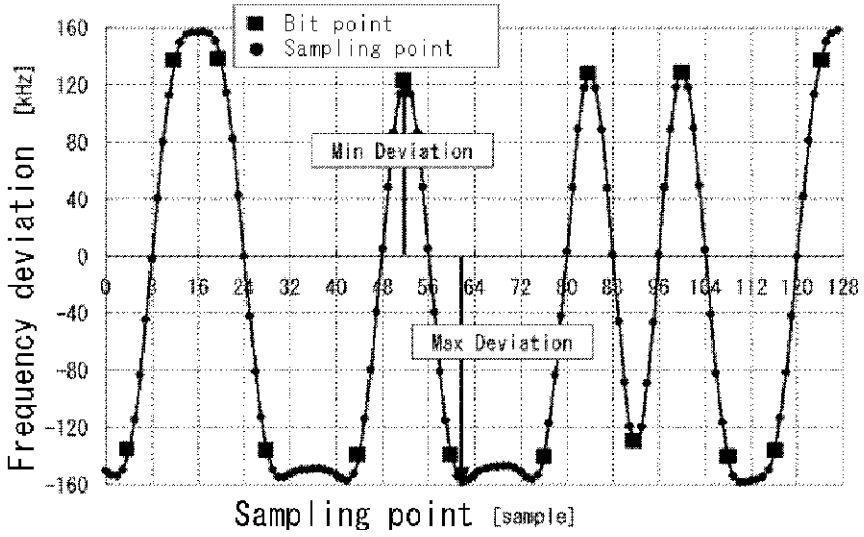


Figure A-1 How to measure Max / Min Deviation

Results which are displayed when AVERAGE is set to ON

The result of the last analysis, which is performed after the averaging process, is displayed on any graph that exclude Total Result and Demodulated Data.

In the Total Result window, values, which are displayed in bits, are indicated by ***.

In Peak Freq Error and Tx Peak Power, the maximum absolute value in the averaging processes is displayed.

All other results in the Total Result window display the average values in the averaging process.

A.2 Error Message List

This section describes the error messages displayed on this instrument.

The following information is included.

- Error number
- Displayed message
- Cause of generation and cancellation method

Table A-1 Error Message List

Error number	Displayed message	Description
-1250	No such file or directory.	The file or directory does not exist. Check the file name or directory name.
-1251	Permission denied.	The file operation is prohibited. Check the drive name, file, or directory name.
-1252	Not enough space on the disk.	Not enough free space. Delete all unnecessary files.
-1253	File read/write error.	An error occurred during file I/O. Check if there is sufficient disk space or the disk is write-protected.
-1300	Device is not ready.	No disk is inserted.
-1400	There is no data in the effective state.	The requested data is not defined.
-1500	Option required.	The specified option function is required.
-3210	Input Level is out of range. Check the Ref. Level.	The input signal level is outside the permitted range. Check the reference level or input signal level.
-3242	Cannot find out Burst.	No burst could be found in A/D data.
-3246	Cannot detect Sync Word.	No Sync Word can be found. Check the Sync Word number.
-3249	Sync Word position is different from STD.	The position of Sync Word is different from that of the standard.

ALPHABETICAL INDEX

[Symbol]

[A]

[B]

[C]

[D]

[E]

[F]

[G]

[H]

[I]

[L]

[M]

[O]

[P]

[Q]

[R]

[S]

[T]

[U]

[W]

[Y]

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6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**

7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

8. **OTHER THAN THE REMEDY FOR THE BREACH OF WARRANTY SET FORTH HEREIN, ADVANTEST SHALL NOT BE LIABLE FOR, AND HEREBY DISCLAIMS TO THE FULLEST EXTENT PERMITTED BY LAW ANY LIABILITY FOR, DAMAGES FOR PRODUCT FAILURE OR DEFECT, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLEGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

CUSTOMER SERVICE DESCRIPTION

In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, Advantest recommends a regular preventive maintenance program under its maintenance agreement.

Advantest's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest 's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

SALES & SUPPORT OFFICES

Advantest Korea Co., Ltd.
22BF, Kyobo KangNam Tower,
1303-22, Seocho-Dong, Seocho-Ku, Seoul #137-070, Korea
Phone: +82-2-532-7071
Fax: +82-2-532-7132

Advantest (Suzhou) Co., Ltd.
Shanghai Branch Office:
Bldg. 6D, NO.1188 Gumei Road, Shanghai, China 201102 P.R.C.
Phone: +86-21-6485-2725
Fax: +86-21-6485-2726

Shanghai Branch Office:
406/F, Ying Building, Quantum Plaza, No. 23 Zhi Chun Road,
Hai Dian District, Beijing,
China 100083
Phone: +86-10-8235-3377
Fax: +86-10-8235-6717

Advantest (Singapore) Pte. Ltd.
438A Alexandra Road, #08-03/06
Alexandra Technopark Singapore 119967
Phone: +65-6274-3100
Fax: +65-6274-4055

Advantest America, Inc.
3201 Scott Boulevard, Suite, Santa Clara, CA 95054, U.S.A
Phone: +1-408-988-7700
Fax: +1-408-987-0691

ROHDE & SCHWARZ Europe GmbH
Mühldorfstraße 15 D-81671 München, Germany
(P.O.B. 80 14 60 D-81614 München, Germany)
Phone: +49-89-4129-13711
Fax: +49-89-4129-13723

ADVANTEST®

http://www.advantest.co.jp

ADVANTEST CORPORATION
Shin-Marunouchi Center Building, 1-6-2 Marunouchi, Chiyoda-ku, Tokyo 100-0005, Japan
Phone: +81-3-3214-7500