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ADVANTEST CORPORATION

R3681 Series OPT60
WiBro (WiBro 16e/D12)
Modulation Analysis Software
User's Guide

MANUAL NUMBER FOE-8440244A00

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 60 WiBro 16e/D12 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 60.
Chapter 8. SPECIFICATIONS	Shows the specifications of option 60.
APPENDIX	Describes operation principles and the error code table.

1.2 Product Overview

The WiBro 16e/D12 modulation analysis option is software that performs the modulation analysis of the WiBro16e/D12 base station signal.

This option includes the following features.

- The constellation error measurement function includes the single frame mode and the multi frame mode. In the single frame mode, a frame to be measured can be specified from the waveform acquired in the memory and the analysis can be performed. In the multi frame mode, the set frames or symbols are measured.
- The Ramp measurement function acquires a burst waveform, synchronizes it with the preamble, and displays it with the template.

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

3.2 Locating This Instrument

3.3 Connecting Accessories

3.4 Supply Description

3.5 Operation Check

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 OPT60 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 OPT60 User's Guide (WiBro 16e)	ER3681OPT60	1	English version
R3681 Series OPT60 User's Guide (WiBro 16e/D12)		1	

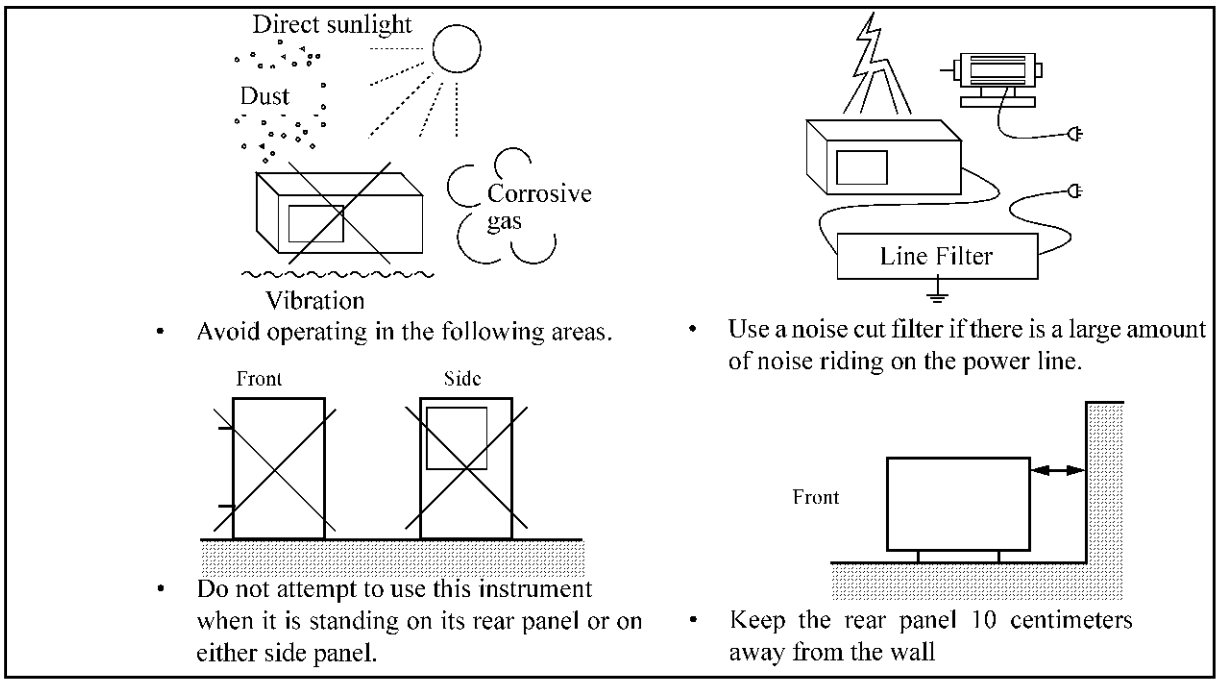
3.2 Locating This Instrument

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).

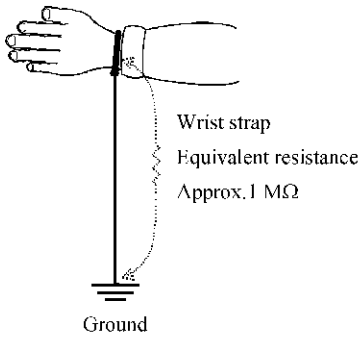


Figure 3-2 Countermeasures against Static Electricity from the Human Body

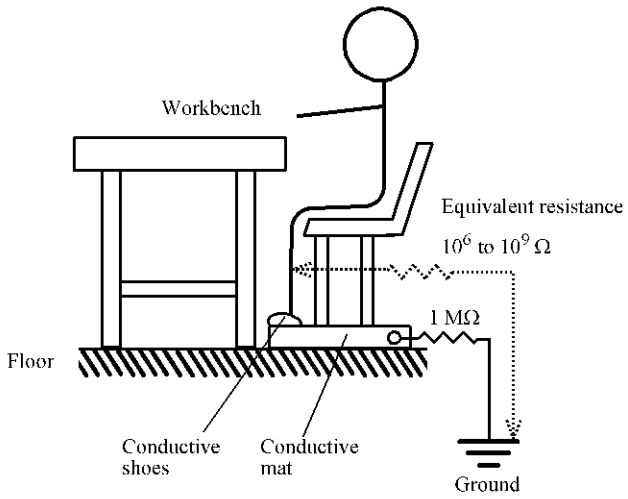


Figure 3-3 Countermeasures against Static Electricity from the Work Floor

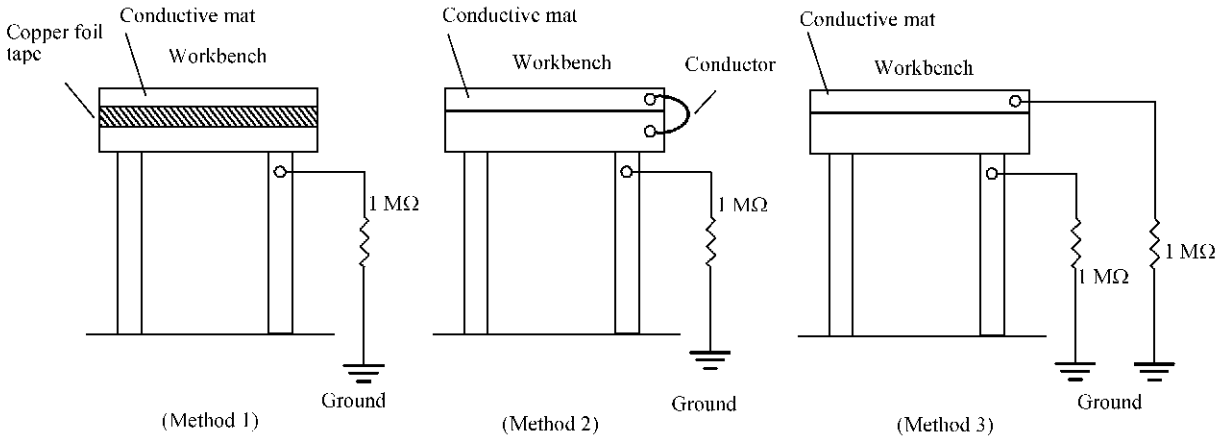


Figure 3-4 Countermeasures against Static Electricity from the Workbench

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.

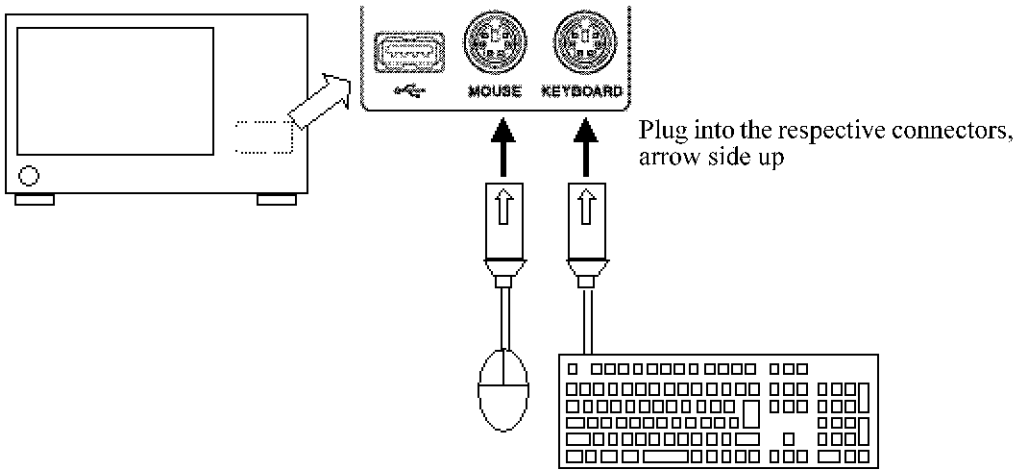


Figure 3-5 Connecting the Keyboard and Mouse

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).

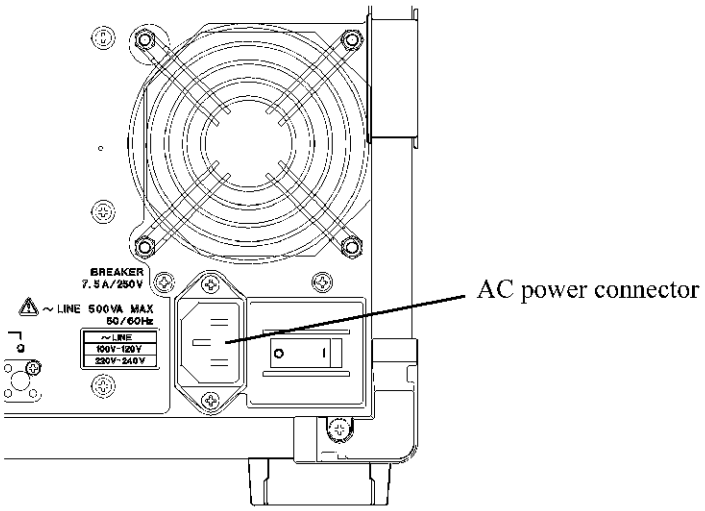


Figure 3-6 Connecting the Power Cable

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.

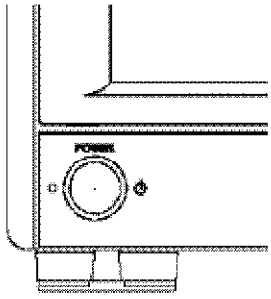


Figure 3-7 **POWER** Switch

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.

MEMO: ***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.***

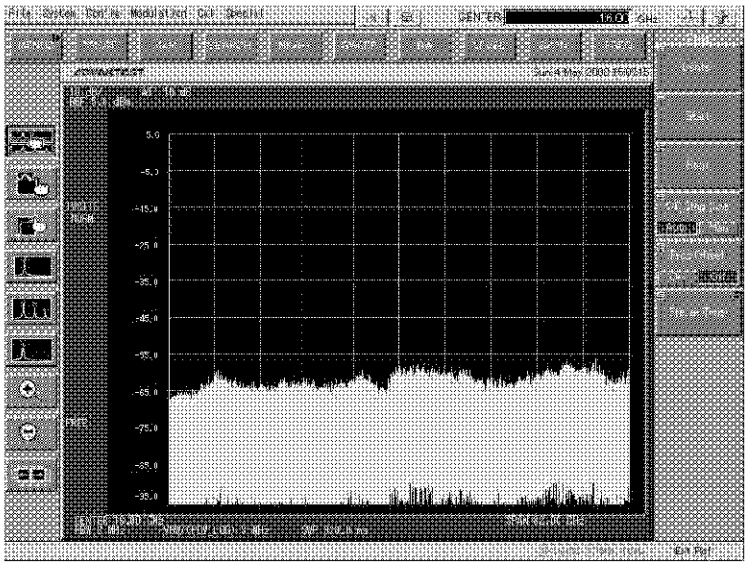


Figure 3-8 Initial Setup Screen

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.

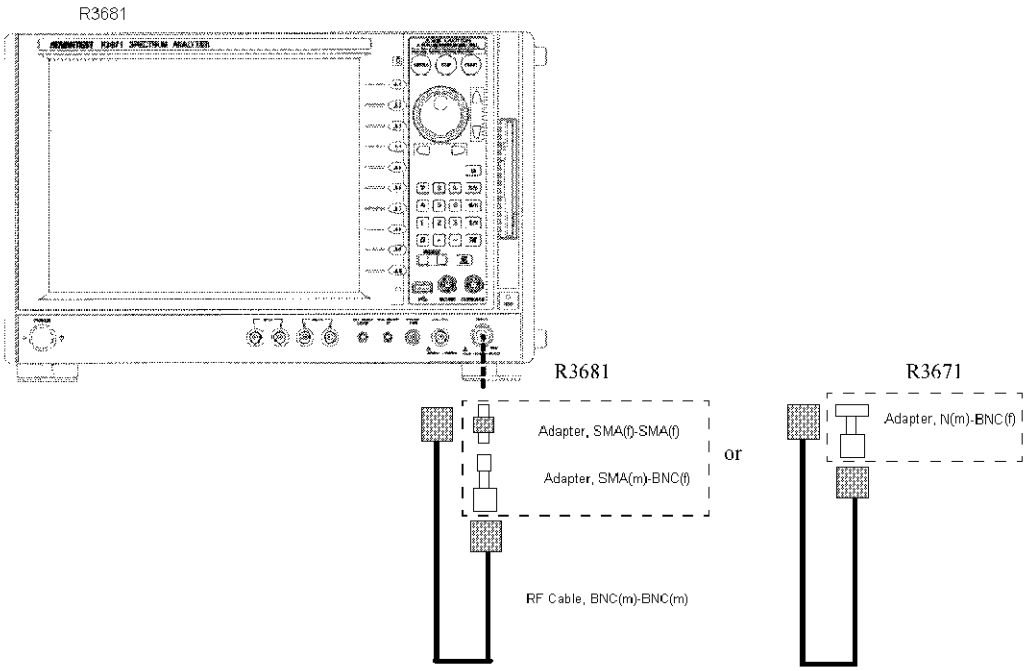


Figure 3-9 Autocalibration

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 Modulation Analysis which Uses Multi Frame Mode

Many OFDM symbols and frames can be measured repeatedly by using the Multi Frame mode. This mode is suitable for measurements that are compliant with the standard.

Figure 4-1 Connection Diagram for the Modulation Analysis that Uses the Multi Frame Mode

Setting measurement conditions

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **3**, **5**, **0**, and **M/n** on the keypad. The center frequency is set to 2350 MHz.
6. Touch the **{TRIGGER}** button on the function bar.
7. Touch the **Trigger Source** key on the soft menu bar.
8. Touch the **Free Run** key on the soft menu bar. The trigger source is set to the internal trigger.
9. Touch the **{INPUT}** button on the function bar.
10. Touch the **Input Setup** key on the soft menu bar. The **[Input Setup]** dialog box is displayed.
11. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
12. Set the **[IQ Inverse]** option button in the **[Input Setup]** dialog box to **[OFF]**.

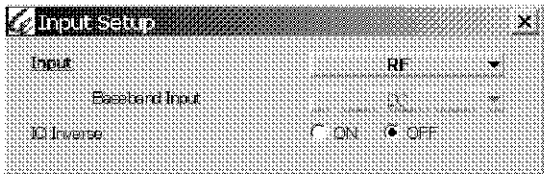


Figure 4-2 **[Input Setup]** Dialog Box

13. Touch the close button ☒ in the **[Input Setup]** dialog box to close the dialog box.
14. Touch the **{MEAS MODE}** button on the function bar.
15. Touch the **Modulation Analysis** key on the soft menu bar.
16. Touch the **{LEVEL}** button on the function bar.
17. Touch the **Auto Level Set** key on the soft menu bar. The Ref Level is automatically set to the optimum value.
18. Touch the **{MEAS CONTROL}** button on the function bar.
19. Touch the **Multi Frame** key on the soft menu bar. The measurement mode is set to the Multi Frame mode.
20. Touch the **Meas Parameters** key on the soft menu bar. The **[Meas Parameters Setup]** dialog box is displayed.
21. Touch the **[Mod Analysis(1)]** tab and set the measurement parameters.
22. To measure the burst signal, set the **[Continuous Signal]** option button to **[OFF]**.
23. The threshold level, which is used to search for the burst, is set automatically. Set the **[Threshold Setup]** option button to **[Auto]**.
24. The settings in the measurement window are set automatically. Set the **[Meas Window Setup]** option button to **[Auto]**.
25. Set the FFT position when the demodulation is performed. To start the Fourier transform from the center of the guard interval, select **[Symbol Timing]** and press **0** and **ENT** on the keypad.
26. Select the correction type used when correcting the frequency characteristics and performing the measurement. To select the correction type which uses the preamble, select **[CH Est(Preamble)]** from **[Correction Type]**.
27. Set whether to correct the amplitude for each OFDM symbol by using the pilot subcarrier. Set the **[Pilot Track(Amplitude)]** option button to **[ON]** because the amplitude correction, which uses the pilot subcarrier, is performed.
28. Set whether to correct the phase for each OFDM symbol by using the pilot subcarrier. To correct the phase by using the pilot subcarrier, set the **[Pilot Track(Phase)]** option button to **[ON]**.
29. Set the **[τ Offset Setup]** option button to **[OFF]** because the offset cannot be added to the τ measurement result.

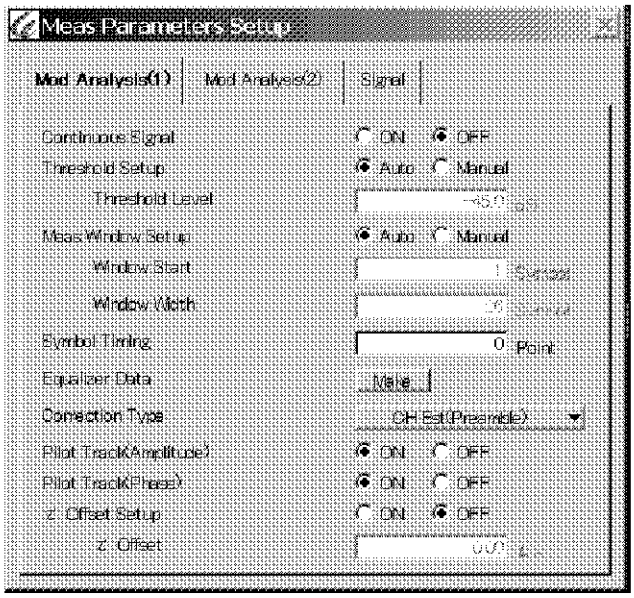


Figure 4-3 **Mod Analysis(1)** Tab in **[Meas Parameters Setup]** Dialog Box

30. Touch the **[Mod Analysis(2)]** tab and set the measurement conditions. To repeat the measurement for each frame, select **[Frame]** from **[Meas Condition]**.

31. Set the number of frames, which are calculated at one time, to 1.
Select **[Meas Frame Length]** and press **1** and **ENT** on the keypad.

32. Constellation Error Trigger is not used. Set **[Constellation Error Trigger]** to **[OFF]**.

33. Select a receiving filter. Set **[Baseband Filter]** to **[Wide]**.

MEMO: ***Select a filter, whose bandwidth is wider enough than the signal bandwidth, assuming that no signal exists in adjacent channels.***

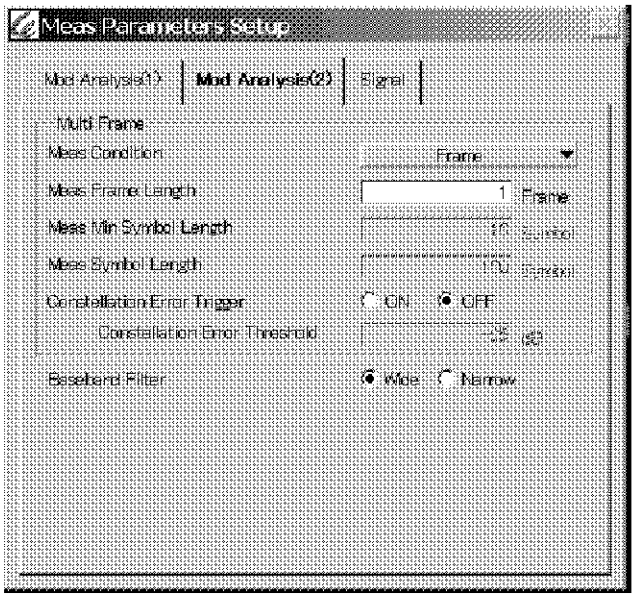


Figure 4-4 **Mod Analysis(2)** Tab in **[Meas Parameters Setup]** Dialog Box

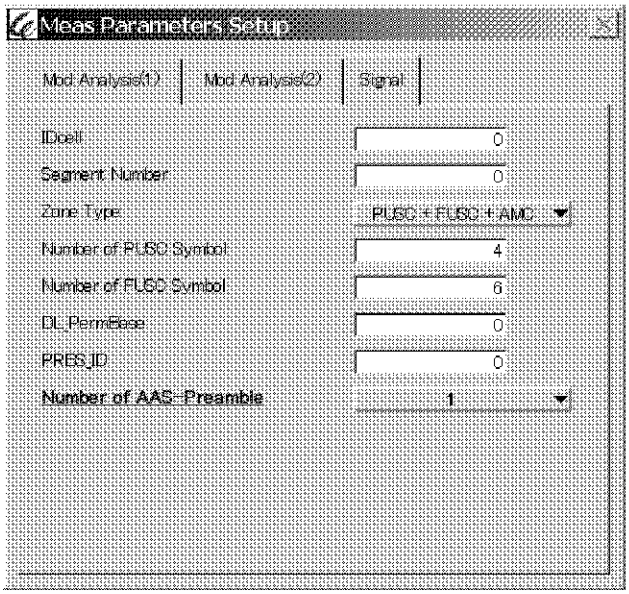


Figure 4-5 **Signal** Tab in **[Meas Parameters Setup]** Dialog Box

34. Touch the **[Signal]** tab and set parameters of a signal to be measured.

35. Enter the cell ID of the signal. Select **[IDcell]** and press **0** and **ENT** on the keypad.

36. Enter the segment number of the signal. Select **[Segment Number]** and press **0** and **ENT** on the keypad.

37. Set the subchannel type which is included in the signal.
Select **[PUSC+FUSC+AMC]** from **[Zone Type]**.

38. Set the number of symbols of the PUSC subchannel which is included in the signal. Select **[Number of PUSC Symbol]** and press **4** and **ENT** on the keypad.

39. Set the number of symbols of the FUSC subchannel which is included in the signal. Select **[Number of FUSC Symbol]** and press **6** and **ENT** on the keypad.

40. Set "Permutation Base" of the signal. Select **[DL_PermBase]** and press **0** and **ENT** on the keypad.

41. Set "PRBS ID" of the signal. Select **[PRBS_ID]** and press **0** and **ENT** on the keypad.

42. Set the number of "AAS Preamble" symbols in the signal.
Set **[Number of AAS-Preamble]** to **[1]**.

43. Touch the **Return** key on the soft menu bar to close the dialog box.

44. Press the **SINGLE** button on the front panel or the **Single Meas** key on the soft menu bar. The Single measurement is performed and the measurement results are displayed.

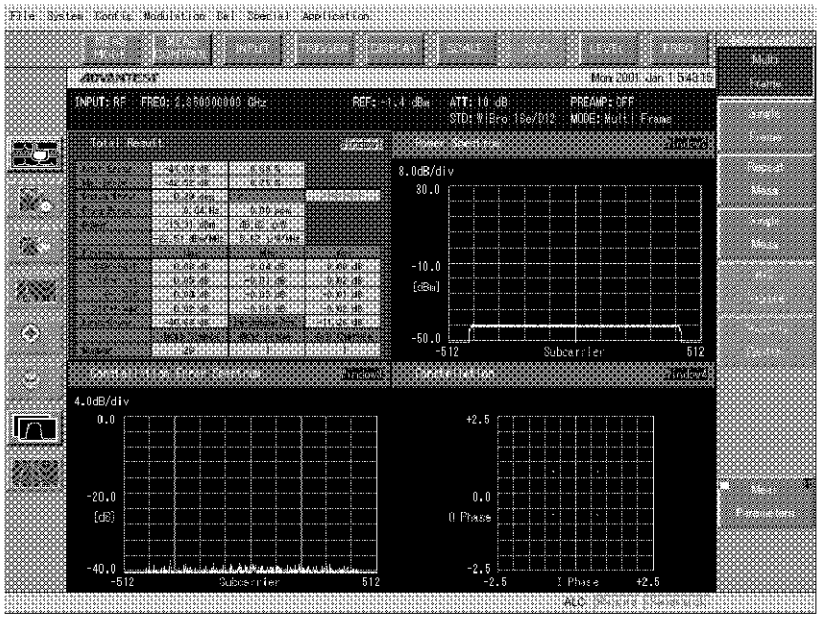
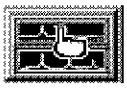


Figure 4-6 Results of Modulation Analysis which Uses Multi Frame Mode

45. To change the graph display, touch the active window switching icon  and then touch the window to be changed.

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

47. Touch the **Window Format** key on the soft menu bar. The **|Window Format|** dialog box is displayed.

48. Touch the **[Format]** tab and select the graph to be displayed. In this example, to display the change with time of the constellation error, select **|Constellation Error Time|**.

49. Touch the **[Time Trace]** tab and set the data to be displayed. In this example, the average values for each symbol and the data of subcarrier number 10 are displayed. Select **|RMS|** and **|Specified Subcarrier|**. Touch **|Specified Subcarrier|**, **1**, **0**, **ENT**, and **|Apply|**.

50. Touch the **Return** key on the soft menu bar to close the **|Window Format|** dialog box.

51. Adjust the graph scale. Touch the **{SCALE}** button on the function bar.

52. Touch the **Y Scale Upper** key on the soft menu bar and enter the upper limit of the Y scale by using the keypad.

53. Touch the **Y Scale Lower** key on the soft menu bar and enter the lower limit of the Y scale by using the keypad.

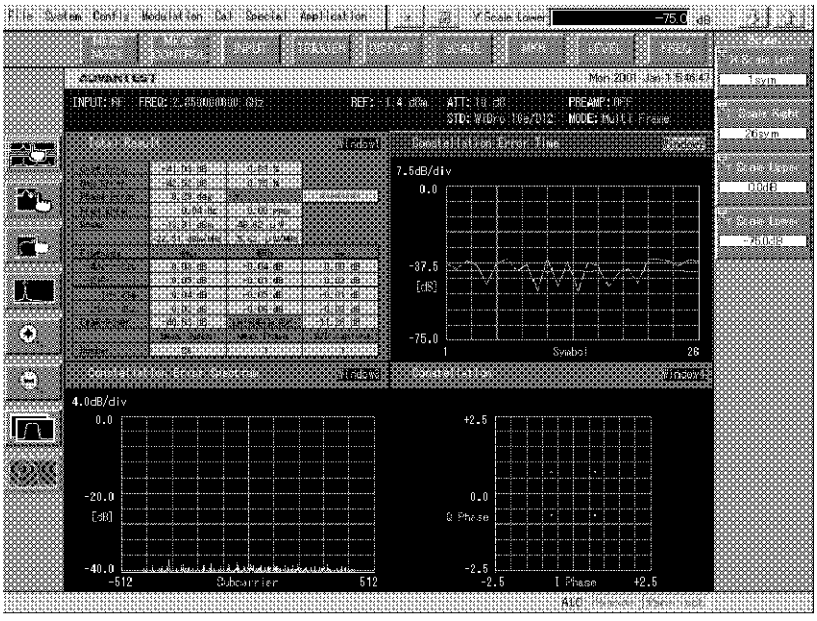


Figure 4-7 Display Example of Constellation Error Time

4.2 Modulation Analysis that Uses the Single Frame Mode

If the Single Frame mode is used, any one frame can be selected and measured.

This mode is suitable to verify the selected frame.

Figure 4-8 Connection Diagram for the Modulation Analysis that Uses the Single Frame Mode

Measurement condition setting

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **3**, **5**, **0**, and **M/n** on the keypad. The center frequency is set to 2350 MHz.
6. Touch the **{TRIGGER}** button on the function bar.
7. Touch the **Trigger Source** key on the soft menu bar.
8. Touch the **Free Run** key on the soft menu bar. The trigger source is set to the internal trigger.
9. Touch the **{INPUT}** button on the function bar.
10. Touch the **Input Setup** key on the soft menu bar. The **[Input Setup]** dialog box appears.
11. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
12. Set the **[IQ Inverse]** option button in the **[Input Setup]** dialog box to **[OFF]**.

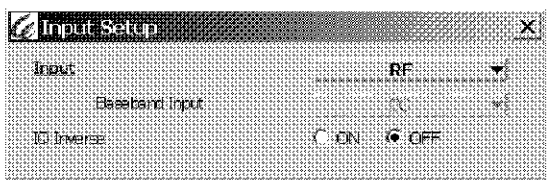


Figure 4-9 **[Input Setup]** Dialog Box

13. Touch the close button ✕ in the **[Input Setup]** dialog box to close the dialog box.
14. Touch the **{MEAS MODE}** button on the function bar.
15. Touch the **Modulation Analysis** key on the soft menu bar.
16. Touch the **{LEVEL}** button on the function bar.
17. Touch the **Auto Level Set** key on the soft menu bar. The Ref Level is automatically set to the optimum value.
18. Touch the **{MEAS CONTROL}** button on the function bar.
19. Touch the **Single Frame** key on the soft menu bar. The measurement mode is set to the Single Frame mode.
20. Touch the **Meas Parameters** key on the soft menu bar. The **[Meas Parameters Setup]** dialog box is displayed.
21. Touch the **[Mod Analysis(1)]** tab and set the measurement parameters.
22. To measure the burst signal, set **[Continuous Signal]** to **[OFF]**.
23. The threshold level, which is used to search for the burst, is automatically set. Set the **[Threshold Setup]** option button to **[Auto]**.
24. The settings in the measurement window are automatically set. Set the **[Meas Window Setup]** option button to **[Auto]**.
25. Set the FFT position when the demodulation is performed. To start the Fourier transform from the center of the guard interval, select **[Symbol Timing]** and press **0** and **ENT** on the keypad.
26. Select the correction type used when correcting the frequency characteristics and performing the measurement. To select the correction type which uses the preamble, select **[CH Est(Preamble)]** from **[Correction Type]**.
27. Set whether to correct the amplitude for each OFDM symbol by using the pilot subcarrier. Set the **[Pilot Track(Amplitude)]** option button to **[ON]** because the amplitude correction, which uses the pilot subcarrier, is performed.
28. Set whether to correct the phase for each OFDM symbol by using the pilot subcarrier. To correct the phase by using the pilot subcarrier, set the **[Pilot Track(Phase)]** option button to **[ON]**.
29. Set the **[τ Offset Setup]** option button to **[OFF]** because the offset cannot be added to the τ measurement result.

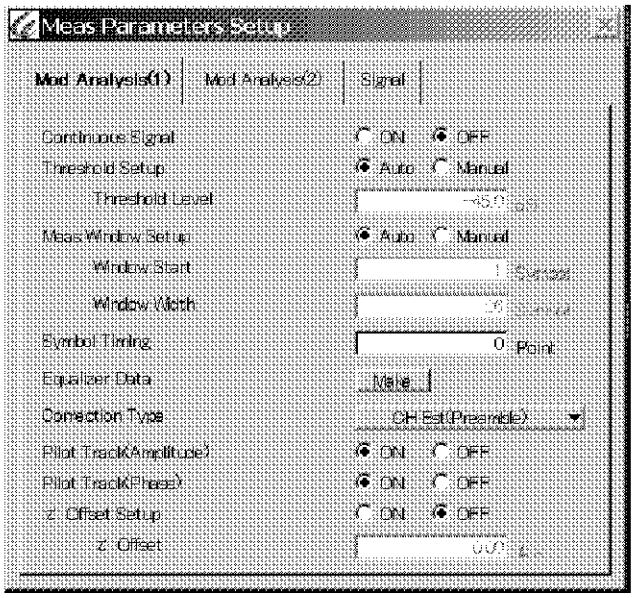


Figure 4-10 **[Meas Parameters Setup]** Dialog Box

30. Touch the **[Mod Analysis(2)]** tab and set the measurement conditions.
31. Select a receiving filter. Set **[Baseband Filter]** to **[Wide]**.

MEMO: Select a filter, whose bandwidth is wider enough than the signal bandwidth, assuming that no signal exists in adjacent channels.

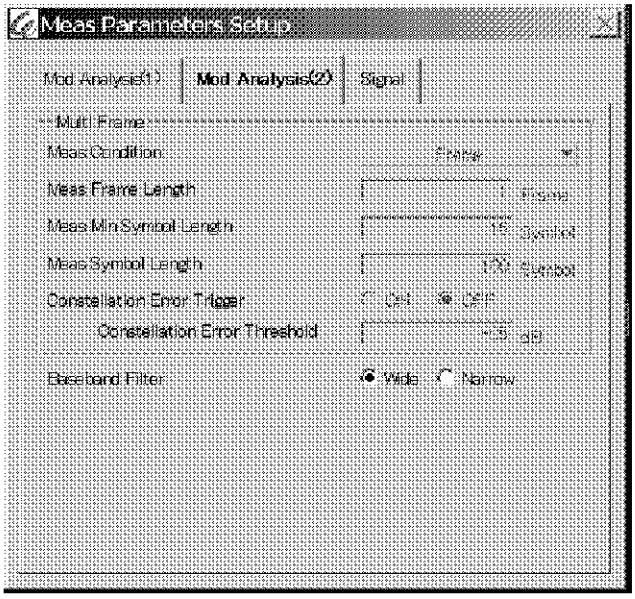


Figure 4-11 **Mod Analysis(2)** Tab in **[Meas Parameters Setup]** Dialog Box

32. Touch the **[Signal]** tab and set parameters of a signal to be measured.

33. Enter the cell ID of the signal. Select **[IDcell]** and press **0** and **ENT** on the keypad.

34. Enter the segment number of the signal. Select **[Segment Number]** and press **0** and **ENT** on the keypad.

35. Set the subchannel type which is included in the signal.
Select **[PUSC+FUSC+AMC]** from **[Zone Type]**.

36. Set the number of symbols of the PUSC subchannel which is included in the signal. Select **[Number of PUSC Symbol]** and press **4**, and **ENT** on the keypad.

37. Set the number of symbols of the FUSC subchannel which is included in the signal. Select **[Number of FUSC Symbol]** and press **6** and **ENT** on the keypad.

38. Set "Permutation Base" of the signal. Select **[DL_PermBase]** and press **0** and **ENT** on the keypad.

39. Set "PRBS ID" of the signal. Select **[PRBS_ID]** and press **0** and **ENT** on the keypad.

40. Set the number of "AAS Preamble" symbols in the signal.
Set **[Number of AAS-Preamble]** to **[1]**.

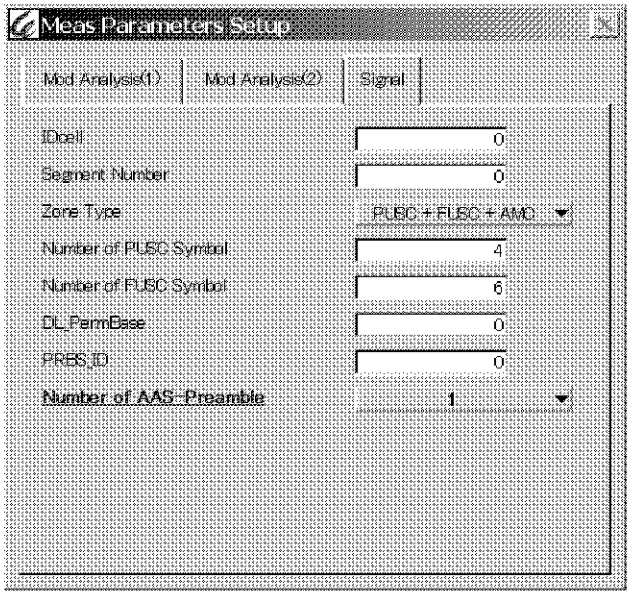


Figure 4-12 **Signal** Tab in **[Meas Parameters Setup]** Dialog Box

41. Touch the **Return** key on the soft menu bar to close the dialog box.

42. Press the **START** button on the front panel or the **A/D Capture** button on the soft menu bar. A/D data of the signal is captured and the waveform of the signal is displayed on the Frame Selection screen.

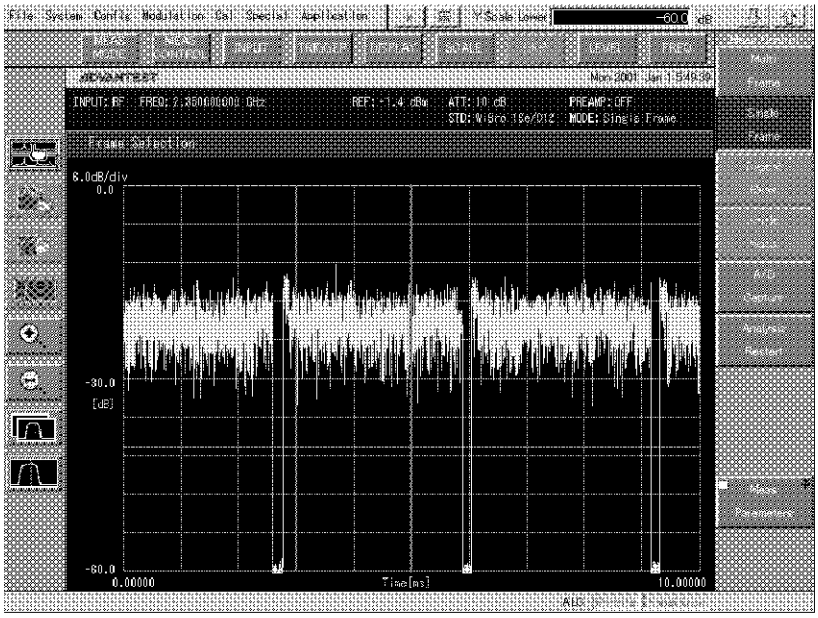


Figure 4-13 Frame Selection Screen

43. Touch the cursor specification icon  on the measurement tool bar.

44. Touch the frame to be measured on the Frame Selection screen. The cursor is set inside the specified frame.

45. Press the **SINGLE** button on the front panel or the **Analysis Restart** key on the soft menu bar. The analysis is performed and the measurement result screen is displayed.

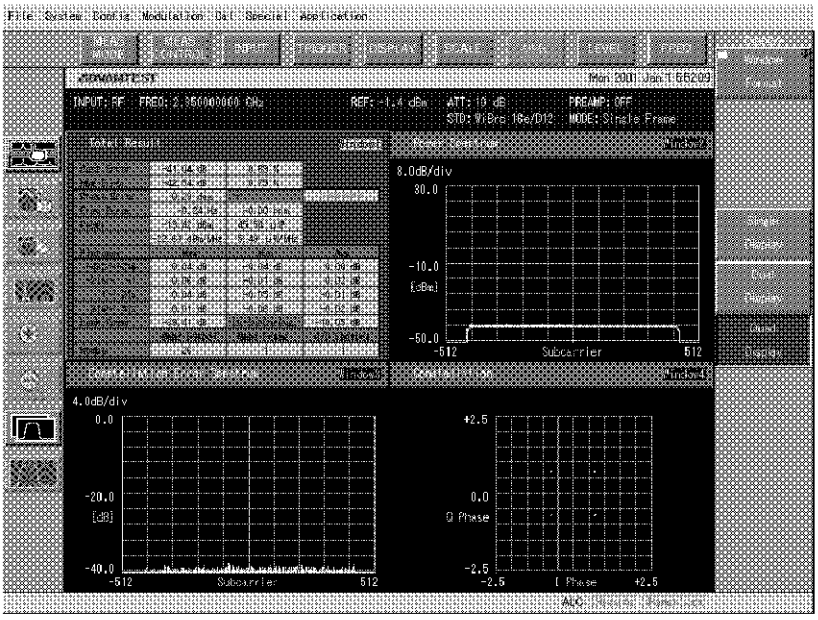
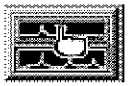


Figure 4-14 Results of the Modulation Analysis that Uses the Single Frame Mode

46. To switch the graph display, touch the active window switching icon  and touch the target screen.

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

48. Touch the **Window Format** key on the soft menu bar. The **|Window Format|** dialog box is displayed.

49. Touch the **[Format]** tab and select the graph to be displayed. In this example, to display the time change of the constellation error, select **|Constellation Error Time|**.

50. Touch the **[Time Trace]** tab and set data to be displayed. In this example, the average values for each symbol and the data of subcarrier number 10 are displayed. Select **|RMS|** and **|Specified Subcarrier|**. Touch **|Specified Subcarrier|**, **1**, **0**, **ENT**, and **|Apply|**.

51. Touch the **Return** key on the soft menu bar to close the **|Window Format|** dialog box.

52. Adjust the graph scale. Touch the **{SCALE}** button on the function bar.

53. Touch the **Y Scale Upper** key on the soft menu bar and enter the upper limit of the Y scale by using the keypad.

54. Touch the **Y Scale Lower** key on the soft menu bar and enter the lower limit of the Y scale by using the keypad.

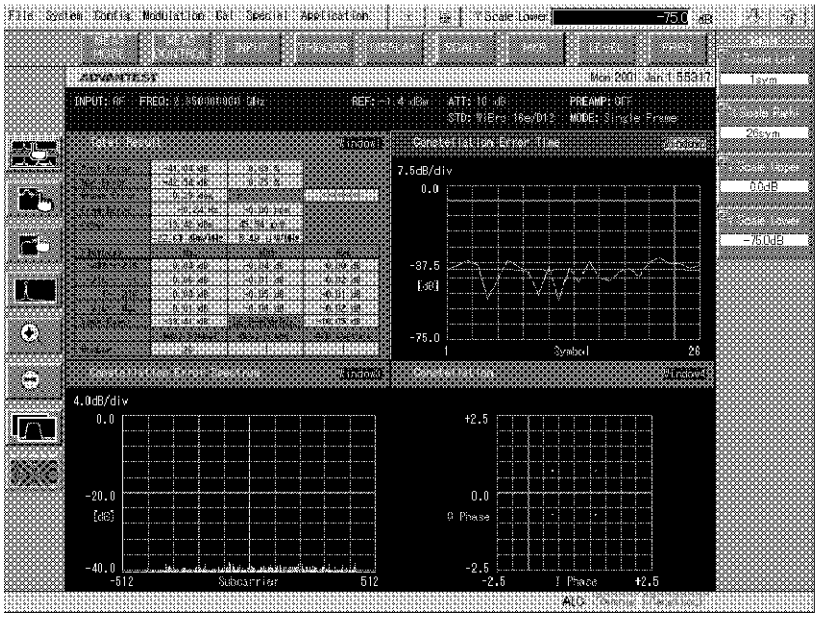


Figure 4-15 Display Example of Constellation Error Time

4.3 Example of the Measurement that Uses the Equalizer Function

The degradation of a signal, which is caused by a DUT, can be measured by using a function which corrects frequency characteristics of the signal source.

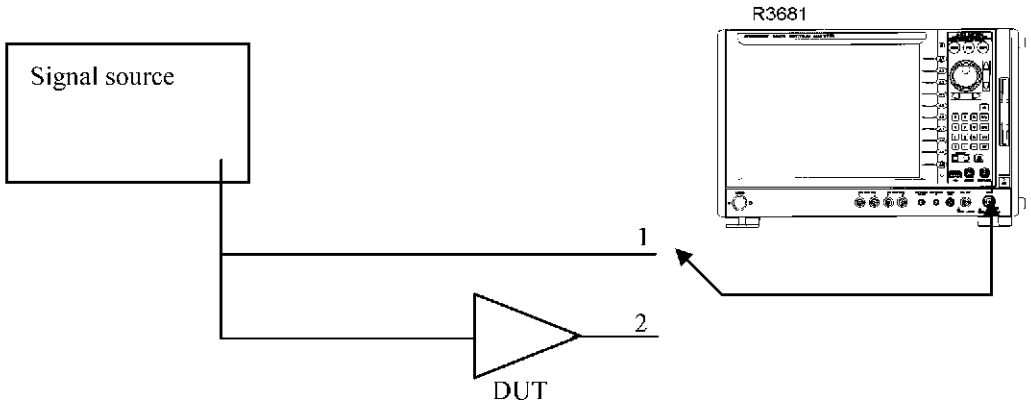


Figure 4-16 Connection Diagram for the Modulation Analysis that Uses the Equalizer

Measurement condition setting

1. Set the signal path to 1 that is shown in Figure 4-16 and perform the measurement according to the procedures that are described in Section 4.1 or Section 4.2.
2. Touch the **{MEAS CONTROL}** button on the function bar.
3. Touch the **Meas Parameters** key on the soft menu bar. The **[Meas Parameters Setup]** dialog box is displayed.
4. Touch the **[Mod Analysis(1)]** tab and set the measurement parameters.
5. If the **[Make]** button in **[Equalizer Data]** is touched, the frequency characteristic correction data is calculated so that the constellation error in the signal source is minimized.
6. The calculated correction value is used when frequency characteristics are corrected. Select **[Equalizer]** in **[Correction Type]**.
7. Touch **Return** key on the soft menu bar to close the **[Meas Parameters Setup]** dialog box.

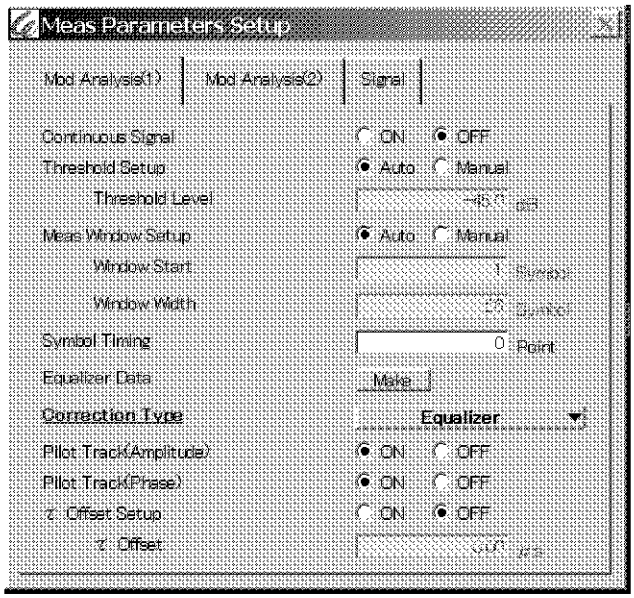


Figure 4-17 **[Meas Parameters Setup]** Dialog Box Displayed when the Equalizer is Used

8. Touch the **Analysis Restart** key on the soft menu bar. The measurement result screen is displayed. The result corrected for the signal source is displayed.

9. Switch the signal path shown in Figure 4-16 to 2 and press the **SINGLE** button on the front panel or the **A/D Capture** button on the soft menu bar. In the Multi Frame mode, the measurement results are displayed.

10. In the Single Frame mode, the Frame Selection screen is displayed. Select a frame to be measured and press the **SINGLE** button on the front panel or the **Analysis Restart** button on the soft menu bar. The analysis is performed and the measurement result screen is displayed.

4.4 Modulation Analysis of the Continuous Wave

This section describes the procedure to measure the continuous signal by using the Multi Frame mode. The signal to be measured must consist of frames that include the preamble.

Figure 4-18 Connection Diagram for the Modulation Analysis that Uses the Multi Frame Mode

Measurement condition setting

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **3**, **5**, **0**, and **M/n** on the keypad. The center frequency is set to 2350 MHz.
6. Touch the **{TRIGGER}** button on the function bar.
7. Touch the **Trigger Source** key on the soft menu bar.
8. Touch the **Free Run** key on the soft menu bar. The trigger source is set to the internal trigger.
9. Touch the **{INPUT}** button on the function bar.
10. Touch the **Input Setup** key on the soft menu bar. The **[Input Setup]** dialog box is displayed.
11. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
12. Set the **[IQ Inverse]** option button in the **[Input Setup]** dialog box to **[OFF]**.

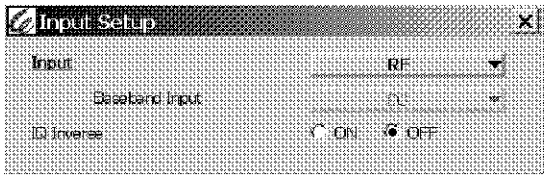


Figure 4-19 **[Input Setup]** Dialog Box

13. Touch the close button ✕ in the **|Input Setup|** dialog box to close the dialog box.
14. Touch the **{MEAS MODE}** button on the function bar.
15. Touch the **Modulation Analysis** key on the soft menu bar.
16. Touch the **{LEVEL}** button on the function bar.
17. Touch the **Auto Level Set** key on the soft menu bar. The Ref Level is automatically set to the optimum value.
18. Touch the **{MEAS CONTROL}** button on the function bar.
19. Touch the **Multi Frame** key on the soft menu bar. The measurement mode is set to the Multi Frame mode.
20. Touch the **Meas Parameters** key on the soft menu bar. The **|Meas Parameters Setup|** dialog box is displayed.
21. Touch the **[Mod Analysis(1)]** tab and set the measurement parameters.
22. To measure the continuous signal, set the **[Continuous Signal]** option button to **|ON|**.
23. Set the measurement window. Enter the analysis start position in **|Window Start|**. The symbol number of the preamble position is defined as 0.
24. Set the length of the measurement window. Enter the analysis length in **|Window Width|** in units of symbol.
25. Set the FFT position when the demodulation is performed. To start the Fourier transform from the center of the guard interval, select **|Symbol Timing|** and press **0** and **ENT** on the keypad.
26. Select the correction type used when correcting the frequency characteristics and performing the measurement. To select the correction type which uses the preamble, select **[CH Est(Preamble)]** from **[Correction Type]**.
27. Set whether to correct the amplitude for each OFDM symbol by using the pilot subcarrier. Set the **[Pilot Track(Amplitude)]** option button to **[ON]** because the amplitude correction, which uses the pilot subcarrier, is performed.
28. Set whether to correct the phase for each OFDM symbol by using the pilot subcarrier. To correct the phase by using the pilot subcarrier, set the **[Pilot Track(Phase)]** option button to **[ON]**.
29. Set the **|τ Offset Setup|** option button to **|OFF|** because the offset cannot be added to the τ measurement result.

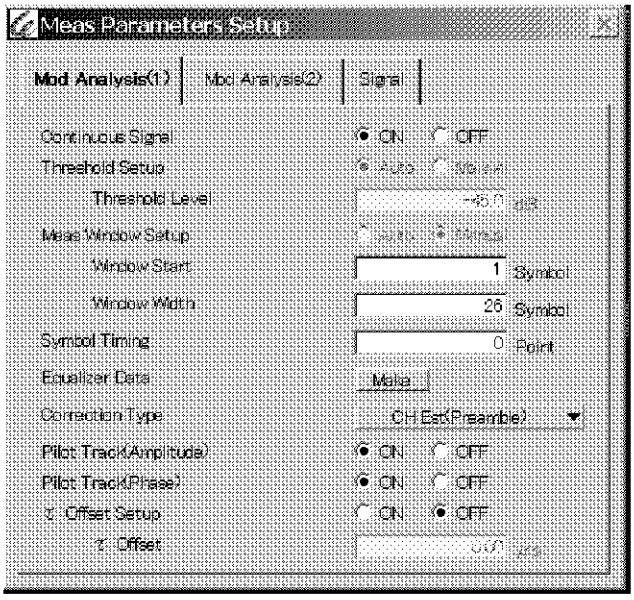


Figure 4-20 **Mod Analysis(1)** Tab in **[Meas Parameters Setup]** Dialog Box

30. Touch the **[Mod Analysis(2)]** tab and set the measurement conditions. To repeat the measurement for each frame, select **[Frame]** from **[Meas Condition]**.

31. Set the number of frames, which are calculated at one time, to 1. Select **[Meas Frame Length]** and press 1 and ENT on the keypad.

32. Constellation Error Trigger is not used. Set **[Constellation Error Trigger]** to **[OFF]**.

33. Select a receiving filter. Set **[Baseband Filter]** to **[Wide]**.

MEMO: ***Select a filter, whose bandwidth is wider enough than the signal bandwidth, assuming that no signal exists in adjacent channels.***

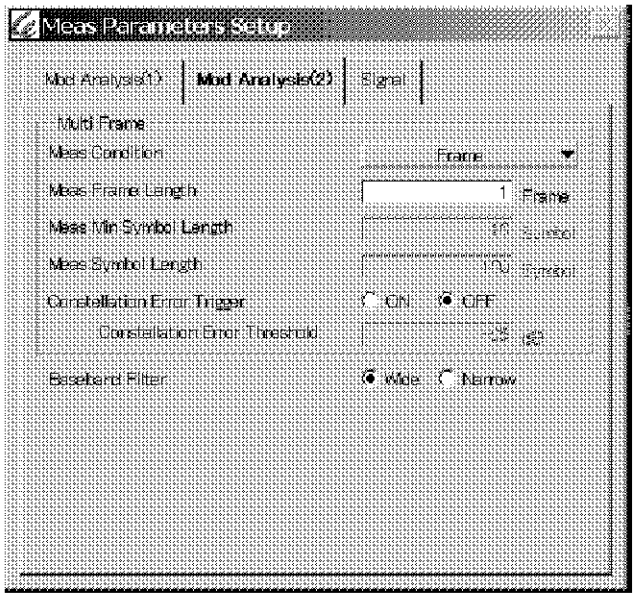


Figure 4-21 **|Meas Parameters Setup| Mod Analysis(2)** Dialog Box

34. Touch the **|Signal|** tab and set parameters of a signal to be measured.

35. Enter the cell ID of the signal. Select **|IDcell|** and press **0** and **ENT** on the keypad.

36. Enter the segment number of the signal. Select **|Segment Number|** and press **0** and **ENT** on the keypad.

37. Set the subchannel type which is included in the signal.
Select **|PUSC+FUSC+AMC|** from **|Zone Type|**.

38. Set the number of symbols of the PUSC subchannel which is included in the signal. Select **|Number of PUSC Symbol|** and press **4** and **ENT** on the keypad.

39. Set the number of symbols of the FUSC subchannel which is included in the signal. Select **|Number of FUSC Symbol|** and press **6** and **ENT** on the keypad.

40. Set "Permutation Base" of the signal. Select **|DL_PermBase|** and press **0** and **ENT** on the keypad.

41. Set "PRBS ID" of the signal. Select **|PRBS_ID|** and press **0** and **ENT** on the keypad.

42. Set the number of "AAS Preamble" symbols in the signal.
Set **|Number of AAS-Preamble|** to **|1|**.

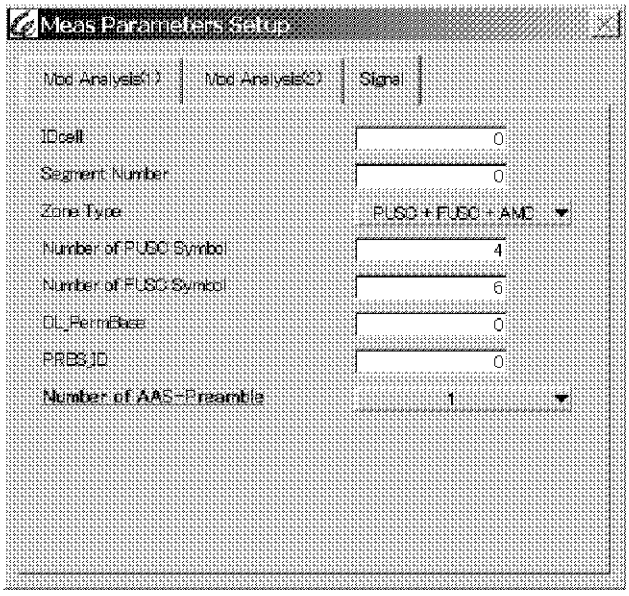


Figure 4-22 **Signal** Tab in **[Meas Parameters Setup]** Dialog Box

43. Touch the **Return** key on the soft menu bar to close the dialog box.

44. Press the **START** button on the front panel or the **Repeat Meas** button on the soft menu bar. The measurement is performed repeatedly and the measurement results are displayed.

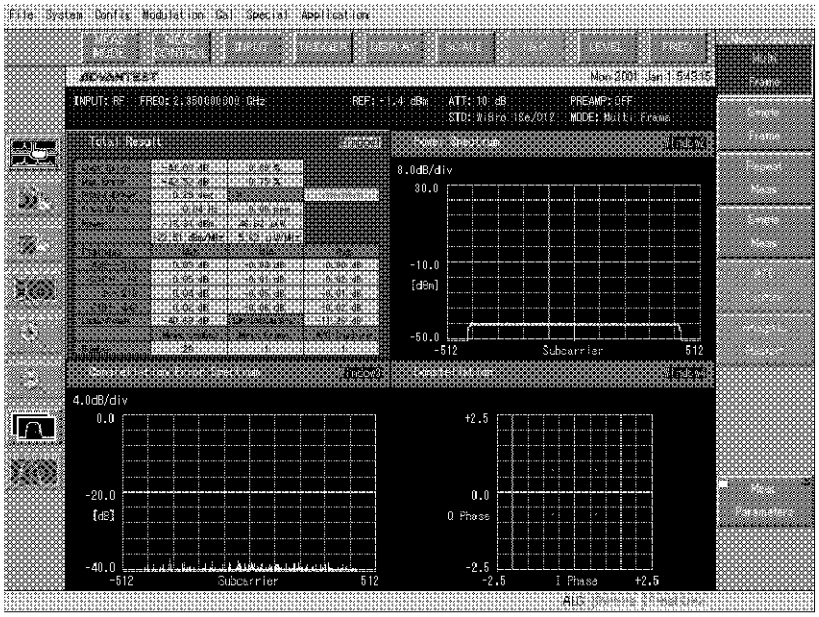


Figure 4-23 Results of the Modulation Analysis that Uses the Multi Frame Mode

45. To change the graph display, touch the active window switching icon  and then touch the window to be changed.
46. Touch the **{MKR}** button on the function bar.
47. Touch **Marker** on the soft menu bar. A marker is displayed on the graph. The marker can be moved by using the knob.
48. Touch **Delta Marker** on the soft menu bar. A delta marker is displayed on the graph.

4.5 How to Use Constellation Error Trigger

If Constellation Error Trigger is used, the measurement can be stopped when an abnormal value of Constellation Error is detected while the measurement that uses the Multi Frame mode is repeated. The frame from which the error is detected is specified and can be analyzed in detail by using the Single Frame mode.

Figure 4-24 Connection Diagram for the Modulation Analysis that Uses the Multi Frame Mode

Measurement condition setting

1. Touch **|Config|** on the menu bar and select **|Modulation Analyzer|**.
2. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **3**, **5**, **0**, and **M/n** on the keypad. The center frequency is set to 2350 MHz.
6. Touch the **{TRIGGER}** button on the function bar.
7. Touch the **Trigger Source** key on the soft menu bar.
8. Touch the **Free Run** key on the soft menu bar. The trigger source is set to the internal trigger.
9. Touch the **{INPUT}** button on the function bar.
10. Touch the **Input Setup** key on the soft menu bar. The **[Input Setup]** dialog box is displayed.
11. Set **|Input|** in the **|Input Setup|** dialog box to **|RF|**.
12. Set the **[IQ Inverse]** option button in the **[Input Setup]** dialog box to **[OFF]**.

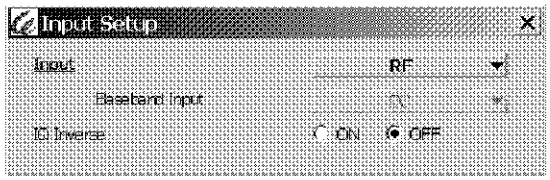


Figure 4-25 **|Input Setup|** Dialog Box

13. Touch the close button ☒ in the **|Input Setup|** dialog box to close the dialog box.
14. Touch the **{MEAS MODE}** button on the function bar.
15. Touch the **Modulation Analysis** key on the soft menu bar.
16. Touch the **{LEVEL}** button on the function bar.
17. Touch the **Auto Level Set** key on the soft menu bar. The Ref Level is automatically set to the optimum value.
18. Touch the **{MEAS CONTROL}** button on the function bar.
19. Touch the **Multi Frame** key on the soft menu bar. The measurement mode is set to the Multi Frame mode.
20. Touch the **Meas Parameters** key on the soft menu bar. The **[Meas Parameters Setup|** dialog box is displayed.
21. Touch the **[Mod Analysis(1)]** tab and set the measurement parameters.
22. To measure the burst signal, set the **|Continuous Signal|** option button to **|OFF|**.
23. The threshold level, which is used to search for the burst, is automatically set. Set the **|Threshold Setup|** option button to **|Auto|**.
24. The settings in the measurement window are automatically set. Set the **|Meas Window Setup|** option button to **[Auto]**.
25. Set the FFT position used when the demodulation is performed. To start the Fourier transform from the center of the guard interval, select **|Symbol Timing|** and press **0** and **ENT** on the keypad.
26. Select the correction type used when correcting the frequency characteristics and performing the measurement. To select the correction type which uses the preamble, select **[CH Est(Preamble)]** from **[Correction Type]**.
27. Set whether to correct the amplitude for each OFDM symbol by using the pilot subcarrier. Set the **[Pilot Track(Amplitude)]** option button to **[ON]** because the amplitude correction, which uses the pilot subcarrier, is performed.
28. Set whether to correct the phase for each OFDM symbol by using the pilot subcarrier. To correct the phase by using the pilot subcarrier, set the **[Pilot Track(Phase)]** option button to **[ON]**.
29. Set the **|τ Offset Setup|** option button to **|OFF|** because the offset cannot be added to the τ measurement result.

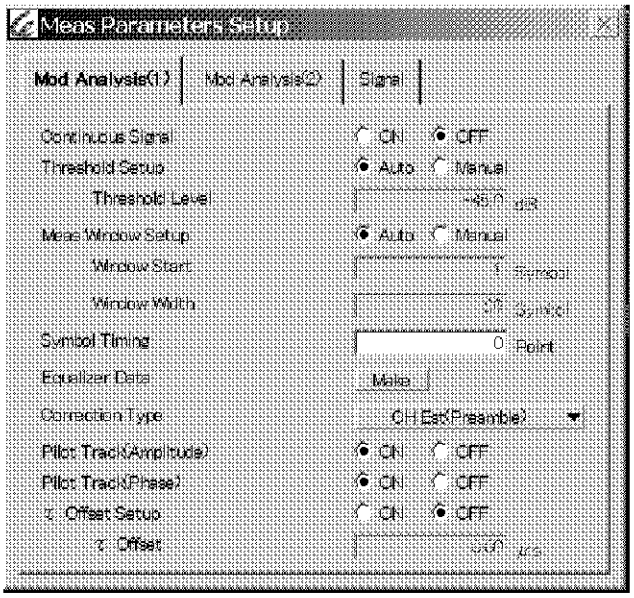


Figure 4-26 **Mod Analysis(1)** Tab in **[Meas Parameters Setup]** Dialog Box

30. Touch the **[Mod Analysis(2)]** tab and set the measurement conditions. To repeat the measurement for each frame, select **[Frame]** from **[Meas Condition]**.

31. Set the number of frames, which are calculated at one time, to 1. Select **|Meas Frame Length|** and press [1] and [ENT] on the keypad.

32. To use Constellation Error Trigger, set the **[Constellation Error Trigger]** option button to **[ON]**.

33. Set the threshold of Constellation Error Trigger. Set the threshold to stop the measurement if Constellation Error exceeds -30 dB.
    Touch **|Constellation Error Trigger|** and enter [-], [3], [0], and [ENT] by using keypad.

34. Select a receiving filter. Set **|Baseband Filter|** to **|Wide|**.

MEMO: ***Select a filter, whose bandwidth is wider enough than the signal bandwidth, assuming that no signal exists in adjacent channels.***

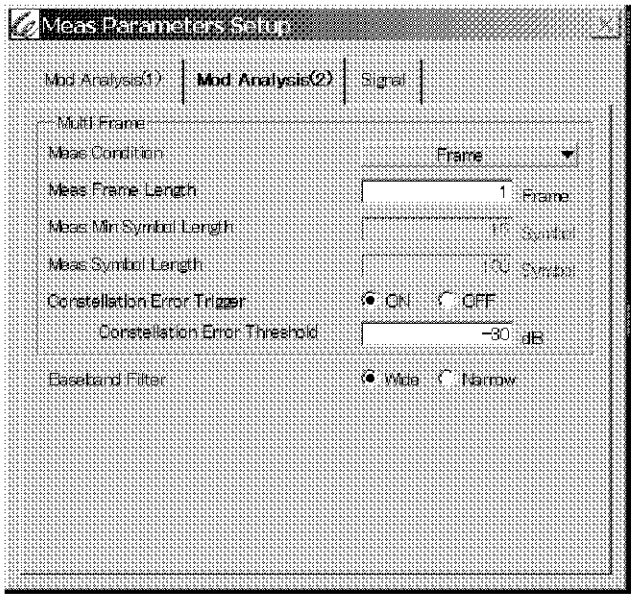


Figure 4-27 **Mod Analysis(2)** Tab in **[Meas Parameters Setup]** Dialog Box

35. Touch the **[Signal]** tab and set parameters of a signal to be measured.

36. Enter the cell ID of the signal. Select **[IDcell]** and press **0** and **ENT** on the keypad.

37. Enter the segment number of the signal. Select **[Segment Number]** and press **0** and **ENT** on the keypad.

38. Set the subchannel type which is included in the signal.
Select **[PUSC+FUSC+AMC]** from **[Zone Type]**.

39. Set the number of symbols of the PUSC subchannel which is included in the signal. Select **[Number of PUSC Symbol]** and press **4**, and **ENT** on the keypad.

40. Set the number of symbols of the FUSC subchannel which is included in the signal. Select **[Number of FUSC Symbol]** and press **6** and **ENT** on the keypad.

41. Set "Permutation Base" of the signal. Select **[DL_PermBase]** and press **0** and **ENT** on the keypad.

42. Set "PRBS ID" of the signal. Select **[PRBS_ID]** and press **0** and **ENT** on the keypad.

43. Set the number of "AAS Preamble" symbols in the signal.
Set **[Number of AAS-Preamble]** to **[1]**.

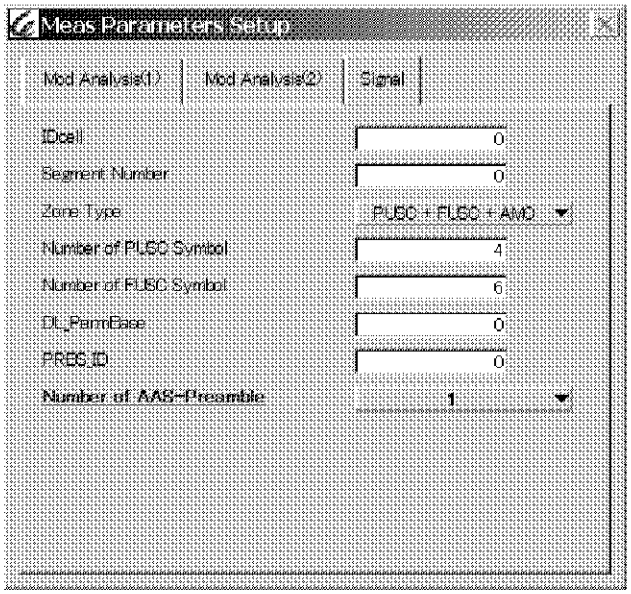


Figure 4-28 **Signal** Tab in **[Meas Parameters Setup]** Dialog Box

44. Touch the **Return** key on the soft menu bar to close the dialog box.

45. Press the **SINGLE** button on the front panel or the **Single Meas** key on the soft menu bar. The Single measurement is performed and the measurement results are displayed.

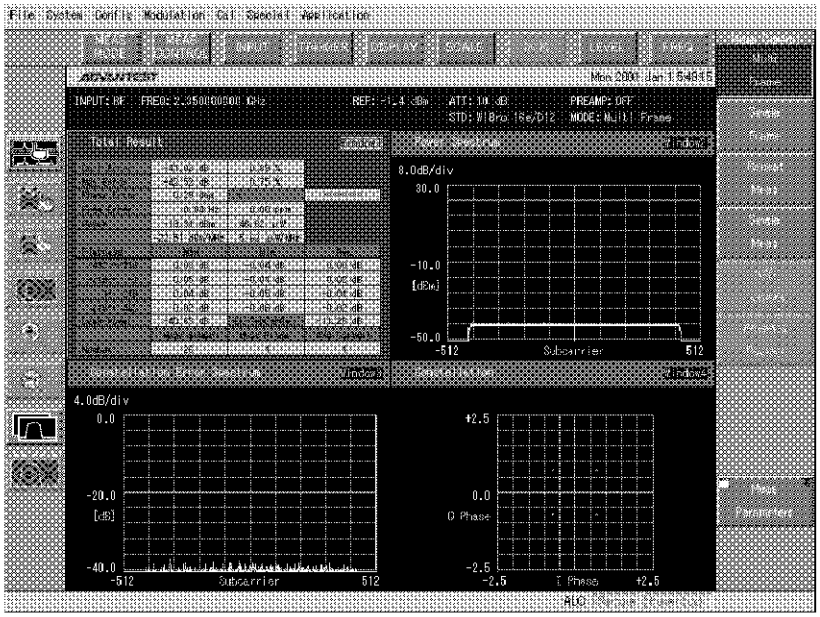


Figure 4-29 Results of the Modulation Analysis that Uses the Multi Frame Mode

If a constellation error of -30 dB or larger is detected during the measurement, the measurement terminates. Because data remains in the memory, it can be analyzed in detail by returning to the Single Frame mode.

46. Touch the **{MEAS CONTROL}** button on the function bar.
47. Touch the **Single Frame** key on the soft menu bar. The measurement mode is set to the Single Frame mode.
48. If the active window switching icon  is touched, the Frame Selection screen is displayed.
49. Touch the cursor specification icon  on the measurement tool bar.
50. In the signal waveform displayed on the Frame Selection screen, touch the screen near a frame to be measured. The cursor is placed within the frame.
51. Press the **SINGLE** button on the front panel or the **Analysis Restart** key on the soft menu bar. The analysis is performed and the measurement result screen is displayed.

4.6 Ramp Measurement

In the Ramp measurement, the rising edge and falling edge characteristics of the burst are displayed and whether they are in the range of the template that is compliant with the standard can be measured.

Figure 4-30 Connection Diagram for the Ramp Measurement

Measurement condition setting

1. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**.
2. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch the **{FREQ}** button on the function bar.
4. Touch the **Center** key on the soft menu bar.
5. Press **2**, **3**, **5**, **0**, and **M/n** on the keypad. The center frequency is set to 2350 MHz.
6. Touch the **{TRIGGER}** button on the function bar.
7. Touch the **Trigger Source** key on the soft menu bar.
8. Touch the **Free Run** key on the soft menu bar. The trigger source is set to the internal trigger.
9. Touch the **{INPUT}** button on the function bar.
10. Touch the **Input Setup** key on the soft menu bar. The **[Input Setup]** dialog box is displayed.
11. Set **[Input]** in the **[Input Setup]** dialog box to **[RF]**.
12. Set the **[IQ Inverse]** option button in the **[Input Setup]** dialog box to **[OFF]**.

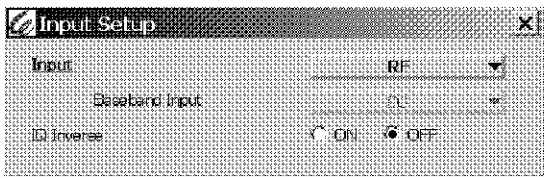


Figure 4-31 **[Input Setup]** Dialog Box

13. Touch the close button ✕ in the **|Input Setup|** dialog box to close the dialog box.
14. Touch the **{MEAS MODE}** button on the function bar.
15. Touch the **Ramp** key on the soft menu bar.
16. Touch the **{LEVEL}** button on the function bar.
17. Touch the **Auto Level Set** key on the soft menu bar. The Ref Level is automatically set to the optimum value.
18. Touch the **{MEAS CONTROL}** button on the function bar.
19. Touch the **Meas Parameters** key on the soft menu bar. The **[Meas Parameters Setup]** dialog box is displayed.
20. Set the length of the signal in **|Frame Length|** in symbols.
21. Set the template parameters Y0 to Y3.

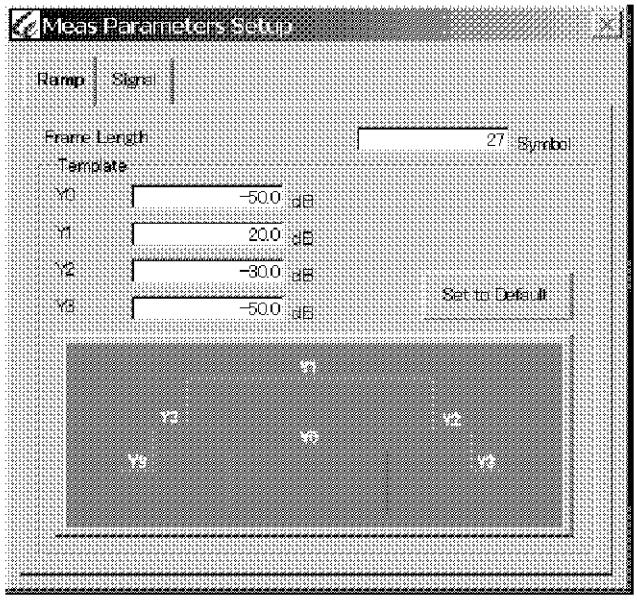


Figure 4-32 **[Meas Parameters Setup]** Dialog Box

22. Touch the **[Signal]** tab and set parameters of a signal to be measured.
23. Enter the cell ID of the signal. Select **|IDcell|** and press **0** and **ENT** on the keypad.
24. Enter the segment number of the signal. Select **|Segment Number|** and press **0** and **ENT** on the keypad.

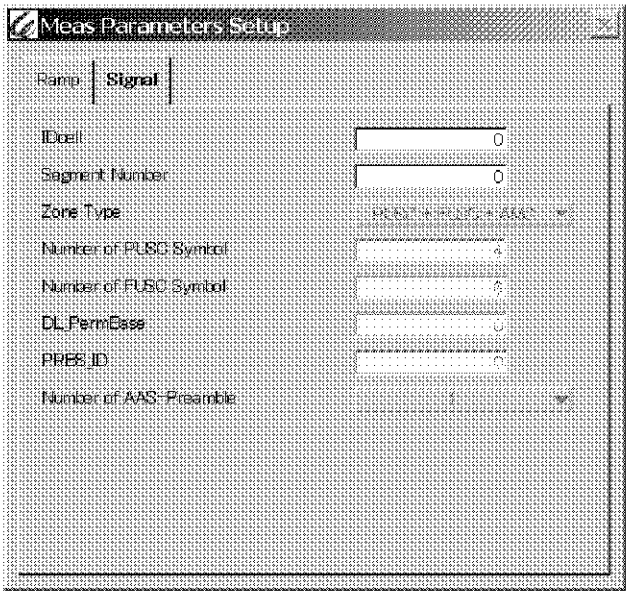


Figure 4-33 **Signal** Tab in **[Meas Parameters Setup]** Dialog Box

25. Touch the **Return** key on the soft menu bar to close the dialog box.

26. Press the **SINGLE** button on the front panel or the **Single Meas** key on the soft menu bar. The Single measurement is performed, and the measurement results are displayed.

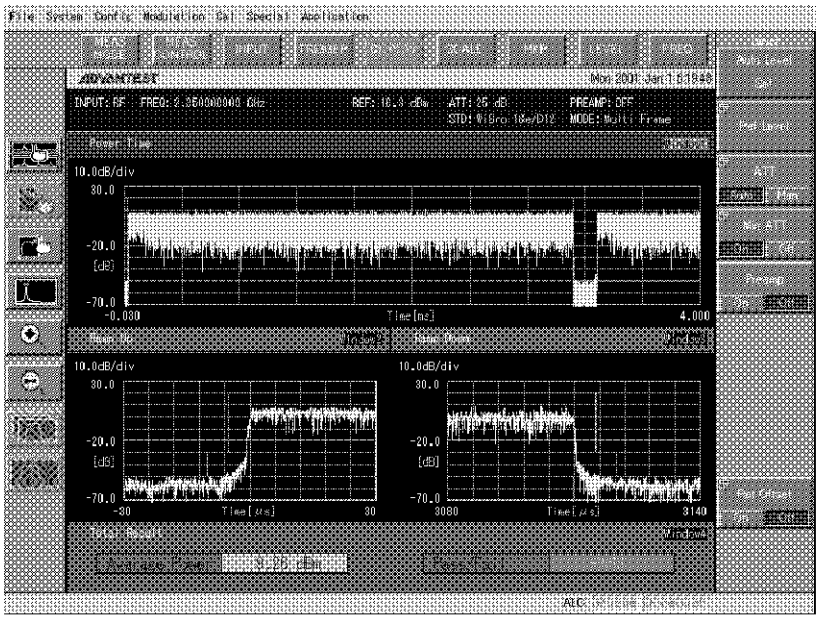


Figure 4-34 Example of the Ramp Measurement

27. To change the graph display, touch the active window switching icon  and then touch the window to be changed.
28. Touch the **{MKR}** button on the function bar.
29. Touch **Marker** on the soft menu bar. A marker is displayed on the graph. The marker can be moved by using the knob.
30. Touch **Delta Marker** on the soft menu bar. A delta marker is displayed on the graph.

5. MENU MAP, FUNCTIONAL EXPLANATION

This chapter describes the configurations and functions of the soft keys displayed on the touch screen of the WiBro 16e/D12 modulation analysis option.

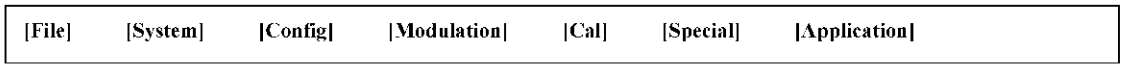
MEMO:

- *[.....] 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 a 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:



The menu bar consists of the same items as those of Spectrum Analyzer except that the additional items; Save Meas Data... and Save A/D Data... exist under the File menu when Modulation Analyzer is used.

[Save Meas Data...] Saves the data displayed on the selected display.

[Save A/D Data...] Saves the A/D data.
If the AD data is saved by selecting File Type:DAT, the AD data, whose frequency characteristics were corrected, is saved in text format.
For more information, refer to A.2, "A/D Data Save Function."
If the AD data is saved by selecting File Type:MNT, the AD data, whose frequency characteristics were not corrected, is saved in binary format. These data is used only for maintenance, and therefore cannot be disclosed.

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

Next, select the WiBro 16e/D12 modulation analysis function from among the modulation analysis functions.

Select **[WiBro 16e/D12]** from **[Modulation]** on the menu bar to select the WiBro 16e/D12 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.

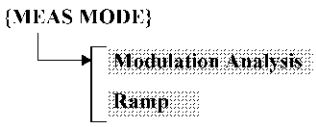
When you touch a button on the function bar, the associated soft keys are displayed on the soft menu bar.

5.5 Description of the Function of Each Key

This section describes the function of each key.

5.5.1 {MEAS MODE}

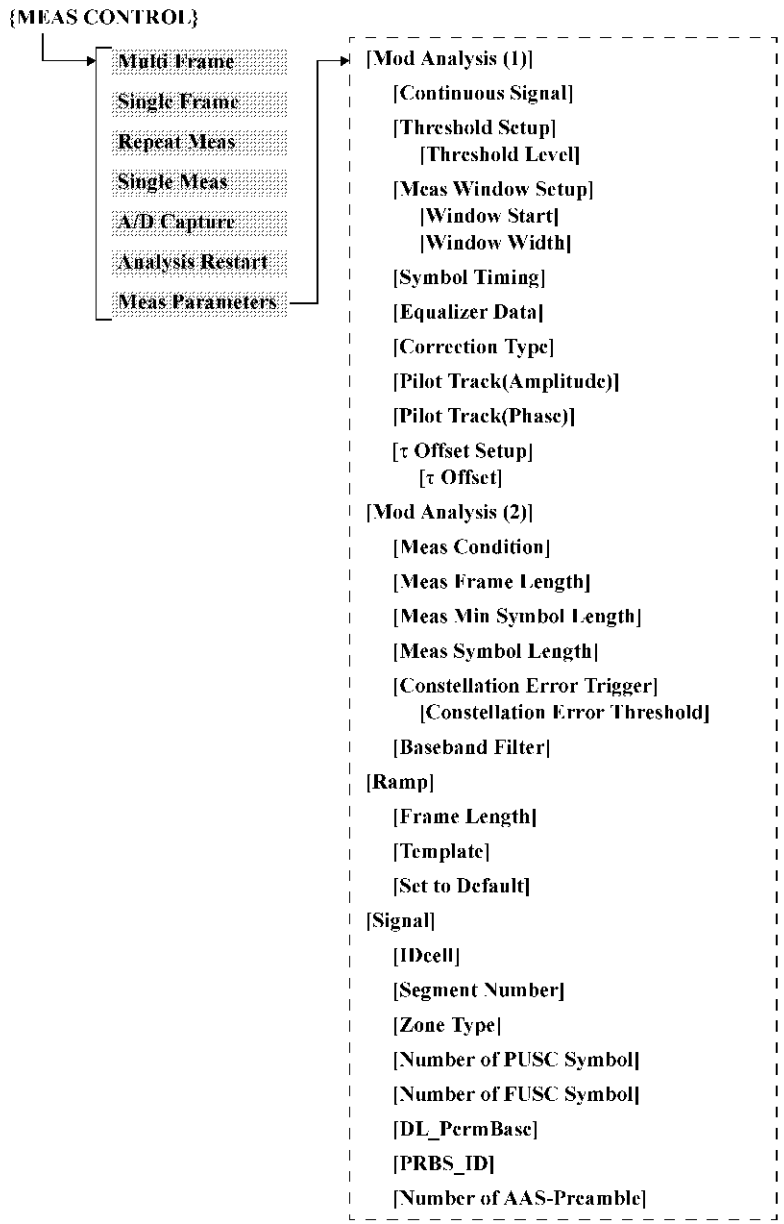
When you touch the **{MEAS MODE}** button, the soft keys related to the selection of a measurement mode are displayed on the soft menu bar.



Modulation Analysis	Selects the modulation analysis function. Constellation errors can be measured.
Ramp	Selects the function which measures the rising and falling edges of the frame.

5.5.2 {MEAS CONTROL}

When you touch the **{MEAS CONTROL}** button, the soft keys related to the selection of a measurement mode, import and analysis of A/D data on measurement signals, and setup of measurement conditions are displayed on the soft menu bar.



Multi Frame

Valid only when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **Multi Frame** key is touched, the measurement mode is set to the Multi Frame mode. The Multi Frame mode acquires A/D data of the signal to be measured and automatically detects and analyzes one frame that is included in the A/D data.
A/D data is repeatedly acquired and analyzed until the measurement condition that is set in Meas Parameters is satisfied.
In the Total Result window, the cumulative total value of all frames is displayed until the measurement condition that is set in Meas Parameters is satisfied.
All windows except for the Total Result window display the measurement result of only the most recently analyzed frame.

MEMO: ***The Multi Frame mode is suitable for performing measurements of multiple symbols repeatedly under the same measurement conditions.***

Single Frame

Valid only when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **Single Frame** key is touched, the measurement mode is set to the Single Frame mode.
In the Single Frame mode, using A/D Capture, measurements can be repeatedly performed by using the once acquired A/D data on the measurement signal under various measurement conditions.

MEMO: ***The Single Frame mode is suitable for performing measurement by selecting a burst to be measured from the data captured.***

Repeat Meas

Valid only in the Multi Frame mode when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **Repeat Meas** key is touched, measurements in the Multi Frame mode are repeatedly performed. When the conditions set in Meas Parameters are satisfied, the number of symbols measured is returned to 0 and measurement is restarted.

When **{MEAS MODE}** is set to **Ramp**, the Ramp measurement is repeatedly performed if **Repeat Meas** is touched.

Single Meas

Valid only in the Multi Frame mode when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **Single Meas** key is touched, measurement is performed in the Multi Frame mode once. When the conditions set in Meas Parameters are satisfied, the measurement is terminated.

When **{MEAS MODE}** is set to **Ramp**, the Ramp measurement in one frame is performed if **Single Meas** is touched.

A/D Capture

Valid only in the Single Frame mode when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **A/D Capture** key is touched, acquisition of A/D data on the signal to be measured is started. When acquisition of A/D data is complete, the time waveform of the acquired burst is displayed in the form of the Frame Selection display.

IMPORTANT:

Frame Selection Screen Display
When data is acquired by using A/D Capture, the envelope waveform of the signal is displayed on the Frame Selection screen.
Select the frame, which is analyzed in the Single Frame mode, by using the envelope waveform display. The frame to be measured can be selected by setting the cursor on the frame.

Analysis Restart

Valid only in the Single Frame mode when **{MEAS MODE}** is set to **Modulation Analysis**.
If the **Analysis Restart** key is touched, the frame, which is selected with the cursor, starts being measured.
If the **Analysis Restart** key is touched after the measurement, the measurement restarts.

IMPORTANT:

If the* Analysis Restart *key is touched before A/D data is completely acquired, an error occurs.

Meas Parameters

If the **Meas Parameters** key is touched, a dialog box that is used to set the measurement condition is displayed.

[Mod Analysis (1)]

The dialog box is displayed only when **{MEAS MODE}** is set to **Modulation Analysis**.
Sets the measurement parameters of the modulation analysis.

[Continuous Signal]

Sets whether the signal is a continuous wave.

ON: Analyzes the continuous wave.

OFF: Analyzes the burst signal.

IMPORTANT:

When a continuous wave is analyzed while Continuous Signal is set to ON, Window Start and Window Width must be in the frame range of the continuous wave.
Otherwise incorrect measurement results may be acquired.

[Threshold Setup] When the burst wave is analyzed, the frame in A/D data is detected based on the threshold level.
In Threshold Level Setup, the method to set the threshold level can be changed.

Auto: Automatically sets the threshold level.

Manual: Manually sets the threshold level.
If Manual is selected, the Threshold Level text box, in which the threshold level is manually entered, is displayed.

[Threshold Level]
Enter the threshold level when Threshold Setup is set to Manual.
Set the threshold level by judging from the burst wave level that is displayed on the Frame Selection screen.

MEMO: ***When the Threshold Setup setting is set to Auto, an automatically-set threshold level is displayed on the Frame Selection screen.***
If Manual is set, a manually-entered threshold level is displayed on the Frame Selection screen.

[Meas Window Setup] Selects the method to set the measurement symbol range.

Auto: Automatically sets the measurement symbol range so that all data symbols in the frame are in the measurement range.

Manual: Manually sets the measurement symbol range.

[Window Start] Sets the start position in the measurement symbol range by using a symbol number when Meas Window Setup is set to Manual.
The first preamble is treated as symbol 0.

[Window Width]
Sets the length of the measurement symbol range by using a symbol number when Meas Window Setup is set to Manual.

MEMO: ***When Meas Window Setup is set to Manual, the manually-entered measurement symbol range is displayed on the Meas Window screen.***

[Symbol Timing] Sets the start position in the range, which is used for the FFT (demodulation) in the OFDM symbol.
The position, which is found by adding 1/2 of the guard interval to the beginning of the OFDM symbol, is 0.

[Equalizer Data] Creates equalizer data.
After the frame analysis, press the Make key.
Equalizer data, which corrects the frequency characteristics (amplitude and phase), is calculated.

[Correction Type] Selects the method used to correct frequency characteristics.

Equalizer:
Corrects the frequency characteristics by using the equalizer data. To use this function, the equalizer data must have been previously created.

CH Estimation(Preamble):
Corrects the frequency characteristics by using channel correction data which is estimated from the preamble.

CH Estimation(Pilot):
Corrects the frequency characteristics by using channel correction data which is estimated from the pilot subcarrier.

OFF: Does not correct the frequency characteristics.

IMPORTANT:
To calculate the Equalizer data, the frame must have been previously analyzed.

[Pilot Track(Amplitude)]
Sets whether to correct the amplitude for each symbol by using the pilot subcarrier.

ON: Corrects the amplitude for each symbol.

OFF: Does not correct the amplitude for each symbol.

[Pilot Track(Phase)] Sets whether to synchronize the phase for each symbol by using the pilot subcarrier.

ON: Corrects the phase for each symbol.

OFF: Does not corrects the phase for each symbol.

[τ Offset Setup] To correct the time offset, sets whether to add the time offset to the τ measurement result and display τ.

ON: Displays τ after adding the time offset to the τ measurement result.

OFF: Displays τ without adding the time offset to the τ measurement result.

[τ Offset] Sets the time offset. This menu can be used when **[τ Offset Setup]** is set to ON.

[Mod Analysis (2)] The dialog box is displayed only when **{MEAS MODE}** is set to **Modulation Analysis**.
Sets the measurement parameters of the modulation analysis.
Sets the measurement condition used when multi frames are measured.

[Meas Condition] **[Meas Condition]** is enabled when the Multi Frame mode is set.
In **[Meas Condition]**, the measurement condition is set.

Frame: Measures the set number of Frames.

Symbol: Measures the set number of Symbols.

Frame & Min Symbol:
Measures the set number of Frames. However, any Frame whose number of symbols is less than Min Symbol is not measured.

[Meas Frame Length] **[Meas Frame Length]** is enabled when the Multi Frame mode is set.
In **[Meas Frame Length]**, the required number of frames is set.

[Meas Min Symbol Length]
[Meas Min Symbol Length] is enabled when the Multi Frame mode is set.
In **[Meas Min Symbol Length]**, the minimum number of symbols required for one frame in the Total Result measurement is set.

[Meas Symbol Length] **[Meas Symbol Length]** is enabled when the Multi Frame mode is set.
In **[Meas Symbol Length]**, the number of symbols required for the Total Result measurement is set.

[Constellation Error Trigger]
[Constellation Error Trigger] is enabled when the Multi Frame mode is set.
In **[Constellation Error Trigger]**, whether to stop the measurement when a Constellation Error, which is larger than the setting value in Constellation Error Threshold, is detected.

ON: Uses the Constellation Error Trigger function.

OFF: Does not use the Constellation Error Trigger function.

MEMO: ***If this function halts the measurement, the message "EVM fail stop." is displayed.***

[Constellation Error Threshold]
In **[Constellation Error Threshold]**, the threshold level, which is used to judge whether to stop the measurement when Constellation Error Trigger is set to ON, is entered.

[Baseband Filter] Sets the bandwidth of the receiving filter when the modulation analysis is performed.
If signals exist in adjacent channels, select Narrow.

Wide: Selects a filter whose bandwidth is wider than the bandwidth of the carrier. The high speed measurement can be performed. However, if signals exist in adjacent channels, the measurement cannot be performed.

Narrow: Selects a filter whose bandwidth is subequal to the bandwidth of the carrier. Even if signals exist in adjacent channels, the measurement can be performed but it takes time to perform the measurement.

[Ramp] The dialog box is displayed only when **{MEAS MODE}** is set to **Ramp**.
Sets the measurement parameter used for the rising and falling edges measurements of the frame.

[Frame Length] Sets the signal frame length (the number of symbols) to be measured.

[Template] Sets the template.

[Set to Default] Returns the template settings to their default value.

[Signal] Sets the information on the signal.

[IDcell] Sets the signal Cell ID.

[Segment Number] Sets the signal Segment Number.

[Zone Type] Selects the Zone type.

PUSC only:
Sets the Zone type to PUSC only.

FUSC only:
Sets the Zone type to FUSC only.

AMC only:
Sets the Zone type to AMC only.

PUSC+FUSC+AMC:
Set the Zone type to PUSC+FUSC+AMC.

[Number of PUSC Symbol]
Sets the PUSC length in units of symbol.

[Number of FUSC Symbol]
Sets the FUSC length in units of symbol.

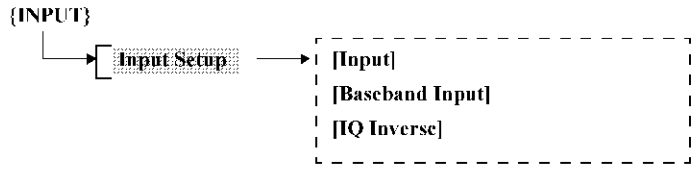
[DL_PermBase] Sets the signal Permutation Base.

[PRBS_ID] Sets the signal PRBS ID.

[Number of AAS-Preamble]
Selects the number of "AAS Preamble" symbols.

5.5.3 {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

When you touch the **Input Setup** key, the dialog box for setting up the input format for the measuring instrument is displayed. 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|

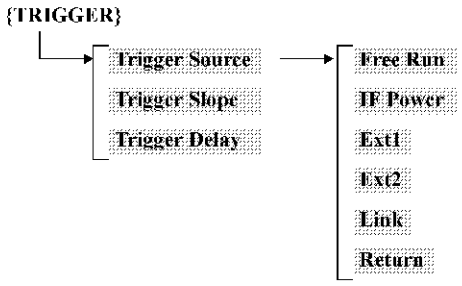
Selects whether or not to invert the phase of the signal to be measured.

ON: Inverts.

OFF: Does not invert.

5.5.4 {TRIGGER}

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



Trigger Source When you touch the **Trigger Source** key, the soft keys related to the trigger setup are displayed 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 Obtains and analyzes data synchronized with the external signal entered into the EXT TRIG IN 1 connector. The threshold level for Ext1 is fixed to the TTL level.

Ext2 Obtains and analyzes data synchronizing with the external signal 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 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, Ext2, and Link.

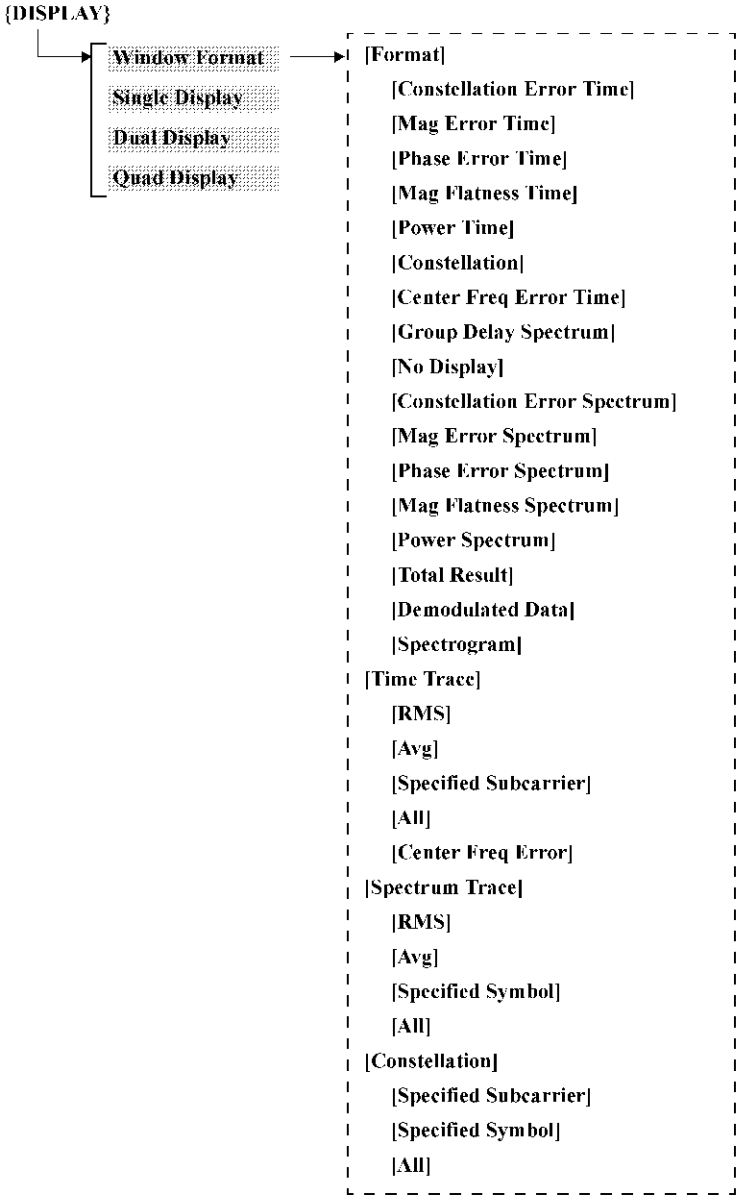
+: Starts sweep at the rise of a trigger.

-: Starts sweep at the fall of a trigger.

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

5.5.5 {DISPLAY}

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



Window Format — Displays a dialog box in which the display type of results is set, is displayed.
After the display format of the results is selected, the format can be set in detail in Time Trace, Spectrum Trace, and Constellation.

[Format] Selects the display type of the results.

[Constellation Error Time]
Displays Constellation Error for each symbol on a graph.
On the graph, the vertical axis shows Constellation Error (dB) and the horizontal axis shows time (symbol). The Constellation Error RMS value trace, Constellation Error value of any one of the subcarriers, or Constellation Error value plot of all symbols or subcarriers can be displayed.

[Mag Error Time] Displays Magnitude Error for each symbol on a graph.
On the graph, the vertical axis shows Magnitude Error (dB) and the horizontal axis shows time (symbol).
The Magnitude Error RMS value trace, Magnitude Error value trace of any one of the subcarriers, or Magnitude Error value plot of all symbols or subcarriers can be displayed.

[Phase Error Time] Displays Phase Error for each symbol on a graph.
On the graph, the vertical axis shows Phase Error (deg) and the horizontal axis shows time (symbol). The Phase Error average value trace, Phase Error value trace of any one of the subcarriers, or Phase Error value plot of all symbols or subcarriers can be displayed.

[Mag Flatness Time] Displays Magnitude Flatness for each symbol on a graph.
On the graph, the vertical axis shows Magnitude Flatness (dB) and the horizontal axis shows time (symbol). The Magnitude Flatness average value trace, Magnitude Flatness value trace of any one of the subcarriers, or Magnitude Flatness value plot of all symbols or subcarriers can be displayed.

[Power Time] Displays the power for each symbol on a graph.
On the graph, the vertical axis shows power (dBm) and the horizontal axis shows time (symbol). The symbol power average value trace, power value trace of any one of the subcarriers, or power value plot of all symbols or subcarriers can be displayed.

[Constellation] Displays the constellation. On the graph, the vertical axis shows the magnitude of the I signal and the horizontal axis shows the magnitude of the Q signal. Constellations of all symbols or subcarriers, the constellation of any one of the subcarriers, or the constellation of any one of the symbols can be displayed.

[Center Freq Error Time]
Displays the center frequency error for each symbol on a graph.
On the graph, the vertical axis shows the frequency error (Hz) and the horizontal axis shows time (symbol). The center frequency error trace and the average value can be displayed.

[Group Delay Spectrum]
Displays Group Delay of each subcarrier on a graph.
On the graph, the vertical axis shows Group Delay and the horizontal axis shows the frequency (subcarrier). Group Delay is calculated from the phase difference.

[No Display] Displays nothing.

[Constellation Error Spectrum]
Displays Constellation Error for each subcarrier on a graph.
On the graph, the vertical axis shows Constellation Error (dB) and the horizontal axis shows the frequency (subcarrier). The Constellation Error RMS value trace, Constellation Error value trace of any one of the symbols, or Constellation Error value plot of all symbols or subcarriers can be displayed.

[Mag Error Spectrum] Displays Magnitude Error for each subcarrier on a graph. On the graph, the vertical axis shows Magnitude Error (dB) and the horizontal axis shows the frequency (subcarrier). The Magnitude Error RMS value trace, EVM value trace of any one of the symbols, or Magnitude Error value plot of all symbols or subcarriers can be displayed.

[Phase Error Spectrum]
Displays Phase Error for each subcarrier on a graph. On the graph, the vertical axis shows Phase Error (deg) and the horizontal axis shows the frequency (subcarrier). The Phase Error average value trace, Phase Error value trace of any one of the symbols, or Phase Error value plot of all symbols or subcarriers can be displayed.

[Mag Flatness Spectrum]
Displays Magnitude Flatness for each subcarrier on a graph. On the graph, the vertical axis shows Magnitude Flatness (dB) and the horizontal axis shows the frequency (subcarrier). The Magnitude Flatness average value trace, Magnitude Flatness value trace of any one of the symbols, or Magnitude Flatness value plot of all symbols or subcarriers can be displayed.

[Power Spectrum] Displays the power for each subcarrier on a graph. On the graph, the vertical axis shows the power (dBm) and the horizontal axis shows the frequency (subcarrier). The subcarrier power average value trace, power value trace of any one of the symbols, or power value plot of all symbols or subcarriers can be displayed.

[Total Result] Displays the total of the measurement values of all frames for the chips in the measurement range as the result.

- Cnst Error (dB, %): RMS value of Constellation Error
- Mag Error (dB, %): RMS value of Magnitude Error
- Phase Error (deg): RMS value of Phase Error
- τ(sec) Time difference between an external trigger and the head of a preamble
- Freq Error (Hz, ppm): Center Frequency Error
- Power (dBm, W, dBm/MHz, W/MHz): Power
- Flatness (dB): Spectral Flatness
- Leak-Power (dB): Center Frequency Leakage Power (Total power ratio)
- Lk-SubCarAvg (dB): Center Frequency Leakage Power (Sub carrier average power ratio)
- Number - Meas Symbol: Number of symbols to be measured
- Number - Meas Frame: Number of frames to be measured
- Number - A/D Capture: Number of A/D data captures

[Demodulated Data] The demodulated data on the signal measured is displayed.
It is displayed for each symbol and subcarrier in a hexadecimal number respectively. The subcarrier type and the modulation system are distinguished by color. The demodulated data on the first 10 symbols (when the dual or quad display is selected) or the first 24 symbols (when the single display is selected) in the measurement range is displayed on the screen. To see the demodulated data on the subsequent symbols, change the measurement range. All the demodulated data in the measurement range can be saved in a file.

QPSK:	green
16QAM:	light blue
64QAM:	pink
Pilot subcarrier:	yellow

When there are no subcarriers, red asterisks (**) are displayed.

[Spectrogram] Displays the spectrogram.
Displays the time change of the spectrum of the measurement signal. The vertical axis shows time (symbol) and the horizontal axis shows frequency (subcarrier). The color shows the power strength.

[Time Trace] Sets the result graph that has a horizontal axis showing time (symbol). The checked items are displayed on the graph. Multiple items can be selected.

[RMS] Displays the RMS value of the measurement result on a trace.

NOTE: ***RMS can be selected only for Constellation Error and Magnitude Error.***

[Avg] Displays the average value of the measurement result on a trace.

NOTE: ***Avg can be selected only for Phase Error, Magnitude Flatness, Power, and Center Freq Error.***

[Specified Subcarrier] Sets the subcarrier number to be displayed on a graph.

NOTE: ***This cannot be selected for Center Freq Error.***

[All] Displays measurement values of all subcarriers for each symbol on a plot.

NOTE: ***This cannot be selected for Center Freq Error.***

[Center Freq Error] Displays the center frequency error of each symbol on a trace.

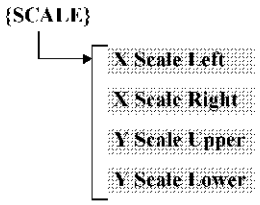
[Spectrum Trace] Sets the result graph that has a horizontal axis showing frequency (subcarrier). The checked items are displayed on the graph. Multiple items can be selected.

[RMS] Displays the RMS value of the measurement result on a trace.

	NOTE: ***RMS can be selected only for Constellation Error and Magnitude Error.***
[Avg]	Displays the average value of the measurement result on a trace.
	NOTE: ***Avg can be selected only for Phase Error, Magnitude Flatness, and Power.***
[Specified Symbol]	Sets the symbol number to be displayed on a graph.
[All]	Displays measurement values of all symbols for each subcarrier on a plot.
[Constellation]	Performs setup related to the constellation display. The checked items are displayed. Only one item can be selected at a time.
[Specified Subcarrier]	Displays the constellation of any one of the subcarriers.
[Specified Symbol]	Displays the constellation of any one of the symbols.
[All]	Displays the constellations of all symbols and subcarriers.
Single Display	Selects the single display.
Dual Display	Selects the dual display.
Quad Display	Selects the quad display.

5.5.6 {SCALE}

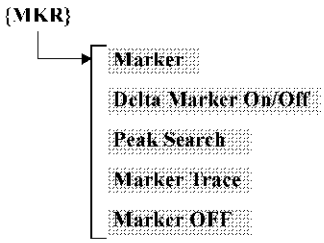
When you touch the **{SCALE}** button, the soft keys related to the setup of the X-axis and Y-axis scales in the active display window are displayed on the soft menu bar.



X Scale Left	Sets the minimum value on the X axis.
X Scale Right	Sets the maximum value on the X axis.
Y Scale Upper	Sets the maximum value on the Y axis.
Y Scale Lower	Sets the minimum value on the Y axis.

5.5.7 {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 normal marker.

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

On: Displays the delta marker and normal marker in the same position. Displays the relative value (measurement value such as Constellation Error) to the normal marker in the marker area.

Off: Deletes the display of the delta marker.

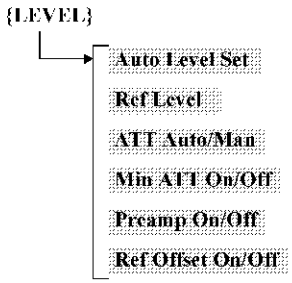
Peak Search — Performs a peak search.

Marker Trace — When more than one trace exists, moves the normal marker between traces. The marker moves between traces every time it is pressed.

Marker OFF — Deletes the display of the normal marker and the delta marker.

5.5.8 {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.

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

Ref Level

Sets the reference level.

ATT Auto/Man

Sets the attenuator.

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

Man: Sets the attenuator value.

Min ATT On/Off

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 On/Off

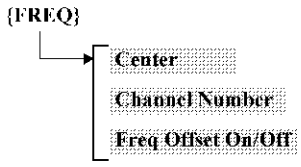
Switches the reference level offset function ON and OFF.

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.

5.5.9 {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.

CAUTION: ***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 On/Off

Switches the center frequency offset function ON and OFF.

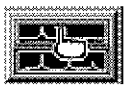
On: Sets the offset value and changes only the displayed center frequency by the offset value.
(Displayed center frequency = Set value + Offset value)

Off: Cancels the offset function.

5.5.10 Measurement Tool Bar

The functions of waveform range selection, active window selection, and so on are displayed as icons.

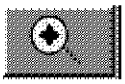
The following functions can be used by touching the icons:

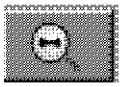

: Active window switching: Used to make one of the split windows active.


: 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 after searching for the peak of the waveform in the range specified by the range specification icon.


: Zoom in icon: Used to zoom in on the waveform displayed in the window. The range specified by the range specification icon is zoomed in on by touching on the range.


: Zoom out icon: Used to zoom out from the waveform displayed in the window.


: Window switching: Switches the waveform window and the result window.


: Cursor specification icon: Used to specify the signal to be measured using a cursor.
After touching the icon, select the signal to be measured on the Frame Selection screen.

6. SCPI COMMAND REFERENCE

This chapter describes the SCPI command reference for this instrument.

6.1 Command Reference Format

This section describes the format of explanations of each command described in this chapter.

Explanations of each command include the following items:

Function description

SCPI command

Parameter

Query reply

- [Function description]

  The usage of commands and operation of this instrument when they are executed.

- [SCPI command]

  The SCPI command shows the syntax of a command sent from the external controller to this instrument. The syntax consists of a command part and a parameter part. The command part and parameter part are delimited by a space.

  When there are multiple parameters, they are delimited by commas (,). The three points (...) displayed between commas represent the parameter(s) omitted in the position.

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

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

  The part written in lowercase alphabetical characters in the syntax shows that it can be omitted.

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

  The marks used in the syntax are defined as follows:

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

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

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

- [Parameter]

  Describes a parameter required for sending a command.

  When the parameter is a numeric type or a character (string) type, it is enclosed in angle brackets (< >).

  When the parameter is an optional type, it is enclosed in curly brackets ({ }).

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

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

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

  < bool >: String of OFF|ON

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

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

  < type >: Character data selected from multiple types

- [Query reply]

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

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

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

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

6.2 Common Commands

This section describes IEEE common commands.

Function description	SCPI Command	Parameter	Query reply	Remarks
Clears the status byte and related data	*CLS	-	-	
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
Notice of completion of all running operations	*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 for the completion of all running operations	*WAI	-	-	

*1: If the *DDT? command is executed when the macro is undefined, 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 at the last power-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	WIBROHEXED12	WIBROHEXED12	
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-CONFigure

Function description	SCPI command	Parameter	Query reply	Remarks
Meas Mode				
Mod Analysis measurement mode setting	:CONFigure:MANalysis	-	-	
Ramp measurement mode setting	:CONFigure:RAMP	-	-	

6.3.4 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 Control				
Multi Frame/Single Frame selection	[:SENSe]:CONDition:FRAMe	MULTi|SINGle	MULT|SING	
Meas Parameters (Mod Analysis1)				
Continuous Signal setting	[:SENSe]:CONDition:CSIGnal	OFF|ON	OFF|ON	
Threshold setting (manual)	[:SENSe]:CONDition:THReshold	<real>	<real>	
Threshold (auto/manual)	[:SENSe]:CONDition:THReshold:AUTO	OFF|ON	OFF|ON	
Meas Window Setup setting	[:SENSe]:CONDition:MWINdow:AUTO	OFF|ON	OFF|ON	
Window Start setting	[:SENSe]:CONDition:MWINdow:STARt	<int>	<int>	
Window Width setting	[:SENSe]:CONDition:MWINdow:WIDTh	<int>	<int>	
Symbol Timing setting	[:SENSe]:CONDition:STIMing	<int>	<int>	
Creating Equalizer Data	[:SENSe]:CONDition:EQUAlizer:MAKE	-	-	
Correction Type selection	[:SENSe]:CONDition:CTYPe	OFF|EQUAlizer|CEPReamble|CEPilot	OFF|EQUA|CEPR|CEP	
Pilot Track (Amplitude) ON/OFF	[:SENSe]:CONDition:PTRack:AMPLitude	OFF|ON	OFF|ON	
Pilot Track (Phase) ON/OFF	[:SENSe]:CONDition:PTRack:PHASe	OFF|ON	OFF|ON	
τ Offset Value setting	[:SENSe]:CONDition:TAU:OFFSet	<real>	<real>	
τ Offset ON/OFF	[:SENSe]:CONDition:TAU:OFFSet:STATe	OFF|ON	OFF|ON	

6.3.4 Subsystem-SENSe

Function description	SCPI command	Parameter	Query reply	Remarks
Meas Parameters (Mod Analysis2)				
Meas Condition setting	[:SENSe]:CONDition:MCONdition	FRAMe|FMSYmbol|SYMBol	FRAM|FMSY|SYMB	
Symbol Length setting	[:SENSe]:CONDition:SLENgth	<int>	<int>	
Frame Length setting	[:SENSe]:CONDition:MANalysis:FLENgth	<int>	<int>	
Minimum Symbol Length setting	[:SENSe]:CONDition:MSLength	<int>	<int>	
Constellation Error Trigger setting	[:SENSe]:CONDition:CETRigger	<real>	<real>	
Constellation Error Trigger ON/OFF	[:SENSe]:CONDition:CETRigger:STATe	OFF|ON	OFF|ON	
Baseband Filter (Wide/Narrow)	[:SENSe]:CONDition:BBFilter	WIDE|NARRow	WIDE|NARR	
Meas Parameters (Ramp)				
Frame Length setting	[:SENSe]:CONDition:RAMP:FLENgth	<int>	<int>	
Template Level setting (ALL)	[:SENSe]:CONDition:TEMPlate:LEVel:ALL	<real>,<real>,<real>,<real>	<real>,<real>,<real>,<real>	
Template Level Y0 to Y3 setting	[:SENSe]:CONDition:TEMPlate:LEV<lv=1 to 4>	<real>	<real>	
Template Level Default setting	[:SENSe]:CONDition:TEMPlate:DEFault	-	-	
Meas Parameters (Signal)				
Cell ID setting	[:SENSe]:CONDition:ID:CELL	<int>	<int>	
Segment Number setting	[:SENSe]:CONDition:SNUMber	<int>	<int>	
Zone Type PUSC ONLY/FUSC ONLY/AMC ONLY/PUSC+FUSC+AMC	[:SENSe]:CONDition:ZTYPe	PONLy|FONLy|AONLy|ALL	PONL|FONL|AONL|ALL	
Number of PUSC Symbol setting	[:SENSe]:CONDition:PSYMbol:NUMBer	<int>	<int>	
Number of FUSC Symbol setting	[:SENSe]:CONDition:FSYMbol:NUMBer	<int>	<int>	
DL PermBase setting	[:SENSe]:CONDition:DLPBase	<int>	<int>	
PRBS_ID setting	[:SENSe]:CONDition:ID:PRBS	<int>	<int>	
AAS Preamble setting	[:SENSe]:CONDition:AASPreamble	<int>	<int>	

6.3.5 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	
IF Power setting	:TRIGger[:SEQuence]:LEVel:IF	<real>	<real>	
Ext2 Trigger Level setting	:TRIGger[:SEQuence]:LEVel:EXTernal	<real>	<real>	
Trigger Delay setting	:TRIGger[:SEQuence]:DELay	<real>	<real>	

6.3.6 Subsystem-INITiate

Function description	SCPI command	Parameter	Query reply	Remarks
Initiate Single Measurement execution	:INITiate:MEASure:SINGle	-	-	
Repeat Measurement execution	:INITiate:MEASure:REPeat	-	-	
Measurement stop	:INITiate:ABORt	-	-	

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	
Display				
Multi Screen setting	:DISPlay	SINGle|DUAL|QUAD	SING|DUAL|QUAD	
Switching the measurement result active window	:DISPlay:ACTive	<int>	<int>	
Analysis Format selection (Mod)	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:FORMat	OFF|SPECtrogram|TRESult|CESPectrum|CETime|MESPectrum|METime|PESPectrum|PETime|MFSPectrum|MFTime|CONStellation|CFETime|PSPectrum|PTIMe|DDATa|GDSPectrum	OFF|SPEC|TRES|CESP|CET|MESP|MET|PESP|PET|MFSP|MFT|CONS|CFET|PSP|PTIM|DDAT|GDSP	
Time Trace RMS ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME:RMS	OFF|ON	OFF|ON	
Time Trace AVG ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME :AVERage	OFF|ON	OFF|ON	
Time Trace Specified Subcarrier ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME :SSUBcarrier	OFF|ON	OFF|ON	
Time Trace Specified Subcarrier Number setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME :SSUBcarrier:NUMBer	<int>	<int>	
Time Trace All Measurement Value Plot ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME:PLOT :ALL	OFF|ON	OFF|ON	
Time Trace Center Freq Error ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:TIME :CFERror	OFF|ON	OFF|ON	
Spectrum Trace RMS ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:SPECtrum :RMS	OFF|ON	OFF|ON	
Spectrum Trace AVG ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:SPECtrum :AVERage	OFF|ON	OFF|ON	
Spectrum Trace Specified Symbol ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:SPECtrum :SSYMbol	OFF|ON	OFF|ON	
Spectrum Trace Specified Symbol Number setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:SPECtrum :SSYMbol:NUMBer	<int>	<int>	

Function description	SCPI command	Parameter	Query reply	Remarks
Spectrum Trace All Measurement Value Plot ON/OFF	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:SPECtrum :PLOT:ALL	OFF|ON	OFF|ON	
Constellation Trace setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe :CONStellation	ALL|SUBCarrier| SYMBol	ALL|SUBC| SYMB	
Constellation Specified Subcarrier Number setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe :CONStellation:SSUBcarrier:NUMBer	<int>	<int>	
Constellation Specified Symbol Number setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe :CONStellation:SSYMbol:NUMBer	<int>	<int>	
X Scale Left setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:X[:SCALe] :LEFT	<real>	<real>	
X Scale Right setting	:DISPlay[:WINDow<scrn=1|2|3|4>]:TRACe:X[:SCALe] :RIGHt	<real>	<real>	
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>	
Y Scale Upper setting (Ramp)	:DISPlay:RAMP[:WINDow<scrn=1|2|3>]:TRACe :Y[:SCALe]:UPPer	<real>	<real>	
Y Scale Lower setting (Ramp)	:DISPlay:RAMP[:WINDow<scrn=1|2|3>]:TRACe :Y[:SCALe]:LOWer	<real>	<real>	

6.3.8 Subsystem-MMEMory

Function description	SCPI command	Parameter	Query reply	Remarks
Save/Recall				
Measurement result Save execution	:MMEMory:STORe:MEASure:STATe	<int>	-	*1
AD data Save execution	:MMEMory:STORe:AD:STATe	<int>	-	*1
Measurement condition Save selection	:MMEMory:SELect:ITEM:WIBROHEXED12: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
Total Result (Mod)				
Constellation Error reading	:MEASure:TRESult:CERRor	-	<real>,<real>	
Peak Constellation Error reading	:MEASure:TRESult:PCERror	-	<real>,<real>,<int>,<int>	
Mag Error reading	:MEASure:TRESult:MERRor	-	<real>,<real>	
Phase Error reading	:MEASure:TRESult:PERRor	-	<real>	
Frequency Error reading	:MEASure:TRESult:FERRor	-	<real>,<real>	
Transmit Power reading	:MEASure:TRESult:POWer	-	<real>,<real>,<real>,<real>	
τ reading	:MEASure:TRESult:TAU	-	<real>	
Spectral Flatness reading	:MEASure:TRESult:FLATness[:NUMBer<tbl=1|2|3|4>]	-	<int>,<int>,<real>,<real>,<real>...<int>,<int>,<real>,<real>,<real> (4 sets) *4	
Frequency Leakage reading	:MEASure:TRESult:LEAKage	-	<real>,<real>	
Frequency Leakage reading (Overall)	:MEASure:TRESult:LEAKage:OPOWer	-	<real>	
Frequency Leakage reading (Average Power)	:MEASure:TRESult:LEAKage:APOWer	-	<real>	
Meas Number reading	:MEASure:TRESult:NUMBer	-	<int>,<int>,<int>	
The number of Meas Symbol reading	:MEASure:TRESult:NUMBer:SYMBol	-	<int>	
The number of Meas Frame reading	:MEASure:TRESult:NUMBer:FRAMe	-	<int>	
The number of Meas A/D Capture reading	:MEASure:TRESult:NUMBer:CAPTure	-	<int>	
Total Result (Ramp)				
Ramp reading	:MEASure:TRESult:RAMP:ALL	-	<real>,PASS|FAIL	
Average Power reading	:MEASure:TRESult:RAMP:APOWer	-	<real>	
Pass/Fail reading	:MEASure:TRESult:RAMP:FAIL	-	PASS|FAIL	

*4: When [:NUMBer<tbl=1|2|3|4>] is omitted, only a data set is output.

6.3.10 Subsystem-READ

Function description	SCPI command	Parameter	Query reply	Remarks
Total Result (Mod)				
Constellation Error reading	:READ:TRESult:CERRor	-	<real>,<real>	
Peak Constellation Error reading	:READ:TRESult:PCERror	-	<real>,<real>,<int>,<int>	
Mag Error reading	:READ:TRESult:MERRor	-	<real>,<real>	
Phase Error reading	:READ:TRESult:PERRor	-	<real>	
Frequency Error reading	:READ:TRESult:FERRor	-	<real>,<real>	
Transmit Power reading	:READ:TRESult:POWer	-	<real>,<real>,<real>,<real>	
τ reading	:READ:TRESult:TAU	-	<real>	
Spectral Flatness reading	:READ:TRESult:FLATness[:NUMBer<tbl=1|2|3|4>]	-	<int>,<int>,<real>,<real>,<real>...<int>,<int>,<real>,<real>,<real> (4 sets) *4	
Frequency Leakage reading	:READ:TRESult:LEAKage	-	<real>,<real>	
Frequency Leakage reading (Overall)	:READ:TRESult:LEAKage:OPOWer	-	<real>	
Frequency Leakage reading (Average Power)	:READ:TRESult:LEAKage:APOWer	-	<real>	
Meas Number reading	:READ:TRESult:NUMBer	-	<int>,<int>,<int>	
The number of Meas Symbol reading	:READ:TRESult:NUMBer:SYMBol	-	<int>	
The number of Meas Frame reading	:READ:TRESult:NUMBer:FRAMe	-	<int>	
The number of Meas A/D Capture reading	:READ:TRESult:NUMBer:CAPTure	-	<int>	
Total Result (Ramp)				
Ramp reading	:READ:TRESult:RAMP:ALL	-	<real>,PASS|FAIL	
Average Power reading	:READ:TRESult:RAMP:APOWer	-	<real>	
Pass/Fail reading	:READ:TRESult:RAMP:FAIL	-	PASS|FAIL	

*4: When [:NUMBer<tbl=1|2|3|4>] is omitted, only a data set is output.

6.3.11 Subsystem-FETCh

Function description	SCPI command	Parameter	Query reply	Remarks
Total Result (Mod)				
Constellation Error reading	:FETCh:TRESult:CERRor	-	<real>,<real>	
Peak Constellation Error reading	:FETCh:TRESult:PCERror	-	<real>,<real>,<int>,<int>	
Mag Error reading	:FETCh:TRESult:MERRor	-	<real>,<real>	
Phase Error reading	:FETCh:TRESult:PERRor	-	<real>	
Frequency Error reading	:FETCh:TRESult:FERRor	-	<real>,<real>	
Transmit Power reading	:FETCh:TRESult:POWer	-	<real>,<real>,<real>,<real>	
τ reading	:FETCh:TRESult:TAU	-	<real>	
Spectral Flatness reading	:FETCh:TRESult:FLATness[:NUMBer<tbl=1|2|3|4>]	-	<int>,<int>,<real>,<real>,<real>...<int>,<int>,<real>,<real>,<real> (4 sets) *4	
Frequency Leakage reading	:FETCh:TRESult:LEAKage	-	<real>,<real>	
Frequency Leakage reading (Overall)	:FETCh:TRESult:LEAKage:OPOWer	-	<real>	
Frequency Leakage reading (Average Power)	:FETCh:TRESult:LEAKage:APOWer	-	<real>	
Meas Number reading	:FETCh:TRESult:NUMBer	-	<int>,<int>,<int>	
The number of Meas Symbol reading	:FETCh:TRESult:NUMBer:SYMBol	-	<int>	
The number of Meas Frame reading	:FETCh:TRESult:NUMBer:FRAMe	-	<int>	
The number of Meas A/D Capture reading	:FETCh:TRESult:NUMBer:CAPTure	-	<int>	
Total Result (Ramp)				
Ramp reading	:FETCh:TRESult:RAMP:ALL	-	<real>,PASS|FAIL	
Average Power reading	:FETCh:TRESult:RAMP:APOWer	-	<real>	
Pass/Fail reading	:FETCh:TRESult:RAMP:FAIL	-	PASS|FAIL	

*4: When [:NUMBer<tbl=1|2|3|4>] is omitted, only a data set is output.

6.3.12 Subsystem-STATus

Function description	SCPI command	Parameter	Query reply	Remarks
Status				
Standard Operation Enable Register setting	:STATus:OPERation:ENABle	<int>	<int>	
Standard Operation Event Register setting	:STATus:OPERation:EVENt	-	<int>	
Questionable Enable Register setting	:STATus:QUEStionable:ENABle	<int>	<int>	
Questionable Event Register setting	:STATus:QUEStionable:EVENt	-	<int>	
Measuring Enable Register setting	:STATus:OPERation:MEASure:ENABle	<int>	<int>	
Measuring Operation Event Register setting	:STATus:OPERation:MEASure:EVENt	-	<int>	

6.3.13 Subsystem-HCOPy

Function description	SCPI command	Parameter	Query reply	Remarks
Hcopy				
Copy output to the file or printer	:HCOPy[:IMMediate]	-	-	
Specification of the output destination (file or printer)	:HCOPy:DESTination	MMEMory|PRINt	MMEM|PRIN	
Specification of the output file number	:HCOPy:MMEMory:FILE:NUMBer	<int>	<int>	
Specification of the output file type	:HCOPy:MMEMory:FILE:TYPE	BITMap| PNGraphic	BITM|PNG	

6.4 Status Register

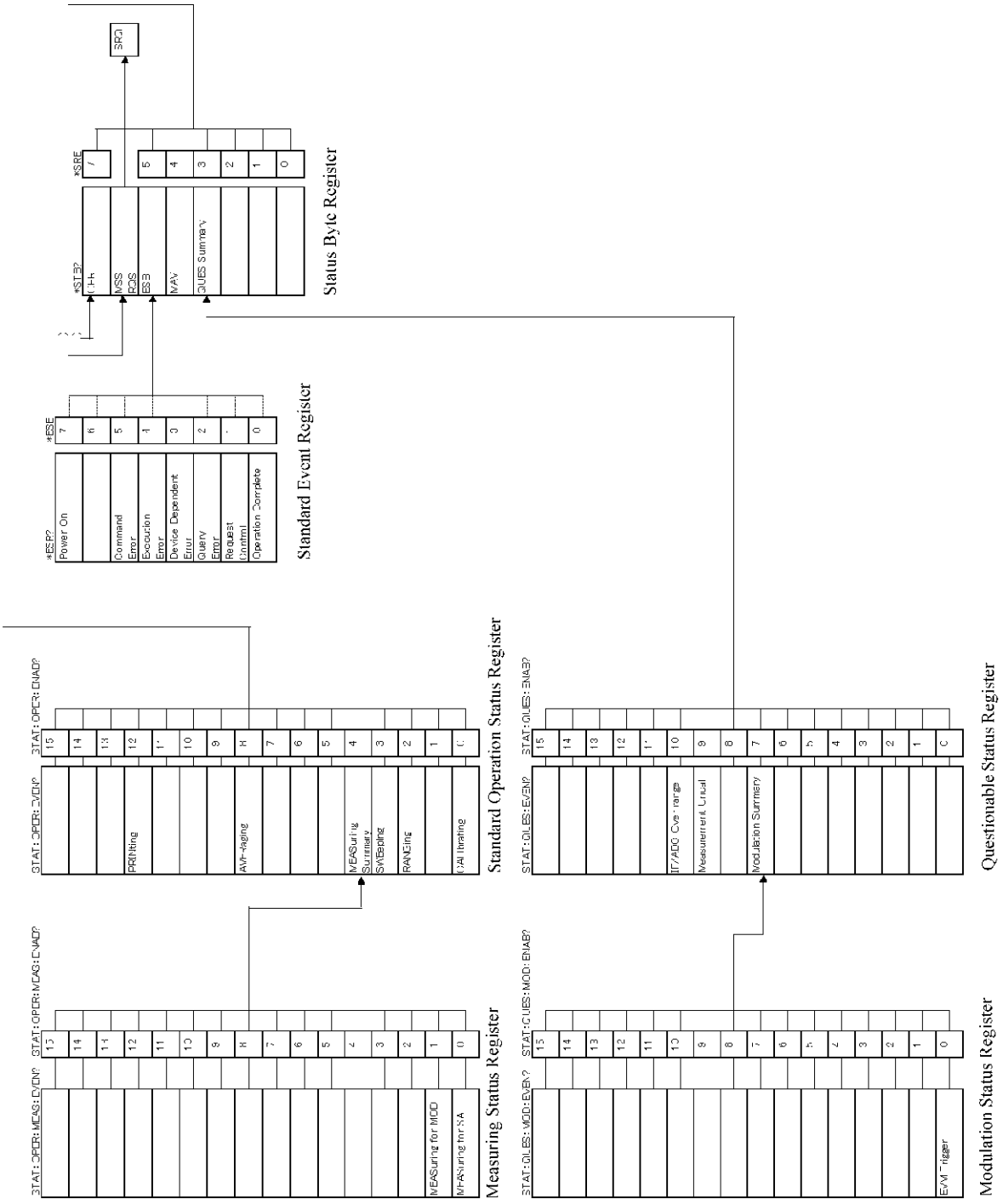


Figure 6-1 Status Registers

7. PERFORMANCE VERIFICATION

This chapter describes the method of verifying whether or not this instrument meets the specified performance.

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

CAUTION: ***Before executing performance verification, execute warm-up and all calibrations.***

7.1 Test Signal Specifications

The test signals used for performance verification are shown below:

Table 7-1 List of Test Signal Specifications

No.	Test signal name	Signal specifications		Test item
1	WiBro 16e/D12 downlink signal	Center frequency: Power: The number of data symbols: IDcell: Segment Number: Zone Type: Data subcarrier modulation format:	2.35 GHz -10 dBm 25 0 0 PUSC only QPSK	Power measurement Center frequency error measurement

7.2 Test Procedures

1. Connect the signal source as shown below:

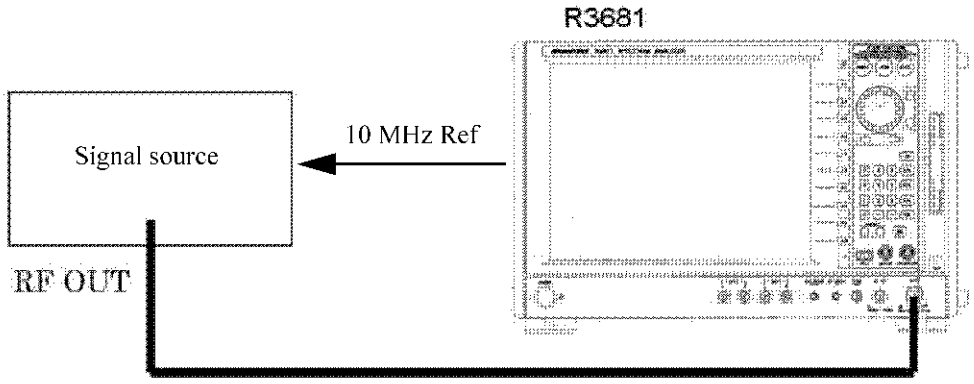


Figure 7-1 Connection Diagram for the Signal Source

2. Touch **[Config]** on the menu bar and select **[Modulation Analyzer]**. Touch **[Modulation]** on the menu bar and select **[WiBro 16e/D12]**.
3. Touch **[Special]** on the menu bar and select **[Preset]** and **[Current]**. All setting items are set to their default values.
4. Set 2.35 GHz by pressing **Center** in **{FREQ}**.
5. Press **Auto Level Set** in **{LEVEL}**.
6. Touch **Meas Parameters** and **Mod Analysis(1)** in **{MEAS CONTROL}**.
7. Set **[Correction Type]** to **[CH Est(Preamble)]**.
8. Touch the **Return** key.
9. Press the **SINGLE** button on this instrument to perform measurements.
10. Record Power [dBm] and Freq Error [Hz] of Total Result in the test data record sheet.

7.3 Test Data Record Sheet

Test data record sheet

Model name:

Serial number:

Test signal	Test item	Specifications			Judgment
		Minimum value	Measured value	Maximum value	Pass/Fail
WiBro 16e/D12 downlink signal	Power measurement (@2.35 GHz)	-10.9 dBm		-9.1 dBm	
	Center frequency error measurement	-10 Hz		+10 Hz	

8. SPECIFICATIONS

8.1 WiBro 16e/D12 Modulation Analysis Performance

Item	Specifications
Temperature range	+20°C - +30°C
Input frequency range	
RF input	20 MHz - 6 GHz
Input level range	
RF input	Preamp OFF -20 dBm - +30 dBm
IQ input	1.0 V_{P-P}
Constellation error measurement	
Residual constellation error	The RMS value of 25 symbols in the WiBro downlink signal that is measured by using CH Estimation(Preamble) For the RF input, the measurement is performed after Auto Level Set is executed. < -40 dB
Power measurement (RF input only)	
Measurement accuracy	After Auto Level Set is executed for the WiBro downlink signal of -10 dBm, Averaged power on 25 symbol with CH Estimation(Preamble). < ± (0.3 + Frequency Response + Calibration Signal Level Accuracy) dB
Frequency response	
50 MHz - 2.5 GHz	< ±0.4 dB
20 MHz - 6 GHz	< ±1.0 dB
Calibration signal level accuracy	< ±0.2 dB
Measurement accuracy (typ.)	< ±0.6 dB (50 MHz - 2.5 GHz)
Center frequency leakage power measurement	
Residual center frequency leakage power	Comparison with the average power of subcarriers in the measured WiBro downlink signal For the RF input, the measurement is performed after Auto Level Set is executed.
RF input	< -40 dB
IQ input	< -10 dB

Item	Specifications
Center frequency error measurement	
Measurement range	< ±200 Hz
Measurement accuracy	The average value of 25 symbols in the measured WiBro downlink signal For the RF input, the measurement is performed after Auto Level Set is executed. < ±(10 + Center Frequency × Frequency reference error) Hz

APPENDIX

This chapter describes the following supplemental information:

A.1 Technical Reference

A.2 A/D Data Save Function

A.3 Measurement Data Save Function

A.4 Error Message List

A.1 Technical Reference

A.1.1 Measured Value Calculation Method

Constellation Error

Constellation Error RMS of Total Result is calculated by using the following equation that is modified from the defined equation for Constellation Error. The defined equation is described in "8.4.12.3 Transmitter constellation error and test method" of "IEEE P802.16-REVd/D5,May 2004":

$$ConstellationError_{rms} = \frac{\sum_{i=1}^{N_f} \sqrt{\sum_{j=1}^{L_p} \left[\sum_{k=1}^{864} \left\{ \left(I(i,j,k) - I_0(i,j,k) \right)^2 + \left(Q(i,j,k) - Q_0(i,j,k) \right)^2 \right\} \right]}}{N_f \cdot 864 \cdot L_p \cdot P_o}$$

N_f: Number of measured frame

L_p: Number of measured Symbol

P_o: Average Power of constellation

I,Q: measured signal

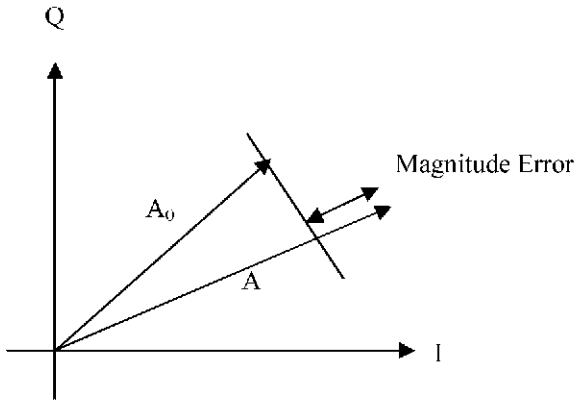
I_0,Q_0: Ideal signal

The average power P_o is found by averaging the powers of all subcarriers in the measurement symbol range.

The RMS value of Constellation Error Time is calculated for each symbol by using the defined equation for Constellation Error.
The RMS value of Constellation Error Spectrum is calculated for each subcarrier by using the defined equation for Constellation Error.
The Constellation Error value to be plotted is calculated for each symbol and each subcarrier by using the defined equation for Constellation Error.

The numerical value "864" in the formula is the number of subcarriers that include the pilot for AMC. The value is 840 for PUSC. It is 850 for FUSC.

Magnitude Error



Assuming subcarrier number k, symbol number j, frame number i, ideal constellation (I_0 (i, j, k), Q_0 (i, j, k)), and measurement symbol (I (i, j, k), Q (i, j, k)), the amplitude of the ideal constellation A_0 and the amplitude of the measurement symbol A are defined as follows:

$$A_0(i,j,k) = \sqrt{(I_0(i,j,k))^2 + (Q_0(i,j,k))^2}$$

$$A(i,j,k) = \sqrt{(I(i,j,k))^2 + (Q(i,j,k))^2}$$

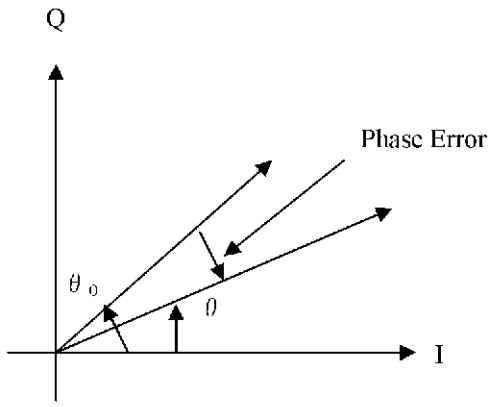
Calculate the Magnitude Error RMS of the Total Result with the following formula.

$$MagError_{RMS} = \frac{\sum_{i=1}^{N_f} \sqrt{\sum_{j=1}^{L_p} \left[\sum_{k=1}^{N_s} \left\{ \frac{(A(i,j,k) - A_0(i,j,k))^2}{(A_0(i,j,k))^2} \right\} \right]}}{N_s \times L_p}}{N_f}$$

N_S is the number of subcarriers, L_p the length of packet (number of symbols) and N_f the number of frames.

The RMS value of Magnitude Error Time is calculated for each symbol, using the formula for defining Magnitude Error. The RMS value of Magnitude Error Spectrum is calculated for each subcarrier, using the formula for defining Magnitude Error. The Magnitude Error values to be plotted are calculated for each symbol and subcarrier, using the formula for defining Magnitude Error.

Phase Error



The phase of the ideal constellation θ_0 and the phase of the measurement symbol θ are defined as follows:

$$\theta_0(i,j,k) = \arctan\left[\frac{Q_0(i,j,k)}{I_0(i,j,k)}\right]$$

$$\theta(i,j,k) = \arctan\left[\frac{Q(i,j,k)}{I(i,j,k)}\right]$$

Calculate the Phase Error RMS of the Total Result with the following formula.

$$PhaseError_{RMS} = \frac{\sum_{i=1}^{N_f}\sqrt{\sum_{j=1}^{L_p}\left[\sum_{k=1}^{N_s}\left\{(\theta(i,j,k)-\theta_0(i,j,k))^2\right\}\right]}}{N_s \times L_p}$$

$$N_f$$

The AVG value of Phase Error Time is calculated for each symbol, using the average value of Phase Error. For the AVG value of Phase Error Spectrum, the average value of Phase Error is calculated for each subcarrier. For Phase Error values to be plotted, Phase Error is calculated for each symbol and subcarrier.

Magnitude Flatness

For Magnitude Flatness, the ratio of the amplitude of the measurement symbol to the amplitude of the ideal constellation is calculated. The difference from Magnitude Error is shown in the following formula.

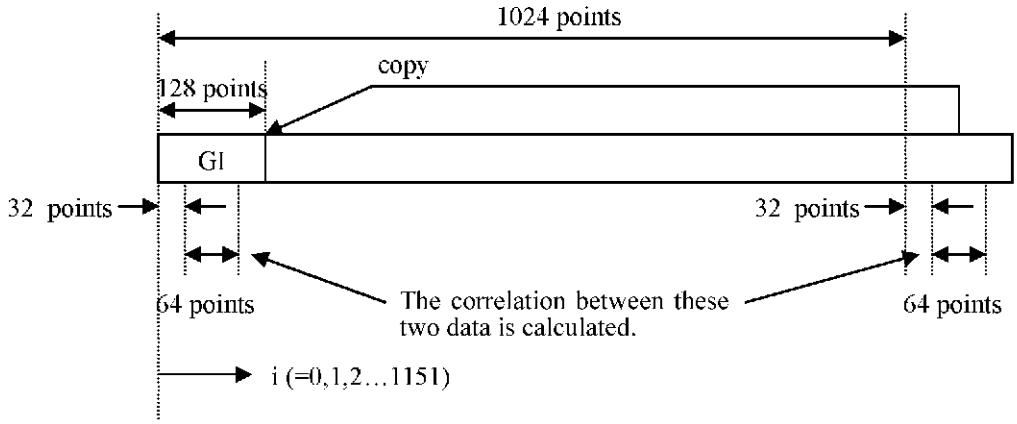
$$MagError(i,j,k) = \frac{A(i,j,k) - A_0(i,j,k)}{A_0(i,j,k)}$$

$$MagFlat(i,j,k) = \frac{A(i,j,k)}{A_0(i,j,k)}$$

For the AVG value of Magnitude Flatness Time, the average value of Magnitude Flatness is calculated for each symbol. For the AVG value of Magnitude Flatness Spectrum, the average value of Magnitude Flatness is calculated for each subcarrier. For Magnitude Flatness values to be plotted, Magnitude Flatness is calculated for each symbol and subcarrier.

Center Frequency Error

Center Frequency Error is estimated by calculating the correlation between the OFDM symbol guard interval and the original data, and finding the phase shift that occurred during the FFT interval.
The following figure shows the OFDM symbol structure and data range that is used to calculate the correlation:



The equation that is used to calculate Center Frequency Error is as follows:
s(i) is the time-series data from the OFDM symbol.

$$ferror = \frac{1}{64}\sum_{i=0}^{63}\left\{\arctan\left[\frac{\mathrm{Im}\left(s(i+1024)\times s^{*}(i)\right)}{\mathrm{Re}\left(s(i+1024)\times s^{*}(i)\right)}\right]\right\}\times\frac{10MHz}{2\pi\times 1024}$$

Center Frequency Error is calculated for each OFDM symbol.
The frequency error that is displayed in Total Result is acquired by averaging the frequency error of each OFDM symbol in the measurement symbol range.
If multiple frames are measured in the Multi Frame mode, the center frequency error is acquired by averaging the frequency error of each frame.

Power

Power is calculated from the subcarrier power that is obtained by demodulating (FFT) each symbol. For the AVG value of Power Time, the average power of all subcarriers is calculated for each symbol. For the AVG value of Power Spectrum, the average power of all symbols is calculated for each subcarrier.

The Power of the Total Result is the average value of total power obtained by aggregating the AVG values of Power Spectrum. The value indicated with the unit of [W/MHz] is the value obtained by dividing the average value of total power with the frequency band width [MHz] of the OFDM signal. The bandwidth here is not OBW, but the value obtained from the difference in frequencies of the two subcarriers most apart upwards and downwards from the center frequency.
For WiBro 16e/D12, the frequency bandwidth is 8.30 MHz (=9.76 kHz × 850 subcarriers).

Spectral Flatness

Spectral Flatness is calculated based on the definition described in "8.4.12.2 Transmitter spectral flatness" of "IEEE P802.16-REVd/D5,May 2004".
Data that is used to calculate Spectral Flatness is Power Spectrum.
If multiple frames are measured in the Multi Frame mode, Spectral Flatness is acquired by averaging the power spectrum of each frame.

"Avg" displays the differences between the average power in the -432 to +432 subcarrier range (as the reference: 0 dB) and the average power in the following four subcarrier ranges; -432 to -216, -216 to -1, +1 to +216, and +216 to +432.
When the measurement that is compliant with the above standard is performed, refer to this Avg value.

"MAX" and "MIN" display the differences between the reference power and the maximum and minimum subcarrier powers in the following four subcarrier ranges; -432 to -216, -216 to -1, +1 to +216, and +216 to +432.

Center Frequency Leakage

Center Frequency Leakage is calculated based on the definition that is described in "17.3.9.6.1 Transmitter center frequency leakage" of "IEEE Std 802.11a-1999".
Data that is used to calculate Center Frequency Leakage is Power Spectrum.
If multiple frames are measured in the Multi Frame mode, Center Frequency Leakage is acquired by averaging the power spectrum of each frame.

Center Frequency Leakage indicates the difference between the reference power and the power of subcarrier number 0.
The total power of subcarrier numbers -432 to +432 and the average power of subcarrier numbers -432 to +432 are defined as the reference powers. Two results of Center Frequency Leakage, which are acquired by using these two reference powers, are displayed in Total Result.

A.1.2 Estimation of the Subcarrier Modulation Format

The subcarrier modulation format is estimated by finding the ideal symbols, at which the constellation error between the ideal symbol point and the symbol is at a minimum, for QPSK, 16QAM, and 64QAM and then comparing the ideal symbols to find the smallest constellation error.

IMPORTANT: ***If Constellation Error deteriorates sufficiently, the modulation format may be estimated incorrectly and incorrect measurement values are displayed.***

A.1.3 Frequency Characteristics Correction Function

CH Estimation (Preamble)

This function estimates the frequency characteristics (gain and phase) by using the preamble of a standard signal. Because the preamble signal is predetermined by the standard, the correction values of the phase and amplitude can be determined for each subcarrier in the preamble so that the amplitude error and phase error are minimized.
After data is corrected by using this correction value, Constellation Error is calculated.

CH Estimation (Pilot)

The correction values are calculated by using the pilot subcarrier so that the magnitude error and the phase error are minimized.
The characteristics of a frequency where the pilot subcarrier does not exist are interpolated by using the linear interpolation.

Equalizer

Equalizer is a function which corrects frequency characteristics by using data that is complementary to the error which is displayed in Constellation Error Spectrum.
The correction data is created when the **[Make]** button of Equalizer Data is pressed.
The difference between Equalizer and CH Estimation is that Equalizer creates correction data only when the **[Make]** button of Equalizer is pressed and the data is held until the **[Make]** button is re-pressed whereas CH Estimation automatically estimates frequency characteristics every time a frame is analyzed.
Equalizer is suitable when Constellation Errors, which are measured before and after the amplifier or filter is inserted, are compared.

Use Equalizer according to the following procedures: (Refer to measurement examples in Chapter 4.)

1. Connect the signal source such as SG directly to the measurement instrument and measure Constellation Error.
   Select CH Estimation(Preamble) from the **[Correction Type]** menu in the **[Meas Parameters Setup]** dialog box.

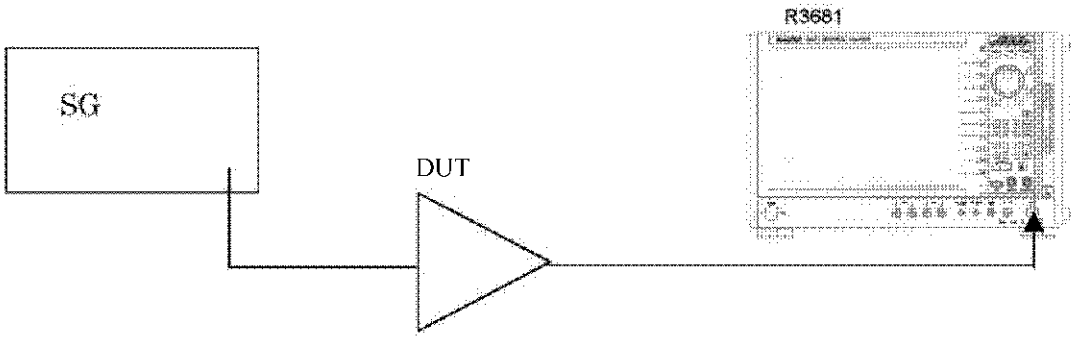
NOTE: ***Equalizer does not correct a signal source distortion, IQ signal unbalance, and quadrature modulator error.***
If the signal includes Constellation Error deterioration because of these causes, Constellation Error cannot be improved even by using Equalizer.

2. Press the **[Make]** button of **[Equalizer Data]** in the **[Meas Parameters Setup]** dialog box. The correction data is calculated.

3. Select Equalizer from the menu of **[Correction Type]** in the **[Meas Parameter Setup]** dialog box.

4. Measure Constellation Error again.
   Constellation Error that was corrected by Equalizer is displayed.

5. Connect the DUT to the signal source and measurement instrument, and measure Constellation Error.
   The Constellation Error that was deteriorated by the DUT is displayed.



Some measurement results can be improved by using CH Estimation(Preamble), CH Estimation(Pilot), or Equalizer in which the frequency characteristics are corrected.
The following table shows whether each measurement result can be improved.

Table A-1 Frequency Characteristics Correction by using Equalizer (1 of 2)

Measurement result	○ : Can be improved × : Cannot be improved
Total Result -> Cnst Error	○
Total Result -> Mag Error	○
Total Result -> Phase Error	○
Total Result -> Tau	×
Total Result -> Freq Error	×
Total Result -> Power	×
Total Result -> Flatness	×
Total Result -> Leak-Power	×
Total Result -> Lk-SubCarAvg	×
Constellation Error Time	○
Constellation Error Spectrum	○
Mag Error Time	○
Mag Error Spectrum	○
Phase Error Time	○
Phase Error Spectrum	○
Mag Flatness Time	○
Mag Flatness Spectrum	○
Power Time	×
Power Spectrum	×

Table A-1 Frequency Characteristics Correction by using Equalizer (2 of 2)

Measurement result	○ : Can be improved × : Cannot be improved
Constellation	○
Center Freq Error Time	×
Demodulated Data	○
Group Delay Spectrum	×
Spectrogram	×

A.1.4 Pilot Synchronization Function

Pilot Track (Amplitude)

The amplitude is estimated, corrected, and analyzed for each symbol by using the pilot subcarrier.
This function is effective when the amplitude fluctuates over time.

Pilot Track (Phase)

This function performs the symbol synchronization, initial phase estimation, and analysis for each symbol by using the pilot subcarrier. This function is effective when the carrier frequency fluctuates or the FFT sampling frequency fluctuates.
(If Pilot Track is set to OFF, the amplitude, symbol synchronization, and initial phase are not estimated for each symbol after they are estimated by using the preamble.)

A.2 A/D Data Save Function

This function is used to save A/D conversion data of a signal under test obtained by A/D Capture in a text format file. Ideal A/D data can be obtained after correction of this instrument's internal frequency characteristics.

The sampling frequency is fixed at 20 MHz and the time length of data is fixed at 10 ms.

The magnitudes of I signals and Q signals are written into one file in chronological order. The following shows the format:

I[0], Q[0]

I[1], Q[1]

I[2], Q[2]

.

.

.

I[n-1], Q[n-1]

A.3 Measurement Data Save Function

This function is used to save numeric data used in tables of measurement results and to plot graphs in a CSV format file.

Only data displayed in the active window is saved. To save all displayed data of the 4 measurement result windows, switch each to active and save the results in turn.

In the beginning of the file, the measurement parameters set by the user interface are written. The measurement result data is written following this portion.

A.3.1 Measurement Result Save Format

- Spectrum system display (Constellation Error Spectrum, etc.)

  Measurement result data of Constellation Error Spectrum, Magnitude Error Spectrum, Phase Error Spectrum, Magnitude Flatness Spectrum, and Power Spectrum are saved in the following format:

  ***** Results *****

  Measurement result name

  Specified Symbol Number (This line is deleted when no choice has been made.)

  Title line

  Subcarrier number, RMS/AVG value, Specified Symbol measurement value, ALL values (for the number of symbols)

  Data is saved in order of subcarrier number.

  Whether or not to display RMS/AVG, Specified Symbol, and ALL can be selected, so only those items selected to display are saved in the file.

  For the All value, data in the analyzed symbol range is saved in the horizontal-axis direction in order of symbol number.

  Example of Power Spectrum

  ***** Results *****

  <<< Power [Spectrum] >>>

  Specified Symbol,3

  Subcar,AVG[dBm],Spec Sym[dBm],Symbol[3],Symbol[4],Symbol[5] ...

  -512,-59.73,-54.42,-54.42,-64.55,-67.02...

  -511,-58.82,-61.91,-61.91,-70.91,-72.32...

  -510,-59.58,-53.31,-53.31,-80.55,-58.05...

  :

  :

- Group delay display

  Measurement result data of Group Delay is saved in the following format:

  ***** Results *****
  Measurement result name
  Title line
  Subcarrier number, Group Delay value

  Data is saved in order of subcarrier number.

  Example of Group Delay
  ***** Results *****
  <<< Group Delay Spectrum>>>
  Subcar,GD[s]
  -512,********
  -511,********
  -510,********
  :
  :

- Time system display (excluding Freq Error)

  Measurement result data of Constellation Error Time, Magnitude Error Time, Phase Error Time, Magnitude Flatness Time, and Power Time are saved in the following format:

  ***** Results *****
  Measurement result name
  Specified Subcarrier Number (This line is deleted when no choice has been made.)
  Title line
  Symbol number, RMS/AVG value, Specified Subcar measurement value, ALL values (for the number of carriers)

  Data is saved in order of symbol number.
  Data in the analyzed symbol range is saved.
  Whether or not to display RMS/AVG, Specified Subcarrier, and ALL can be selected, so only those items selected to display are saved in the file.

Example of Power Time
***** Results *****
<<< Power [Time] >>>
Specified Subcarrier,27
Symbol,AVG[dBm],Spec Sub[dBm],Subcar[-512],Subcar[-511],Subcar[-510] ...
3,-26.13,-52.18,-54.41,-61.97,-53.33 ...
4,-26.32,-59.69,-64.55,-70.94,-80.57 ...
5,-25.48,-56.15,-67.02,-72.39,-58.04 ...
:
:

- Center Freq Error Time
  Measurement result data of Center Freq Error Time is saved in the following format:

  ***** Results *****
  <<< Center Freq Error Time >>>
  Title line
  Symbol number, waveform data

  Data is saved in order of symbol number.
  Data in the analyzed symbol range is saved.

  Example of Center Freq Error Time
  ***** Results *****
  <<< Center Frequency Time >>>
  Symbol,AVG[Hz],Center Freq Error[Hz]
  3,-7589,-10556
  4,-7589,-2870
  5,-7589,-9352
  :
  :

- Constellation
  Measurement result data of Constellation is saved in the following format:

  ***** Results *****
  <<< Constellation >>>
  Specified Symbol = n or Specified Subcarrier = m or ALL
  Title line
  Symbol number, subcarrier number, I signal, Q signal

  Data is saved in order of symbol number, and within the same symbol number, in order of subcarrier number.

Data in the analyzed symbol range is saved.

Example of Constellation

***** Results *****
<<< Constellation >>>
ALL
Symbol,Subcar,I,Q
3,-512,********,********
3,-511,********,********
3,-510,********,********
:
:
3,-435,********,********
3,-434,********,********
3,-433,********,********
3,-432,-0.95818,-0.84726
3,-431,-0.94491,+0.92378
3,-430,-0.25531,-0.94444
:
:

- Demodulated Data

  Measurement result data of Demodulated Data is saved in the following format:

  ***** Results *****
  <<< Demodulated Data >>>
  Title line
  Symbol number, subcarrier number, demodulated data, modulation format

  Data is saved in order of symbol number, and within the same symbol number, in order of subcarrier number.
  Data in the analyzed symbol range is saved.
  Where there is no subcarrier, demodulated data cannot be acquired, so *** is displayed.

Example of Demodulated Data

***** Results *****
<<< Demodulated Data >>>
Symbol,Subcar,Data,Mod
3,-512,***,***
3,-511,***,***
3,-510,***,***
:
:
3,-435,***,***
3,-434,***,***
3,-433,***,***
3,-432,0x00,16QAM
3,-431,0x01,PILOT
3,-430,0x04,16QAM
3,-429,0x09,16QAM
3,-428,0x04,16QAM
3,-427,0x02,16QAM
3,-426,0x09,16QAM
:
:

- Spectrogram

  Measurement result data of Spectrogram is saved in the following format:

  ***** Results *****
  <<< Spectrogram >>>
  Subcarrier number, ALL values (for the number of symbols)

  Data is saved in the order of subcarrier number along the vertical axis, and in order of symbol number along the horizontal axis.
  Data in the analyzed symbol range is saved.

  Example of Spectrogram

  ***** Results *****
  <<< Spectrogram >>>
  Subcar,Symbol[3],Symbol[4],Symbol[5] ...
  -512,-54.42,-61.91,-53.36 ...
  -511,-26.08,-26.12,-26.05 ...
  -510,-23.26,-32.61,-23.16 ...
  :
  :

- Measurement Window

  Measurement result data of Measurement Window is saved in the following format:

  ***** Results *****
  Time of waveform data start position
  Time of waveform data end position
  Time resolution of waveform data
  <<< Measurement Window >>>
  Sample number, waveform data, symbol number, symbol type

  Sample numbers are obtained by counting from the beginning of waveform data in chronological order.
  In the sample number line at the symbol start position, symbol number and symbol type are written.
  In other than the symbol start position, the symbol number and symbol type are displayed as *****.

  Example of Measurement Window
  ***** Results *****
  Start Time[ms],2.13800
  Stop Time[ms],2.51500
  Time Resolution[ms],0.00001
  <<< Measurement Window >>>
  No.,Power[dBm],Symbol No.,Symbol Type
  0,-58.10,********,********
  1,-55.29,********,********
  2,-53.63,********,********
  :
  :
  688,-55.55,********,********
  689,-62.75,********,********
  690,-62.14,0,PREAMBLE
  691,-55.10,********,********
  692,-54.12,********,********
  :
  :

A.4 Error Message List

This section describes the error messages displayed on this instrument.

In explanation, the following items are explained:

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

Table A-2 Error Message List (1 of 2)

Error number	Displayed message	Cause of generation and cancellation method
-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 unnecessary files.
-1253	File read/write error.	An error was generated during file I/O. Check if disk space remains or write-protection is applied.
-1300	Device is not ready.	A disk is not 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 out of the permitted range. Check the reference level or input signal level.
-3211	Auto Level Set cannot be succeed. Signal level is not stable.	Auto Level Set was not completed. Check to see if the input signal level is not constant or the attenuator is set to manual.
-3220	Cannot find out signal. Input level may be too low.	In Multi Frame Mode, a frame is not detected from within A/D data, or in Single Frame Mode a frame is not detected at the frame selection cursor position.
-3221	Analysis has stopped. A/D data is not captured.	In Single Frame Mode, Analysis Restart was executed before A/D capture was complete. Execute Analysis Restart after A/D capture is complete.
-3222	Cannot find Preamble. Standard may be mismatched.	A preamble was not detected at the beginning of a frame.
-3226	Not available while A/D capturing.	The requested operation cannot be accepted during A/D capture.
-3227	Not available while analyzing.	The requested operation cannot be accepted during measurement (or analysis).
-3228	Not available in I/Q input mode.	The requested operation cannot be accepted during baseband I/Q input.

Table A-2 Error Message List (2 of 2)

Error number	Displayed message	Cause of generation and cancellation method
-3230	Analysis has stopped. Equalizer data is not calculated.	The analysis is executed by setting the Equalizer to ON when the Equalizer data does not exist. Execute the analysis after calculating the Equalizer data.
-3231	Analysis has stopped. Press "Make" button again.	The analysis is executed by using the invalid Equalizer data. Execute the analysis after re-calculating the Equalizer data.
-3232	Cannot calculate equalizer data.	Equalizer data cannot be calculated. Check whether the OFDM analysis was completed correctly.
-3233	Cannot find Ramp Down. Frame length may be too long.	The falling edge of the frame cannot be detected. Check whether the whole frame is in the range of the A/D Capture Length.

ALPHABETICAL INDEX

[Symbol]

[A]

[B]

[C]

[D]

[E]

[F]

[G]

[H]

[I]

[L]

[M]

[O]

[P]

[Q]

[R]

[S]

[T]

[U]

[W]

[X]

[Y]

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