CombiView

MX880053A
FM/Audio Application Applet
Operation Manual

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P/N: M-W3659AE
Revision: 8.0
Created: January 2022

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

These indicate that the marked part should be recycled.

MX880053A
FM/Audio Application Applet
Operation Manual

18 December 2012 (First Edition)
21 January 2022 (Eighth Edition)

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Revision History:

February 29th, 2020
December 17th, 2021

Protection Against Computer Virus Infections

Prior to the software installation

Before installing this software or any other software recommended or approved by Anritsu, run a virus scan on your computer, including removable media (e.g. USB flash drive and CF memory card) you want to connect to your computer.

When using this software and connecting with the measuring instrument

- Copying files and data

  On your computer, do not save any copies other than the following:
  - Files and data provided by Anritsu
  - Files created by this software
  - Files specified in this document

  Before copying these files and/or data, run a virus scan, including removable media (e.g. USB flash drive and CF memory card).
- Connecting to network

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- Simultaneously running any software other than that recommended or approved by Anritsu
- Closing the lid (Laptop computer)
- Turning on the screen saver function
- Turning on the battery-power saving function (Laptop computer)

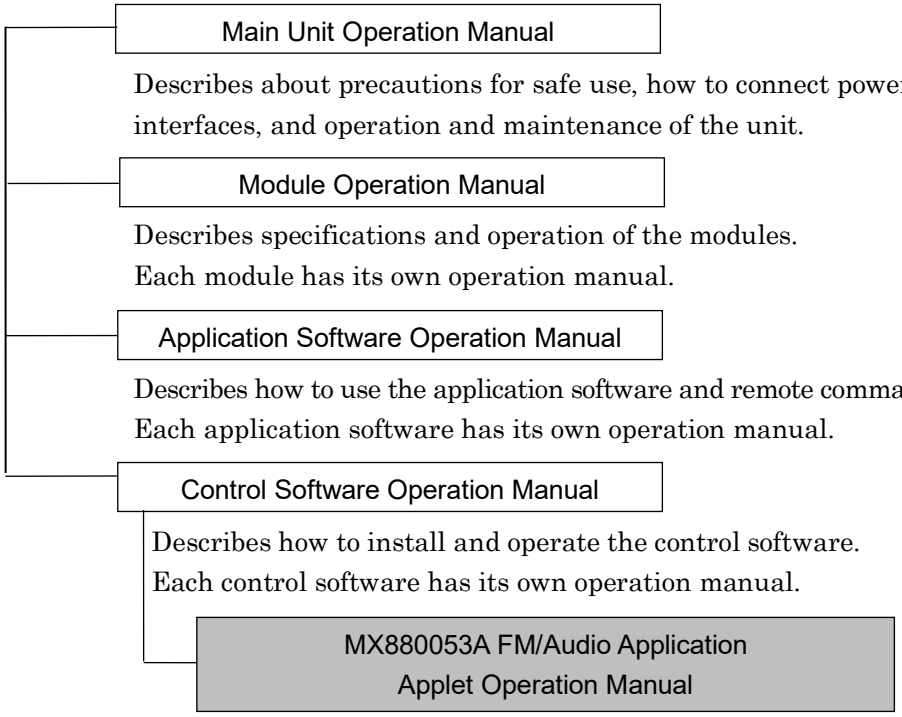
For how to turn off the functions, refer to the operation manual that came with your computer.

About This Manual

This manual mainly describes the operation of the MX880053A FM/Audio Application Applet.
Products relevant to the MT8870A Universal Wireless Test Set include:

- MT8870A Universal Wireless Test Set (main unit)
- Modules installed in the MT8870A
- Application software installed in the MT8870A
- Control software installed in a PC to control the MT8870A remotely

These products are referred to as the "Universal Wireless Test Set Series". The operation manuals of the Universal Wireless Test Set Series consist of separate documents for the main unit, module(s), application software, and control software as shown below. ▭ indicates this manual.



Convention Used in This Manual

Except where there is a good reason to do otherwise, this manual assumes the use of MT8870A and MU887000A.
Note that the descriptions in this manual also apply to MT8872A, MU887001A, or MU887002A.
MU887000A/01A means the MU887000A or MU887001A.
Additionally, the Anritsu management code of the options described in this manual is "0" unless there is a reason.

The option number: The option number is indicated by three digits.

MU88700XA- x x x

- Number indicating function
- Anritsu management code

Contents

About This Manual I

Chapter 1 Overview 1-1

1.1 CombiView Introduction 1-1
1.2 Composition 1-6

Chapter 2 Before Use 2-1

2.1 Operating Environment 2-1
2.2 Connecting to MT8870A 2-4
2.3 Installing and Uninstalling MX880053A 2-5
2.4 Starting and Stopping CombiView 2-6
2.5 Names of CombiView Screens Elements 2-9

Chapter 3 Operation 3-1

3.1 Basic Operations 3-1
3.2 Common Settings 3-10
3.3 FM Transmitter Measurement 3-12
3.4 FM Receiver Measurement 3-22
3.5 Audio Signal Measurement 3-28
3.6 Audio Signal Transmission 3-35

Chapter 1 — Overview

1.1 CombiView Introduction

CombiView is PC application software for the external Control PC used to control the MT8870A Universal Wireless Test Set (hereafter MT8870A).

CombiView allows the user to configure measurements and display results.

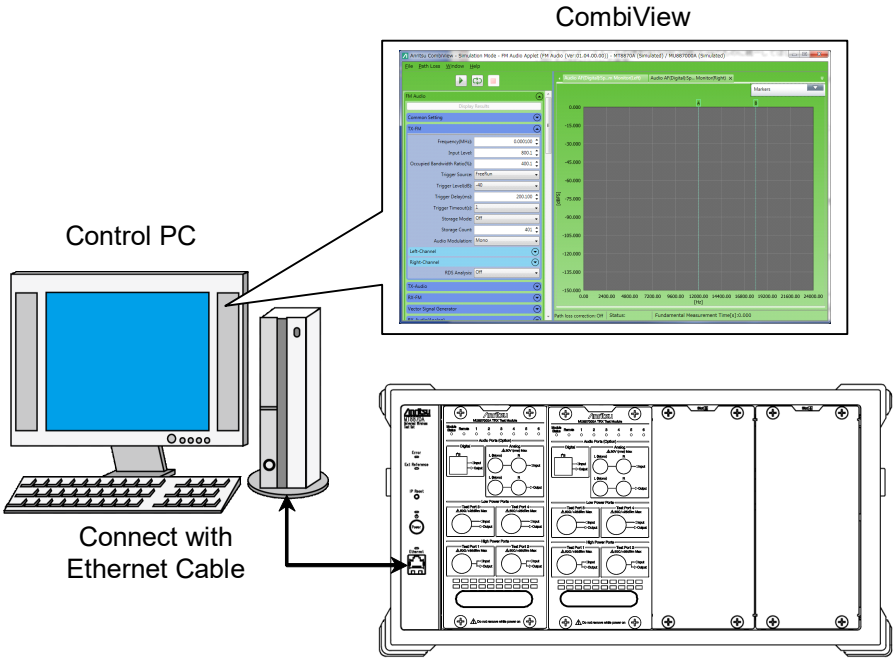


Figure 1.1-1 Ethernet Connection between Control PC and MT8870A

The CombiView application:

- Supports measurement using the MT8870A without creating remote control programs.
- Automatically detects application software registered in the MT8870A.
- Runs in the Windows 7 and Windows 10 OS environments.
- Supports remote control over Ethernet (IPv4) and GPIB.
- Supports multiple measurement standards with additional Applets.

CombiView supports the following Applets.

Table 1.1-1 CombiView Applets

Model/Code	Product Name
MX880051A	Cellular Application Applet
MX880052A	SRW Application Applet
MX880053A	FM/Audio Application Applet
MX880054A	Signal Generator Application Applet
MX880055A	Small Cell Application Applet
MX880056A	IEEE802.15.4 Application Applet
MX880057A	Z-Wave Application Applet

Note: MU887002A does not support MX880053A.

The MX880053A FM/Audio Application Applet (hereafter MX880053A) adds application measurement functions to CombiView.

The CombiView applets and the optional applications that each applet supports are shown in the figure below. This manual provides information on the area enclosed by the dotted line.

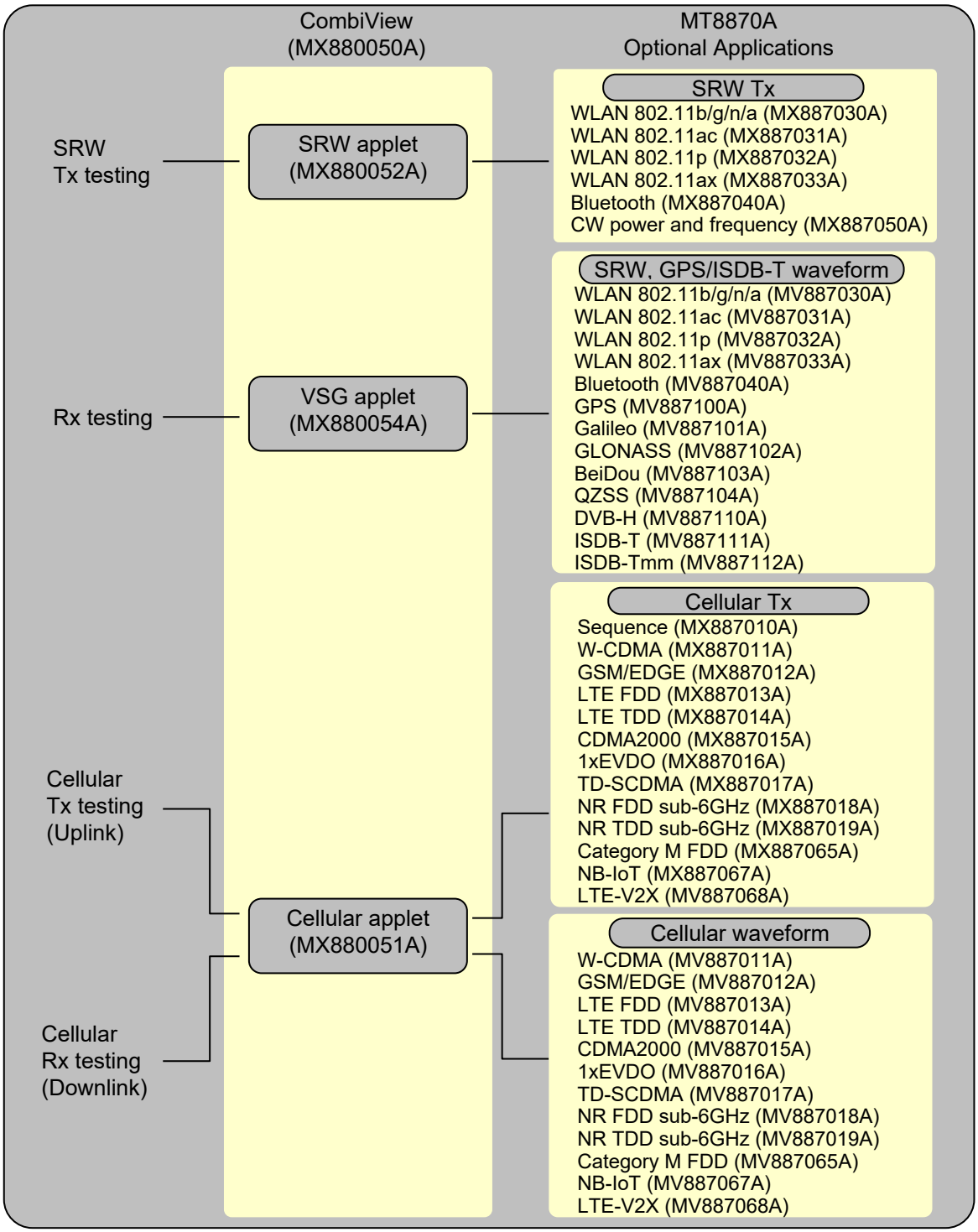


Figure 1.1-2 CombiView Applets and Associated MT8870A Applications Options (1/2)

Note: MU887002A does not support MV887112A.

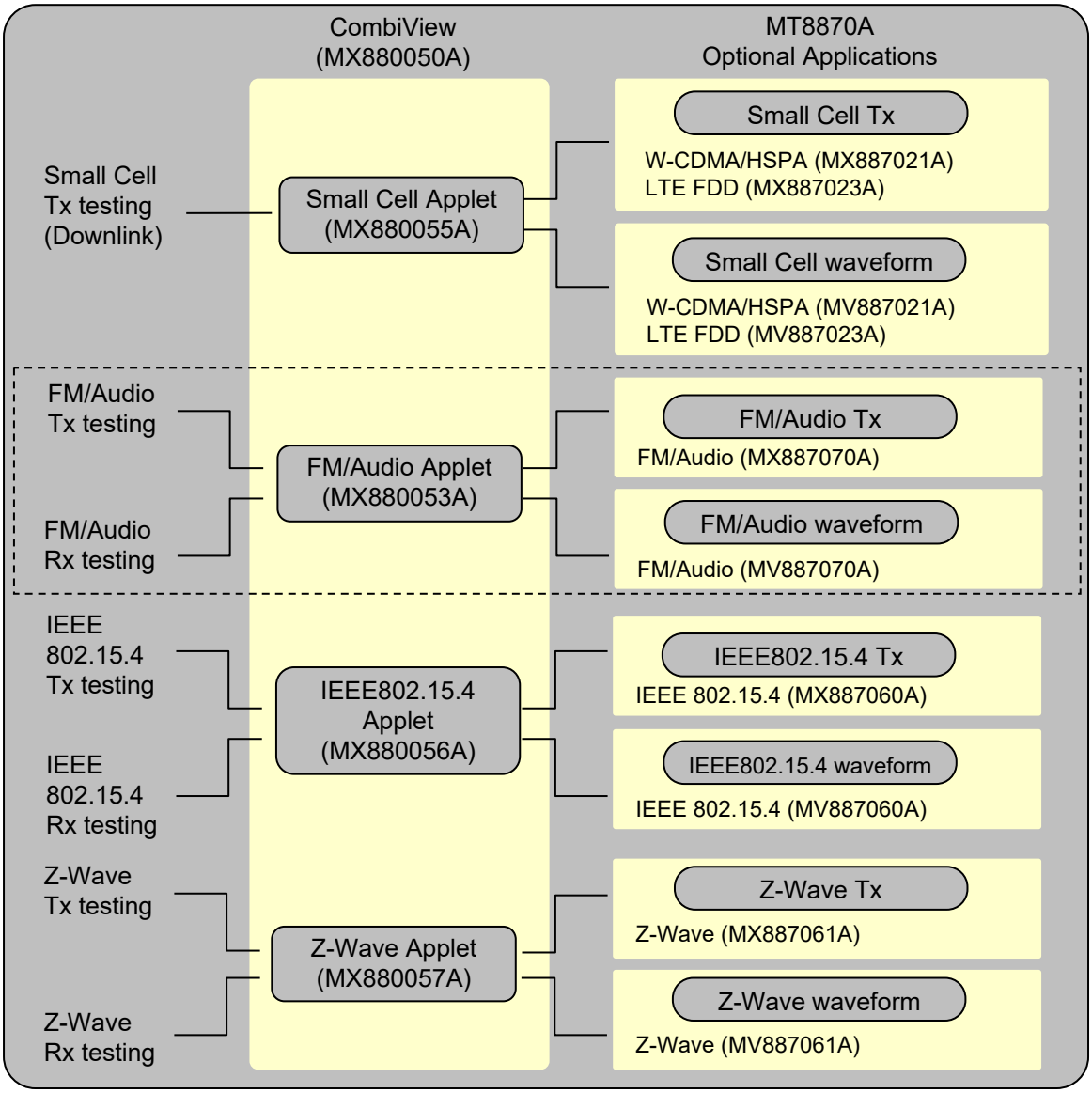


Figure 1.1-3 CombiView Applets and Associated MT8870A Applications Options (2/2)

Note: MU887002A does not support MX880053A, MX887070A, and MV887070A.

At least one of following application software licenses must be registered in the MT8870A to control it using the MX880053A. Additionally, the MU887000A-002 Audio Measurement Hardware is required to measure and transmit audio signals.

Table 1.1-2 Application Software Licenses Required by MT8870A

Model/Code	Product Name
MX887070A	FM/Audio TRX Measurement

An example of the MX880053A screen is shown below. A parameter setting dialog box is displayed when a setting item in the left frame is clicked. The measurement results are displayed in the right frame.

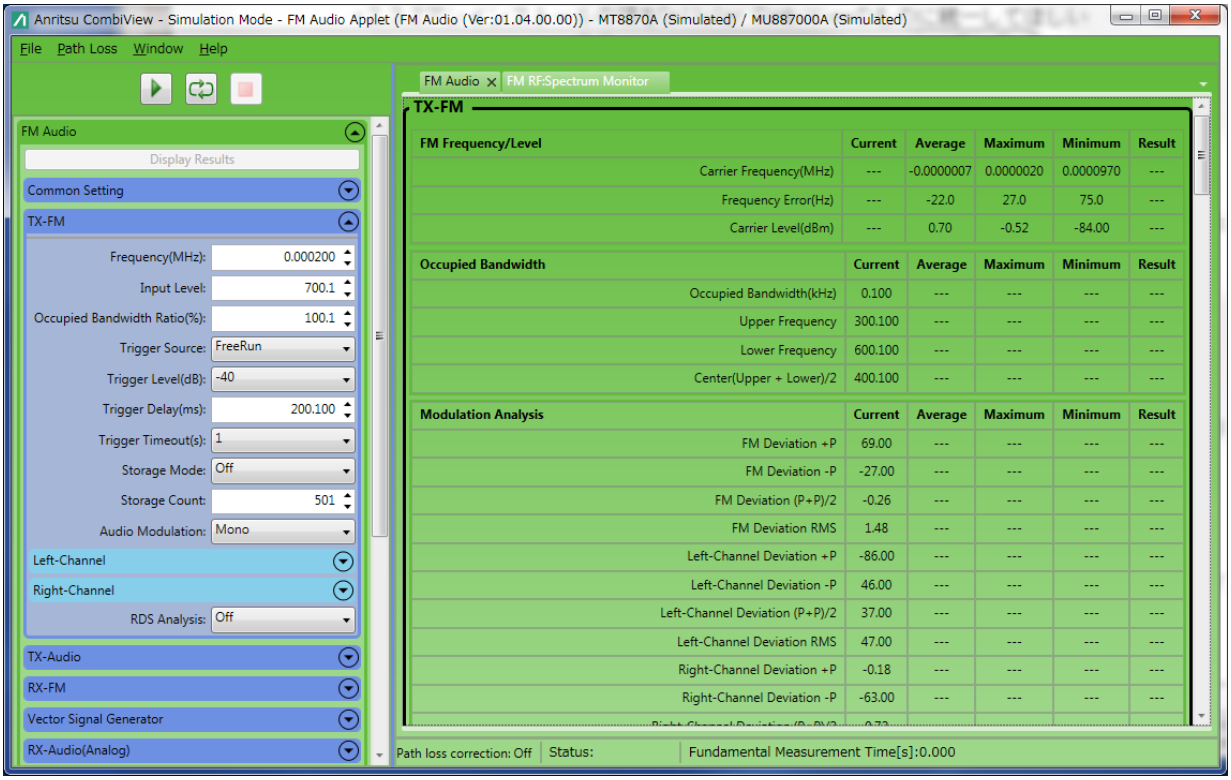


Figure 1.1-4 MX880053A Screen

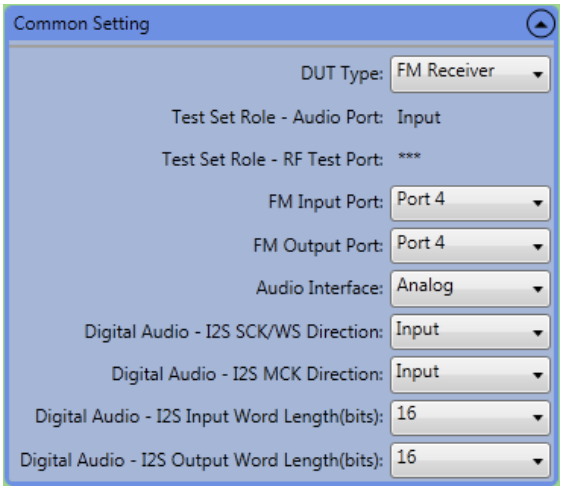


Figure 1.1-5 Parameter Setting Screen

1.2 Composition

The MX880053A composition is listed in the following table.

The electronic files are stored in one or more storage media (DVD, etc.)

Table 1.2-1 Composition

Model/Code	Product Name	Remarks
MX880053A	FM/Audio Application Applet	—
W3659AE	MX880053A FM/Audio Application Applet Operation Manual	English

Chapter 2 — Before Use

This chapter explains how to start the MX880053A.

Note: MU887002A does not support MX880053A.

2.1 Operating Environment

This section describes the MX880053A operating environment.

Table 2.1-1 Operating Environment

Item	Specification
OS	Windows 7 Service Pack 1, Japanese/English Windows 10 Japanese/English
Display	Resolution: 1024 × 768 or better
Memory	Capacity: ≥1 GB
Hard disk free space	≥200 MB *1
VISA	NI-VISA*2
.NET Framework	.NET Framework 4.0 (Full set version) or .NET Framework 4.5

*1: This is the free space required by the CombiView software. More free space is required to install VISA and .NET Framework.
*2: For version compatibility among OS, .NET Framework, and NI-VISA, refer to Table 2.1-3.

Table 2.1-2 Void

Table 2.1-3 Compatibility Table of .NET Framework and NI-VISA

NET Framework	NI-VISA 5.0.3 to 5.2	NI-VISA 5.3 or later
.NET Framework 4.0	✓	✓
.NET Framework 4.5	–	✓

✓: Compatible –: Incompatible

Table 2.1-4 NI-VISA Version

CombiView Package Version	NI-VISA Version
Ver 01.06.01 or older	Version 5.03 to Version 5.4
Ver 01.07.00 or later	Version 5.03 to Version 5.4.1, and Version 14.0 or later

For package version compatibility with CombiView and cellular applet, refer to Table 2.1-5. They may not function properly in combinations that are not shown in the table.

Table 2.1-5 Package Version Compatibility

Package	CombiView	FM/Audio Applet
Ver 01.02.08	1.2.4702.26073	1.2.8.0
Ver 01.03.04	1.2.4821.28484	1.3.1.0
Ver 01.04.15	1.4.1.0	1.3.1.0
Ver 01.04.16	1.4.3.0	1.3.1.0
Ver 01.06.01	1.4.3.0	1.3.1.0
Ver 01.07.00	1.6.2.0	1.4.0.0
Ver 01.07.09	1.6.10.0	1.4.1.0
Ver 02.00.03	2.0.3.0	2.0.3.0
Ver 02.00.04	2.0.3.0	2.0.4.0
Ver 02.00.05	2.0.5.0	2.0.4.1
Ver 02.00.07	2.0.6.3	2.0.4.1

For package versions compatible with a module to be used, refer to Table 2.1-6.

Table 2.1-6 Version Compatibility

Module	Package
MU887000A	All version
MU887001A	Ver 01.04.16 or later

To use the package of Ver 01.06.01 or earlier, select [.NET Framework 4.0 Languages Support] at NI-VISA installation.

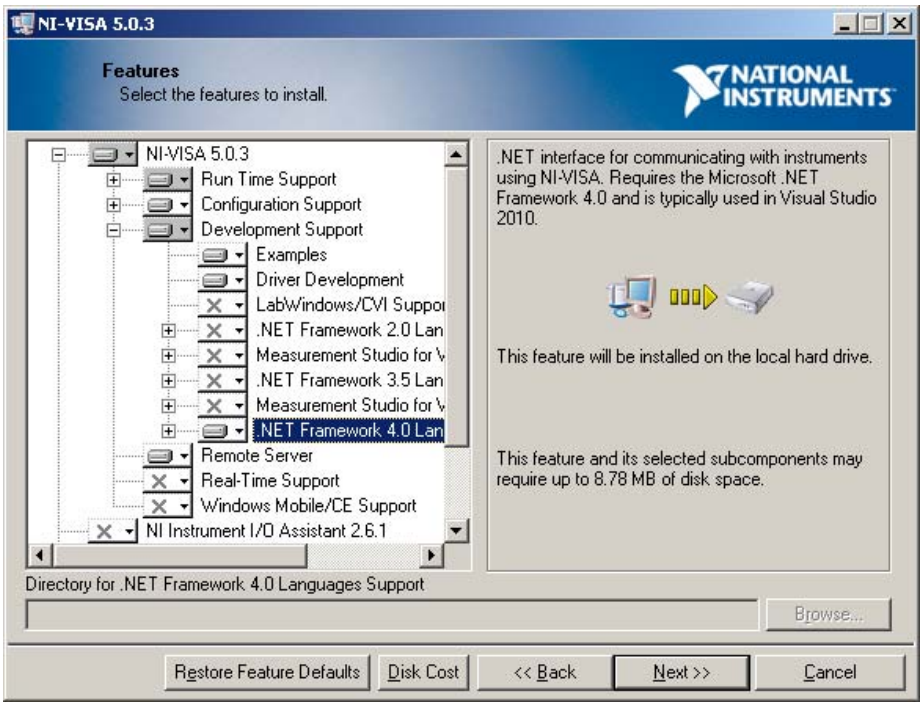


Figure 2.1-1 Selecting .NET Framework4.0 Languages Support

2.2 Connecting to MT8870A

Connect the Control PC having CombiView installed on it to the MT8870A. Refer to section 2.5 Connecting Cables in the MT8870A Universal Wireless Test Set Operation Manual.

CombiView detects connected instruments automatically. It is not necessary to set the IP address or GPIB address of connected instruments.

2.2.1 Connecting Ethernet cable

Use an Ethernet cable that is category-5 or better and straight-through.

1. Connect the Ethernet cable to the Control PC.
2. Connect the other end of the Ethernet cable to the Ethernet connector on the front or rear panel of MT8870A.

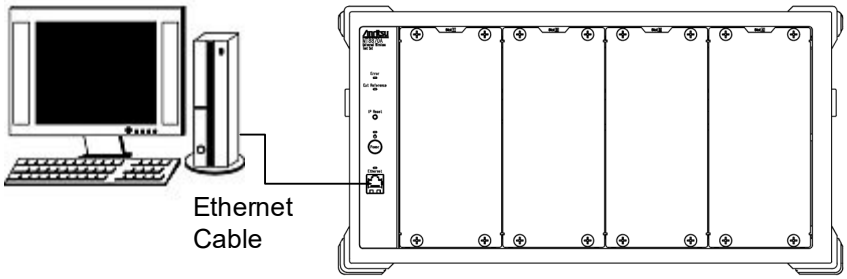


Figure 2.2.1-1 Connecting to Front Ethernet Connector

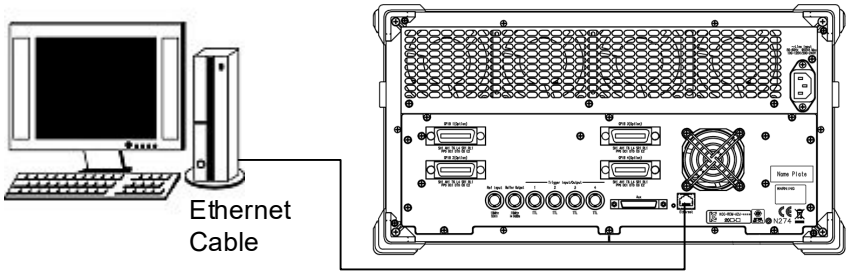


Figure 2.2.1-2 Connecting to Rear Ethernet Connector

2.2.2 Connecting GPIB cables

MT8870A-001 is required to control the MT8870A using GPIB. Connectors 1 to 4 correspond to slots 1 to 4. A GPIB interface must also be added to the Control PC. The operation of CombiView over the National Instruments GPIB interface has been verified by Anritsu.

1. Connect a GPIB cable to the GPIB interface added to the Control PC.
2. Connect the other end of the GPIB cable to the GPIB connector on the MT8870A rear panel.

2.3 Installing and Uninstalling MX880053A

2.3.1 Installing

To install the MX880053A, run the installation file on the storage media as follows:

1. Open the /Installer/CombiView folder on the storage media.
2. Double-click **CombiViewSetup.msi.**
3. Follow the instructions displayed by the installation dialog.
4. Double-click **CombiView.MT8870x.FMAudio.Installer.msi.**
5. Follow the instructions displayed by the installation dialog.

2.3.2 Uninstalling

1. At the Windows Control Panel, click **Programs and Features**,
   and then double-click **MX880053A CombiView FMAudio Applet** in the list of **Uninstall or change program**.
2. When you are asked if you really want to uninstall the MX880053A, click **Yes** to uninstall it.
3. Similarly as step2, uninstall Anritsu CombiView.

2.4 Starting and Stopping CombiView

Starting CombiView

When using Windows 7: Start CombiView at the Control PC by clicking **Start** > **All Programs** > **Anritsu** > **CombiView**.

When using Windows 10: Start CombiView at the Control PC by clicking **Start** > A column of the app list > **Anritsu** > **CombiView**.

When CombiView is launched, the **Instrument Connection Options** dialog box is displayed.

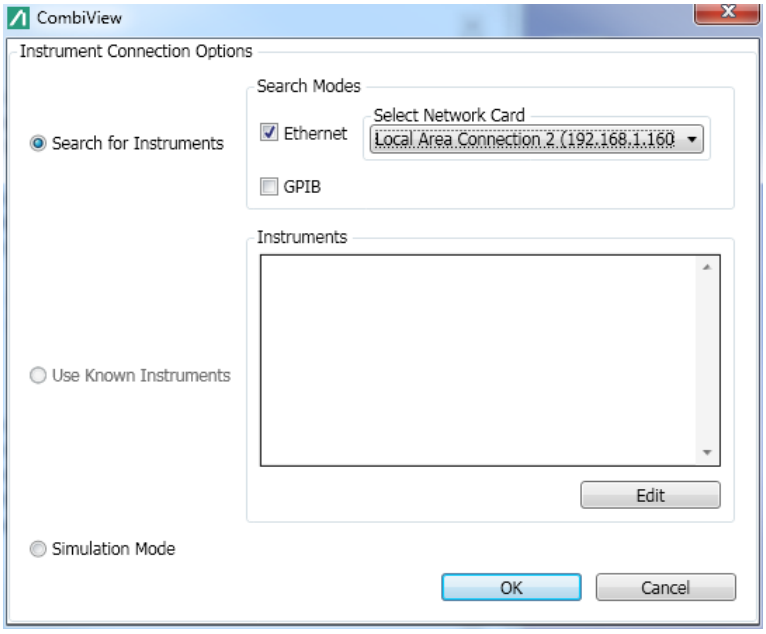


Figure 2.4-1 Instrument Connection Options Dialog Box

In the selected search mode, CombiView searches for MT8870As in the network.

Table 2.4-1 Search Mode for MT8870As

Name	Description
Search for Instruments	Searches for all MT8870As existing in the selected network.
Use Known Instruments	Searches for MT8870As to which the modules with IP addresses specified are installed.
Simulation Mode	Places CombiView offline (the state where there is no communication with connected instruments) without searching for MT8870As.

To edit the IP addresses of known MT8870As, click **Use Known Instruments**, and then click **Edit**.

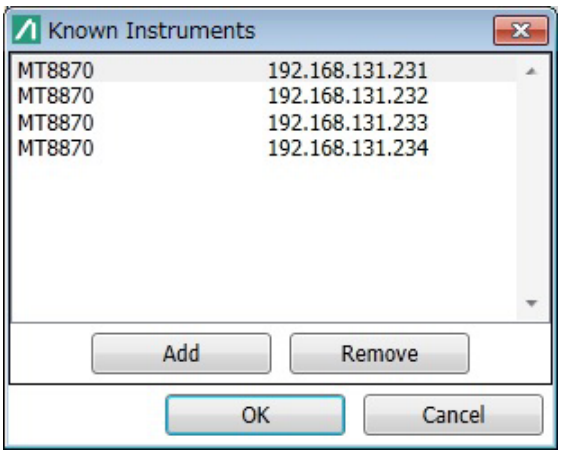


Figure 2.4-2 Known Instruments Dialog Box

To add a known MT8870A, click **Add**, and then enter its IP address. To delete an MT8870A from the list, select it, and then click **Remove**.

Note:	Multiple instances of CombiView cannot be started simultaneously. The following message is displayed if CombiView is already running.

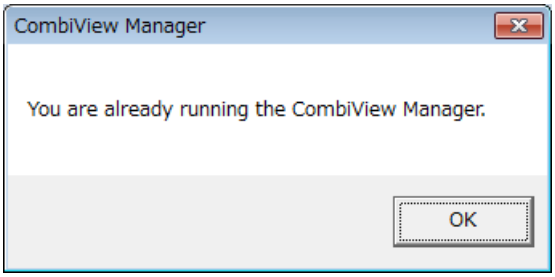


Figure 2.4-3 Message when CombiView is running

Stopping CombiView

Click the **Close** button at the top right corner of the window.

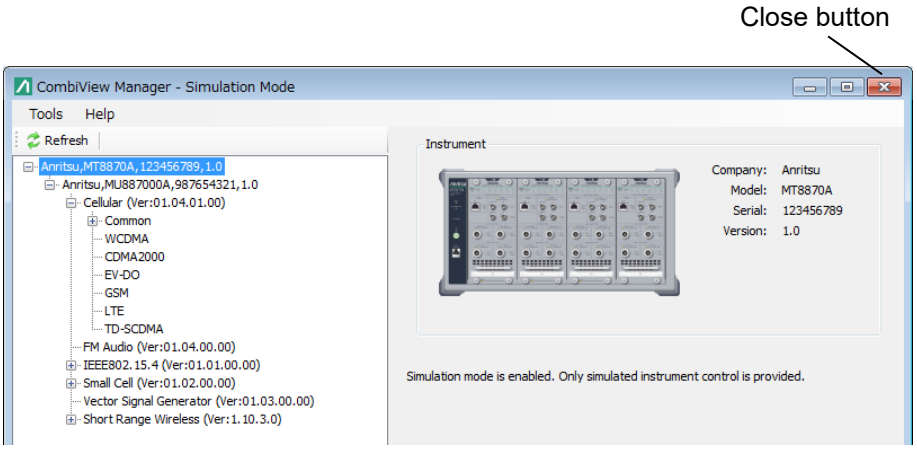


Figure 2.4-4 Close Button

Note:	When the MX880053A stops, the MT8870A remote command language is the SCPI mode. To change to the Native language mode, send the `:SYST:LANG NAV` command.

2.5 Names of CombiView Screens Elements

This section names each part of the CombiView screens.

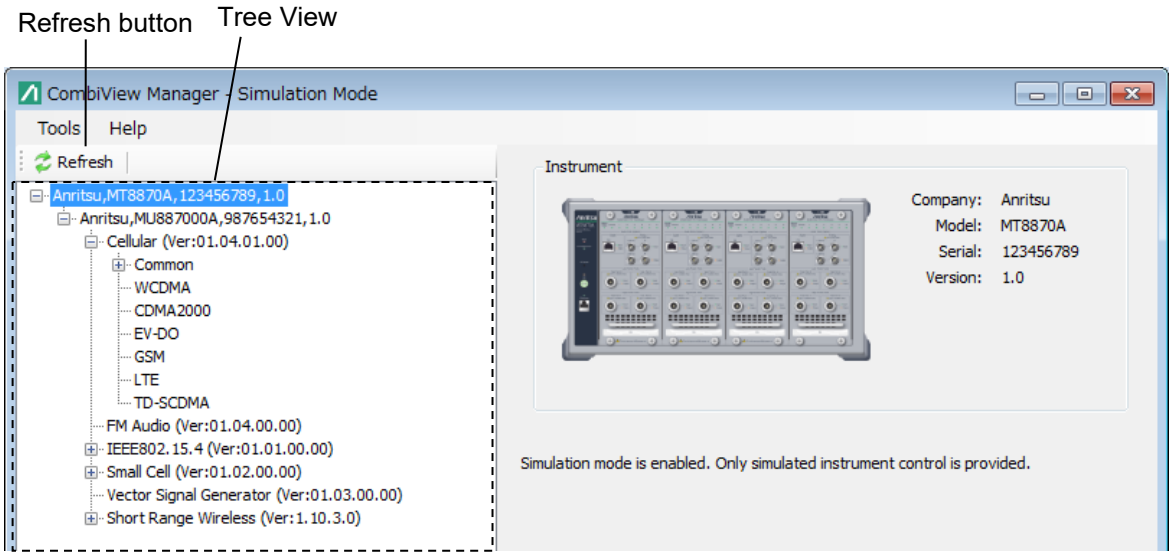


Figure 2.5-1 CombiView Manager Screen

Table 2.5-1 Menu of CombiView Manager Screen

Name	Description
Tools	
Update Connection Options	Opens the **Instrument Connection Options** dialog box to search for MT8870As again in the network.
MT8870A-Utility tool	Starts the MX887900A Utility Tool
Help	
About	Displays information about hardware and applets

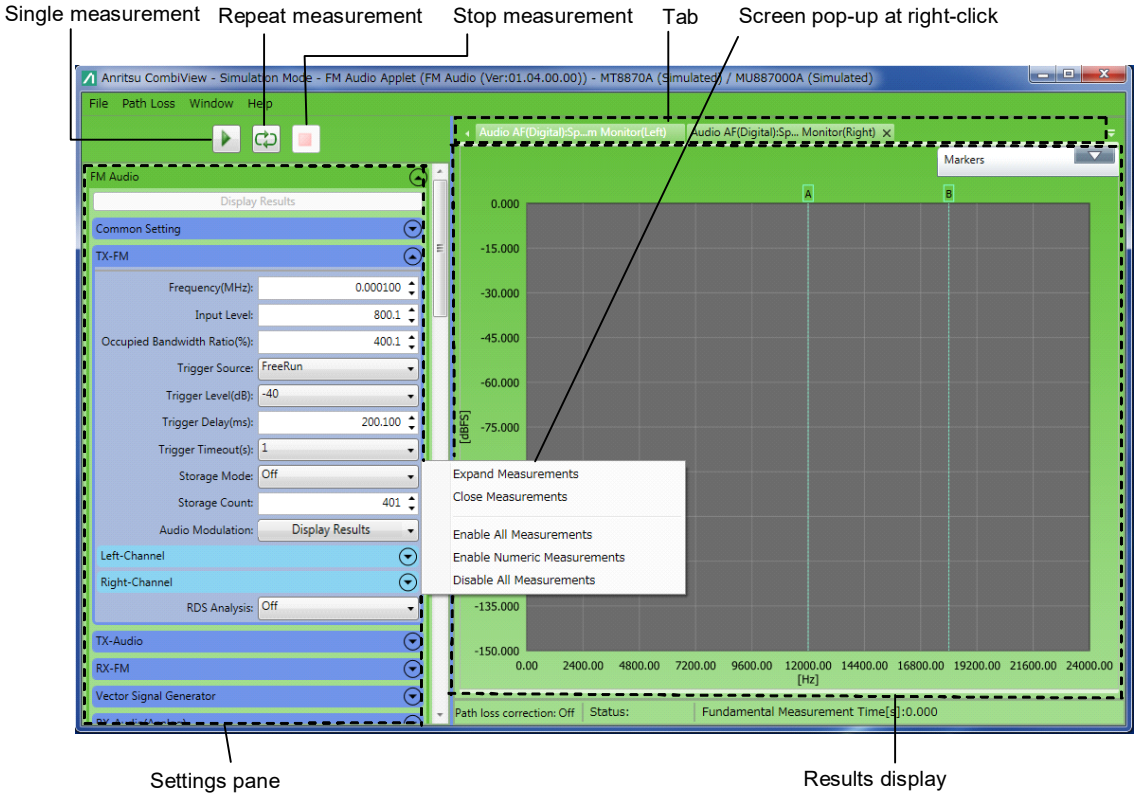


Figure 2.5-2 CombiView Screen

The width of the Settings pane can be adjusted by dragging the vertical bar that separates the Settings pane from the results display area.

Table 2.5-2 Menus of CombiView Screen

Name	Description
File	
Load Settings	Load the settings pane information from a file.
Save Settings	Save the settings pane information to a file.
Save Settings as…	Save the settings pane information to a file specifying the name.
Exit	Closes the CombiView screen
Path Loss	
Configure Correction…	Sets a correction value for power loss of each port.
Apply Correction	Applies the parameter value set by Configure Correction...
Window	
Tile Horizontal	Arranges multiple result tabs in a vertical stack.
Tile Vertical	Arranges multiple result tabs side by side.
Reset Window Layout	Releases the result tab display in order.
Help	
About	Displays information about MX880053A

Click **Configure Correction** to display the window below. This window allows setting a power loss value from cable, etc. Adding lines to the table enables settings for multiple measurement frequencies.

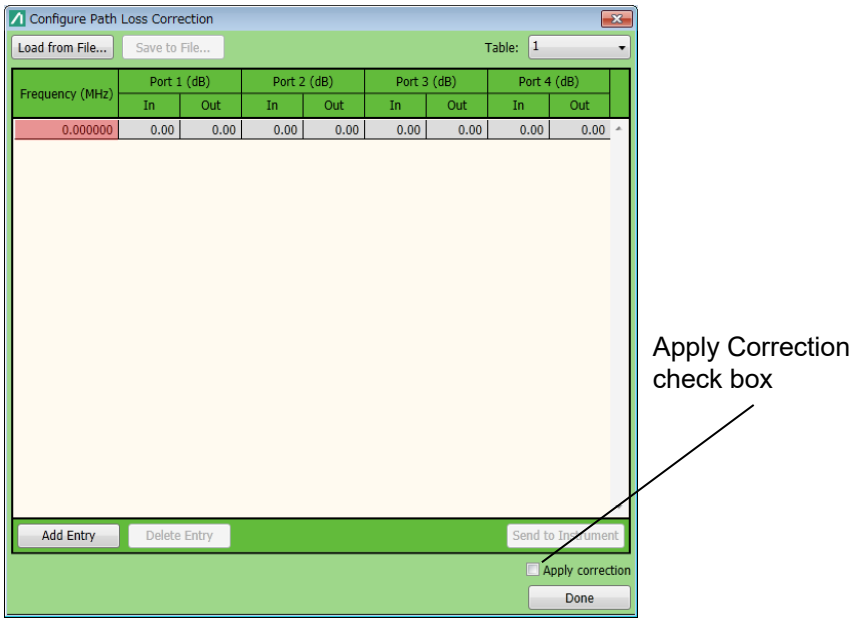


Figure 2.5-3 Configure Path Loss Correction Screen

Table 2.5-3 Configure Path Loss Correction Screen Menu

Name	Description
Load from File…	Loads settings from a Path Loss parameter file to the table.
Save to File…	Saves the Path Loss setting parameters in csv format.
Table	Changes the table to set Path Loss. Up to 16 tables can be created.
Add Entry	Adds new lines.
Delete Entry	Deletes the selected lines.
Send to Instrument	Sends the Path Loss settings to the MU887000A.
Done	Ends Path Loss Configure Correction.

Select the Apply Correction check box to apply the Path Loss setting. This function is the same as **Apply Correction** in the CombiView menu.

When trying to change a table or close Configure Pass Loss Correction without sending the edited parameters to the MU887000A, the message below is displayed.

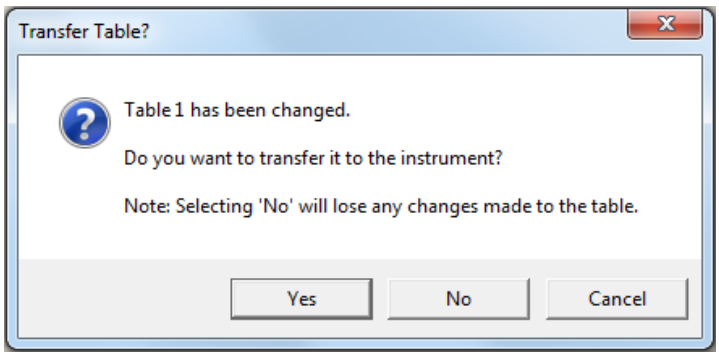


Figure 2.5-4 Transfer Table? Message

When selecting **Yes**, the specified parameter is sent to the MU887000A. When selecting **No**, the parameter is not sent to the MU887000A, but the parameters set for the table is deleted.

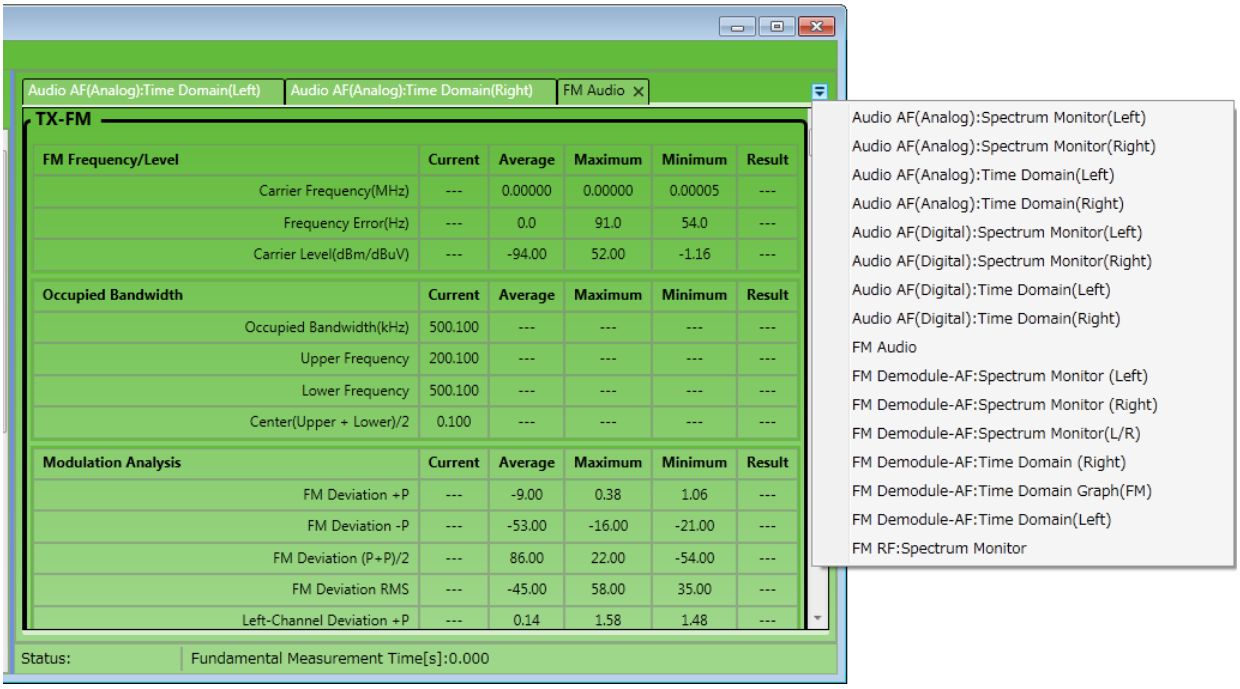


Figure 2.5-5 Tab Selection

If many graphs are selected, one or two tabs may not appear on the screen. In that case, tabs to display can be selected from the list by clicking the tab selection.

Chapter 3 — Operation

This chapter describes basic operation of the MX880053A, as well as the items displayed at each measurement.

3.1 Basic Operations

3.1.1 Selecting measurement Items

When CombiView is started, the **CombiView Manager** tree view screen displays information about the detected hardware (MT8870A).

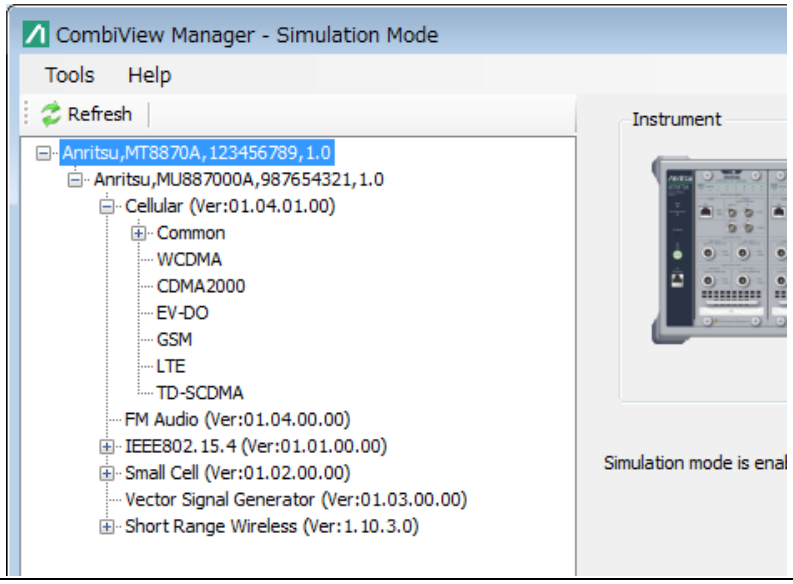


Figure 3.1.1-1 Tree View

1. Click ⊞. If FM Audio appears in the tree view, the measurement conditions can be set and the results can be displayed on the MX880053A.
   Uninstalled applications are also shown in the tree view. Attempting to start an uninstalled application displays an alert dialog.
2. Click the **Refresh** button to update the display.
3. Double-click the name of the application to start.
4. Establishing communications with the MT8870A may require several seconds before the **CombiView** screen opens.
   The MT8870A setting parameters are displayed in the settings pane.

3.1.2 Operations at measurement settings pane

Measurement settings pane

The measurement settings pane consists of text boxes and buttons to set measurement parameters.

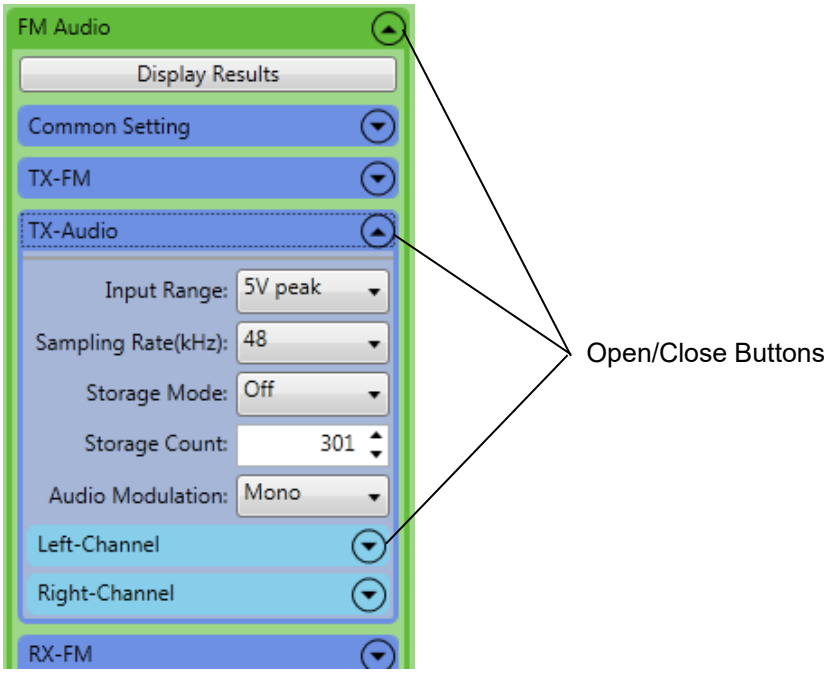


Figure 3.1.2-1 Measurement Settings Pane

The contents of the measurement settings pane vary with the measurement item, but the following buttons are always displayed.

Table 3.1.2-1 Measurement Settings Pane Buttons

Name	Description
Display Results	Displays numerical measurement results.
Common Setting	Sets the RF port, audio port, and measurement type of the MU887000A.
TX-FM	Set the parameters for FM transmitter measurement.
TX-Audio	Sets the parameters for audio signal measurement.
RX-FM	Sets the parameters for FM receiver measurement.
Vector Signal Generator	Sets the MU887000A output signal.
RX-Audio(Analog)	Sets the output signal to audio port (analog).
RX-Audio(Digital)	Sets the output signal to audio port (digital).
Display Results Settings	Displays measurement results.
Graph: FM RF Spectrum Monitor	Sets the graph view of FM transmitter measurement on the spectrum monitor.
Graph: FM Demod-AF	Sets the graph view of the demodulated signal of FM receiver measurement.
Graph: Audio AF(Analog)	Sets the graph view of audio signal measurement (analog).
Graph: Audio AF(Digital)	Sets the graph view of audio signal measurement (digital).
Level Calibration	Executes calibration of the MU887000A. Calibration type can be selected before executing.
Test Command	Sends the input command.

Click the Open/Close button to display the hidden setting items.

Starting/stopping measurement

To start or stop measurement, click the following buttons.

Table 3.1.2-2 Measurement Start/Stop Buttons

Button	Name	Behavior
	Measurement Start Button	Starts and executes one measurement
	Continuous Measurement Start Button	Repeats measurement until Stop button click
	Measurement Stop Button	Stops measurement

The status indication lamp 3 of MU887000A is on during the execution of measurement.

When the measurement error occurs, the status indication lamp 3 of MU887000A is lit in red.

In that case, query the cause by using :FETCh:FMAudio:MEASurement:STATe? command.

For the command explanation, refer to Chapter 3 "SCPI Command Reference" in *the MX887070A FM/Audio TRX Measurement Operation Manual*

Measurement results display

Click the **Display Results** button at the measurement settings pane to display numeric data.

Graph display

To display the graph, click the check icon on the settings pane before starting measurement. When the check icon is enabled (changed to dark gray), the MX880053A reads the waveform data after the measurement. Click the graph icon on the settings pane to display the graph tab.

Dragging this tab displays the result in a separate floating window.

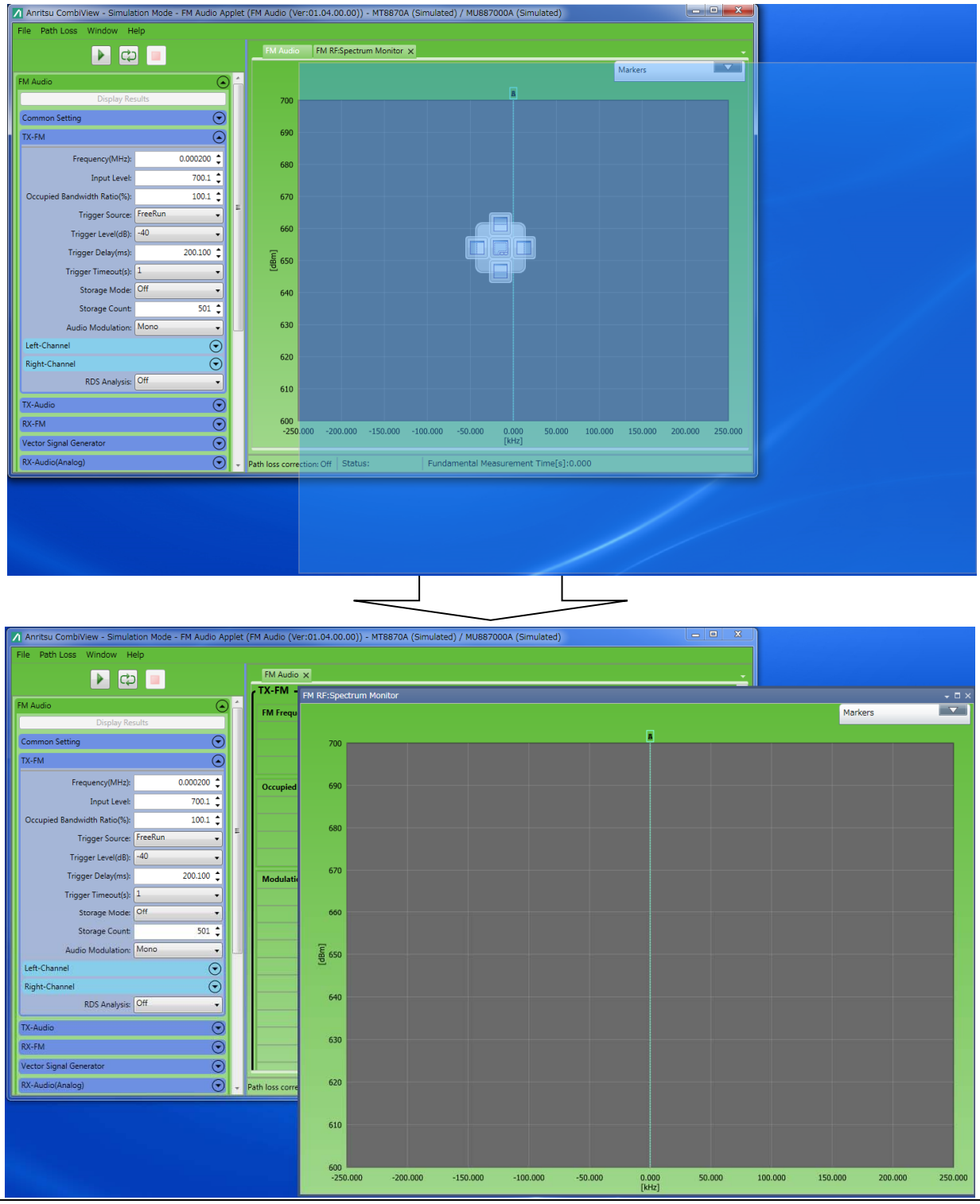


Figure 3.1.2-2 Floating Window

To move the floating window back to its original position, click the ▼ button in the top right corner of the window to display a pull-down menu and click the **Dock** button in the menu.

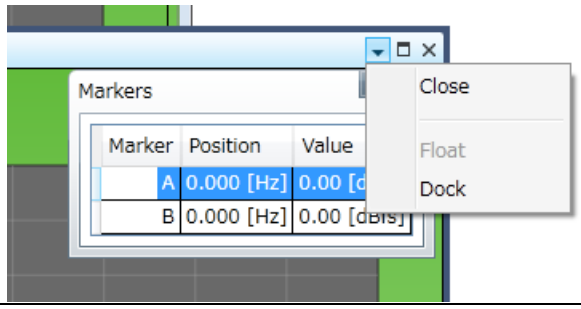


Figure 3.1.2-3 Floating Window Pull-Down Menu

To close the measurement results display, click the × button at the measurement results tab or at the top right of the floating window.

When drag the measurement results tab, a cross-like icon appears at the center of the screen. Drag the tab onto one of the four squares of the icon to display the measurement results in split sections.

Figure 3.1.2-4 Example of Split Window

To restore the original display, drag the split windows onto the center square of the cross-like icon.

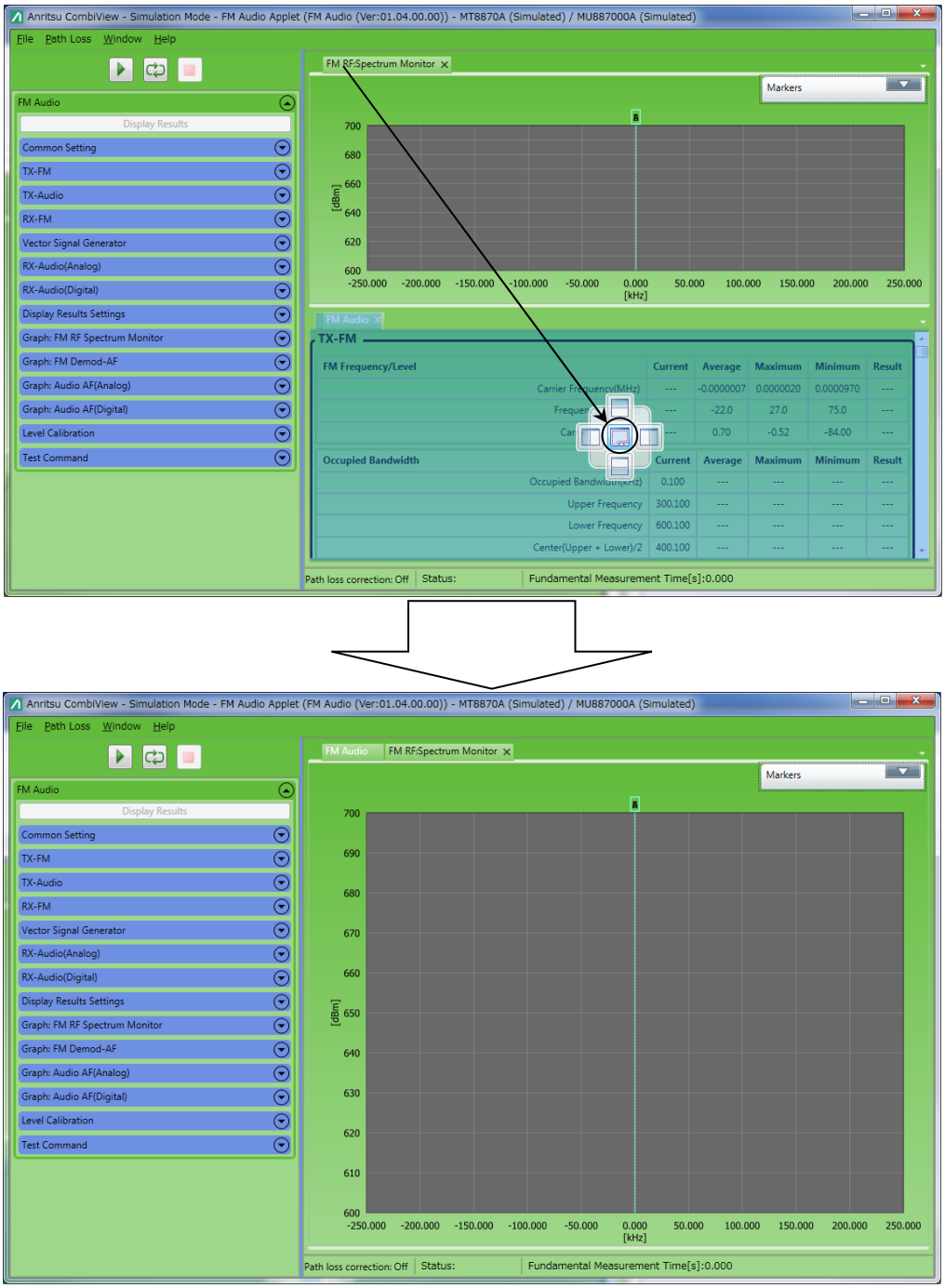


Figure 3.1.2-5 Cancel Window Split

Save Graph and Print Graph

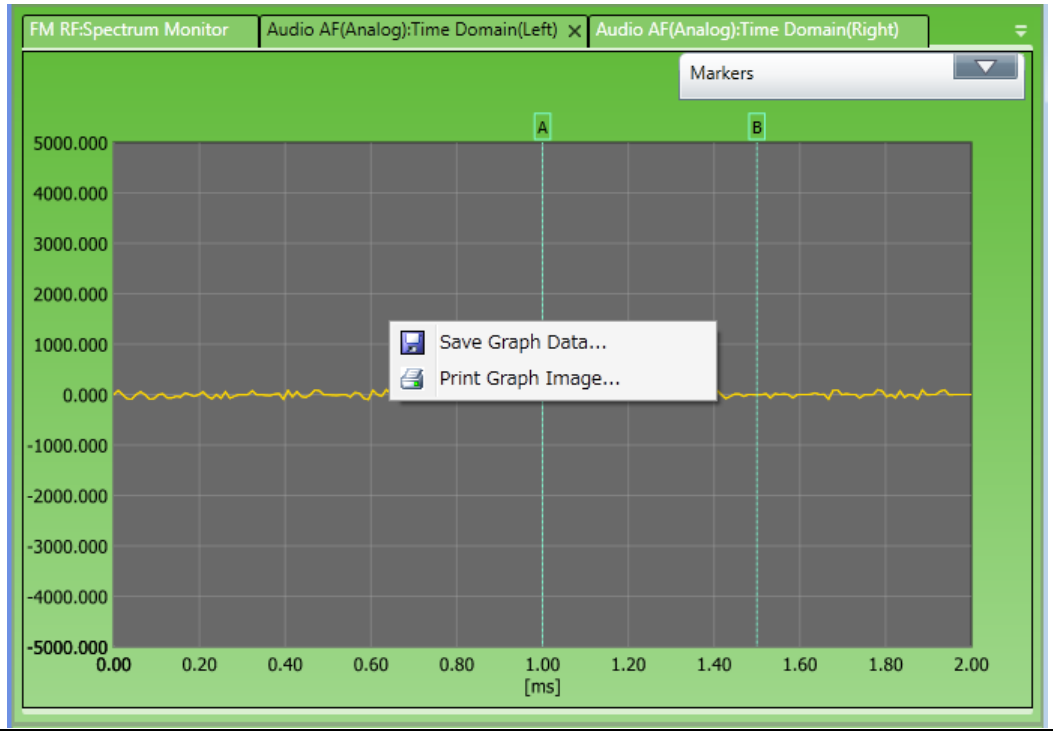


Figure 3.1.2-6 Save Graph and Print Graph

Right-click on the graph to display the popup menu.

Click the **Save Graph Data...** to show folder selecting dialog box.

Select folder to save and input file name, then click **OK**.

Click the **Print Graph Image...** to show print dialog box.

Select the printer and print format, then click **Print**.

Error messages

If set parameters have an error, an error message is displayed when clicking the Measurement Start button or **Apply**.

For the details of the error message, refer to the description of ":SYSTem:ERRor" command in *the MU887000A TRX Test Module Operation Manual*.

3.1.3 Sending commands

To execute other commands not provided in the measurement settings pane and query the MU887000A status:

1. Click the **Test Command** button on the measurement settings pane to open the **Test Command** dialog.
2. Input the command in the **Command/Query** text box.
3. Click the **Send** button. When Query is sent, the response is displayed in the **Query Response** text box.

Notes:

- The MX880053A communicates with the MT8870A in SCPI command Mode. Sending the Native Command causes an error.
- An error code and error message pop up when the sent command is not correct.
  An error code and error message appear in the Query Response field when the sent command is not correct.
  For details of ErrorCode-format messages, refer to the description of the :SYSTem:ERRor? command in the MU887000A TRX Test Module Operation Manual.
- Do not switch the language mode of remote control commands. If the language mode is switched, a command error occurs in subsequent applet operations.

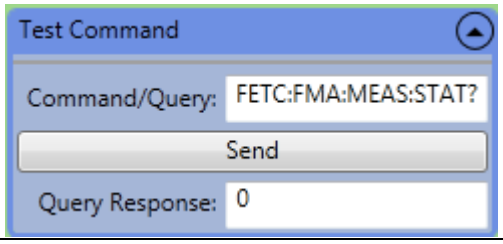


Figure 3.1.3-1 Test Command Dialog

If the sent command is not correct, the status lamp of the MU887000A blinks. For the explanation of the status lamp, refer to Appendix D “Status Indication of lamps” in *the MU887000A TRX Test Module Operation Manual*.

3.2 Common Settings

This section explains the setting items common in Section 3.3 “FM Transmitter Measurement” through Section 3.6 “Audio Signal Measurement.”

3.2.1 Setting conditions

The figure below is the settings pane for FM transmitter measurement. Change the parameter values or selections by clicking ▲/▼.

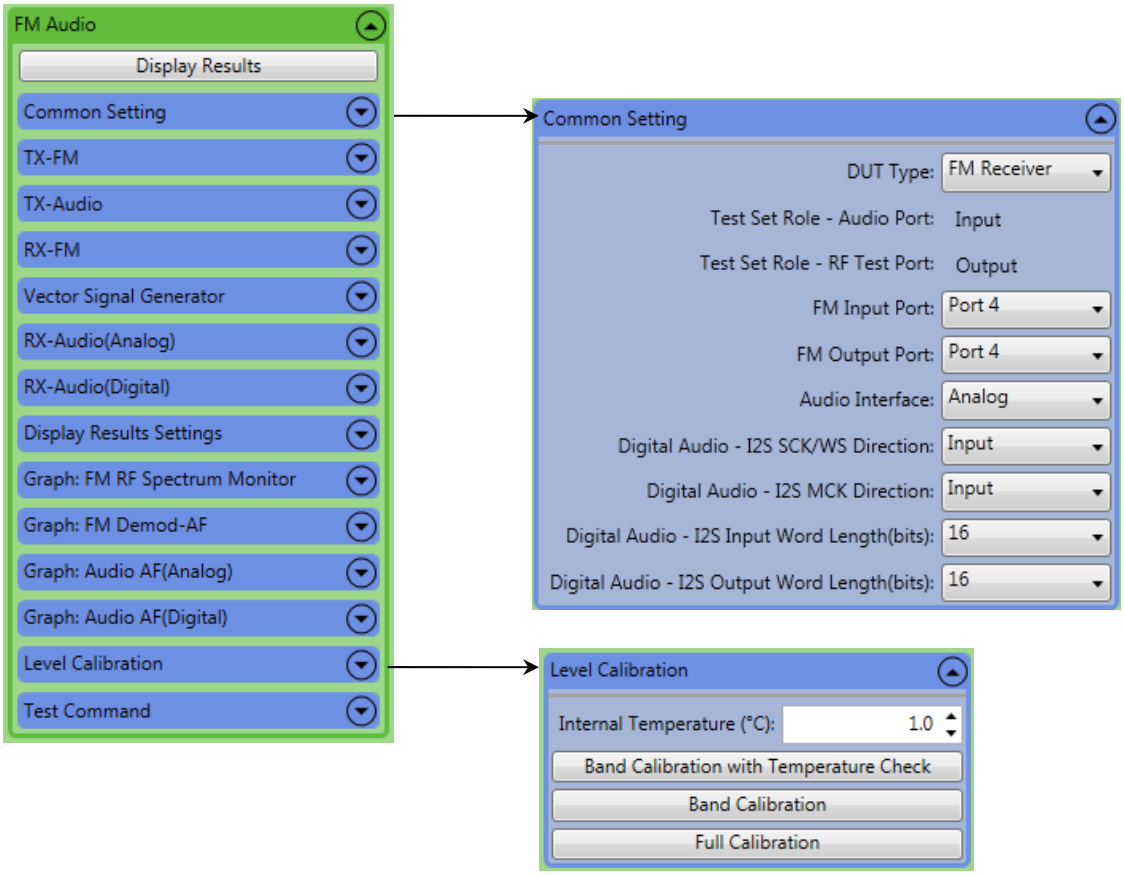


Figure 3.2.1-1 Common Setting Pane

The following items are changed in view depending on the DUT Type setting and the presence of the MU887000A/01A-002.

Test Set Role – Audio Port, Test Set Role – RF Test Port

3.2.2 Related SCPI commands

The following figure shows the remote control commands of the MX887070A FM/Audio TRX Measurement and the corresponding fields on the pane. For details of the commands, refer to Chapter 3 "SCPI Command Reference" in *the MX887070A FM/Audio TRX Measurement Operation Manual*.

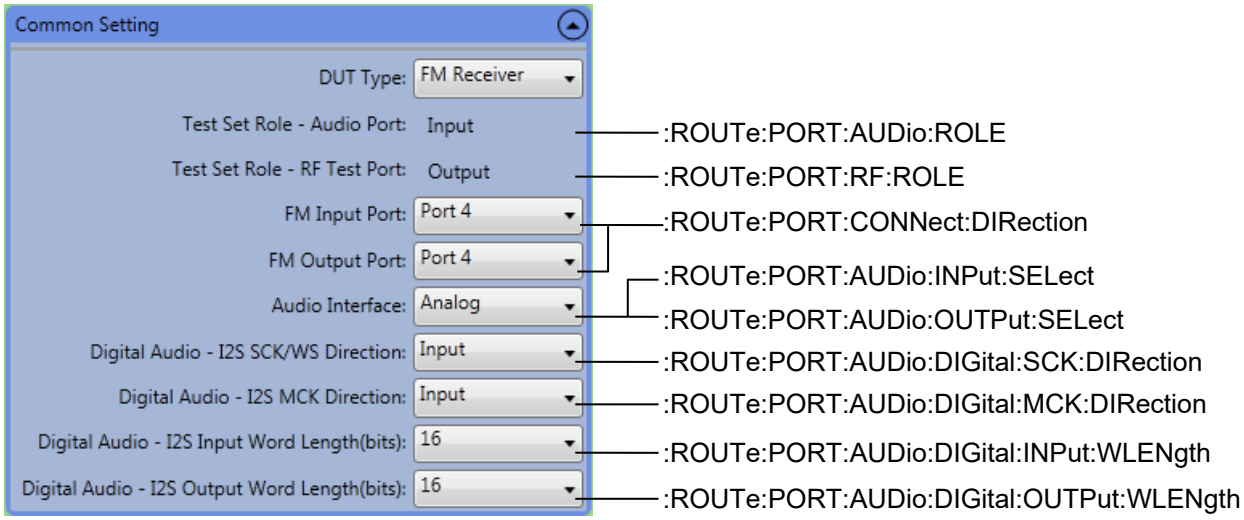


Figure 3.2.2-1 Measurement Settings Pane (Common Setting)

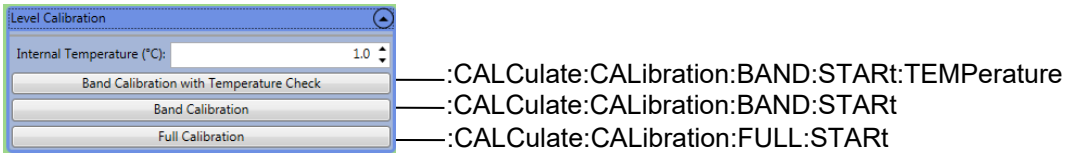


Figure 3.2.2-2 Measurement Settings Pane (Level Calibration)

3.3 FM Transmitter Measurement

This section explains how to perform FM transmitter measurement.

3.3.1 Setting conditions

The figure below is the settings pane for FM transmitter measurement.

Change the parameter values or selections by clicking ▲/▼.

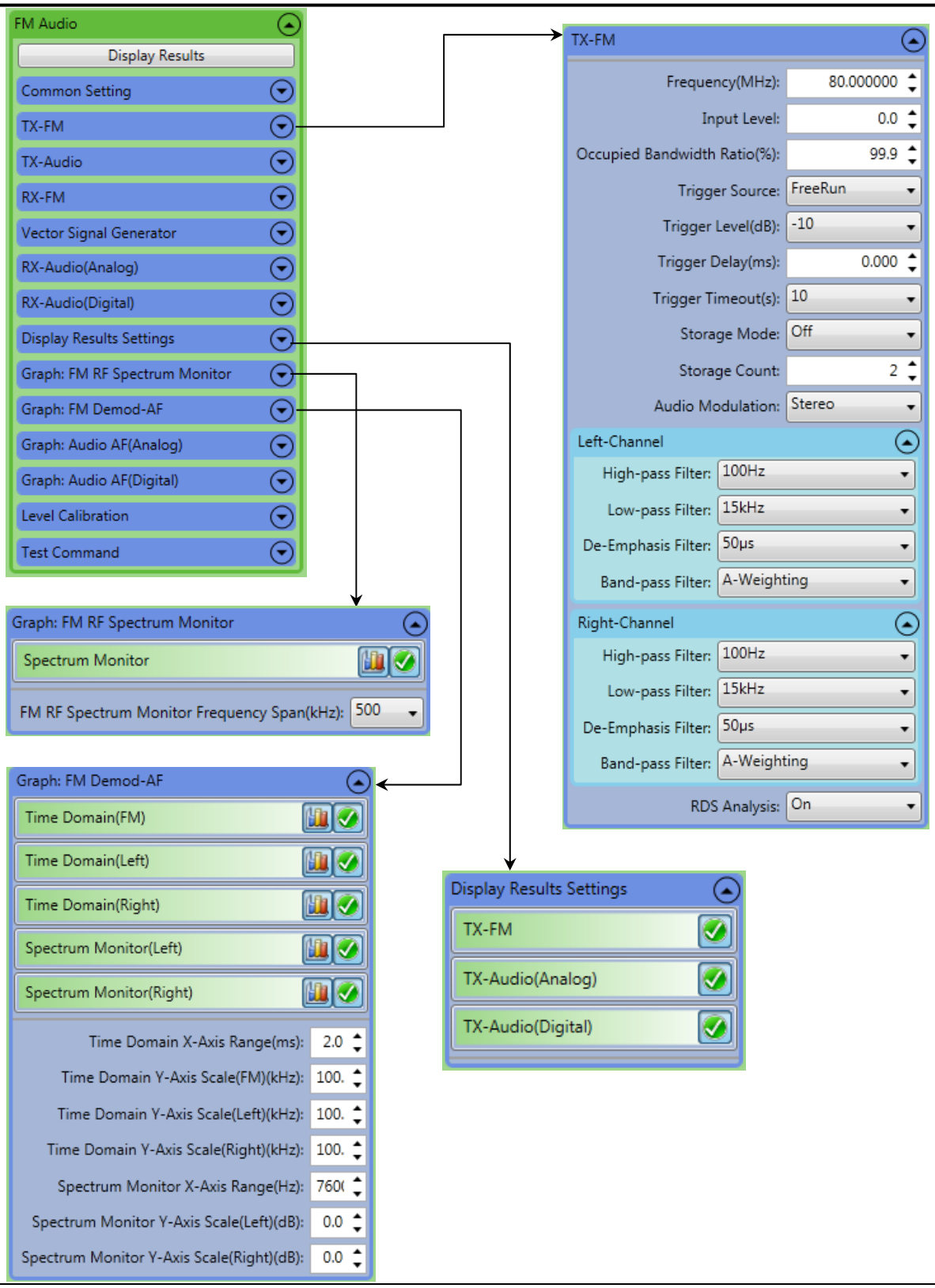


Figure 3.3.1-1 FM Transmitter Measurement

3.3.2 Measurement and results

To perform measurement:

1. Click the Open/Close button to open [Common Setting] and set DUT Type to [FM Transmitter].
2. Set the parameters of [Common Setting].
3. Click the Open/Close button of [TX-FM], and set the parameters from [Frequency (MHz)] to [Audio Modulation].
4. When [Audio Modulation] is set to [Stereo], open [Left-Channel] and [Right-Channel] by clicking the Open/Close buttons and set the parameters.
5. Set [RDS Analysis].
6. Click the Open/Close button of [Graph: FM RF Spectrum Monitor] and enables the check icon .
   Also, set [FM RF Spectrum Monitor Frequency Span(kHz)].
7. Open [Graph: FM Demod-AF] by clicking the Open/Close button, and enable the check icon of [Time Domain (FM)], [Time Domain (Left)], [Time Domain (Right)], [Spectrum Monitor (Left)], or [Spectrum Monitor (Right)].
   Additionally, set the parameters from [Time Domain X-Axis Range(ms)] to [Spectrum Monitor Y-Axis Scale (Right) (dB)].
8. Click [Display Results] to display [FM Audio] tab.
9. Click the Open/Close button to open [Display Results Settings], and select the [TX-FM] check icon .
10. Click the Measurement Start button to send the parameters to the hardware.
11. When the measurement ends, numerical data is displayed in TX-FM on [FM Audio] tab.
12. Click the graph icon on the next pane to display the graph tab.
    [Graph: FM RF Spectrum Monitor], [Graph: FM Demod-AF]
13. To display the marker positions and values, click button in [Makers] sub window on the top-right corner. When dragging the markers, the positions are shown by values in the sub window.

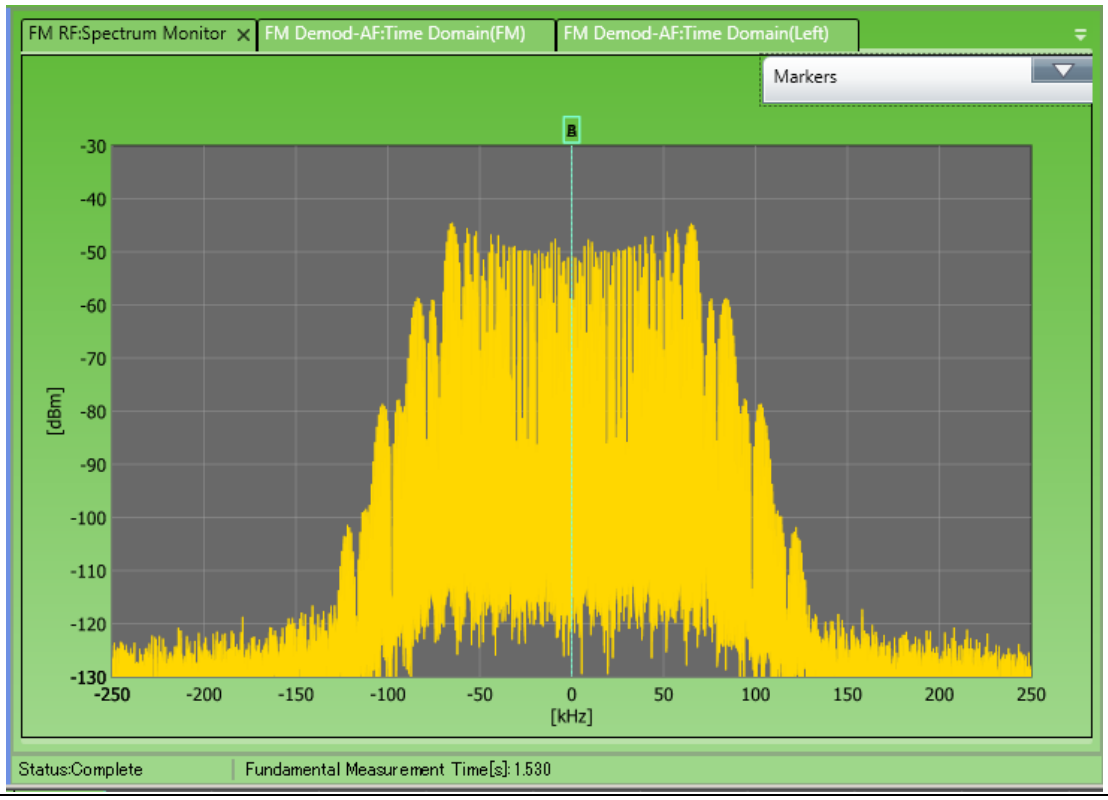


Figure 3.3.2-1 Spectrum Monitor Graph

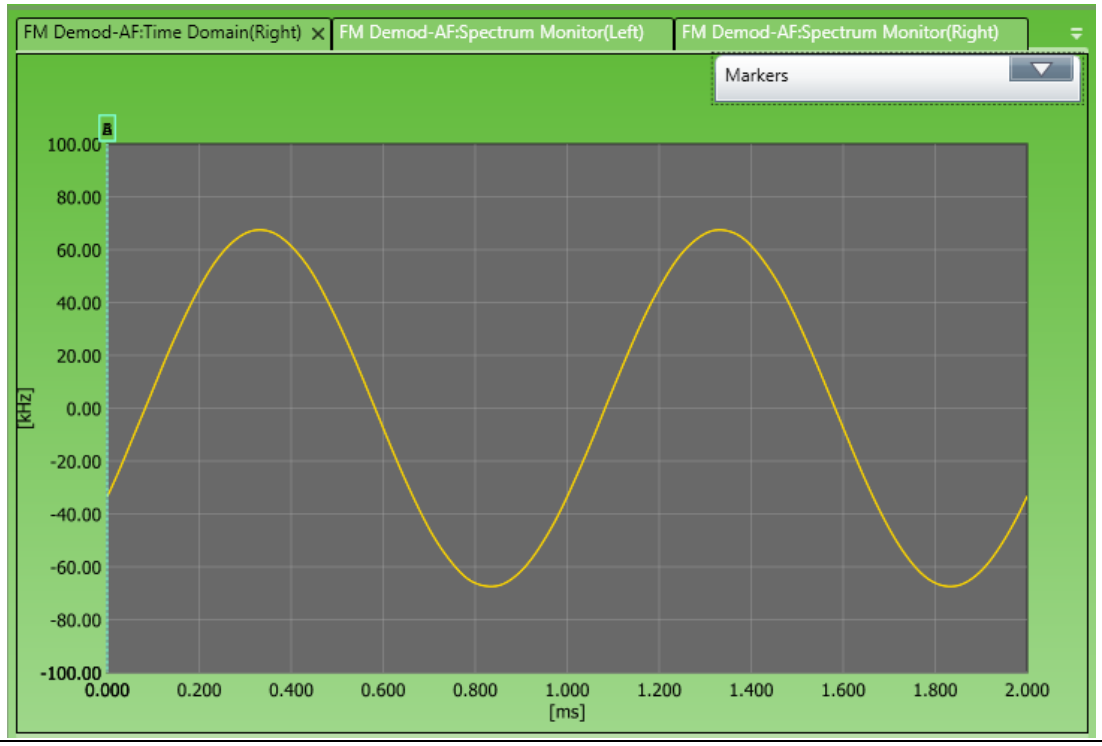


Figure 3.3.2-2 Time Waveform Graph of Demodulated Signal

3.3.3 Related SCPI commands

The figure below shows the remote control commands for the MX887070A FM/Audio transmission measurement and the corresponding fields on the pane.

For details of the commands, refer to Chapter 3 “SCPI Command Reference” in *the MX887070A FM/Audio TRX Measurement Operation Manual*.

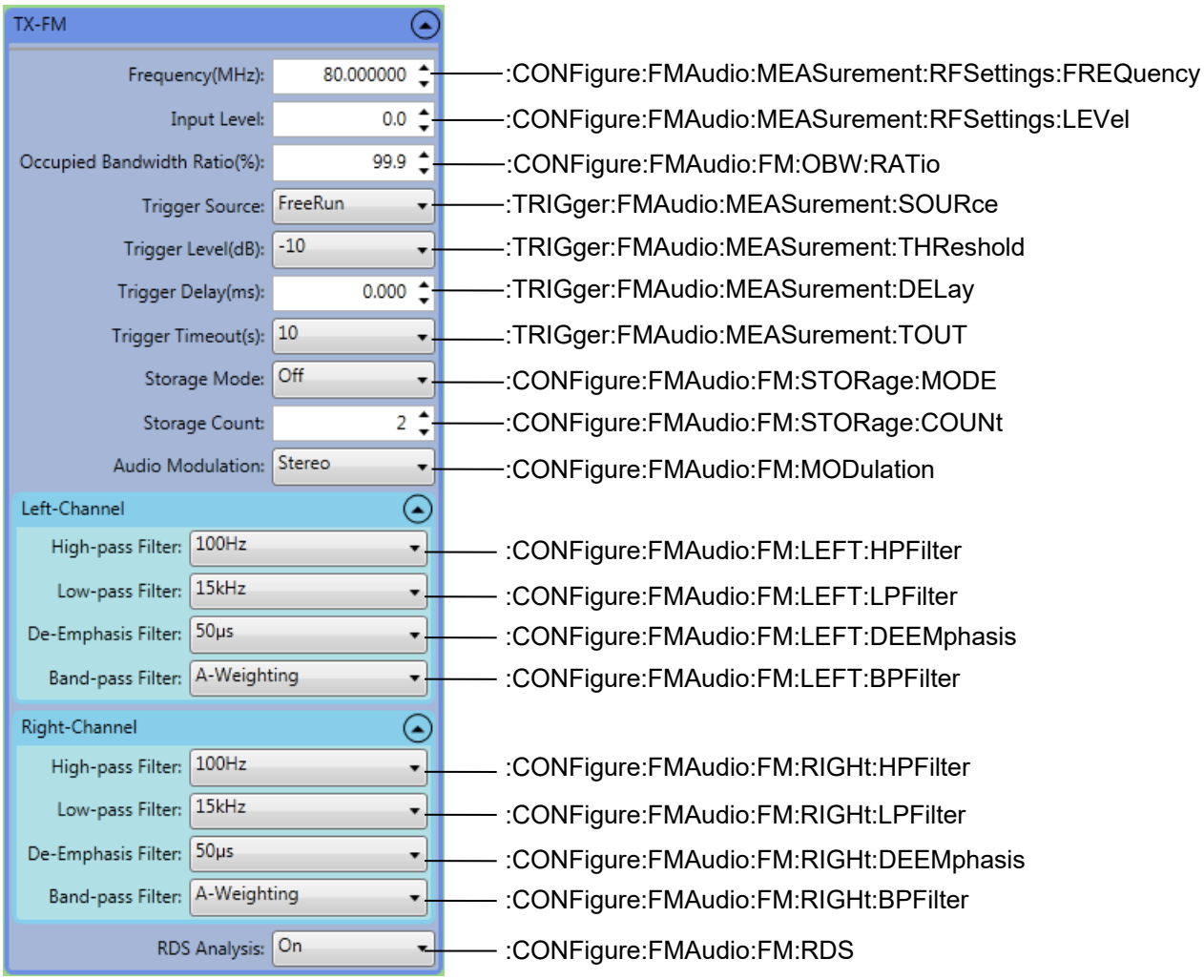
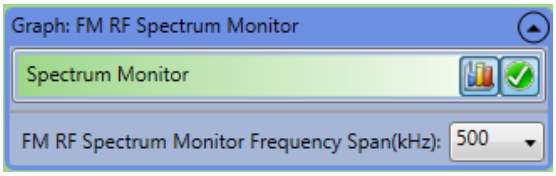
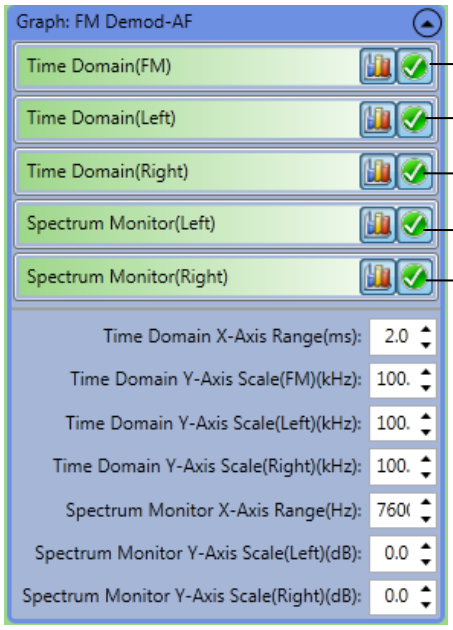


Figure 3.3.3-1 Measurement Settings Pane (TX-FM)



:FETCh:FMAudio:FM:RF:TRACe:BINary

Figure 3.3.3-2 Measurement Settings Pane (Graph FM RF Spectrum Monitor)



:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH:BINary

:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT:BINary

:FETCh:FMAudio:FM:AUDio:TIME:TRACe:RIGHt:BINary

:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT:BINary

:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:RIGHt:BINary

Figure 3.3.3-3 Measurement Settings Pane (Graph FM Demod-AF)

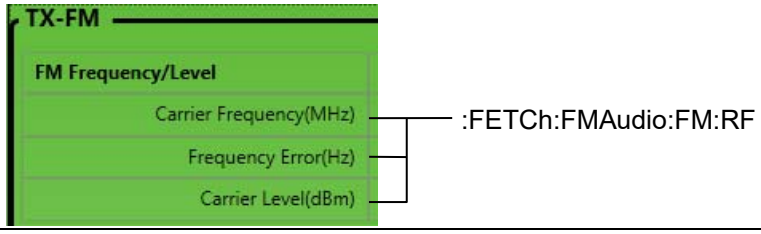


Figure 3.3.3-4 FM Frequency/Level Measurement Results

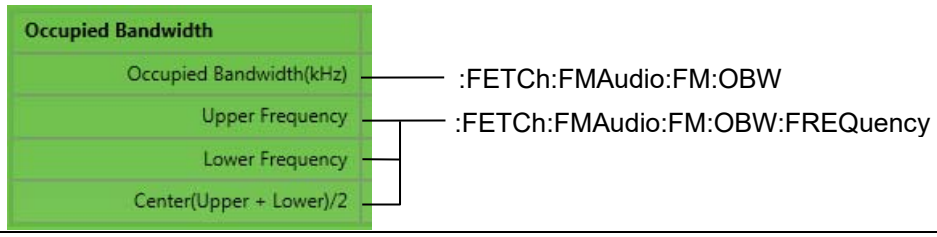


Figure 3.3.3-5 Occupied Bandwidth Measurement Results

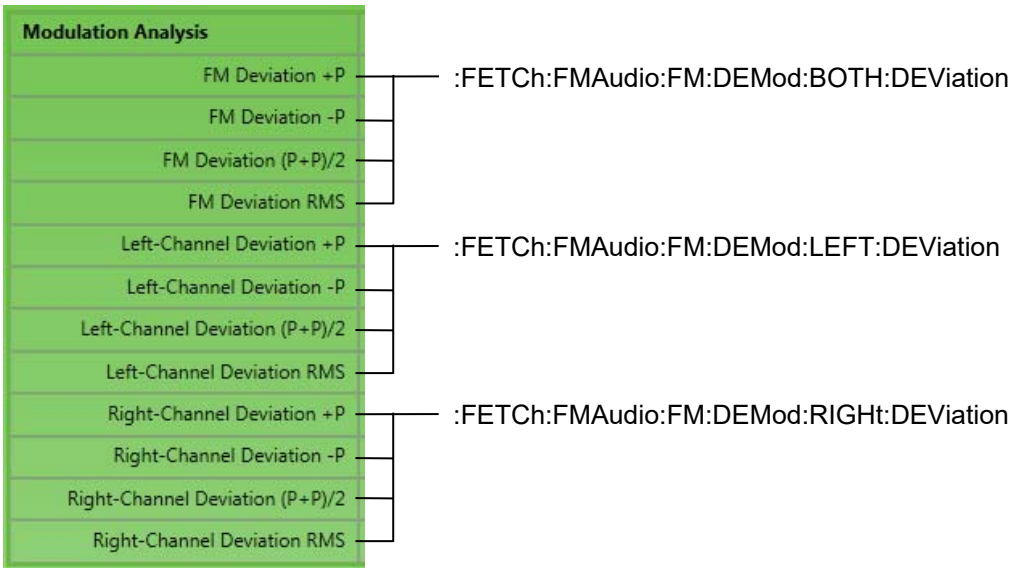


Figure 3.3.3-6 Modulation Analysis Measurement Results

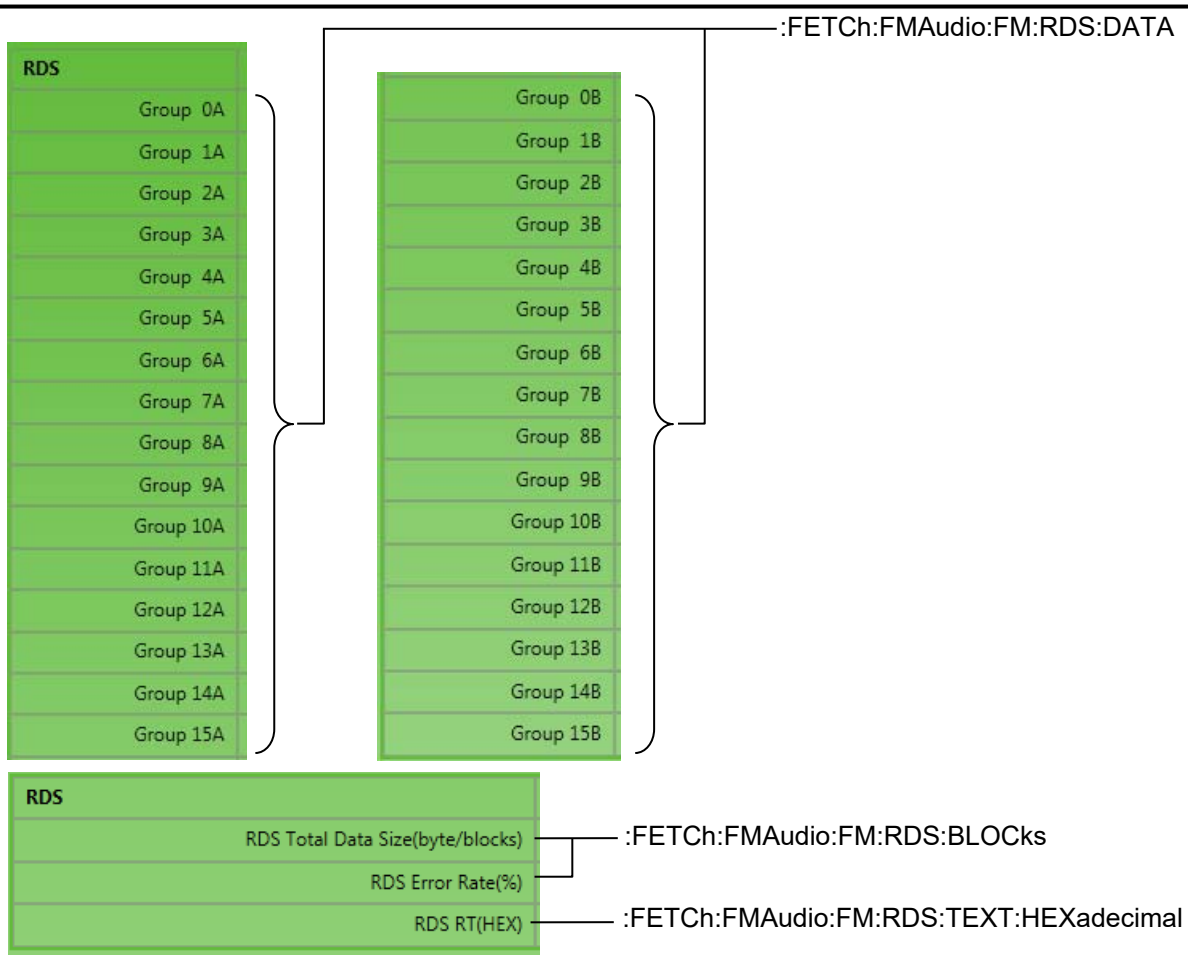


Figure 3.3.3-7 RDS Measurement Results

RDS measurement results are displayed when RDS Analysis is set to **On**.

:FETCh:FMAudio:FM:DEMod:LEFT:AF

:FETCh:FMAudio:FM:DEMod:CROSstalk

Demodulate-AF Frequency/Level	Frequency(Hz)	Level(Hz)	Cross Talk(dB)
Left-Channel Audio Tone 1	---	---	---
Left-Channel Audio Tone 2	---	---	---
Left-Channel Audio Tone 3	---	---	---
Left-Channel Audio Tone 4	---	---	---
Left-Channel Audio Tone 5	---	---	---
Left-Channel Audio Tone 6	---	---	---
Left-Channel Audio Tone 7	---	---	---
Left-Channel Audio Tone 8	---	---	---
Left-Channel Audio Tone 9	---	---	---
Left-Channel Audio Tone 10	---	---	---
Left-Channel Audio Tone 11	---	---	---
Left-Channel Audio Tone 12	---	---	---
Right-Channel Audio Tone 1	---	---	---
Right-Channel Audio Tone 2	---	---	---
Right-Channel Audio Tone 3	---	---	---
Right-Channel Audio Tone 4	---	---	---
Right-Channel Audio Tone 5	---	---	---
Right-Channel Audio Tone 6	---	---	---
Right-Channel Audio Tone 7	---	---	---
Right-Channel Audio Tone 8	---	---	---
Right-Channel Audio Tone 9	---	---	---
Right-Channel Audio Tone 10	---	---	---
Right-Channel Audio Tone 11	---	---	---
Right-Channel Audio Tone 12	---	---	---

:FETCh:FMAudio:FM:DEMod:RIGHt:AF

Figure 3.3.3-8 Demodulate-AF Frequency/Level Measurement Results

The measurement results of the screen below are displayed when Audio Modulation is set to [Stereo]. When Audio Modulation is set to [Mono], "---" is displayed.

Right-Channel Audio Tone 1 to Right-Channel Audio Tone 12, Cross Talk

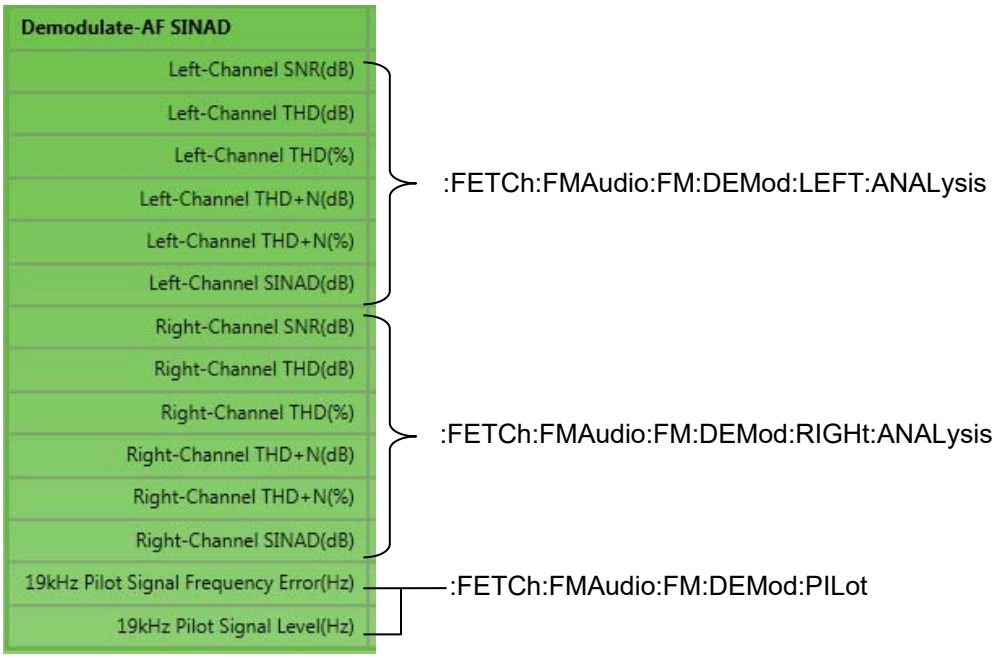


Figure 3.3.3-9 Demodulate-AF SINAD Measurement Results

The measurement results below are displayed when Audio Modulation is set to [Stereo].
When Audio Modulation is set to [Mono], "---" is displayed.

Right-Channel SNR (dB), Right-Channel THD (dB), Right-Channel THD (%),
Right-Channel THD+N (dB), Right-Channel THD+N (%), Right-Channel SINAD (%),
19kHz Pilot Signal Frequency Error (Hz), 19kHz Pilot Signal Level (Hz)

3.4 FM Receiver Measurement

This section explains how to perform FM receiver measurement.

3.4.1 Setting conditions

The figure below is the settings pane for FM receiver measurement.

Change the parameter values or selections by clicking ▲/▼.

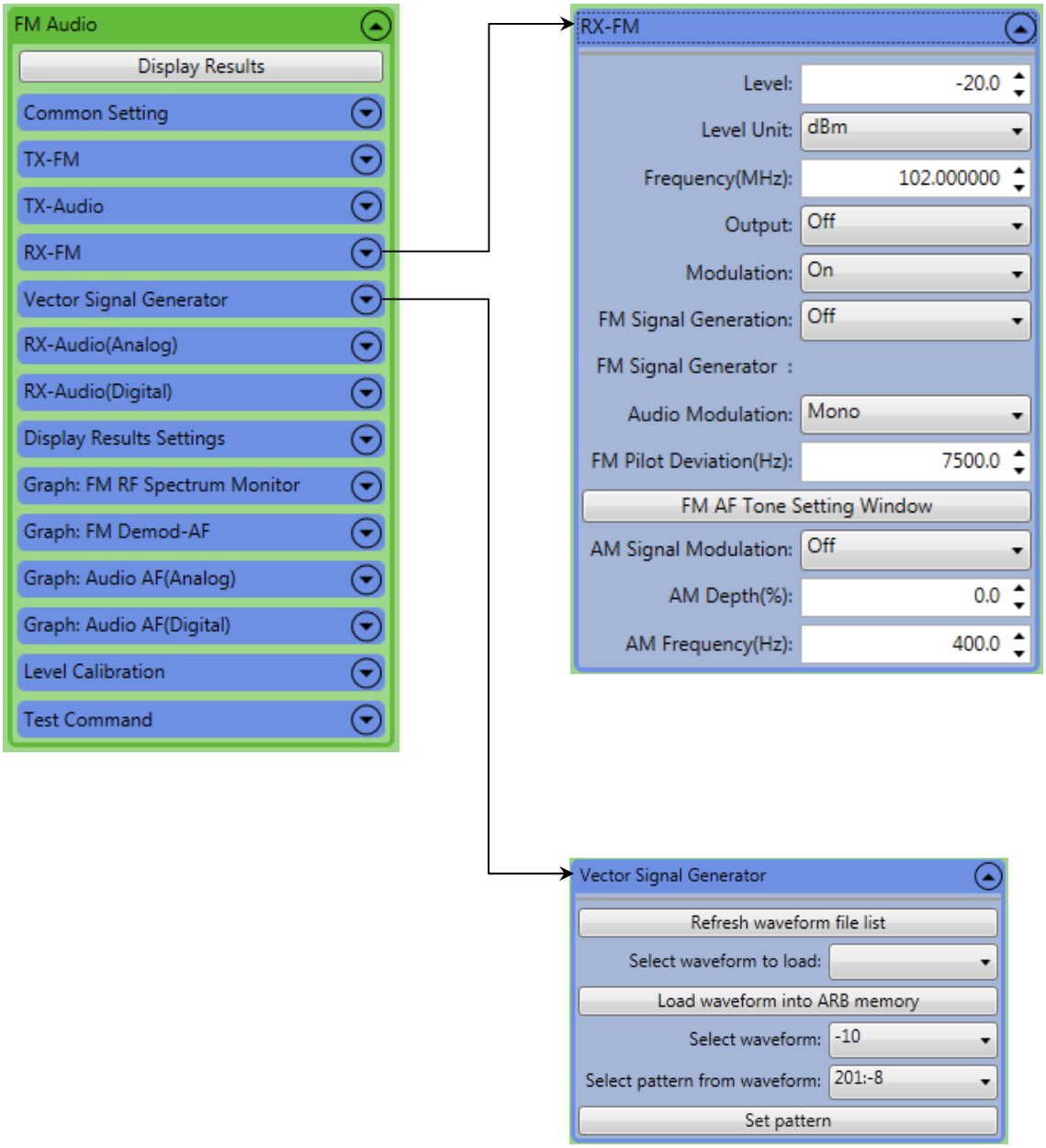


Figure 3.4.1-1 FM Transmitter Measurement Settings Pane

3.4.2 Measurement and results

To perform measurement:

1. Click the Open/Close button to open [Common Setting] and set DUT Type to [FM Receiver].
2. Set the parameters of [Common Setting].
3. Click the Open/Close button of [RX-FM], and set the parameters from [Level] to [AM Frequency].
   Set the [Output] and [Modulation] to On.
4. When [FM Signal Generation] is set to [Off], click the Open/Close button to open [Vector Signal Generator] and set waveform pattern. For setting details, refer to Section 3.4.4 "Setting Waveform Pattern."
   Proceed to Step 7 after setting the waveform pattern.
5. When [FM Signal Generation] is set to [On], set [Audio Modulation].
6. Click [FM AF Tone Setting Window] to set tone signals. Refer to Section 3.4.3 "Setting tone signals".
7. Click the Measurement Start button . The parameters are sent to the hardware, and the MT8870A outputs the RF signal.

3.4.3 Setting Tone Signals

Perform the following steps to set tone signals to output.

1. Click [FM AF Tone Setting Window] to open the FM AF Tone Setting window.
2. Set [On/Off], [Frequency(Hz)], and [Deviation(Hz)] for Left-Channel 1 to 8 individually. The text box color turns into red when the input value is out of the setting range. Check the setting range and re-input the value within the range.
3. When [Audio Modulation] is set to [Stereo], set the parameters for Right-Channels as in Step 2.
4. Click [OK] to save the settings and close the FM AF Tone Setting window. Click [Cancel] to close the window without saving the settings.

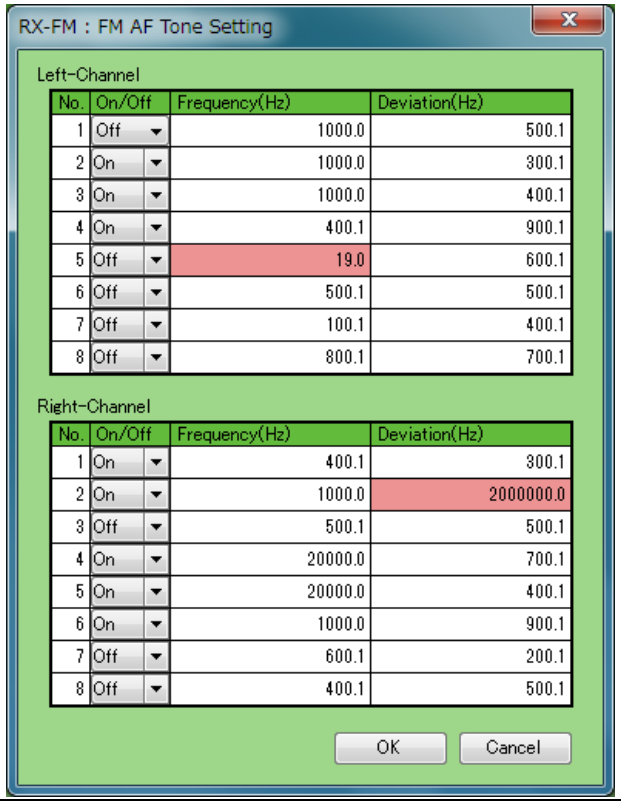


Figure 3.4.3-1 Example of RX-FM : FM AF Tone Setting

3.4.4 Setting waveform pattern

Set the waveform pattern of the RF signal in the procedure below.

1. Click the **Vector Signal Generator** button to open the dialog.
2. Click **Refresh waveform file list** to update the file list before file loading.
3. Click the **Select waveform to load** button to specify the file.
4. Click **Load waveform into ARB memory** to load the file.
5. Click the **Select waveform** button to select the waveform package.
6. Click the **Select pattern from waveform** button to select the waveform pattern.
7. Click the **Set pattern** button to set the selected waveform pattern as the VSG modulation pattern.

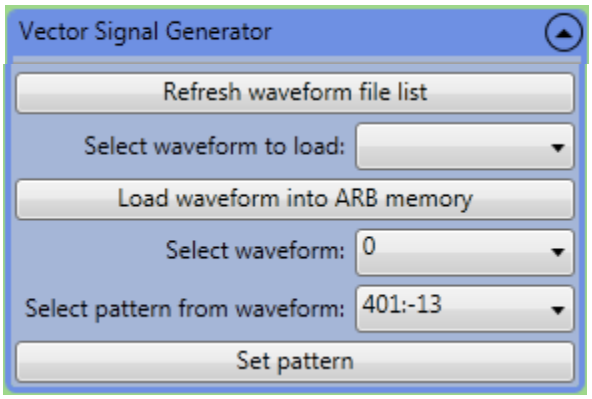


Figure 3.4.4-1 Vector Signal Generator Setting

The file set by **Select waveform to load** button is loaded to the memory in the MU887000A by clicking **Load waveform into ARB memory** button.

While loading the file, the status indication lamp 2 of the MU887000A blinks in green.

When the loading error occurs, the status indication lamp 2 of the MU887000A is lit in red.

In that case, query the cause by using :SOURce:GPRF:GENerator:ARB:FILE:LOAD? command.

For description of the command, refer to Chapter 5 “SCPI Command” in *the MU887000A TRX Test Module Operation Manual*.

Following parameters are sent to MU887000A by clicking **Set pattern** button.

Select waveform, **Select pattern from waveform**

3.4.5 Related SCPI commands

The following figure shows the remote control commands of the MX887070A FM/Audio TRX Measurement and the corresponding fields on the pane.

For details of the commands, refer to Chapter 3 “SCPI Command Reference” in *the MX887070A FM/Audio TRX Measurement Operation Manual* and Chapter 5 “SCPI Command” in *the MU887000A TRX Test Module Operation Manual*.

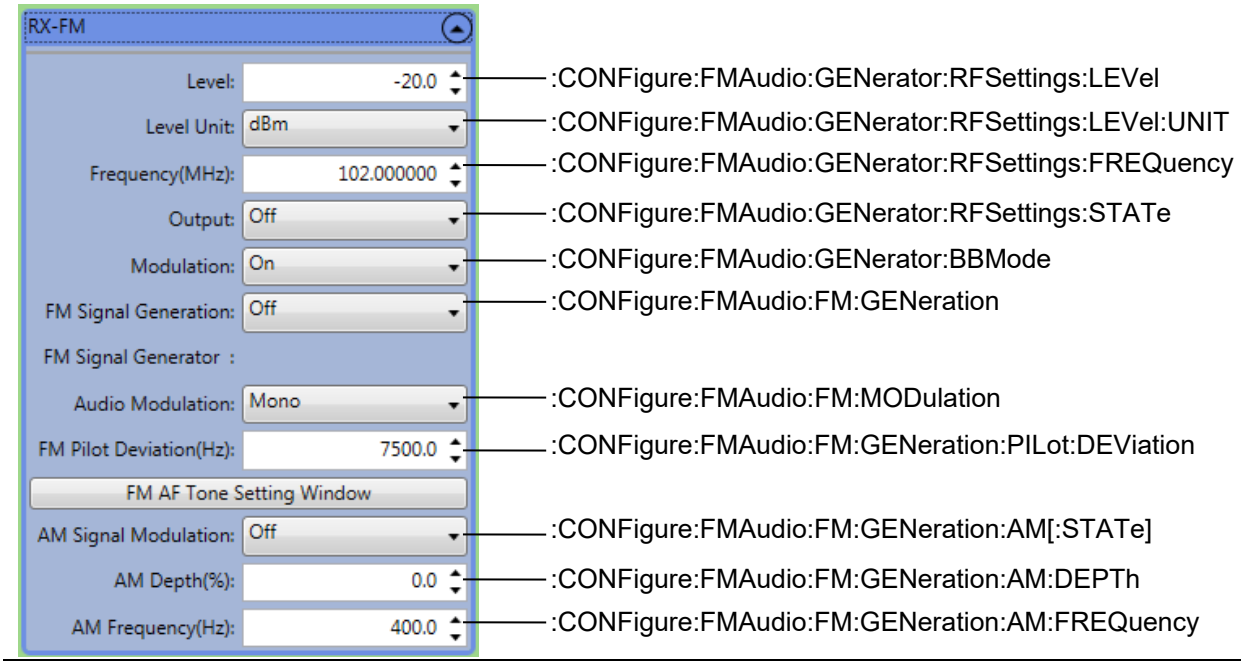


Figure 3.4.5-1 Measurement Settings Pane

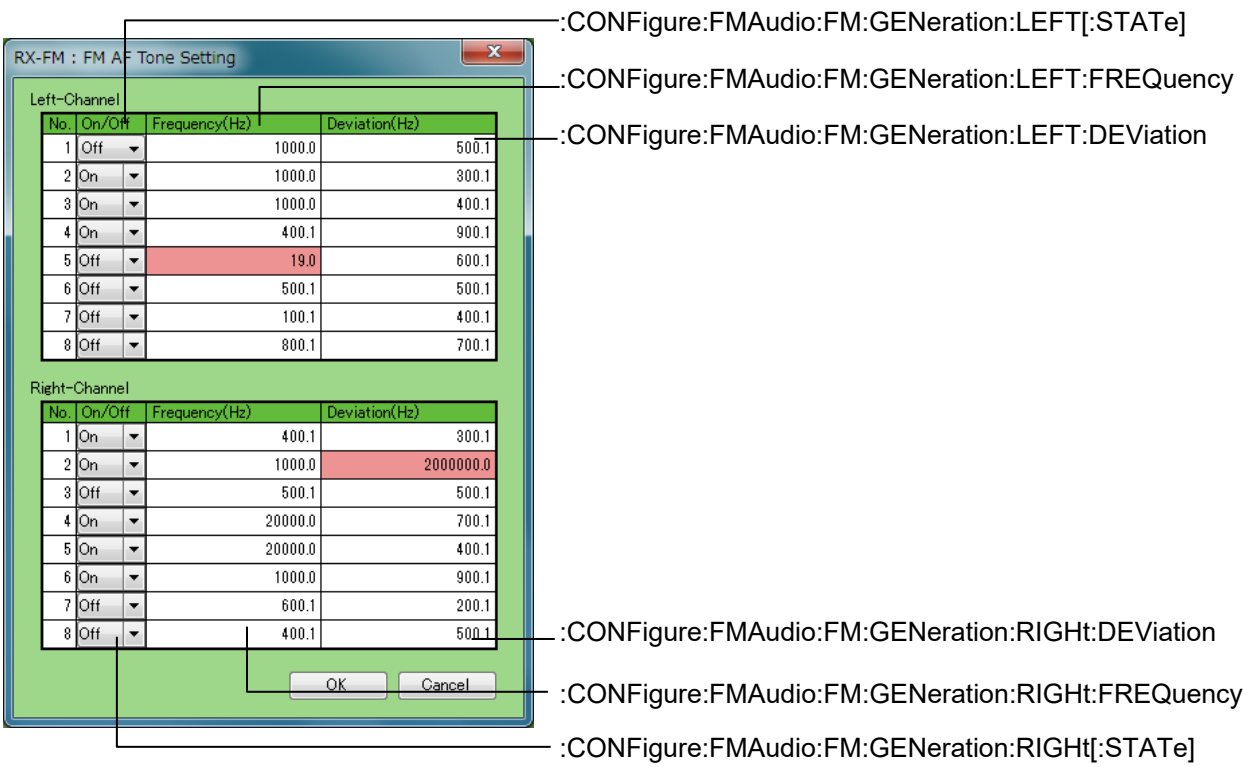


Figure 3.4.5-2 Tone Setting Window

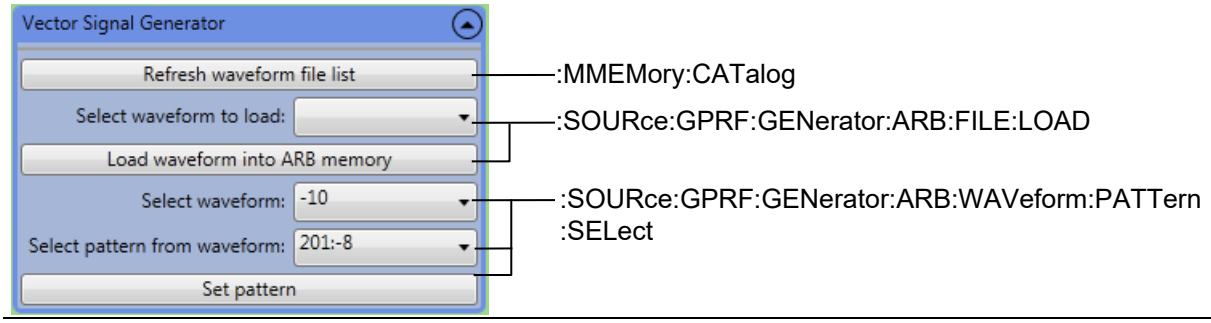


Figure 3.4.5-3 Measurement Settings Pane (Vector Signal Generator)

3.5 Audio Signal Measurement

This section explains how to perform audio signal measurement.

3.5.1 Setting conditions

The figure below is the settings pane for audio signal measurement. Change the parameter values or selections by clicking ▲/▼.

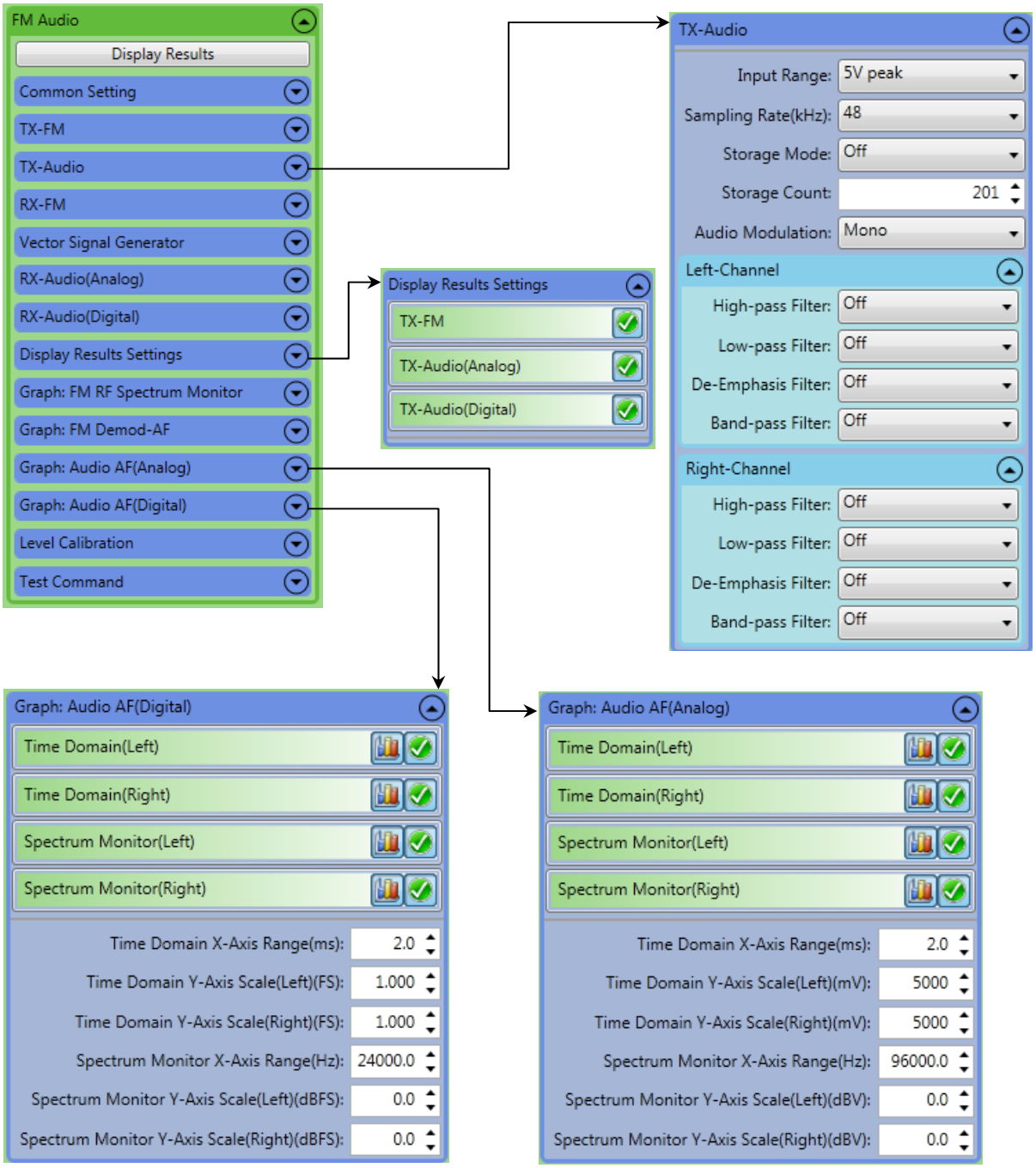


Figure 3.5.1-1 Audio Signal Measurement Settings Pane

3.5.2 Measurement and results

To perform measurement:

1. Click the Open/Close button to open [Common Setting] and set DUT Type to [FM Receiver].
2. Set the parameters of [Common Setting].
3. Click the Open/Close button of [TX-Audio], and set the parameters from [Input Range] to [Audio Modulation].
4. Click the Open/Close button to open [Left-Channel] and set the parameters.
5. When [Audio Modulation] is set to [Stereo], click the Open/Close button to open [Right-Channel] and set the parameters.
6. When [Analog] is set to [Audio Interface] in [Common Setting], click the Open/Close button to open [Graph: Audio AF (Analog)].
7. When [Digital] is set to [Audio Interface] in [Common Setting], click the Open/Close button to open [Graph: Audio AF (Digital)].
8. Enable the check icon of [Time Domain (Left)], [Time Domain (Right)], [Spectrum Monitor (Left)], or [Spectrum Monitor (Right)] .
   Additionally, set the parameters from [Time Domain X-Axis Range(ms)] to [Spectrum Monitor Y-Axis Scale (Right) (dBV)] or [Spectrum Monitor Y-Axis Scale (Right) (dBFS)].
9. Click [Display Results] to display [FM Audio] tab.
10. When [Audio Interface] of [Common Setting] is set to [Analog], click the Open/Close button to open [Display Results Settings] and select the check icon of [TX-Audio(Analog)].
11. When [Audio Interface] of [Common Setting] is set to [Digital], click the Open/Close button to open [Display Results Settings] and select the check icon of [TX-Audio(Digital)].
12. Click the Measurement Start button to send the parameters to the hardware.
13. When the measurement ends, numerical data is displayed in TX-Audio(Analog) or TX-Audio(Digital) in [FM Audio] tab.
14. Click the graph icon on the next pane to display the graph.
    [Time Domain (Left)], [Time Domain (Right)], [Spectrum Monitor (Left)], or [Spectrum Monitor (Right)]
15. To display the marker positions and values, click button in [Makers] sub window on the top-right corner. When dragging the markers, the positions are shown by values in the sub window.

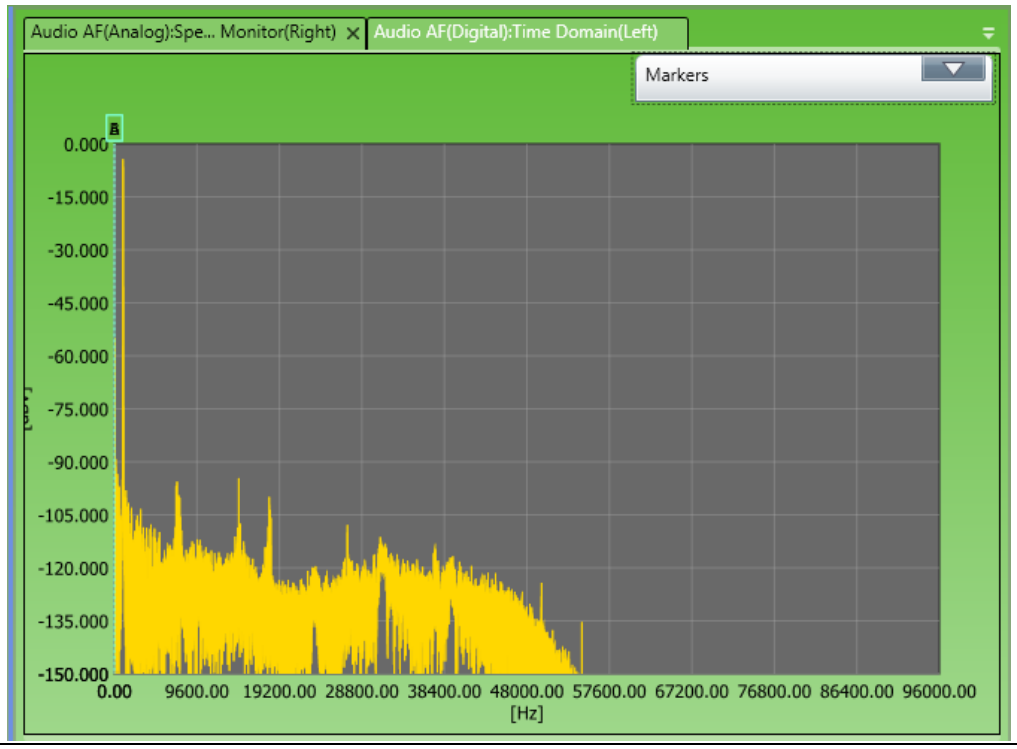


Figure 3.5.2-1 Spectrum Monitor Graph

3.5.3 Related SCPI commands

The following figure shows the remote control commands of the MX887070A FM/Audio TRX Measurement and the corresponding fields on the pane.

For details of the commands, refer to Chapter 3 “SCPI Command Reference” in *the MX887070A FM/Audio TRX Measurement Operation Manual*.

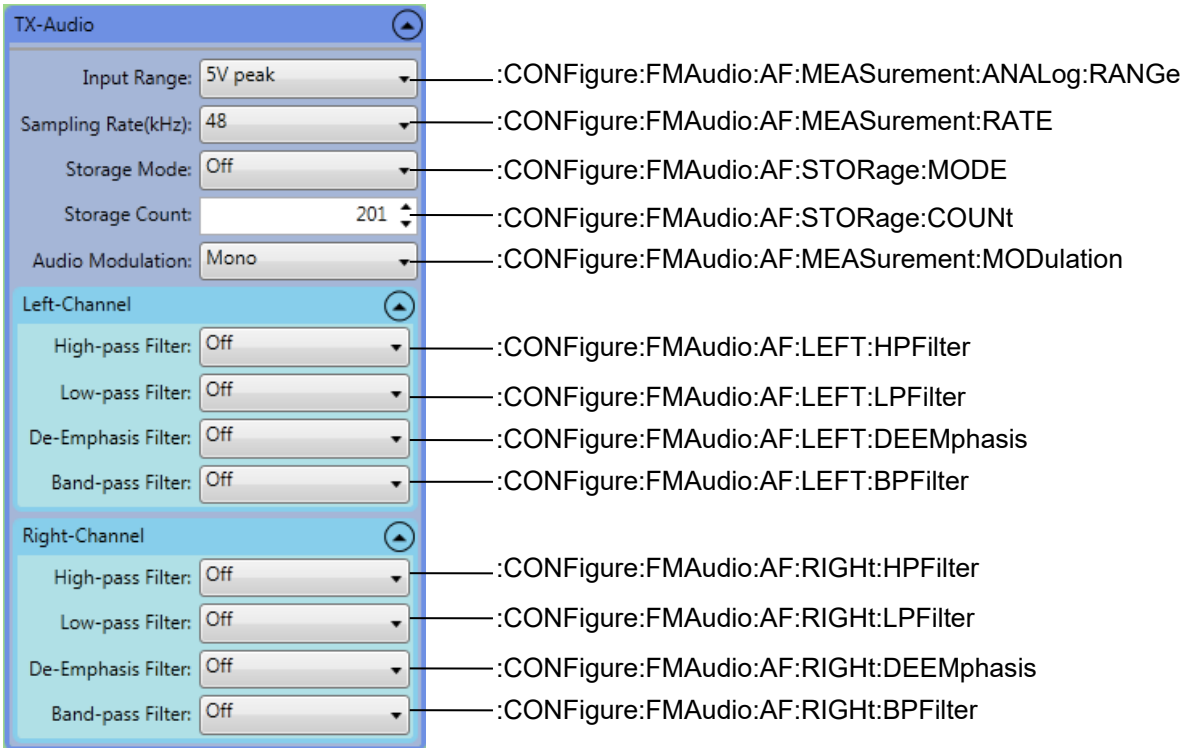


Figure 3.5.3-1 Measurement Settings Pane

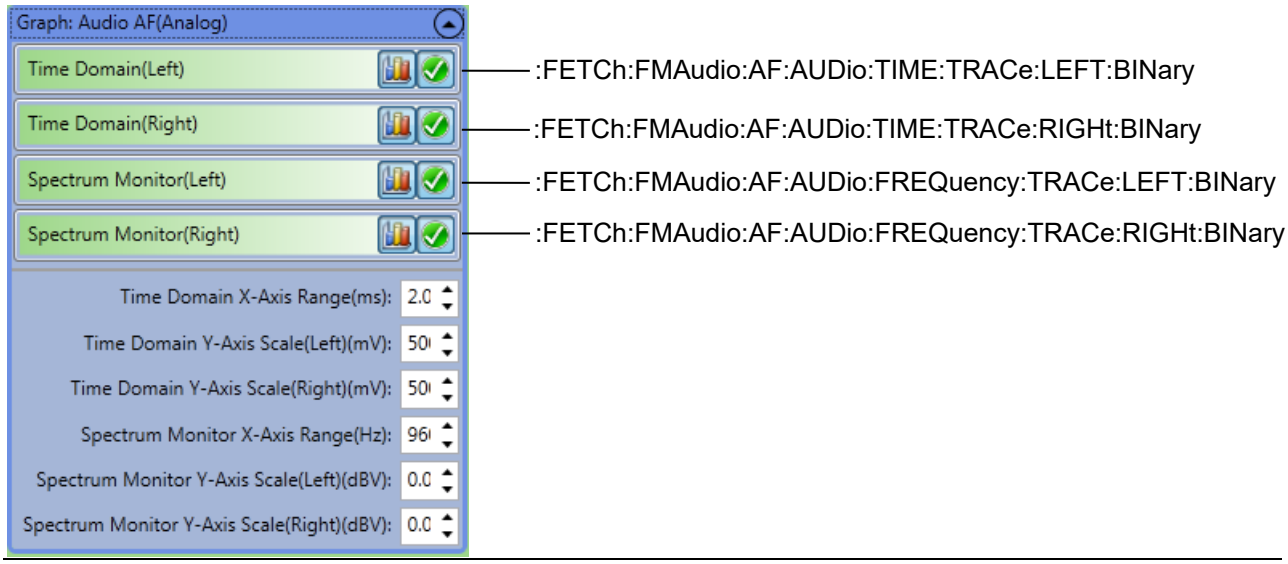


Figure 3.5.3-2 Measurement Settings Pane (Graph: Audio AF (Analog))

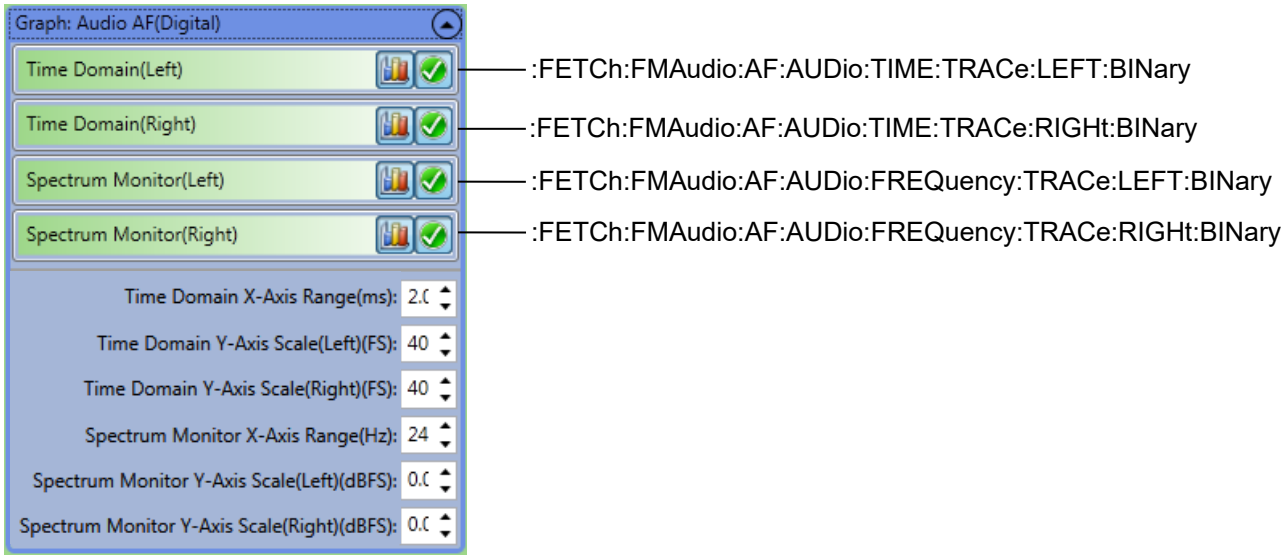


Figure 3.5.3-3 Measurement Settings Pane (Graph: Audio AF (Digital))

AF Total Level	
Left-Channel Total Level +P	:FETCh:FMAudio:AF:AUDio:LEFT:TOTal
Left-Channel Total Level -P	
Left-Channel Total Level (P+P)/2	
Left-Channel Total Level RMS	
Right-Channel Total Level +P	:FETCh:FMAudio:AF:AUDio:RIGHt:TOTal
Right-Channel Total Level -P	
Right-Channel Total Level (P+P)/2	
Right-Channel Total Level RMS	

Figure 3.5.3-4 AF Total Level Measurement Results

:FETCh:FMAudio:AF:AUDio:LEFT:AF

:FETCh:FMAudio:AF:AUDio:CROSstalk

AF Frequency/Level	Frequency(Hz)	Level(mv)	Cross Talk(dB)
Left-Channel Audio Tone 1	-7.00	17.00	-37.00
Left-Channel Audio Tone 2	-0.50	-0.54	-2.00
Left-Channel Audio Tone 3	-76.00	-0.30	-65.00
Left-Channel Audio Tone 4	-46.00	-0.68	-1.04
Left-Channel Audio Tone 5	94.00	-7.00	-5.00
Left-Channel Audio Tone 6	35.00	-65.00	-27.00
Left-Channel Audio Tone 7	-0.24	1.86	81.00
Left-Channel Audio Tone 8	66.00	29.00	-90.00
Left-Channel Audio Tone 9	-44.00	32.00	-16.00
Left-Channel Audio Tone 10	11.00	88.00	-12.00
Left-Channel Audio Tone 11	-95.00	-39.00	-32.00
Left-Channel Audio Tone 12	-51.00	-78.00	63.00
Right-Channel Audio Tone 1	0.70	1.06	-1.18
Right-Channel Audio Tone 2	-0.52	-30.00	-73.00
Right-Channel Audio Tone 3	-3.00	-6.00	-0.92
Right-Channel Audio Tone 4	71.00	22.00	-1.94
Right-Channel Audio Tone 5	88.00	-80.00	-0.30
Right-Channel Audio Tone 6	25.00	52.00	72.00
Right-Channel Audio Tone 7	50.00	0.36	25.00
Right-Channel Audio Tone 8	-1.66	-61.00	-36.00
Right-Channel Audio Tone 9	1.96	-40.00	28.00
Right-Channel Audio Tone 10	57.00	-20.00	5.00
Right-Channel Audio Tone 11	61.00	17.00	-13.00
Right-Channel Audio Tone 12	9.00	-37.00	-85.00

:FETCh:FMAudio:AF:AUDio:RIGHt:AF

Figure 3.5.3-5 AF Frequency/Level Measurement Results

The measurement results of the screen below are displayed when Audio Modulation is set to [Stereo].
When Audio Modulation is set to [Mono], "---" is displayed.

Right-Channel Audio Tone 1 to Right-Channel Audio Tone 12, Cross Talk

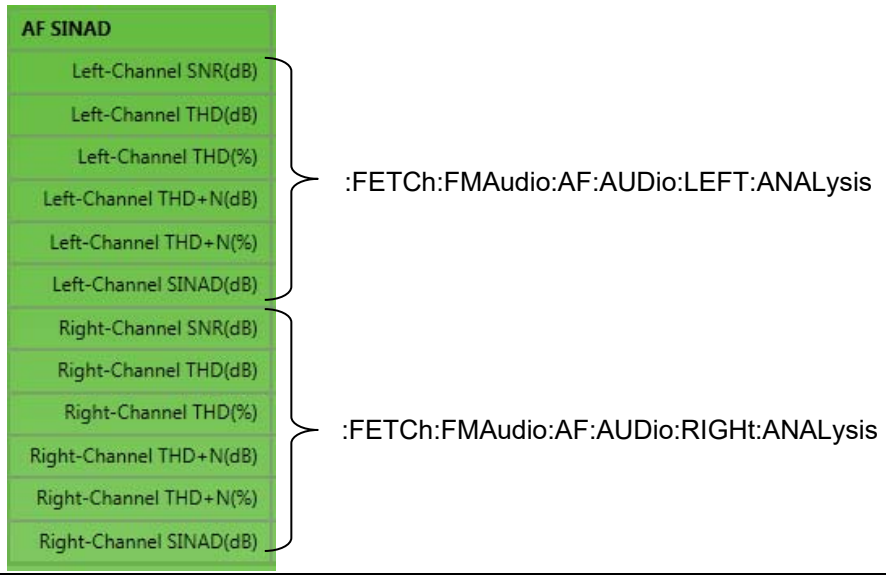


Figure 3.5.3-6 AF SINAD Measurement Results

The measurement results below are displayed when Audio Modulation is set to [Stereo].
When Audio Modulation is set to [Mono], "---" is displayed.

Right-Channel SNR (dB), Right-Channel THD (dB), Right-Channel THD (%),
Right-Channel THD+N (dB), Right-Channel THD+N (%), Right-Channel SINAD (%)

3.6 Audio Signal Transmission

This section explains how to send audio signal.

3.6.1 Setting conditions

The figure below is the settings pane for audio signal transmission. Change the parameter values or selections by clicking ▲/▼.

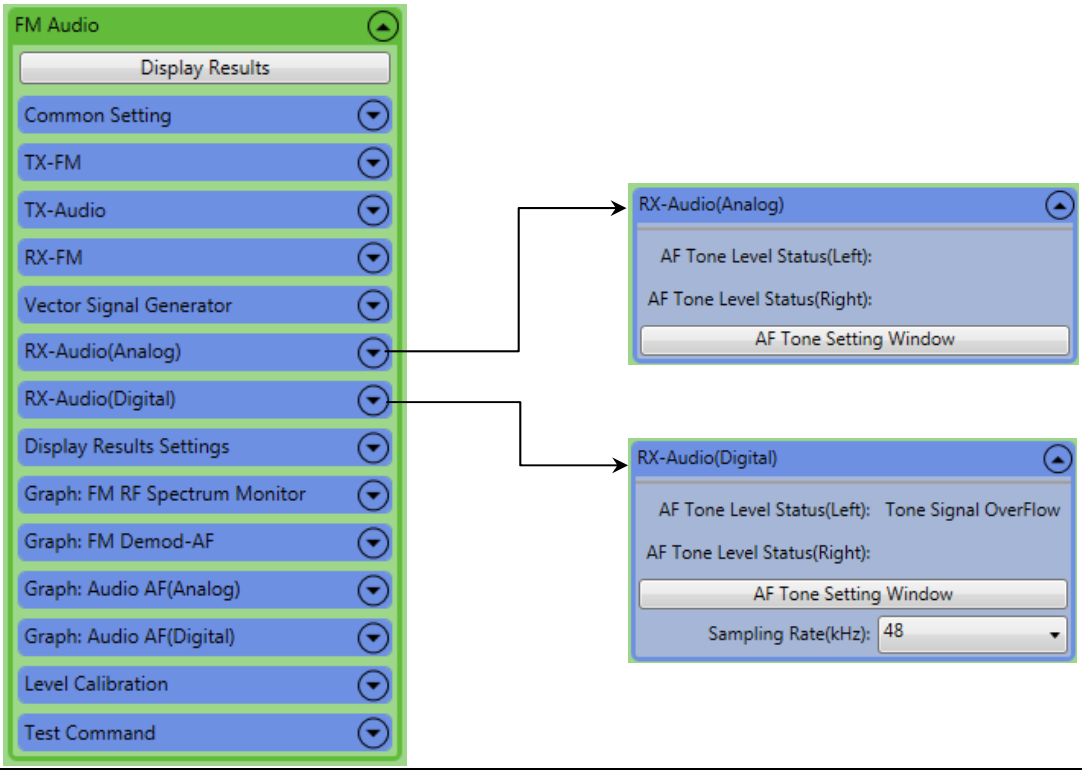


Figure 3.6.1-1 Audio Signal Transmission Settings Pane

3.6.2 Measurement and results

To perform measurement:

1. Click the Open/Close button to open [Common Setting] and set DUT Type to [FM Transmitter].
2. Set the parameters of [Common Setting].
3. When [Analog] is set to [Audio Interface] in [Common Setting], click the Open/Close button to open [RX-Audio(Analog)].
4. When [Digital] is set to [Audio Interface] in [Common Setting], click the Open/Close button to open [RX-Audio(Digital)].
5. Click [AF Tone Setting Window] to set tone signals. Refer to Section 3.6.3 “Setting tone signals”.
6. Click the Measurement Start button to send the parameters to the hardware. The MT8870A outputs the audio signal.

3.6.3 Setting Tone Signals

Perform the following steps to set tone signals to output.

1. Click [AF Tone Setting Window] to open the AF Tone Setting window.
2. Set [On/Off], [Frequency(Hz)], [Level(mVp)] (Analog), and [Level (dBFS)] (Digital) for Left-Channel 1 to 8 individually. The text box color turns into red when the input value is out of the setting range. Check the setting range and re-input the value within the range.
3. Set the parameters for Right-Channels as in Step 2.
4. Click [OK] to save the settings and close the AF Tone Setting window. Click [Cancel] to close the window without saving the settings.

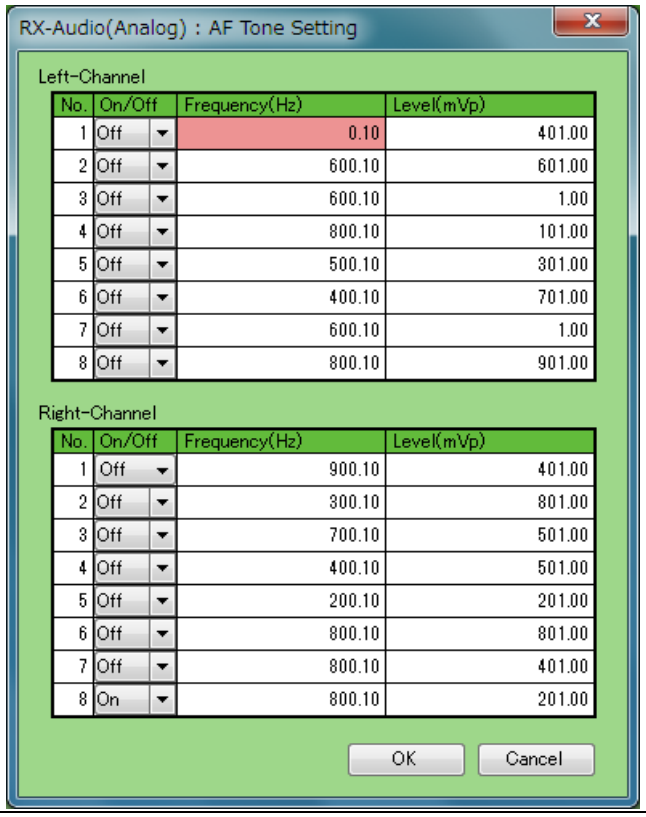


Figure 3.6.3-1 Example of RX-Audio(Analog) : AF Tone Setting

3.6.4 Related SCPI commands

The following figure shows the remote control commands of the MX887070A FM/Audio TRX Measurement and the corresponding fields on the pane.

For details of the commands, refer to Chapter 3 “SCPI Command Reference” in *the MX887070A FM/Audio TRX Measurement Operation Manual*.

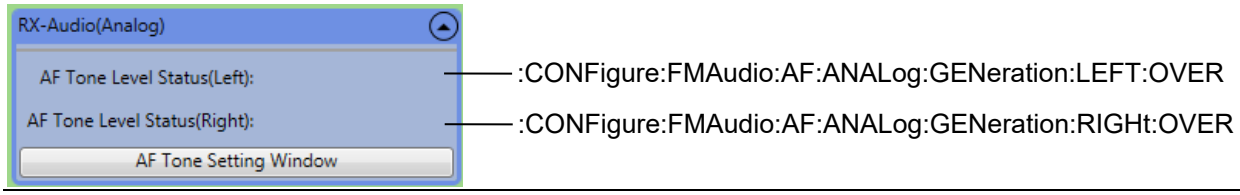


Figure 3.6.4-1 Measurement Settings Pane (RX-Audio (Analog))

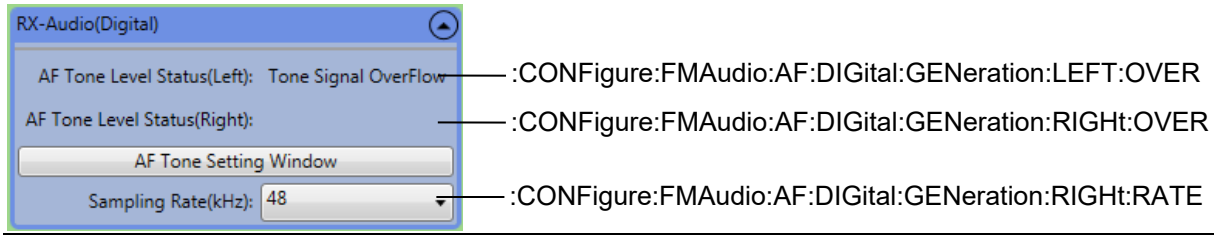


Figure 3.6.4-2 Measurement Settings Pane (RX-Audio (Digital))

When the tone is over the level, Tone Signal Over Flow is displayed in AF Tone Level Status.

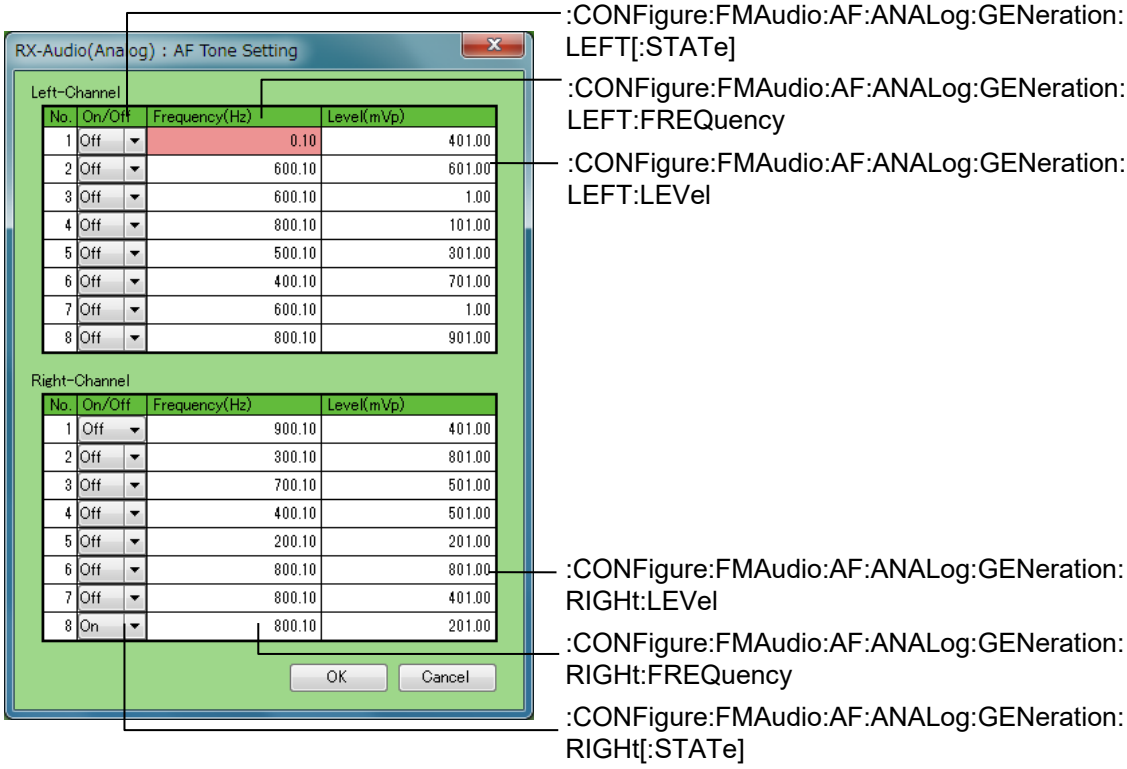


Figure 3.6.4-3 Tone Setting Window (RX-Audio (Analog))

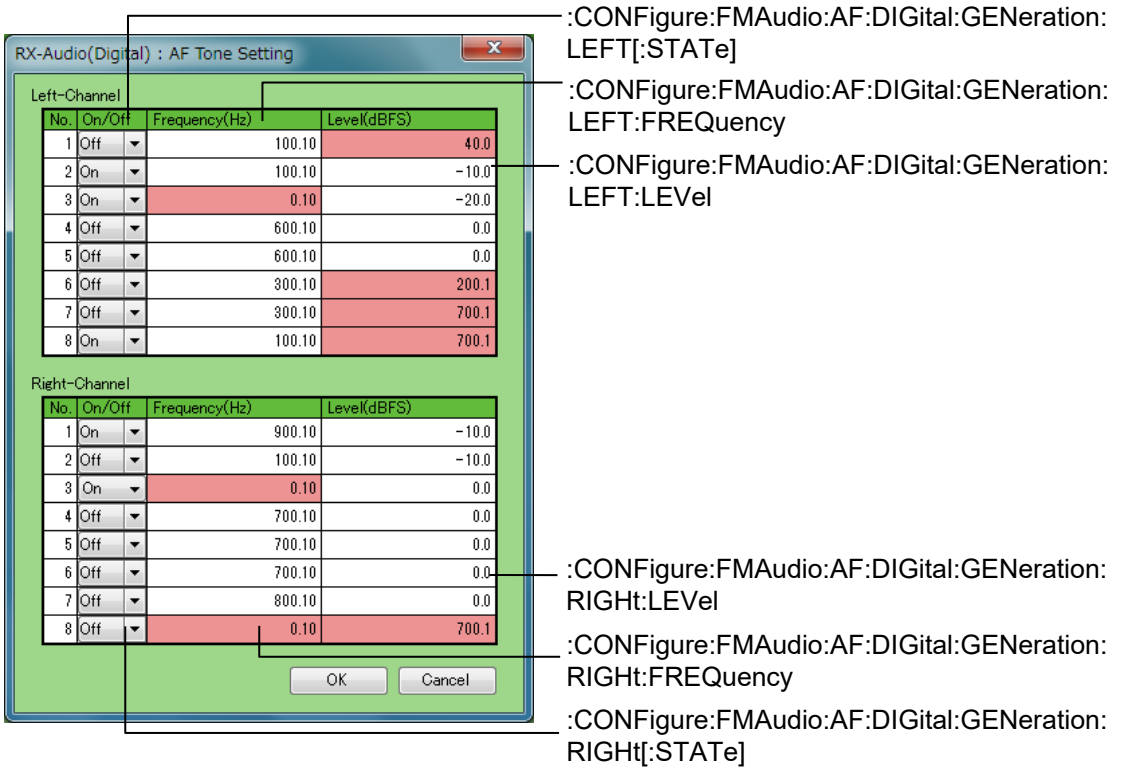


Figure 3.6.4-4 Tone Setting Window (RX-Audio (Digital))