

# **MX887070A FM/Audio TRX Measurement Operation Manual**

**Third Edition**

- For safety and warning information, please read this manual before attempting to use the equipment.
- Additional safety and warning information is provided in the MT8870A Universal Wireless Test Set Operation Manual. Please refer to this document before using the equipment.
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**ANRITSU CORPORATION**

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



These indicate that the marked part should be recycled.

MX887070A  
FM/Audio TRX Measurement  
Operation Manual

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### 1. Product Model

Software: MX887070A FM/Audio TRX Measurement

### 2. Applied Directive and Standards

When MX887070A FM/Audio TRX Measurement is installed in the MT8870A, the applied directive and standards of this software conform to those of the MT8870A main frame.

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that MX887070A can be used with.

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## C-Tick mark



### 1. Product Model

Software: MX887070A FM/Audio TRX Measurement

### 2. Applied Directive and Standards

When MX887070A FM/Audio TRX Measurement is installed in the MT8870A, the applied directive and standards of this software is conform to those of the MT8870A main frame.

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that MX887070A can be used with.




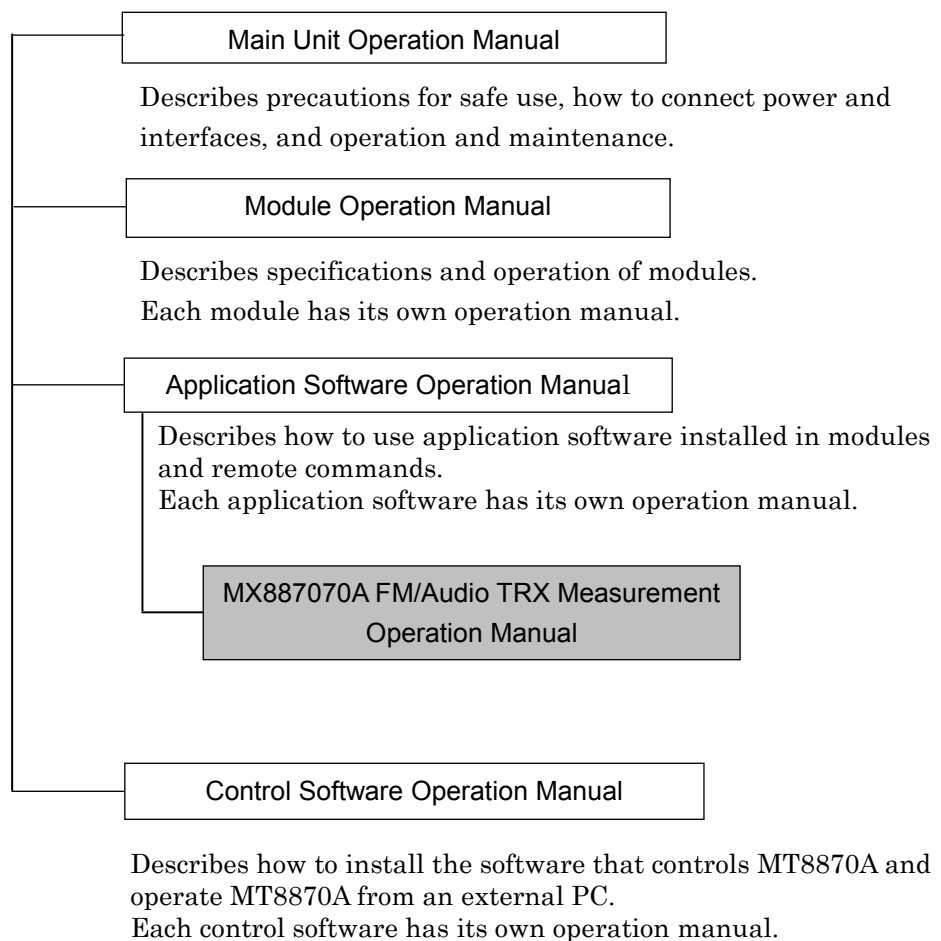
# About This Manual

This manual describes how to operate of the MX887070A FM/Audio TRX Measurement.

Products related to the MT8870A Universal Wireless Test Set are:

- MT8870A Universal Wireless Test Set (Main unit)
- Modules installed in MT8870A Universal Wireless Test Set
- Application software installed in modules
- Control software installed in external PC controller

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



# Table of Contents

<b>About This Manual.....</b>	<b>I</b>
<b>Chapter 1 Outline .....</b>	<b>1-1</b>
1.1    MX887070A Outline.....	1-2
1.2    Product Configuration .....	1-4
1.3    License Registration .....	1-5
1.4    Abbreviations .....	1-6
<b>Chapter 2 Measurement .....</b>	<b>2-1</b>
2.1    Common Operations.....	2-2
2.2    Transmitting FM Signal .....	2-8
2.3    FM Signal Measurement .....	2-17
2.4    Audio Signal Output .....	2-36
2.5    Measuring Audio Signals.....	2-45
<b>Chapter 3 SCPI Command Reference.....</b>	<b>3-1</b>
3.1    List of Commands.....	3-2
3.2    Details of Commands .....	3-16
<b>Chapter 4 Native Command Reference .....</b>	<b>4-1</b>
4.1    List of Commands.....	4-2
4.2    Correspondence with SCPI Commands .....	4-14
<b>Chapter 5 Performance Test .....</b>	<b>5-1</b>
5.1    Outline .....	5-2
5.2    Instruments for Testing Performance .....	5-3
5.3    Performance Test for Each Measurement .....	5-4
5.4    Inputting FM Signal .....	5-9
5.5    FM Signal Output .....	5-16
5.6    Measuring Audio Signal .....	5-19
5.7    Audio Signal Output .....	5-26
5.8    Sample format for performance test result sheet .....	5-31
5.9    Servicing .....	5-43

<b>Appendix A Specifications .....</b>	<b>A-1</b>
<b>Appendix B Digital Interface .....</b>	<b>B-1</b>
<b>Index .....</b>	<b>Index-1</b>

1
2
3
4
5
Appendix
Index



# Chapter 1 Outline

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This chapter outlines the functions of the MX887070A FM/Audio TRX Measurement software option, the product configuration, and license registration.

1.1	Outline of MX887070A.....	1-2
1.1.1	FM Receiver measurement .....	1-2
1.1.2	FM Transmitter measurement .....	1-3
1.2	Product Configuration .....	1-4
1.2.1	Standard configuration .....	1-4
1.2.2	Application software .....	1-4
1.2.3	Application parts .....	1-4
1.3	License Registration .....	1-5
1.4	Abbreviations .....	1-6

## 1.1 Outline of MX887070A

The MX887070A FM/Audio TRX Measurement option (MX887070A hereafter) is licensed software for the MU887000A TRX Test Module (MU887000A hereafter).

The MX887070A has the following functions:

- FM Signal generation
- FM Signal analysis
- Audio signal generation
- Audio signal analysis

Audio signal generation and analysis of the audio signal input from the MU887000A panel require the MU887000A-002/102 Audio Measurement Hardware.

### 1.1.1 FM receiver measurement

MU887000A transmits the FM RF signal to the device under test (DUT hereafter).

Adding the MU887000A-002/102 option supports analysis of the audio signal output from the DUT.

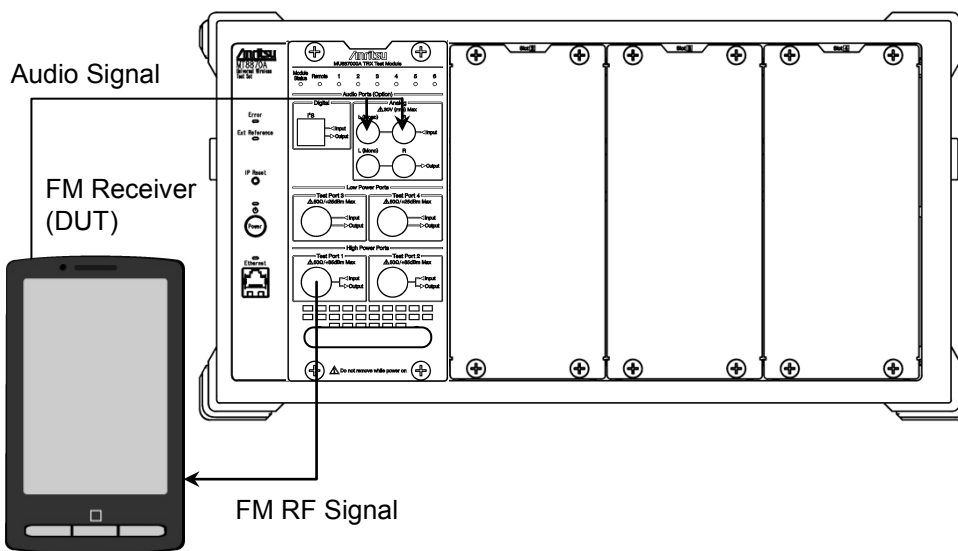


Figure 1.1.1-1 FM Receiver Measurement (with MU887000A-002)

The following items are measured:

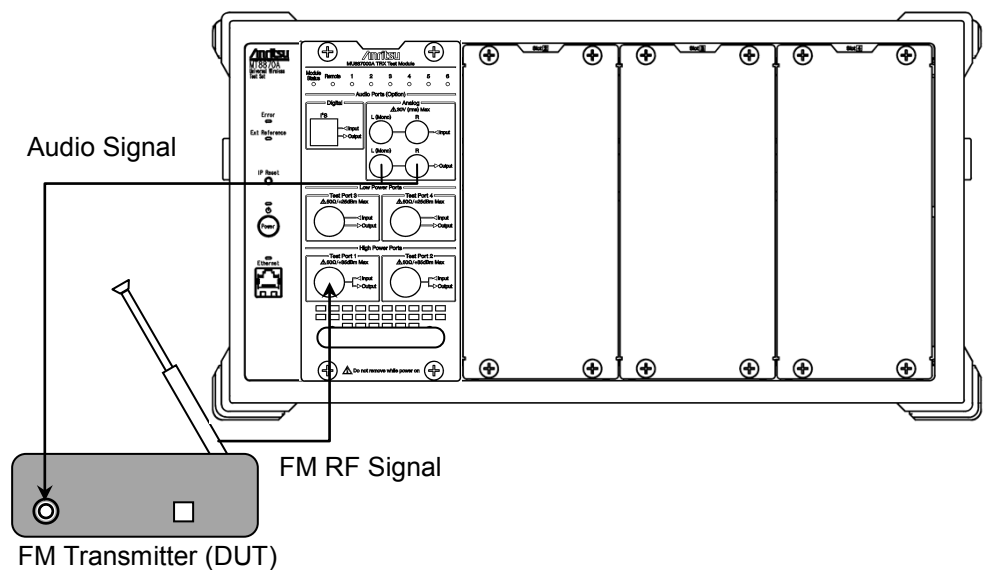
- Audio signal frequency and level
- Audio signal analysis results (SNR, THD, THD+N, SINAD)
- Audio signal time waveform

- Audio signal spectrum
- Audio signal crosstalk

### 1.1.2 FM transmitter measurement

The RF signal received by the MU887000A is analyzed. The demodulated audio signal can be analyzed.

Adding the MU887000A-002/102 option supports output of the audio signal to the DUT.



**Figure 1.1.2-1 FM Transmitter Measurement (with MU887000A-002)**

The following items are measured:

- RF Signal carrier frequency, frequency deviation, level
- RF Signal occupied bandwidth
- RF Signal RDS analysis results
- RF Signal RDS data
- Demodulated audio signal frequency deviation
- Demodulated audio signal frequency and level
- Demodulated audio signal pilot frequency and level
- Demodulated audio signal crosstalk
- Demodulated audio signal analysis results (SNR, THD, THD+N, SINAD)
- Demodulated audio signal time waveform
- Demodulated audio signal spectrum

## 1.2 Product Configuration

This section introduces the standard MT887010A configuration as well as options and application parts.

### 1.2.1 Standard configuration

The standard MX887070A configuration is listed in the following table.

**Table 1.2.1-1 Standard Configuration**

Model/Symbol	Product name	Qty	Items
	DVD	1	
MX887070A	FM/Audio TRX Measurement		On DVD
W3658AE	MX887070A FM/Audio TRX Measurement Operation Manual		English, on DVD

### 1.2.2 Application software

The modulation signal waveform file used by the MX887070A is listed below. Waveform files are sold separately. To order, specify the model/code and name.

**Table 1.2.2-1 Waveforms**

Model/Code	Name
MV887070A	FM RDS Waveforms

### 1.2.3 Application parts

Some application parts (accessories) may be required. They can be ordered separately by specifying the model/code, name and quantity.

**Table 1.2.3-1 Application Parts**

Model/Code	Name	Remarks
W3658AE	MX887070A FM/Audio TRX Measurement Operation Manual	English, printed version

## 1.3 License Registration

A license is required to use the MX887070A in the MU887000A. Refer to Chapter 8 “Utility Tool” in the *MU887000A TRX Test Module Operation Manual* for a description of how to perform license registration.

## 1.4 Abbreviations

The abbreviations used in this manual and printed on the module panel are listed in Table 1.4-1.

**Table 1.4-2 Abbreviations**

Abbreviation	Name
AF	Audio Frequency
AM	Amplitude Modulation
DI	Decoder Indication
ECC	Extended Country Code
EMF	Electro Motive Force
FM	Frequency Modulation
I <sup>2</sup> S	Inter-IC Sound Bus
MCK	Master Clock
MS	Music/Speech Switch
PI	Program Identification
PS	Program Service Name
PTY	Program Type
RBDS	Radio Broadcast Data System
RDS	Radio Data System
RF	Radio Frequency
rms	root mean square
RT	Radio Text
SCK	Continuous Serial Clock
SD	Serial Data
SINAD	Signal to Noise And Distortion
SNR	Signal to Noise Ratio
TA	Traffic Announcement Indication
TP	Traffic Program Indication
THD	Total Harmonic Distortion
THD+N	Total Harmonic Distortion plus Noise
WS	Word Select

## Chapter 2 Measurement

This chapter explains the MX887070A measurement items and commands.

2.1	Common Operations.....	2-2
2.1.1	Selecting the application.....	2-2
2.1.2	Setting the ports .....	2-2
2.1.3	Cable loss correction .....	2-3
2.1.4	Trigger .....	2-4
2.1.5	Starting/stopping measurement .....	2-5
2.2	Sending FM Signal .....	2-8
2.2.1	Setting send signal .....	2-8
2.2.2	Commands .....	2-10
2.2.3	FM signal sending example.....	2-12
2.3	FM Signal Measurement.....	2-17
2.3.1	Setting measurement conditions .....	2-17
2.3.2	Measurement results .....	2-19
2.3.3	Commands .....	2-25
2.3.4	FM signal measurement example .....	2-29
2.4	Audio Signal Output.....	2-36
2.4.1	Setting signal output.....	2-37
2.4.2	Commands .....	2-38
2.4.3	Audio signal output setting example.....	2-40
2.5	Measuring Audio Signals .....	2-45
2.5.1	Setting measurement conditions .....	2-45
2.5.2	Measurement results .....	2-46
2.5.3	Commands .....	2-49
2.5.4	Audio signal measurement example .....	2-52

## 2.1 Common Operations

This section explains the basic operations and shared/common operations.

Both Native and SCPI commands are described in the introduction to commands.

### 2.1.1 Selecting the application

Switch the MU887000A application software to the MX887070A by setting the parameter to FMAUDIO using the following command.

```
SYSSEL  
:INSTRument[:SElect]
```

### 2.1.2 Setting the ports

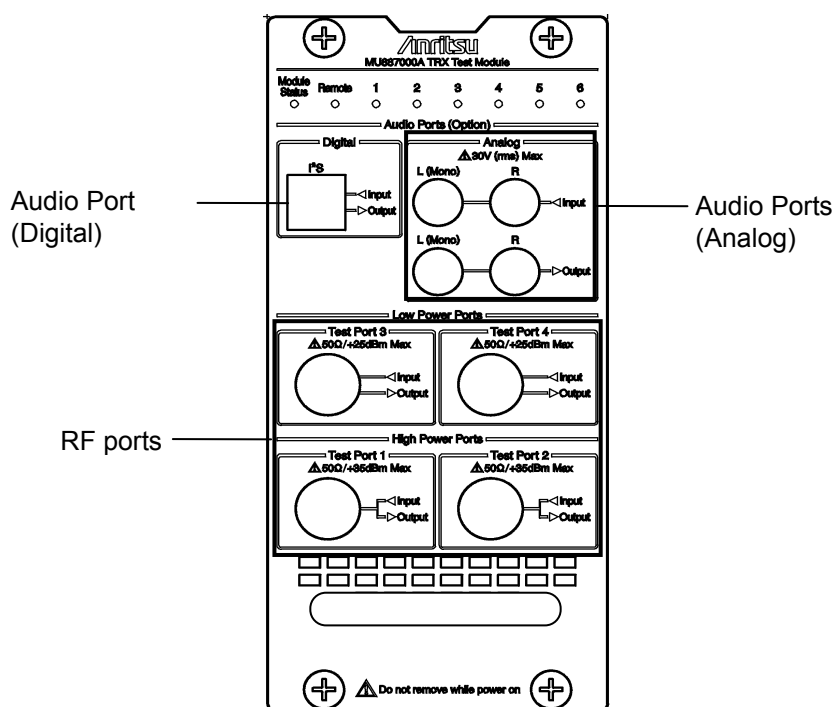


Figure 2.1.2-1 MU887000A Panel (with Opt-002/102)

For details about the audio port (digital), refer to Appendix B “Digital Interface”.

Set the MU887000A ports to be used. The following command sets both the port for outputting the downlink signal and the port for receiving the uplink signals.

Set Port1 to Port4 at the parameter

- Port  
PORT  
:ROUTe:PORT:CONNeCT:DIRection
- RF Signal Input/Output  
ROUT:PORT:RF:ROLE  
:ROUTe:PORT:RF:ROLE

Adding the MU887000A-002/102 supports setting of the audio signal port using the following commands.

- Audio signal input/output  
ROUT:PORT:AUD:ROLE  
:ROUTe:PORT:AUDio:ROLE
- Input port interface  
AUDINSEL  
:ROUTe:PORT:AUDio:INPut:SElect
- Output port interface  
AUDOUTSEL  
:ROUTe:PORT:AUDio:OUTPut:SElect
- Audio port (digital) serial clock and word selection input/output direction  
ROUT:PORT:AUD:DIG:SCK:DIR  
:ROUTe:PORT:AUDio:DIGital:SCK:DIRection
- Audio port (digital) master clock input/output direction  
ROUT:PORT:AUD:DIG:MCK:DIR  
:ROUTe:PORT:AUDio:DIGital:MCK:DIRection
- Audio port (digital) input signal I<sup>2</sup>S bit width  
ROUT:PORT:AUD:DIG:INP:WLEN  
:ROUTe:PORT:AUDio:DIGital:INPut:WLENgth
- Audio port (digital) output signal I<sup>2</sup>S bit width  
ROUT:PORT:AUD:DIG:OUTP:WLEN  
:ROUTe:PORT:AUDio:DIGital:OUTPut:WLENgth

### 2.1.3 Cable loss correction

The loss of coaxial cables can be corrected for the output, input, and measured levels.

Refer to Chapter 3 “Fundamental Operation” in the *MU887000A TRX Test Module Operation Manual* for an explanation of the commands and loss correction data.

## 2.1.4 Trigger

The MX887070A supports starting measurement using changes in signal level as a trigger.

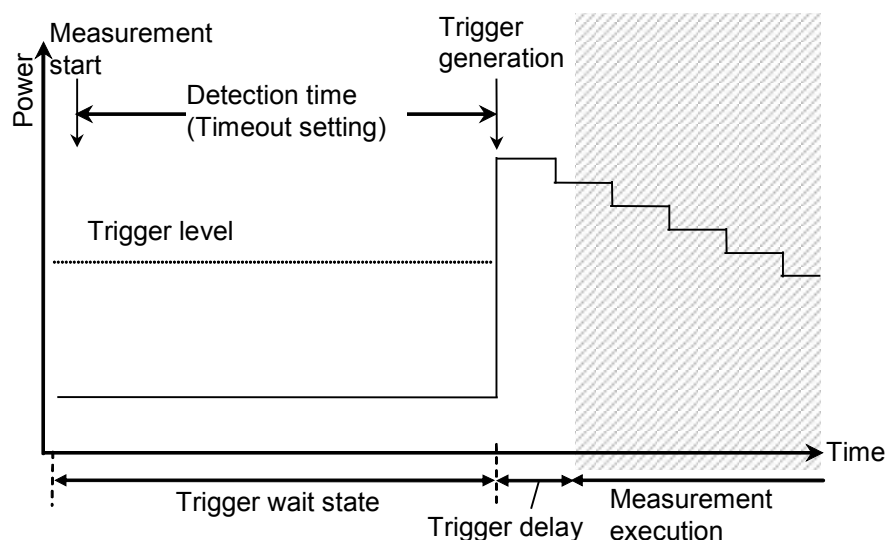


Figure 2.1.4-1 Trigger Conditions

Either Free Run or Power can be selected as the trigger source. When Free Run is specified, measurement is executed as soon as the start measurement command is sent. When Power is specified, measurement is executed when the received RF signal level becomes greater than the trigger level after the measurement start command is sent. If no trigger occurs during the time specified at Trigger Timeout, measurement ends with a timeout error. When inputting a wait time until measurement starts after the trigger occurs, specify the time at Trigger Delay.

The trigger conditions are set by the following commands.

- Trigger Source  
TRIG:FMA:MEAS:SOUR  
:TRIGger:FMAudio:MEASurement:SOURce
- Trigger Level  
TRIG:FMA:MEAS:THR  
:TRIGger:FMAudio:MEASurement:THReshold
- Trigger Delay  
TRIG:FMA:MEAS:DEL  
:TRIGger:FMAudio:MEASurement:DElay
- Trigger Timeout  
TRIG:FMA:MEAS:TOUT  
:TRIGger:FMAudio:MEASurement:TOUT

### 2.1.5 Starting/stopping measurement

#### Starting measurement

To start measurement, send the following command.

```
INIT:FMA:MEAS:SING
:INITiate:FMAudio:MEASurement:SINGLE
```

#### Stopping measurement

To stop measurement, send the following command.

```
ABOR:FMA:MEAS
:ABORT:FMAudio:MEASurement
```

#### Checking measurement status

To query the measurement status and errors, send the following command.

```
FETC:FMA:MEAS:STAT
:FETCh:FMAudio:MEASurement:STATe
```

**Table 2.1.5-1 Query Responses**

Response	Meaning
0	Measurement completed normally
2	Level over
9	Measurement is in progress or not executed
12	Timeout of Tx measurement

The measurement status and errors can be queried using the status registers.

Refer to Chapter 3 “Fundamental Operation” in the *MU887000A TRX Test Module Operation Manual* for an explanation of the status registers. The allocations of MX887070A status registers are described in the following tables.

Native Command Mode

**Table 2.1.5-2 Bit Definitions of End Event Status Register (Signal Generator)**

Bit	Description
7 to 1	Not used and always set to 0
0	Changed to 1 at end of reading waveform file

**Table 2.1.5-3 Bit Definitions of Error Event Status Register (Signal Generator)**

Bit	Description
7 to 1	Not used and always set to 0
0	Changed to 1 at error in read waveform file

**Table 2.1.5-4 Bit Definitions of End Event Status Register (Measurement)**

Bit	Description
7 to 2	Not used and always set to 0
1	Changed to 1 after trigger prepared
0	Changed to 1 when measurement preparation completed

**Table 2.1.5-5 Bit Definitions of Error Event Status Register (Measurement)**

Bit	Description
7 to 3	Not used and always set to 0
2	Changed to 1 at measurement timeout
1	Changed to 1 when measurement result under level
0	Changed to 1 when measurement result over level

## SCPI Command Mode

**Table 2.1.5-6 Bit Definitions of Signal Generator Status Register**

Bit	Description
15 to 1	Not used and always set to 0
0	Changed to 1 while reading file

**Table 2.1.5-7 Bit Definitions of Measurement Status Register**

Bit	Description
15 to 2	Not used and always set to 0
1	Changed to 1 while preparing trigger
0	Changed to 1 during measurement

**Table 2.1.5-8 Bit Definitions of Signal Generator Questionable Register**

Bit	Description
15 to 1	Not used and always set to 0
0	Changed to 1 at error in read file

**Table 2.1.5-9 Bit Definitions of Measurement Questionable Register**

Bit	Description
15 to 3	Not used and always set to 0
2	Changed to 1 at measurement timeout
1	Changed to 1 when measurement result under level.
0	Changed to 1 when measurement result over level over

## 2.2 Transmitting FM Signals

This section describes how to transmit FM RF signals from MU887000A to the DUT.

### 2.2.1 Setting the transmission conditions

Set the following items when transmitting FM signals.

Transmission frequency and output level

Set the center frequency and the output level of the RF signal to be transmitted by MU887000A.

Output and modulation

Set on and off the modulation and output of the RF signal to be transmitted by MU887000A.

Modulation signal generation method

Select from one of the following:

- Waveform Pattern
- Tone Signal

When Waveform pattern is selected, specify a waveform pattern.

When Tone signal is selected, set the following items:

- Tone signal frequency
- Tone signal frequency modulation level
- Tone signal On/Off
- AM modulation depth
- AM modulation frequency
- AM modulation On/Off
- Pilot signal frequency deviation

Waveform pattern

MU887000A can modulate the transmission signal by loading a waveform pattern file. Specify a modulation signal by selecting a pattern in the waveform files that are available separately.

Table 2.2.1-1 Waveform files

File Name	Number of data	Remarks
MV887070A_FMRDS_0001	3	RDS Receiver performance test
MV887070A_FMRDS_0002	1	RDS Receiver performance test
MV887070A_FMRDS_0003	1	RDS Receiver performance test
MV887070A_FMRDS_0004	1	

For details of the waveform files, refer to the *Waveform file for GNSS & Broadcast Operation Manual*.

For how to use the waveform files, refer to Chapter 4 “Vector Signal Generator” in the *MU887000A TRX Test Module Operation Manual*.

#### Tone signal

Set tone signals (sine waves) as modulation signals for FM. (Up to eight tone signals can be set for L and R respectively.)

- Modulation method  
Set to Mono or Stereo. When Mono is set, the tone signals are set to the left channel.
- Tone frequency  
Set the tone frequency in the range of 20.0 to 40 000.0 Hz for L and R respectively.
- Tone signal frequency modulation deviation  
Set the frequency modulation deviation in the range of 0.0 to 100 000.0 Hz for L and R respectively.
- Tone signal On/Off

#### Amplitude Modulation

AM modulation can be applied to the FM-modulated signal.

- AM modulation depth  
Set the modulation depth in the range of 0.0 to 75.0%.
- AM modulation frequency  
Set the modulation frequency in the range of 0.0 to 15 000.0 Hz.
- AM modulation On/Off

#### Pilot signal frequency deviation

Set the FM frequency deviation of the pilot signal in the range of 0.0 to 10 000 Hz.

## 2.2.2 Commands

This subsection describes the commands that are required for setting the FM signal transmission conditions.

- Ports  
Refer to 2.1.2 “Setting the ports”.
- Transmission frequency (DUT Rx frequency)  
CONF:FMA:GEN:RFS:FREQ  
:CONFigure:FMAudio:GENerator:RFSettings:FREQuency
- Output level unit  
CONF:FMA:GEN:RFS:LVL:UNIT  
:CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT
- Output level  
CONF:FMA:GEN:RFS:LVL  
:CONFigure:FMAudio:GENerator:RFSettings:LEVel
- Output On/Off  
CONF:FMA:GEN:RFS:STAT  
:CONFigure:FMAudio:GENerator:RFSettings:STATe
- Modulation On/Off  
CONF:FMA:GEN:BBM  
:CONFigure:FMAudio:GENerator:BBMode
- Modulation signal generation method  
CONF:FMA:FM:GEN  
:CONFigure:FMAudio:FM:GENeration
- Modulation method  
CONF:FMA:FM:GEN:MOD  
:CONFigure:FMAudio:FM:GENeration:MODulation
- Tone signal On/Off (L)  
CONF:FMA:FM:GEN:LEFT  
:CONFigure:FMAudio:FM:GENeration:LEFT[:STATe]
- Tone frequency (L)  
CONF:FMA:FM:GEN:LEFT:FREQ  
:CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency
- Tone signal frequency modulation shift (L)  
CONF:FMA:FM:GEN:LEFT:DEV  
:CONFigure:FMAudio:FM:GENeration:LEFT:DEViation
- Tone signal On/Off (R)  
CONF:FMA:FM:GEN:RIGH  
:CONFigure:FMAudio:FM:GENeration:RIGHT[:STATe]
- Tone frequency (R)  
CONF:FMA:FM:GEN:RIGH:FREQ  
:CONFigure:FMAudio:FM:GENeration:RIGHT:FREQuency

- **Tone signal frequency modulation shift (R)**  
CONF:FMA:FM:GEN:RIGH:DEV  
:CONFigure:FMAudio:FM:GENeration:RIGHT:DEVIation
- **AM modulation On/Off**  
CONF:FMA:FM:GEN:AM  
:CONFigure:FMAudio:FM:GENeration:AM[:STATe]
- **AM modulation depth**  
CONF:FMA:FM:GEN:AM:DEPT  
:CONFigure:FMAudio:FM:GENeration:AM:DEPTH
- **AM modulation frequency**  
CONF:FMA:FM:GEN:AM:FREQ  
:CONFigure:FMAudio:FM:GENeration:AM:FREQuency
- **Pilot signal frequency deviation**  
CONF:FMA:FM:GEN:PIL:DEV  
:CONFigure:FMAudio:FM:GENeration:PILot:DEVIation

### 2.2.3 Setting example of the FM transmission signal

This subsection describes an example of setting the FM transmission signal in the Native command mode.

The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

Processing flow

- Set the application software type to FMAUDIO.
- Set the following measurement conditions:
 

Test Port	Port 1
RF Port I/O	Output
Output Level Units	dBm
Output Level	–20 dBm
Center Frequency	85 MHz
Modulation Signal Selection	Tone signal
Modulation Method	Stereo
AM Modulation Signal	Off
Pilot Signal Modulation Depth	7.5 kHz
- Set the tone signals as follows. However, the frequency and FM level cannot be set for tone numbers where Output is Off.

Left	Number	1	2	3	4	5	6	7	8
	Output	On	On	On	On	Off	Off	Off	Off
	Tone Frequency (Hz)	100	450	950	2560	1000	1000	1000	1000
	FM Level (Hz)	3500	3500	3500	3500	3500	3500	3500	3500
Right	Number	1	2	3	4	5	6	7	8
	Output	On	Off	On	Off	On	Off	On	Off
	Tone Frequency (Hz)	50	1000	125	1000	375	1000	4000	1000
	FM Level (Hz)	3500	3500	3500	3500	3500	3500	3500	3500

- Set RF signal modulation to on.
- Set RF signal output to on.

```
; Sample program for FM signal generation
; Anritsu Corporation October, 2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 3 second
timeout=3

; Set language to "Native".
sendln 'SYST:LANG NAT'
call check_error_code

; Set application software type to "FM/Audio".
sendln 'SYSSEL FMAUDIO'
call check_error_code

; Set test port to "Port1".
sendln 'PORT PORT1,PORT1'
call check_error_code

; Set role of RF port to "Output".
sendln 'ROUT:PORT:RF:ROLE OUTPUT'
call check_error_code

; Set unit of output level to "dBm".
sendln 'CONF:FMA:GEN:RFS:LEV:UNIT DBM'
call check_error_code

; Set output level to "-20 dBm".
sendln 'CONF:FMA:GEN:RFS:LEV -20'
call check_error_code

; Set center frequency to "85 MHz".
sendln 'CONF:FMA:GEN:RFS:FREQ 85MHZ'
call check_error_code

; Set tone modulation to "On".
sendln 'CONF:FMA:FM:GEN ON'
call check_error_code

; Set modulation type to "Stereo".
sendln 'CONF:FMA:FM:GEN:MOD STEREO'
```

```
call check_error_code

; Set Left tone signals.
sendln 'CONF:FMA:FM:GEN:LEFT 1,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 2,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 3,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 4,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 5,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 6,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 7,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT 8,0'
call check_error_code

sendln 'CONF:FMA:FM:GEN:LEFT:FREQ 1,100'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:FREQ 2,450'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:FREQ 3,950'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:FREQ 4,2560'
call check_error_code

sendln 'CONF:FMA:FM:GEN:LEFT:DEV 1,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:DEV 2,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:DEV 3,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:LEFT:DEV 4,3500'
call check_error_code

; Set Right tone signals.
sendln 'CONF:FMA:FM:GEN:RIGH 1,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 2,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 3,1'
```

```

call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 4,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 5,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 6,0'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 7,1'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH 8,0'
call check_error_code

sendln 'CONF:FMA:FM:GEN:RIGH:FREQ 1,50'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:FREQ 3,125'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:FREQ 5,375'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:FREQ 7,4000'
call check_error_code

sendln 'CONF:FMA:FM:GEN:RIGH:DEV 1,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:DEV 3,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:DEV 5,3500'
call check_error_code
sendln 'CONF:FMA:FM:GEN:RIGH:DEV 7,3500'
call check_error_code

; Set Amplitude Modulation to "Off".
sendln 'CONF:FMA:GEN:AM OFF'
call check_error_code

; Set Pilot Signal Deviation to "7.5 kHz".
sendln 'CONF:FMA:GEN:PIL:DEV 7500'
call check_error_code

; Set RF modulation to "On".
sendln 'CONF:FMA:GEN:BBM ON'
call check_error_code

; Set RF Output to "On".
sendln 'CONF:FMA:GEN:RFS:STAT ON'

```

```
call check_error_code

messagebox 'Macro end successfully' 'Finish'

End

;      ----- subroutines -----

:check_error_code
; query error
sendln 'SYSERR?'
waitln 'No error'

; in case of timeout
if result=0 goto _timeout
; in case of error occurring
if result=2 then
    e_message='Error code = '
    strconcat e_message inputstr
    messagebox e_message 'Command Error occurred'
end
endif

; in case of no error

return

:check_response

;for debug
messagebox inputstr 'debug1'
int2str result_str result
messagebox result_str 'debug2'

return

:_timeout
messagebox 'No response from MT8870A.' 'Time out!'
call check_error_code
End
```

## 2.3 Measuring FM Signals

This section describes how to measure RF signals input to MU887000A.  
Refer to 2.3.2 “Measurement results” for the measurement items.

### 2.3.1 Setting the measurement conditions

Set the following items when measuring FM signals.

#### Rx Frequency

Set the frequency of the RF signal input to MU887000A.

#### Input Level

Set the level of the RF signal input to MU887000A.

#### Occupied Bandwidth

Set the power ratio (occupation ratio) for evaluating the occupied bandwidth in the range of 80 to 99.9%.

#### Demodulation Method

Set the FM demodulation method to Mono or Stereo.

#### Averaging Times

Set the number of FM measurement times. The measured value averaging times is determined by this value.

#### Filter

Set the bandwidth of the filter used for the signal demodulated from the RF signal. Set the following filters for L and R respectively. When Mono is set as the Demodulation Method, set the filters for the left channel.

- High pass filter (OFF, 20 Hz, 100 Hz, 300 Hz, 400 Hz)
- Low pass filter (OFF, 3 kHz, 15 kHz, 20 kHz, 30 kHz)
- De-Emphasis filter (OFF, 50  $\mu$ s, 75  $\mu$ s, 750  $\mu$ s)
- Band pass filter (OFF, A-weighting, C-message, CCITT)

Gain (dB)

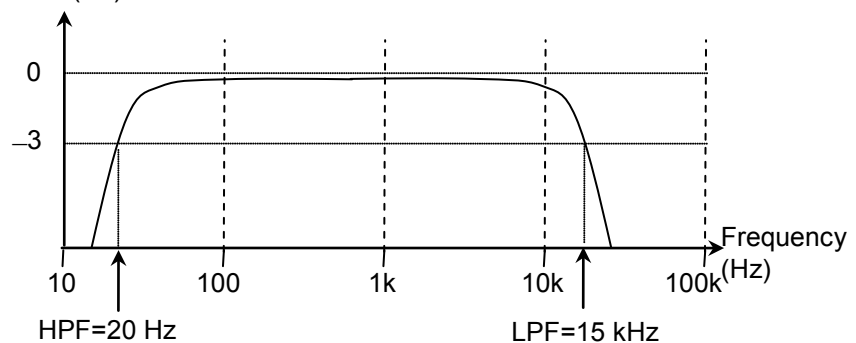
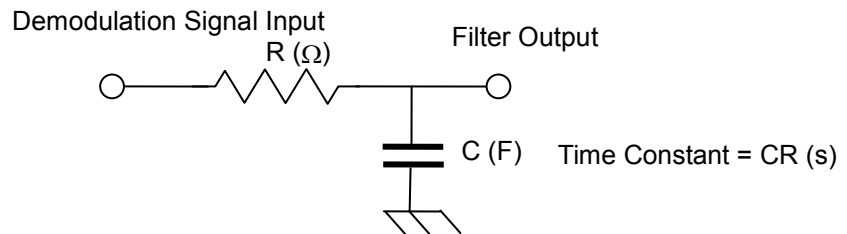


Figure 2.3.1-1 Filter Setting Example

The de-emphasis filter is set as a time constant to suppress harmonic noise.



**Figure 2.3.1-2 De-emphasis Equivalent Circuit**

Use a pass band filter conforming to the standards.

- A-weighting: IEC 61672-1 *Electroacoustics—Sound level meters—Part 1: Specifications*
- C-message: IEEE 743 *IEEE Standard Equipment Requirements and Measurement Techniques for Analog Transmission Parameters for Telecommunications*
- CCITT (ITU-T O.41): ITU-T Recommendation O.41 *Psophometer for use on telephone-type circuits*

#### RDS Analysis

Set the RDS measurement on and off.

### 2.3.2 Measurement results

#### RF Summary

The average, max. and min. values are obtained for the following items:

- Carrier frequency (Hz)
- Frequency deviation (Hz)
- Carrier level (dBm or dBμ)

#### RDS Block

The following items are obtained.

- RDS bit count
- RDS block count
- Bit error rate

#### RDS Data

The following items are obtained.

- RDS block count
- Group name for each block
- Information word for each block
- Check/offset word for each block

#### Radio Text

RDS radio text in hexadecimal

#### OBW

Occupied frequency width with specified power in total power of signal input to MU887000A.

- Upper Frequency

Finds  $f_{\text{upper}}$  frequency with power of  $\frac{100 - \text{OccupationRatio}}{2}$  in total power from upper limit of measured waveform. Difference between this frequency and set Uplink frequency.

- Lower Frequency

Finds  $f_{\text{lower}}$  frequency with power of  $\frac{100 - \text{OccupationRatio}}{2}$  in total power from lower limit of measured waveform. Difference between this frequency and set Uplink frequency.

- Center Frequency

Value of  $\frac{f_{\text{upper}} + f_{\text{lower}}}{2}$

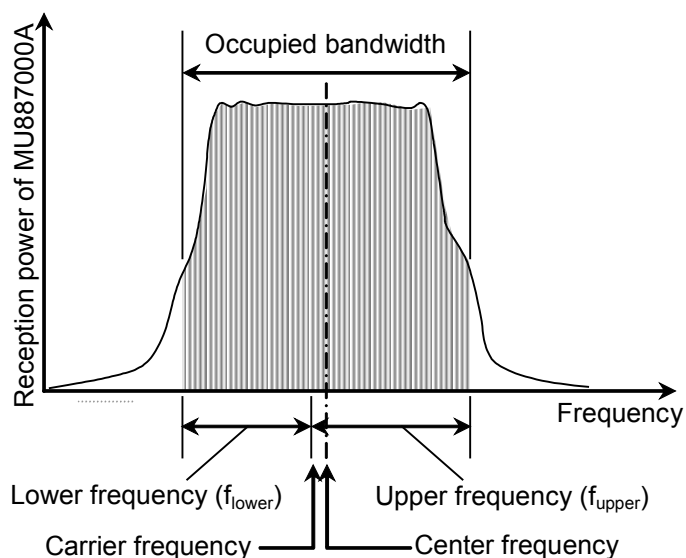


Figure 2.3.2-1 Occupied Bandwidth

#### Demodulation Signal Frequency Deviation

The following items are obtained.

Table 2.3.2-1 Frequency Deviation Measurement Target and Items

Signal Items	Stereo Pre-separation	Stereo (L)	Stereo (R)
+ Side Frequency Deviation (Hz)	✓	✓	✓
– Side Frequency Deviation (Hz)	✓	✓	✓
Average of + Side Frequency Deviation (Hz) and – Side Frequency Deviation (Hz)	✓	✓	✓
Mean Square of Frequency Deviation (Hz)	✓	✓	✓

#### Demodulation Signal Frequency Deviation and Level

This measures the frequency deviation (Hz) and level (dB) of the tone signal for L and R respectively.

#### Demodulation Signal Analysis

The average, max. and min. values of the following items are obtained for L and R respectively.

- SNR (dB)
- THD (dB)
- THD (%)
- THD+N (dB)

- THD+N (%)
- SINAD (dB)

The formula for each of the items is shown below. The harmonic is calculated up to the 10th order.

$V_1$ : Signal voltage (V)

$V_n$ : Voltage (V) of the  $n^{\text{th}}$  order harmonic

$N$ : Voltage (V) of noise

$V_{\text{all}}$ : Total voltage of signal, harmonics and noise

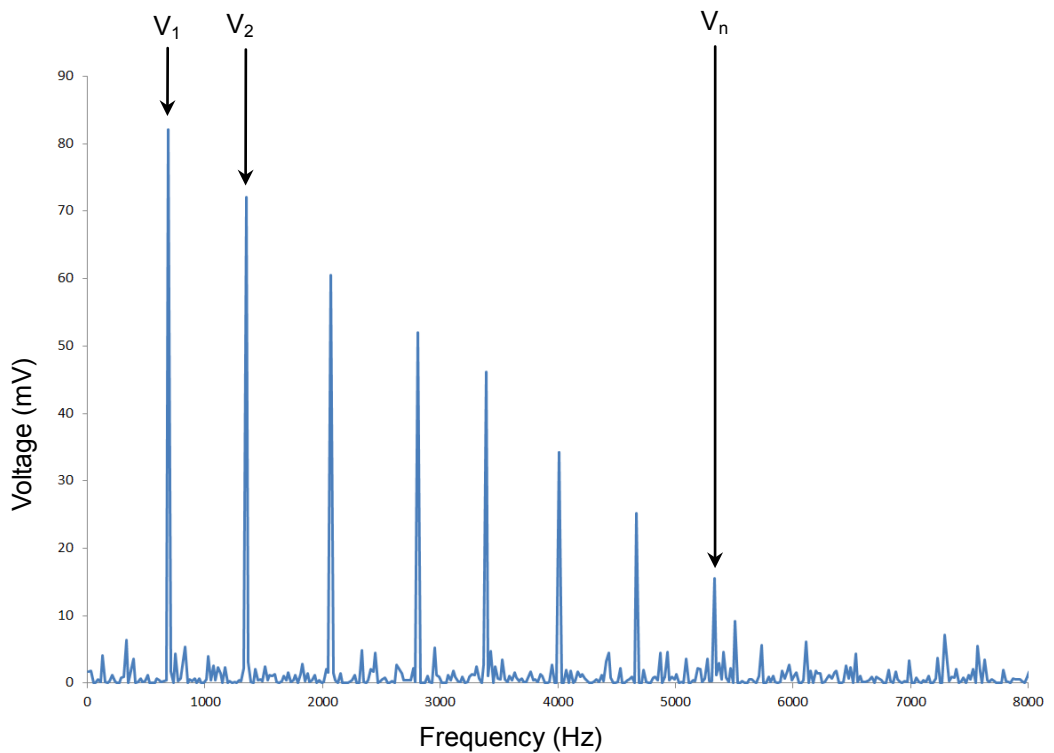


Figure 2.3.2-2 Demodulation Signal Spectrum

$$SNR = 20 \log_{10} \left( \frac{V_1}{N} \right) \text{ (dB)}$$

$$THD = 20 \log_{10} \left( \frac{\sqrt{V_2^2 + V_3^2 + V_4^2 + \dots + V_n^2}}{V_{\text{all}}} \right) \text{ (dB)}$$

$$THD + N = 20 \log_{10} \left( \frac{\sqrt{V_2^2 + V_3^2 + V_4^2 + \dots + V_n^2 + N^2}}{V_{\text{all}}} \right) \text{ (dB)}$$

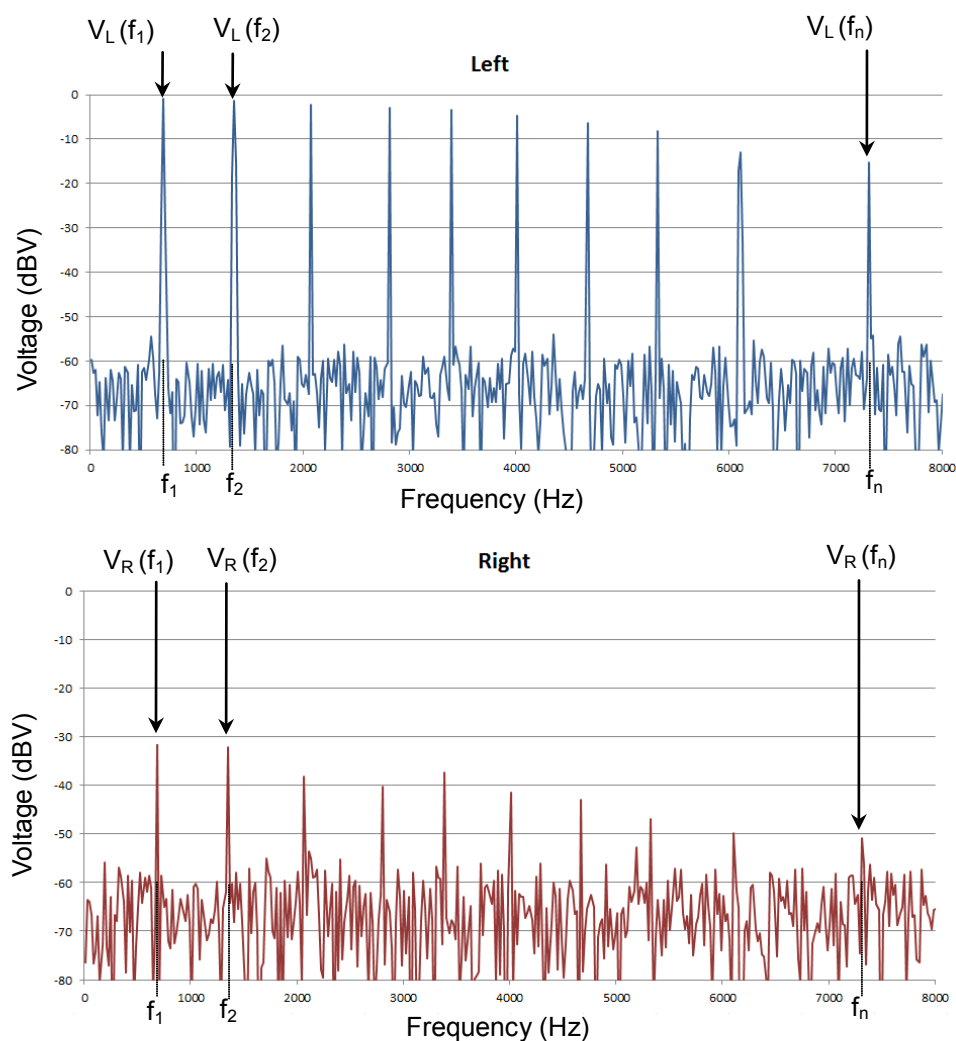
$$\text{SINAD} = 20 \log_{10} \left( \frac{V_{\text{all}}}{\sqrt{V_2^2 + V_3^2 + V_4^2 + \dots + V_n^2 + N^2}} \right) \text{ (dB)}$$

### Pilot Signal Frequency and Frequency Error

The average, max. and min. values of the pilot signal frequency (Hz) and the frequency error (Hz) are obtained.

### Stereo Signal Crosstalk

The average, max. and min. values of the crosstalk from the left to right stereo signals (dB), and from the right to left stereo signals (dB) are obtained.



**Figure 2.3.2-3 Demodulation Spectrum Measurement Example**

$f_n$ :  $n^{\text{th}}$  tone frequency (Hz)

$V_L$ : Left signal root mean square voltage (Vrms)

$V_R$ : Right signal root mean square voltage (Vrms)

$$Crosstalk_{L \rightarrow R}(f_1) = 20 \log_{10} \left( \frac{V_R(f_1)}{V_L(f_1)} \right) \text{ (dB)}$$

$$Crosstalk_{R \rightarrow L}(f_1) = 20 \log_{10} \left( \frac{V_L(f_1)}{V_R(f_1)} \right) \text{ (dB)}$$

$$Crosstalk_{L \rightarrow R}(f_2) = 20 \log_{10} \left( \frac{V_R(f_2)}{V_L(f_2)} \right) \text{ (dB)}$$

$$Crosstalk_{R \rightarrow L}(f_2) = 20 \log_{10} \left( \frac{V_L(f_2)}{V_R(f_2)} \right) \text{ (dB)}$$

:

$$Crosstalk_{L \rightarrow R}(f_{12}) = 20 \log_{10} \left( \frac{V_R(f_{12})}{V_L(f_{12})} \right) \text{ (dB)}$$

$$Crosstalk_{R \rightarrow L}(f_{12}) = 20 \log_{10} \left( \frac{V_L(f_{12})}{V_R(f_{12})} \right) \text{ (dB)}$$

**Note:**

When measuring crosstalk from left to right, only the signal for the left channel in the RF signal is modulated. Conversely, when measuring crosstalk from right to left, only the signal for the right channel in the RF signal is modulated. If both the right and left channels are modulated, the crosstalk measured value cannot be calculated correctly.

If Mono is set as the demodulation method, \*\*\* is obtained as a result of measurement.

**RF Signal Spectrum**

This measures the spectrum of the Rx frequency  $\pm 250$  kHz in dB units. Spectrum data can be transferred as text or binary data.

**Demodulation Signal Spectrum**

This measures the spectrum of the demodulation signal for left and right separately.

In the frequency range of 0 to 76 kHz, the spectrum level is 0 dB for a frequency deviation of 75 kHz.

Spectrum data can be transferred as text or binary data.

**Demodulation Signal Time Waveform**

This measures the time variation of the demodulation signal frequency deviation separately for L+R and L/R.

The waveform measurement time is 100 ms and the waveform data units are Hz.

Time-variation data can be transferred as text or binary data.

For the binary data, the head string starts with a number sign (#) and continues with data after a numeric value indicating the data length. The data length is displayed when the next character of the number sign (#) is other than 0.

The binary data follows the number indicating the data length.

Example: #42002an%\*qe4445+\...

When the measurement is started, data is collected for the number of times set by the Averaging Times.

**Table 2.3.2-2 Measurement Results Reflecting Averaging Times Setting**

Item	Measurement Result			
	Mean	Max.	Min.	Last Measured
RF Summary	✓	✓	✓	
RDS Block				✓ *1
RDS Data				✓ *1
Radio Text				✓ *2
Occupied Bandwidth				
Demodulation Signal Frequency Deviation	✓			
Demodulation Signal Frequency Deviation and Level	✓			
Demodulation Signal Analysis	✓	✓	✓	
Pilot Signal Frequency and Frequency Deviation	✓	✓	✓	
Stereo Signal Crosstalk	✓	✓	✓	
RF Signal Spectrum	✓			
Demodulation Signal Spectrum	✓			
Demodulation Signal Time Waveform				

\*1: Measures RDS 1 Group at each measurement

\*2: The Radio Text measurement result is the linked data of the text included in all of the measured RDS groups.

### 2.3.3 Commands

This subsection describes the commands that are used for setting the FM signal measurement conditions.

#### Ports

Refer to 2.1.2 “Setting the ports”.

#### Setting Measurement Conditions

- **Rx Frequency (DUT Tx Frequency)**  
`CONF:FMA:MEAS:RFS:FREQ`  
`:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency`
- **Input Level**  
`CONF:FMA:MEAS:RFS:LVL`  
`:CONFigure:FMAudio:MEASurement:RFSettings:LEVel`
- **Occupation Ratio**  
`CONF:FMA:FM:OBW:RAT`  
`:CONFigure:FMAudio:FM:OBW:RATio`
- **Demodulation Method**  
`CONF:FMA:FM:MOD`  
`:CONFigure:FMAudio:FM:MODulation`
- **Averaging Switching**  
`CONF:FMA:FM:STOR:MODE`  
`:CONFigure:FMAudio:FM:STORage:MODE`
- **Averaging Count**  
`CONF:FMA:FM:STOR:COUN`  
`:CONFigure:FMAudio:FM:STORage:COUNT`
- **High Pass Filter (L)**  
`CONF:FMA:FM:LEFT:HPF`  
`:CONFigure:FMAudio:FM:LEFT:HPFilter`
- **High Pass Filter (R)**  
`CONF:FMA:FM:RIGH:HPF`  
`:CONFigure:FMAudio:FM:RIGHT:HPFilter`
- **Low Pass Filter (L)**  
`CONF:FMA:FM:LEFT:LPF`  
`:CONFigure:FMAudio:FM:LEFT:LPFilter`
- **Low Pass Filter (R)**  
`CONF:FMA:FM:RIGH:LPF`  
`:CONFigure:FMAudio:FM:RIGHT:LPFilter`
- **De-emphasis Filter (L)**  
`CONF:FMA:FM:LEFT:DEEM`  
`:CONFigure:FMAudio:FM:LEFT:DEEMphasis`

- **De-emphasis Filter (R)**  
CONF:FMA:FM:RIGH:DEEM  
:CONFigure:FMAudio:FM:RIGHT:DEEMphasis
- **Band Pass Filter (L)**  
CONF:FMA:FM:LEFT:BPF  
:CONFigure:FMAudio:FM:LEFT:BPFilter
- **Band Pass Filter (R)**  
CONF:FMA:FM:RIGH:BPF  
:CONFigure:FMAudio:FM:RIGHT:BPFilter
- **RDS Analysis**  
CONF:FMA:FM:RDS  
:CONFigure:FMAudio:FM:RDS

### Querying Measurement Results

- **RF Summary**  
FETC:FMA:FM:RF  
:FETCh:FMAudio:FM:RF
- **RDS Block Data**  
FETC:FMA:FM:RDS:BLOC  
:FETCh:FMAudio:FM:RDS:BLOCks
- **RDS Data**  
FETC:FMA:FM:RDS:DATA  
:FETCh:FMAudio:FM:RDS:DATA
- **Radio Text**  
FETC:FMA:FM:RDS:TEXT:HEX  
:FETCh:FMAudio:FM:RDS:TEXT:HEXadecimal
- **Occupied Bandwidth**  
FETC:FMA:FM:OBW  
:FETCh:FMAudio:FM:OBW
- **Occupied Bandwidth Frequency**  
FETC:FMA:FM:OBW:FREQ  
:FETCh:FMAudio:FM:OBW:FREQuency
- **Demodulation Signal Frequency Deviation (Pre-stereo Separation)**  
FETC:FMA:FM:DEM:BOTH:DEV  
:FETCh:FMAudio:FM:DEMod:BOTH:DEViation
- **Demodulation Signal Frequency Deviation (L)**  
FETC:FMA:FM:DEM:LEFT:DEV  
:FETCh:FMAudio:FM:DEMod:LEFT:DEViation
- **Demodulation Signal Frequency Deviation (R)**  
FETC:FMA:FM:DEM:RIGH:DEV  
:FETCh:FMAudio:FM:DEMod:RIGHT:DEViation
- **Demodulation Signal Frequency and Level (L)**  
FETC:FMA:FM:DEM:LEFT:AF  
:FETCh:FMAudio:FM:DEMod:LEFT:AF

- **Demodulation Signal Frequency and Level (R)**  
FETC:FMA:FM:DEM:RIGH:AF  
:FETCh:FMAudio:FM:DEMod:RIGHT:AF
- **Demodulation Signal Analysis (L)**  
FETC:FMA:FM:DEM:LEFT:ANAL  
:FETCh:FMAudio:FM:DEMod:LEFT:ANALysis
- **Demodulation Signal Analysis (R)**  
FETC:FMA:FM:DEM:RIGH:ANAL  
:FETCh:FMAudio:FM:DEMod:RIGHT:ANALysis
- **Payload Signal Frequency and Frequency Deviation**  
FETC:FMA:FM:DEM:PIL  
:FETCh:FMAudio:FM:DEMod:PILOt
- **Stereo Signal Crosstalk**  
FETC:FMA:FM:DEM:CROS  
:FETCh:FMAudio:FM:DEMod:CROSstalk
- **RF Signal Spectrum**  
FETC:FMA:FM:RF:TRAC  
:FETCh:FMAudio:FM:RF:TRACe
- **RF Signal Spectrum (Binary Transfer)**  
FETC:FMA:FM:RF:TRAC:BIN  
:FETCh:FMAudio:FM:RF:TRACe:BINary
- **Audio Signal Spectrum (L)**  
FETC:FMA:FM:AUD:FREQ:TRAC:LEFT  
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT
- **Audio Signal Spectrum (L, Binary Transfer)**  
FETC:FMA:FM:AUD:FREQ:TRAC:LEFT:BIN  
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT:BINary
- **Audio Signal Spectrum (R)**  
FETC:FMA:FM:AUD:FREQ:TRAC:RIGH  
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:RIGHT
- **Audio Signal Spectrum (R, Binary Transfer)**  
FETC:FMA:FM:AUD:FREQ:TRAC:RIGH:BIN  
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:RIGHT:BINary
- **Audio Signal Time Waveform (L and R)**  
FETC:FMA:FM:AUD:TIME:TRAC:BOTH  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH
- **Audio Signal Time Waveform (L and R, Binary Transfer)**  
FETC:FMA:FM:AUD:TIME:TRAC:BOTH:BIN  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH:BINary
- **Audio Signal Time Waveform (L)**  
FETC:FMA:FM:AUD:TIME:TRAC:LEFT  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT

- Audio Signal Time Waveform (L, Binary Transfer)  
FETC:FMA:FM:AUD:TIME:TRAC:LEFT:BIN  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT:BINary
- Audio Signal Time Waveform (R)  
FETC:FMA:FM:AUD:TIME:TRAC:RIGH  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:RIGHT
- Audio Signal Time Waveform (R, Binary Transfer)  
FETC:FMA:FM:AUD:TIME:TRAC:RIGH:BIN  
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:RIGHT:BINary

### 2.3.4 Measurement example of the FM signal

This subsection describes an example of measuring the FM signal in the SCPI command mode.

The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

#### Processing flow

1. Set the application software type to FMAUDIO.
2. Set the following measurement conditions.
 

Test Port	Port 2	
RF Port I/O	Input	
Frequency	100 MHz	
Input Level Units	dBm	
Input Level	0 dBm	
Occupied Ratio	95%	
Demodulation Method	Stereo	
Averaging Count	10	
High Pass Filter	Left: Off	Right: 20 Hz
Low Pass Filter	Left: Off	Right: 30 kHz
De-emphasis Filter	Left: 50 $\mu$ s	Right: 50 $\mu$ s
Band Pass Filter	Left: A-weighting	Right: A-weighting
RDS Analysis	On	
3. Set the trigger condition.
 

Trigger Source	Free run
----------------	----------
4. Initialize the status register.
5. Start measurement.
6. Read the status register.
7. When measurement is finished, query the following measurement results.
 

RF Summary, RDS Analysis, RDS Data, OBW, OBW (Frequency), Demodulation Signal Frequency Deviation (pre-stereo separation, left, right), Demodulation Signal Frequency and Level (L and R), Demodulation Signal Analysis (L and R), Pilot Signal Frequency and Frequency Deviation, Stereo Signal Crosstalk, RF Signal Spectrum, Audio Signal Spectrum (L and R), Time Waveform (L and R, L, R)

```
; Sample program for FM signal measurement
; Anritsu Corporation October, 2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 10 second
timeout=10

; Set language to "SCPI".
sendln 'SYST:LANG SCPI'
call check_error_code

; Set application software type to "FM/Audio".
sendln ':INST FMAUDIO'
call check_error_code

; Set test port to "Port2".
sendln ':ROUT:PORT:CONN:DIR PORT2,PORT2'
call check_error_code

; Set role of RF port to "Input".
sendln ':ROUT:PORT:RF:ROLE INPUT'
call check_error_code

; Set uplink frequency to "100 MHz".
sendln ':CONF:FMA:MEAS:RFS:FREQ 100MHZ'
call check_error_code

; Set unit of input level to "dBm".
sendln ':CONF:FMA:MEAS:RFS:LEV:UNIT DBM'
call check_error_code

; Set Input Level to "0 dBm".
sendln ':CONF:FMA:MEAS:RFS:LEV 0'
call check_error_code

; Set OBW Ratio to "95%".
sendln ':CONF:FMA:FM:OBW:RAT 95'
call check_error_code

; Set Demodulation method to "Stereo".
sendln ':CONF:FMA:FM:MOD STEREO'
```

```
call check_error_code

; Set Storage Mode to "Average".
sendln ':CONF:FMA:FM:STOR:MODE AVERAGE'
call check_error_code

; Set Storage Count to "10".
sendln ':CONF:FMA:FM:STOR:COUN 10'
call check_error_code

; Set HPF (L) to "Off".
sendln ':CONF:FMA:FM:LEFT:HPF OFF'
call check_error_code

; Set HPF (R) to "20 Hz".
sendln ':CONF:FMA:FM:RIGH:HPF HPF20'
call check_error_code

; Set LPF (L) to "Off".
sendln ':CONF:FMA:FM:LEFT:LPF OFF'
call check_error_code

; Set LPF (R) to "30 kHz".
sendln ':CONF:FMA:FM:RIGH:LPF LPF30K'
call check_error_code

; Set De-emphasis filter (L) to "50 us".
sendln ':CONF:FMA:FM:LEFT:DEEM US50'
call check_error_code

; Set De-emphasis filter (R) to "50 us".
sendln ':CONF:FMA:FM:RIGH:DEEM US50'
call check_error_code

; Set BPF (L) to "A-weight".
sendln ':CONF:FMA:FM:LEFT:BPF AWIGHTING'
call check_error_code

; Set BPF (R) to "A-weight".
sendln ':CONF:FMA:FM:RIGH:BPF AWIGHTING'
call check_error_code

; Set RDS Analysis to "On".
sendln ':CONF:FMA:FM:RDS ON'
```

```
call check_error_code

; Set Trigger Source to "Freerun".
sendln ':TRIG:FMA:MEAS:SOUR FREERUN'
call check_error_code

; Preset status registers.
sendln '*CLS'
sendln ':STAT:PRESET'
call check_error_code

; ! Note !
; Input the RF signal to MU887000A.

; Start measurement
sendln ':INIT:FMA:MEAS:SING'
call check_error_code

; waiting measurement up to 10 second
for i 1 10

    sendln ':STAT:OPER:MEAS?'
    pause 1; wait 1 second
    recvln
    recvln
    ;call check_response ; debug
    if result=0 goto _timeout
    if result=1 then
        break
    endif
    call check_error_code
next

; Query RF Summary
sendln ':FETC:FMA:FM:RF?'
call check_error_code

; Query RDS Analysis result
sendln ':FETC:FMA:FM:RDS?'
call check_error_code

; Query RDS Data
sendln ':FETC:FMA:FM:RDS:DATA?'
call check_error_code
```

```
; Query Occupied Band Width
sendln ':FETC:FMA:FM:OBW?'
call check_error_code

; Query OBW Frequency
sendln ':FETC:FMA:FM:OBW:FREQ?'
call check_error_code

; Query Deviation for Stereo
sendln ':FETC:FMA:FM:DEM:BOTH:DEV?'
call check_error_code

; Query Deviation for Left
sendln ':FETC:FMA:FM:DEM:LEFT:DEV?'
call check_error_code

; Query Deviation for Right
sendln ':FETC:FMA:FM:DEM:RIGH:DEV?'
call check_error_code

; Query Frequency/Level for Left
sendln ':FETC:FMA:FM:DEM:LEFT:AF?'
call check_error_code

; Query Frequency/Level for Right
sendln ':FETC:FMA:FM:DEM:RIGH:AF?'
call check_error_code

; Query Audio Analysis for Left
sendln ':FETC:FMA:FM:DEM:LEFT:ANAL?'
call check_error_code

; Query Audio Analysis for Right
sendln ':FETC:FMA:FM:DEM:RIGH:ANAL?'
call check_error_code

; Query Pilot signal
sendln ':FETC:FMA:FM:DEM:PIL?'
call check_error_code

; Query Crosstalk
sendln ':FETC:FMA:FM:DEM:CROS?'
call check_error_code
```

```
; Query Spectrum for RF signal
sendln ':FETC:FMA:FM:RF:TRAC? 1,0,32769'
call check_error_code

; Query Spectrum for Left
sendln ':FETC:FMA:FM:AUD:FREQ:TRAC:LEFT? 1,0,30001'
call check_error_code

; Query Spectrum for Right
sendln ':FETC:FMA:FM:AUD:FREQ:TRAC:RIGHT? 1,10000,20001'
call check_error_code

; Query Waveform for Left+Right
sendln ':FETC:FMA:FM:AUD:TIME:TRAC:BOTH? 1,0,10001'
call check_error_code

; Query Waveform for Left
sendln ':FETC:FMA:FM:AUD:TIME:TRAC:LEFT? 1,0,10001'
call check_error_code

; Query Waveform for Right
sendln ':FETC:FMA:FM:AUD:TIME:TRAC:RIGHT? 1,0,10001'
call check_error_code

messagebox 'Macro end successfully' 'Finish'

End

; ----- subroutines -----

:check_error_code
; query error
sendln ':SYSTem:ERRor?'
waitln 'No error'

; in case of timeout
if result=0 goto _timeout
; in case of error occurring
if result=2 then
    e_message='Error code = '
    strconcat e_message inputstr
    messagebox e_message 'Command Error occurred'
end
```

```
endif

; in case of no error

return

:check_response

;for debug
messagebox inputstr 'debug1'
int2str result_str result
messagebox result_str 'debug2'

return

:_timeout
messagebox 'No response from MT8870A.' 'Time out!'
call check_error_code
End
```

## 2.4 Outputting Audio Signals

MX887070A can output audio signals to the Audio Port (Option) connector of MU887000A when the MU887000A-002/102 option is installed.

**Note:**

Audio signal output and measurement cannot be performed simultaneously.

Up to eight tone signals (sine-wave signals) can be set for L and R respectively. The sampling rate cannot be specified for the digital audio port.

**Table 2.4-1 Audio Signal Setting Range**

Audio Port	Analog	Digital
Frequency	20.00 to 20 000.00 Hz	20.00 to 20 000.00 Hz <sup>*1</sup> 20.00 to 14 000.00 Hz <sup>*2</sup> 20.00 to 7 000.00 Hz <sup>*3</sup>
Level	1 to 5000 mV	−40 to 0.0 dBfs <sup>*4</sup>
Sampling rate		16 kHz, 32 kHz, 44.1 kHz, 48 kHz

\*1: Sampling rate: 44.1 kHz, 48 kHz

\*2: Sampling rate: 32 kHz

\*3: Sampling rate: 16 kHz

\*4: dB full scale: Logarithmic scale for full scale

### 2.4.1 Setting the output signal conditions

Set the following items when outputting audio signals.

#### Port

Set the audio port to digital or analog.

#### Sampling Rate

Set the output signal sampling rate if the audio port is set to digital.

#### Frequency

Set the frequency for each tone signal.

#### Level

Set the level for each tone signal.

#### Note:

Set the level of each tone signal so that the total level of them does not exceed the following value:

Analog: 5000 mV

Digital: 0 dBfs

If the total level exceeds this value, the output signal waveform may be distorted.

Example: When setting  $-3$  dBfs and  $-6$  dBfs, the total exceeds 0 dBfs according to the following calculation.

$$-3 \text{ dBfs} = 10^{\frac{-3}{20}} \approx 0.708$$

$$-6 \text{ dBfs} = 10^{\frac{-6}{20}} \approx 0.501$$

$$(-3 \text{ dBfs}) + (-6 \text{ dBfs}) \approx 1.209 \approx 20 \log_{10}(1.209) = 1.649$$

## 2.4.2 Commands

This subsection describes the commands that are used for setting and querying the audio signal output.

### Port

Refer to 2.1.2 “Setting the ports”.

### Analog

- **Tone Signal On/Off (L)**  
CONF:FMA:AF:ANAL:GEN:LEFT  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATE]
- **Tone Frequency (L)**  
CONF:FMA:AF:ANAL:GEN:LEFT:FREQ  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency
- **Tone Signal Level (L)**  
CONF:FMA:AF:ANAL:GEN:LEFT:LEV  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel
- **Over Level Check (L)**  
CONF:FMA:AF:ANAL:GEN:LEFT:OVER  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:OVER
- **Tone Signal On/Off (R)**  
CONF:FMA:AF:ANAL:GEN:RIGH  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT[:STATE]
- **Tone Frequency (R)**  
CONF:FMA:AF:ANAL:GEN:RIGH:FREQ  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency
- **Tone Signal Level (R)**  
CONF:FMA:AF:ANAL:GEN:RIGH:LEV  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel
- **Over Level Check (R)**  
CONF:FMA:AF:ANAL:GEN:RIGH:OVER  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:OVER

### Digital

- **Sampling Rate**  
CONF:FMA:AF:DIG:GEN:RATE  
:CONFigure:FMAudio:AF:GENeration:RATE
- **Tone Signal On/Off (L)**  
CONF:FMA:AF:DIG:GEN:LEFT  
:CONFigure:FMAudio:AF:GENeration:LEFT[:STATE]
- **Tone Frequency (L)**  
CONF:FMA:AF:DIG:GEN:LEFT:FREQ  
:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:FREQuency

- **Tone Signal Level (L)**  
CONF:FMA:AF:DIG:GEN:LEFT:LEV  
:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:LEVel
- **Audio Level Check (L)**  
CONF:FMA:AF:DIG:GEN:LEFT:OVER  
:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:OVER
- **Tone Signal On/Off (R)**  
CONF:FMA:AF:DIG:GEN:RIGH  
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT[:STATe]
- **Tone frequency (R)**  
CONF:FMA:AF:DIG:GEN:RIGH:FREQ  
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT:FREQuency
- **Tone Signal Level (R)**  
CONF:FMA:AF:DIG:GEN:RIGH:LEV  
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT:LEVel
- **Over Level Check (R)**  
CONF:FMA:AF:DIG:GEN:RIGH:OVER  
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT:OVER

### 2.4.3 Setting example for outputting the audio signal

This subsection describes an example of setting the audio signal output in the Native command mode.

The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

Processing flow

- Set the application type to FMAUDIO.
- Set the following items.
 

Output Port	Digital
Digital Port Serial Clock, Word Selection I/O Direction	Output
Digital Port Master Clock I/O Direction	Output
Audio Port I/O Direction	Output
I <sup>2</sup> S Word Length	16
Sampling Rate	32 kHz
- Set the tone signals as follows. However, the frequency and FM level cannot be set for tone numbers where Output is set to Off.

Left	No.	1	2	3	4	5	6	7	8
	Output	On	On	On	On	Off	Off	Off	Off
	Tone Frequency (Hz)	100	450	950	2560	1000	1000	1000	1000
	Level (dBfs)	-6	-12	-18	-24	0	0	0	0
Right	No.	1	2	3	4	5	6	7	8
	Output	On	Off	On	Off	On	Off	On	Off
	Tone Frequency (Hz)	560	1000	1250	1000	4400	1000	8000	1000
	Level (dBfs)	-10	0	-20	0	-30	0	-40	0

- Check that the sum of the level of each tone frequency does not exceed the maximum level.

```
; Sample program for Audio signal generation
; Anritsu Corporation October, 2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 10 second
timeout=10

; Set language to "Native".
sendln 'SYST:LANG NAT'
call check_error_code

; Set application to "FM/Audio".
sendln 'SYSSEL FMAUDIO'
call check_error_code

; Set Audio port to "Digital".
sendln 'AUDOUTSEL DIGITAL'
call check_error_code

; Set Direction of serial clock to "Output".
sendln 'ROUT:PORT:AUD:DIG:SCK:DIR OUTPUT'
call check_error_code

; Set Direction of master clock to "Output".
sendln 'ROUT:PORT:AUD:DIG:MCK:DIR OUTPUT'
call check_error_code

; Set role of Audio port to "Output".
sendln 'ROUT:PORT:AUD:ROLE OUTPUT'
call check_error_code

; Set Bit width of I2S to "16".
sendln 'ROUT:PORT:AUD:DIG:OUTP:WLEN 16'
call check_error_code

; Set Sampling rate to "32 kHz".
sendln 'CONF:FMA:AF:DIG:GEN:RATE 32K'
call check_error_code

; Set Left tone signals.
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 1,1'
```

```
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 2,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 3,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 4,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 5,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 6,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 7,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT 8,0'
call check_error_code

sendln 'CONF:FMA:AF:DIG:GEN:LEFT:FREQ 1,100'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:FREQ 2,450'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:FREQ 3,950'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:FREQ 4,2560'
call check_error_code

sendln 'CONF:FMA:AF:DIG:GEN:LEFT:LEV 1,-6'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:LEV 2,-12'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:LEV 3,-18'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:LEV 4,-24'
call check_error_code

; Set Right tone signals.
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 1,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 2,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 3,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 4,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 5,1'
```

```

call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 6,0'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 7,1'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH 8,0'
call check_error_code

sendln 'CONF:FMA:AF:DIG:GEN:RIGH:FREQ 1,560'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:FREQ 3,1250'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:FREQ 5,4400'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:FREQ 7,8000'
call check_error_code

sendln 'CONF:FMA:AF:DIG:GEN:RIGH:LEV 1,-10'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:LEV 3,-20'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:LEV 5,-30'
call check_error_code
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:LEV 7,-40'
call check_error_code

; Query Over level of Left
sendln 'CONF:FMA:AF:DIG:GEN:LEFT:OVER?'
call check_error_code

; Query Over level of Right
sendln 'CONF:FMA:AF:DIG:GEN:RIGH:OVER?'
call check_error_code

messagebox 'Macro end successfully' 'Finish'

End

; ----- subroutines -----

:check_error_code
; query error
sendln 'SYSERR?'

```

```
waitln 'No error'

; in case of timeout
if result=0 goto _timeout
; in case of error occurring
if result=2 then
    e_message='Error code = '
    strconcat e_message inputstr
    messagebox e_message 'Command Error occurred'
end
endif

; in case of no error

return

:check_response

;for debug
messagebox inputstr 'debug1'
int2str result_str result
messagebox result_str 'debug2'

return

:_timeout
messagebox 'No response from MT8870A.' 'Time out!'
call check_error_code
End
```

## 2.5 Measuring Audio Signals

MX887070A can measure audio signals that are input to the Audio Port (Option) connector of MU887000A when the MU887000A-002/102 option is installed.

For the items that can be measured, refer to 2.5.2 “Measurement results”.

### 2.5.1 Setting the measurement conditions

Set the following items when measuring audio signals.

#### Demodulation Method

Set the input signals to Mono or Stereo. When Mono is set, audio signals are input to the left channel.

#### Input Level

Set the input level range when the audio port is analog.

#### Sampling Rate

Set the sampling rate when the audio port is digital.

#### Averaging Times

Set the number of measurement times. The measured value averaging times is determined by this value.

#### Filter

Set the bandwidth of the filter used for the signal input to the audio port. Set the following filters for L and R respectively. When Mono is set as the Demodulation Method, set the filters for the left channel.

- High Pass filter (OFF, 20 Hz, 100 Hz, 300 Hz, 400 Hz)
- Low Pass filter (OFF, 3 kHz, 15 kHz, 20 kHz, 30 kHz)
- De-emphasis filter (OFF, 50  $\mu$ s, 75  $\mu$ s, 750  $\mu$ s)
- Band Pass filter (OFF, A-weighting, C-message, CCITT)

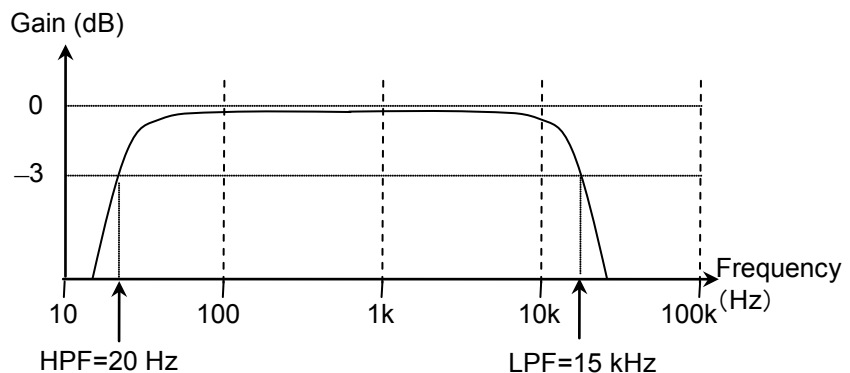
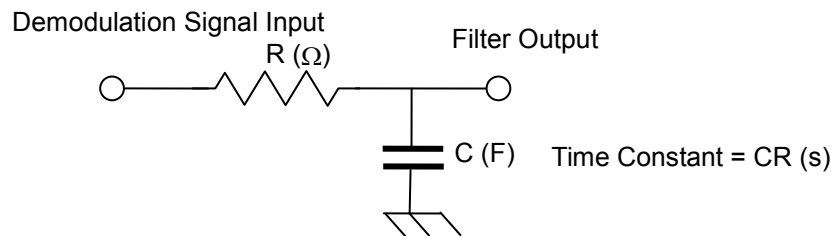


Figure 2.5.1-1 Filter Setting Example

The de-emphasis filter is set as a time constant to suppress harmonic noise.



**Figure 2.5.1-2 De-emphasis Equivalent Circuit**

Use a pass band filter conforming to the standards.

- A-weighting: IEC 61672-1 *Electroacoustics—Sound level meters—Part 1: Specifications*
- C-message: IEEE 743 *IEEE Standard Equipment Requirements and Measurement Techniques for Analog Transmission Parameters for Telecommunications*
- CCITT (ITU-T O.41): ITU-T Recommendation O.41 *Psophometer for use on telephone-type circuits*

## 2.5.2 Measurement results

### Level

The following items are obtained for L and R respectively.

- Peak Level (positive)
- Peak Level (negative)
- Peak-to-Peak/2
- rms Value

### Tone Signal Frequency and Level

This measures the frequency (Hz) and level (dBm) of the tone signal for L and R respectively.

### Signal Analysis

This obtains the average, max. and min. value for L and R respectively.

- SNR (dB)
- THD (dB)
- THD (%)
- THD+N (dB)
- THD+N (%)
- SINAD (dB)

Refer to 2.3.2 “Measurement results” for the calculation.

**Stereo Signal Crosstalk**

This obtains the average, max. and min. values of the crosstalk from the left to right stereo signals (dB), and from the right to left stereo signals (dB).

Refer to 2.3.2 “Measurement results” for the calculation.

**Note:**

When measuring crosstalk from left to right, only the signal for the left channel in the RF signal is modulated. Conversely, when measuring crosstalk from right to left, only the signal for the right channel in the RF signal is modulated. If both the right and left channels are modulated, the crosstalk measured value cannot be calculated correctly.

If Mono is set as the demodulation method, \*\*\* is obtained as a result of measurement.

**Spectrum**

This measures the audio signal spectrum for L and R respectively. The frequency range and data count differ according to the interface and sampling rate.

Spectrum data can be transferred as text or binary data.

**Table 2.5.2-1 Frequency Range**

Interface	Sampling Rate	Frequency Range	Data Count
Analog		0 to 96 kHz	32769
Digital	48 kHz	0 to 24 kHz	8193
	44.1 kHz	0 to 22.05 kHz	8193
	32 kHz	0 to 16 kHz	4097
	16 kHz	0 to 8 kHz	2049

### Time Waveform

This measures the audio signal time waveform for L and R respectively. The frequency range and data count differ according to the interface and sampling rate.

Time-variation data can be transferred as text or binary data.

**Table 2.5.2-2 Waveform Measurement Data Count**

Interface	Sampling rate	Data Count
Analog		19201
Digital	48 kHz	4801
	44.1 kHz	4411
	32 kHz	3201
	16 kHz	1601

For the binary data, the head string starts with a sign (#) and continues with data after a numeric value indicating the data length.

The data length is displayed when the next character of the sign (#) is other than 0.

The binary data follows the number indicating the data length.

Example:

#42002an%\*qe4445+\...

4 digits      2002 bytes binary data

When the measurement is started, data is collected for the number of times set by the Averaging Count.

**Table 2.5.2-3 Measurement Results Reflecting Averaging Times Setting**

Item	Measurement Result			
	Mean	Max.	Min.	Last Measured
Level				✓
Tone Frequency and Level	✓			
Demodulation Signal Analysis	✓	✓	✓	
Stereo Signal Crosstalk	✓	✓	✓	
Spectrum	✓			
Time Waveform				✓

### 2.5.3 Commands

This subsection describes the commands that are used for setting and querying the audio signal measurement.

#### Port

Refer to 2.1.2 “Setting the ports”.

#### Setting Measurement Conditions

- **Demodulation Method**  
`CONF:FMA:AF:MEAS:MOD`  
`:CONFigure:FMAudio:AF:MEASurement:MODulation`
- **Input Level**  
`CONF:FMA:AF:MEAS:ANAL:RANG`  
`:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe`
- **Sampling Rate**  
`CONF:FMA:AF:MEAS:RATE`  
`:CONFigure:FMAudio:AF:MEASurement:RATE`
- **Averaging Switching**  
`CONF:FMA:AF:STOR:MODE`  
`:CONFigure:FMAudio:AF:STORage:MODE`
- **Averaging Count**  
`CONF:FMA:AF:STOR:COUN`  
`:CONFigure:FMAudio:AF:STORage:COUNt`
- **High Pass Filter (L)**  
`CONF:FMA:AF:LEFT:HPF`  
`:CONFigure:FMAudio:AF:LEFT:HPFilter`
- **High Pass Filter (R)**  
`CONF:FMA:AF:RIGH:HPF`  
`:CONFigure:FMAudio:AF:RIGHT:HPFilter`
- **Low Pass Filter (L)**  
`CONF:FMA:AF:LEFT:LPF`  
`:CONFigure:FMAudio:AF:LEFT:LPFilter`
- **Low Pass Filter (R)**  
`CONF:FMA:AF:RIGH:LPF`  
`:CONFigure:FMAudio:AF:RIGHT:LPFilter`
- **De-Emphasis filter (L)**  
`CONF:FMA:AF:LEFT:DEEM`  
`:CONFigure:FMAudio:AF:LEFT:DEEMphasis`
- **De-emphasis Filter (R)**  
`CONF:FMA:AF:RIGH:DEEM`  
`:CONFigure:FMAudio:AF:RIGHT:DEEMphasis`

- **Band Pass Filter (L)**  
CONF:FMA:AF:LEFT:BPF  
:CONFigure:FMAudio:AF:LEFT:BPFilter
- **Band Pass Filter (R)**  
CONF:FMA:AF:RIGHT:BPF  
:CONFigure:FMAudio:AF:RIGHT:BPFilter

### Querying Measurement Results

- **Level (L)**  
FETC:FMA:AF:AUD:LEFT:TOT  
:FETCh:FMAudio:AF:AUDio:LEFT:TOTAl
- **Level (R)**  
FETC:FMA:AF:AUD:RIGHT:TOT  
:FETCh:FMAudio:AF:AUDio:RIGHT:TOTAl
- **Tone Signal Frequency and Level (L)**  
FETC:FMA:AF:AUD:LEFT:AF  
:FETCh:FMAudio:AF:AUDio:LEFT:AF
- **Tone Signal Frequency and Level (R)**  
FETC:FMA:AF:AUD:RIGHT:AF  
:FETCh:FMAudio:AF:AUDio:RIGHT:AF
- **Analysis (L)**  
FETC:FMA:AF:AUD:LEFT:ANAL  
:FETCh:FMAudio:AF:AUDio:LEFT:ANALysis
- **Analysis (R)**  
FETC:FMA:AF:AUD:RIGHT:ANAL  
:FETCh:FMAudio:AF:AUDio:RIGHT:ANALysis
- **Audio Signal Spectrum (L)**  
FETC:FMA:AF:AUD:FREQ:TRAC:LEFT  
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT
- **Audio Signal Spectrum (L, Binary Transfer)**  
FETC:FMA:AF:AUD:FREQ:TRAC:LEFT:BIN  
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT:BINary
- **Audio Signal Spectrum (R)**  
FETC:FMA:AF:AUD:FREQ:TRAC:RIGHT  
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:RIGHT
- **Audio Signal Spectrum (R, Binary Transfer)**  
FETC:FMA:AF:AUD:FREQ:TRAC:RIGHT:BIN  
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:RIGHT:BINary
- **Audio Signal Time Waveform (L)**  
FETC:FMA:AF:AUD:TIME:TRAC:LEFT  
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT
- **Audio Signal Time Waveform (L, Binary Transfer)**  
FETC:FMA:AF:AUD:TIME:TRAC:LEFT:BIN  
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT:BINary

- **Audio Signal Time Waveform (R)**  
FETC:FMA:AF:AUD:TIME:TRAC:RIGH  
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:RIGHT
- **Audio Signal Time Waveform (R, Binary Transfer)**  
FETC:FMA:AF:AUD:TIME:TRAC:RIGH:BIN  
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:RIGHT:BINary
- **Stereo Signal Crosstalk**  
FETC:FMA:AF:AUD:CROS  
:FETCh:FMAudio:AF:AUDio:CROSstalk

## 2.5.4 Measurement example of the audio signal

This subsection describes an example of measuring the audio signal in the SCPI command mode.

The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

Processing flow

1. Set the application type to FMAUDIO.
2. Set the following measurement conditions.

Input Port		Analog
Audio Port Input/Output Port Direction		Input
Demodulation Method		Stereo
Input Level		5000 mV
Averaging Count		20
High Pass Filter	Left: 100 Hz	Right: 20 Hz
Low Pass Filter	Left: 20 kHz	Right: 30 kHz
De-emphasis Filter	Left: Off	Right: Off
Band Pass Filter	Left: CCITT(ITU-T O.41)	Right: CCITT(ITU-T O.41)
3. Set the trigger condition.

Trigger Source	Free run
----------------	----------
4. Initialize the status register.
5. Start measurement.
6. Read the status register.
7. When measurement is finished, query the following measurement results.  
Level (L and R), Tone Signal Frequency and Level (L and R), Signal Analysis (L and R), Stereo Signal Crosstalk, Spectrum (L and R), Time Waveform (L and R)

```
; Sample program for Audio signal measurement
; Anritsu Corporation October, 2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 3 second
timeout=3

; Set language to "SCPI".
sendln 'SYST:LANG SCPI'
call check_error_code

; Set application software type to "FM/Audio".
sendln ':INST FMAUDIO'
call check_error_code

; Set Audio port to "Analog".
sendln ':ROUT:PORT:AUD:INP:SEL ANALOG'
call check_error_code

; Set role of Audio port to "Input".
sendln ':ROUT:PORT:AUD:ROLE INPUT'
call check_error_code

; Set Demodulation method to "Stereo".
sendln ':CONF:FMA:AF:MEAS:MOD STEREO'
call check_error_code

; Set Input Range to "5000 mV".
sendln ':CONF:FMA:AF:MEAS:ANAL:RANG 5000MV'
call check_error_code

; Set Storage Mode to "Average".
sendln ':CONF:FMA:AF:STOR:MODE AVERAGE'
call check_error_code

; Set Storage Count to "20".
sendln ':CONF:FMA:AF:STOR:COUN 20'
call check_error_code

; Set HPF (L) to "100 Hz".
sendln ':CONF:FMA:AF:LEFT:HPF HPF100'
```

```
call check_error_code

; Set HPF (R) to "20 Hz".
sendln ':CONF:FMA:AF:RIGH:HPF HPF20'
call check_error_code

; Set LPF (L) to "20 kHz".
sendln ':CONF:FMA:AF:LEFT:LPF LPF20K'
call check_error_code

; Set LPF (R) to "30 kHz".
sendln ':CONF:FMA:AF:RIGH:LPF LPF30K'
call check_error_code

; Set De-emphasis filter (L) to "Off".
sendln ':CONF:FMA:AF:LEFT:DEEM OFF'
call check_error_code

; Set De-emphasis filter (R) to "Off".
sendln ':CONF:FMA:AF:RIGH:DEEM OFF'
call check_error_code

; Set BPF (L) to "ITU-T 0.41".
sendln ':CONF:FMA:AF:LEFT:BPF CCITT'
call check_error_code

; Set BPF (R) to "ITU-T 0.41".
sendln ':CONF:FMA:AF:RIGH:BPF CCITT'
call check_error_code

; Set Trigger Source to "Freerun".
sendln ':TRIG:FMA:MEAS:SOUR FREERUN'
call check_error_code

; Preset status registers.
sendln '*CLS'
sendln ':STAT:PRESET'
call check_error_code

; ! Note !
; Input the Audio signal to MU887000A.

; Start measurement
sendln ':INIT:FMA:MEAS:SING'
```

```
call check_error_code

; waiting measurement up to 10 second
for i 1 10

    sendln ':STAT:OPER:MEAS?'
    pause 1; wait 1 second
    recvln
    recvln
    ;call check_response ; debug
    if result=0 goto _timeout
    if result=1 then
        break
    endif
    call check_error_code
next

; Query Total Level for Left
sendln ':FETC:FMA:AF:AUD:LEFT:TOT?'
call check_error_code

; Query Total Level for Right
sendln ':FETC:FMA:AF:AUD:RIGH:TOT?'
call check_error_code

; Query Frequency/Level for Left
sendln ':FETC:FMA:AF:AUD:LEFT:AF?'
call check_error_code

; Query Frequency/Level for Right
sendln ':FETC:FMA:AF:AUD:RIGH:AF?'
call check_error_code

; Query Audio Analysis for Left
sendln ':FETC:FMA:AF:AUD:LEFT:ANAL?'
call check_error_code

; Query Audio Analysis for Right
sendln ':FETC:FMA:AF:AUD:RIGH:ANAL?'
call check_error_code

; Query Crosstalk
sendln ':FETC:FMA:AF:AUD:CROS?'
call check_error_code
```

```
; Query Spectrum for Left
sendln ':FETC:FMA:AF:AUD:FREQ:TRAC:LEFT? 1,0,30001'
call check_error_code

; Query Spectrum for Right
sendln ':FETC:FMA:AF:AUD:FREQ:TRAC:RIGHT? 1,10000,20001'
call check_error_code

; Query Waveform for Left
sendln ':FETC:FMA:AF:AUD:TIME:TRAC:LEFT? 1,0,10001'
call check_error_code

; Query Waveform for Right
sendln ':FETC:FMA:AF:AUD:TIME:TRAC:RIGHT? 1,0,10001'
call check_error_code

messagebox 'Macro end successfully' 'Finish'

End

; ----- subroutines -----

:check_error_code
; query error
sendln ':SYSTEM:ERROR?'
waitln 'No error'

; in case of timeout
if result=0 goto _timeout
; in case of error occurring
if result=2 then
    e_message='Error code = '
    strconcat e_message inputstr
    messagebox e_message 'Command Error occurred'
end
endif

; in case of no error
```

```
return

:check_response

    ;for debug
    messagebox inputstr 'debug1'
    int2str result_str result
    messagebox result_str 'debug2'

    return

:_timeout
    messagebox 'No response from MT8870A.' 'Time out!'
    call check_error_code
End
```



# Chapter 3 SCPI Command Reference

---

This chapter describes the details of SCPI commands.  
To switch to the SCPI command mode, send the command SYST:LANG SCPI.

3.1	List of Commands .....	3-2
3.2	Details of Commands .....	3-16

## 3.1 List of Commands

### System

Function	Command	Query	Response
Application Select	:INSTrument[:SElect] <app>	:INSTrument[:SElect]?	<app>
Language Selection of Remote Command	:SYSTem:LANGuage <mode>	:SYSTem:LANGuage?	<mode>

### Common

Function	Command	Query	Response
Standard Select	:CONFIgure:FMAudio:MEASurement:STANdard <std>	:CONFIgure:FMAudio:MEASurement:STANdard?	<std>

### Measurement

Function	Command	Query	Response
Stop Measure	:ABORT:FMAudio:MEASurement	-----	-----
Measurement State	-----	:FETCh:FMAudio:MEASurement:STATe?	<state>
Single Measurement	:INITiate:FMAudio:MEASurement:SINGLE	-----	-----

## Common Parameters

Function	Command	Query	Response
Modulation	:CONFigure:FMAudio:GENerat or:BBMode <on_off>	:CONFigure:FMAudio:GENerat or:BBMode?	<on_off_res>
Frequency - Downlink Frequency	:CONFigure:FMAudio:GENerat or:RFSettings:FREQuency <freq>	:CONFigure:FMAudio:GENerat or:RFSettings:FREQuency?	<freq>
Level - Output Level	:CONFigure:FMAudio:GENerat or:RFSettings:LEVel <level>	:CONFigure:FMAudio:GENerat or:RFSettings:LEVel?	<level>
Level - Output Level Unit	:CONFigure:FMAudio:GENerat or:RFSettings:LEVel:UNIT <unit>	:CONFigure:FMAudio:GENerat or:RFSettings:LEVel:UNIT?	<unit>
Level - Output Control	:CONFigure:FMAudio:GENerat or:RFSettings:STATe <on_off>	:CONFigure:FMAudio:GENerat or:RFSettings:STATe?	<on_off_res>
Frequency - Uplink Frequency	:CONFigure:FMAudio:MEASure ment:RFSettings:FREQuency <freq>	:CONFigure:FMAudio:MEASure ment:RFSettings:FREQuency?	<freq>
Level - Input Level	:CONFigure:FMAudio:MEASure ment:RFSettings:LEVel <level>	:CONFigure:FMAudio:MEASure ment:RFSettings:LEVel?	<level>
I <sup>2</sup> S Master Clock Direction	:ROUTe:PORT:AUDio:DIGital: MCK:DIRectioN <inf>	:ROUTe:PORT:AUDio:DIGital: MCK:DIRectioN?	<inf>

## Common Parameters

Function	Command	Query	Response
I <sup>2</sup> S Serial Clock/Word Select Direction	:ROUTe:PORT:AUDio:DiGital:SCK:DiRection <inf>	:ROUTe:PORT:AUDio:DiGital:SCK:DiRection?	<inf>
Audio Interface for Input	:ROUTe:PORT:AUDio:INPut:SElect <kind>	:ROUTe:PORT:AUDio:INPut:SElect?	<kind>
Audio Interface for Output	:ROUTe:PORT:AUDio:OUTPut:SElect <kind>	:ROUTe:PORT:AUDio:OUTPut:SElect?	<kind>
I <sup>2</sup> S Input Data Bit Width	:ROUTe:PORT:AUDio:DiGital:INPut:WLENGth <bit>	:ROUTe:PORT:AUDio:DiGital:INPut:WLENGth?	<bit>
I <sup>2</sup> S Output Data Bit Width	:ROUTe:PORT:AUDio:DiGital:OUTPut:WLENGth <bit>	:ROUTe:PORT:AUDio:DiGital:OUTPut:WLENGth?	<bit>
Test Set Role - Audio Port	:ROUTe:PORT:AUDio:ROLE <inf>	:ROUTe:PORT:AUDio:ROLE?	<inf>
Set Connect Port Direction	:ROUTe:PORT:CONNeCT:DiRection <input>,<output>	:ROUTe:PORT:CONNeCT:DiRection?	<input>,<output>
Test Set Role - RF Test Port	:ROUTe:PORT:RF:ROLE <inf>	:ROUTe:PORT:RF:ROLE?	<inf>
Trigger - Trigger Delay	:TRIGGer:FMAudio:MEASurement:DElay <time>	:TRIGGer:FMAudio:MEASurement:DElay?	<time>
Trigger - Trigger Source	:TRIGGer:FMAudio:MEASurement:SOURce <source>	:TRIGGer:FMAudio:MEASurement:SOURce?	<source>
Trigger - Trigger Level	:TRIGGer:FMAudio:MEASurement:THReshold <level>	:TRIGGer:FMAudio:MEASurement:THReshold?	<level>
Trigger - Trigger Timeout	:TRIGGer:FMAudio:MEASurement:TOUT <time>	:TRIGGer:FMAudio:MEASurement:TOUT?	<time>

## Audio Generator

Function	Command	Query	Response
RX Audio - Analog - Left Channel AF Tone Frequency	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency <no>,<freq>	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency? <no>	<freq>
RX Audio - Analog - Left Channel AF Tone Level	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel <no>,<level>	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel? <no>	<level>
RX Audio - Analog - Left Channel AF Tone Level Setting State	-----	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:OVER?	-----
RX Audio - Analog - Left Channel AF Tone	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATE] <no>,<on_off>	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATE]? <no>	<on_off_res>
RX Audio - Analog - Right Channel AF Tone Frequency	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency <no>,<freq>	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency? <no>	<freq>
RX Audio - Analog - Right Channel AF Tone Level	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel <no>,<level>	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel? <no>	<level>
RX Audio - Analog - Right Channel AF Tone Level Setting State	-----	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:OVER?	-----
RX Audio - Analog - Right Channel AF Tone	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT[:STATE] <no>,<on_off>	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT[:STATE]? <no>	<on_off_res>
RX Audio - Digital - Left Channel AF Tone Frequency	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT:FREQuency <no>,<freq>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT:FREQuency? <no>	<freq>

## Audio Generator (Cont'd)

Function	Command	Query	Response
RX Audio - Digital - Left Channel AF Tone Level	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT:LEVel <no>,<level>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT:LEVel? <no>	<level>
RX Audio - Digital - Left Channel AF Tone Level Setting State	-----	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT:OVER?	-----
RX Audio - Digital - Left Channel AF Tone	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT[:STATe ] <no>,<on_off>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:LEFT[:STATe ]? <no>	<on_off_res>
RX Audio - Digital - Sampling Rate	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RATE <rate>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RATE?	<rate>
RX Audio - Digital - Right Channel AF Tone Frequency	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT:FREQu ency <no>,<freq>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT:FREQu ency? <no>	<freq>
RX Audio - Digital - Right Channel AF Tone Level	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT:LEVel <no>,<level>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT:LEVel ? <no>	<level>
RX Audio - Digital - Right Channel AF Tone Level Setting State	-----	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT:OVER?	-----
RX Audio - Digital - Right Channel AF Tone	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT[:STAT e] <no>,<on_off>	:CONFigure:FMAudio:AF:DIGi tal:GENeration:RIGHT[:STAT e]? <no>	<on_off_res>

## Audio Measurement

Function	Command	Query	Response
TX Audio - Left Channel Band Pass Filter	:CONFigure:FMAudio:AF:LEFT :BPFilter <filter_type>	:CONFigure:FMAudio:AF:LEFT :BPFilter?	<filter_type>
TX Audio - Left Channel DeEmphasis Filter	:CONFigure:FMAudio:AF:LEFT :DEEMphasis <filter_type>	:CONFigure:FMAudio:AF:LEFT :DEEMphasis?	<filter_type>
TX Audio - Left Channel High Pass Filter	:CONFigure:FMAudio:AF:LEFT :HPFilter <filter_type>	:CONFigure:FMAudio:AF:LEFT :HPFilter?	<filter_type>
TX Audio - Left Channel Low Pass Filter	:CONFigure:FMAudio:AF:LEFT :LPFilter <filter_type>	:CONFigure:FMAudio:AF:LEFT :LPFilter?	<filter_type>
TX Audio - Analog - Input Level	:CONFigure:FMAudio:AF:MEAS urement:ANALog:RANGe <level>	:CONFigure:FMAudio:AF:MEAS urement:ANALog:RANGe?	<level>
TX Audio - Modulation	:CONFigure:FMAudio:AF:MEAS urement:MODulation <mode>	:CONFigure:FMAudio:AF:MEAS urement:MODulation?	<mode>
TX Audio - Digital - Sampling Rate	:CONFigure:FMAudio:AF:MEAS urement:RATE <rate>	:CONFigure:FMAudio:AF:MEAS urement:RATE?	<rate>
TX Audio - Right Channel Band Pass Filter	:CONFigure:FMAudio:AF:RIGH t:BPFilter <filter_type>	:CONFigure:FMAudio:AF:RIGH t:BPFilter?	<filter_type>
TX Audio - Right Channel DeEmphasis Filter	:CONFigure:FMAudio:AF:RIGH t:DEEMphasis <filter_type>	:CONFigure:FMAudio:AF:RIGH t:DEEMphasis?	<filter_type>
TX Audio - Right Channel High Pass Filter	:CONFigure:FMAudio:AF:RIGH t:HPFilter <filter_type>	:CONFigure:FMAudio:AF:RIGH t:HPFilter?	<filter_type>
TX Audio - Right Channel Low Pass Filter	:CONFigure:FMAudio:AF:RIGH t:LPFilter <filter_type>	:CONFigure:FMAudio:AF:RIGH t:LPFilter?	<filter_type>
TX Audio - Storage Count	:CONFigure:FMAudio:AF:STOR age:COUNT <count>	:CONFigure:FMAudio:AF:STOR age:COUNT?	<count>
TX Audio - Storage Mode	:CONFigure:FMAudio:AF:STOR age:MODE <mode>	:CONFigure:FMAudio:AF:STOR age:MODE?	<mode>



## Audio Measurement (Cont'd)

Function	Command	Query	Response
TX AF - Audio Spectrum Wave Data	-----	:FETCh:FMAudio:AF:AUDio:FR EQuency:TRACe:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_ length-1>,<data_length>
TX AF - Audio Spectrum Wave Binary Data	-----	:FETCh:FMAudio:AF:AUDio:FR EQuency:TRACe:LEFT RIGHT:BINary? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...< data[length]>
TX AF - Audio Time Domain Wave Data	-----	:FETCh:FMAudio:AF:AUDio:TI ME:TRACe:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_ length-1>,<data_length>
TX AF - Audio Time Domain Wave Binary Data	-----	:FETCh:FMAudio:AF:AUDio:TI ME:TRACe:LEFT RIGHT:BINary ? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...< data[length]>

## Audio Result

Function	Command	Query	Response
TX Audio - AF Crosstalk Summary	-----	:FETCh:FMAudio:AF:AUDio:CR OSstalk?	<lr_level_ave1>,<lr_level_ave2>,...,<lr_level_ave12>,<rl_level_ave1>,<rl_level_ave2>,...,<rl_level_ave12>
TX Audio - AF Frequency/Level Summary	-----	:FETCh:FMAudio:AF:AUDio:LE FT RIGHT:AF?	<freq_ave_1>,<level_ave_1>,<freq_ave_2>,...,<level_ave_11>,<freq_ave_12>,<level_ave_12>
TX Audio - AF Analysis Summary	-----	:FETCh:FMAudio:AF:AUDio:LE FT RIGHT:ANALysis?	<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_ave>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>
TX Audio - AF Total Level Summary	-----	:FETCh:FMAudio:AF:AUDio:LE FT RIGHT:TOTAl?	<total_level_plus_p_current>,<total_level_minus_p_current>,<total_level_p+pPer2_current>,<total_level_rms_current>

## FM Generator

Function	Command	Query	Response
RX FM - Signal Generation	:CONFigure:FMAudio:FM:GENeration <on_off>	:CONFigure:FMAudio:FM:GENeration?	<on_off_res>
RX FM - Left Channel AF Tone Deviation	:CONFigure:FMAudio:FM:GENeration:LEFT:DEVIation <no>,<freq>	:CONFigure:FMAudio:FM:GENeration:LEFT:DEVIation? <no>	<freq>
RX FM - Left Channel AF Tone Frequency	:CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency <no>,<freq>	:CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency? <no>	<freq>
RX FM - Left Channel AF Tone	:CONFigure:FMAudio:FM:GENeration:LEFT[:STATE] <no>,<on_off>	:CONFigure:FMAudio:FM:GENeration:LEFT[:STATE]? <no>	<on_off_res>
RX FM - Modulation	:CONFigure:FMAudio:FM:GENeration:MODulation <mode>	:CONFigure:FMAudio:FM:GENeration:MODulation?	<mode>
RX FM - Right Channel AF Tone Deviation	:CONFigure:FMAudio:FM:GENeration:RIGHT:DEVIation <no>,<freq>	:CONFigure:FMAudio:FM:GENeration:RIGHT:DEVIation? <no>	<freq>
RX FM - Right Channel AF Tone Frequency	:CONFigure:FMAudio:FM:GENeration:RIGHT:FREQuency <no>,<freq>	:CONFigure:FMAudio:FM:GENeration:RIGHT:FREQuency? <no>	<freq>
RX FM - Right Channel AF Tone	:CONFigure:FMAudio:FM:GENeration:RIGHT[:STATE] <no>,<on_off>	:CONFigure:FMAudio:FM:GENeration:RIGHT[:STATE]? <no>	<on_off_res>
RX FM - AM Signal Modulation	:CONFigure:FMAudio:FM:GENeration:AM[:STATE] <on_off>	:CONFigure:FMAudio:FM:GENeration:AM[:STATE]? <on_off>	<on_off_res>
RX FM - AM Depth	:CONFigure:FMAudio:FM:GENeration:AM:DEPTTh <percent>	:CONFigure:FMAudio:FM:GENeration:AM:DEPTTh?	<percent>
RX FM - AM Frequency	:CONFigure:FMAudio:FM:GENeration:AM:FREQuency <freq>	:CONFigure:FMAudio:FM:GENeration:AM:FREQuency?	<freq>

### FM Generator (Cont'd)

Function	Command	Query	Response
RX FM - FM Pilot Deviation	:CONFigure:FMAudio:FM:GENE ration:PILot:DEVIation <freq>	:CONFigure:FMAudio:FM:GENE ration:PILot:DEVIation?	<freq>

### FM Measurement

Function	Command	Query	Response
TX FM - Left Channel Band Pass Filter	:CONFigure:FMAudio:FM:LEFT :BPFilter <filter_type>	:CONFigure:FMAudio:FM:LEFT :BPFilter?	<filter_type>
TX FM - Left Channel DeEmphasis Filter	:CONFigure:FMAudio:FM:LEFT :DEEMphasis <filter_type>	:CONFigure:FMAudio:FM:LEFT :DEEMphasis?	<filter_type>
TX FM - Left Channel High Pass Filter	:CONFigure:FMAudio:FM:LEFT :HPFilter <filter_type>	:CONFigure:FMAudio:FM:LEFT :HPFilter?	<filter_type>
TX FM - Left Channel Low Pass Filter	:CONFigure:FMAudio:FM:LEFT :LPFilter <filter_type>	:CONFigure:FMAudio:FM:LEFT :LPFilter?	<filter_type>
TX FM - Modulation	:CONFigure:FMAudio:FM:MODu lation <mode>	:CONFigure:FMAudio:FM:MODu lation?	<mode>
TX FM - Occupied Bandwidth Ratio	:CONFigure:FMAudio:FM:OBW: RATio <ratio>	:CONFigure:FMAudio:FM:OBW: RATio?	<ratio>
TX FM - RDS Analysis	:CONFigure:FMAudio:FM:RDS <on_off>	:CONFigure:FMAudio:FM:RDS?	<on_off_res>
TX FM - Right Channel Band Pass Filter	:CONFigure:FMAudio:FM:RIGH t:BPFilter <filter_type>	:CONFigure:FMAudio:FM:RIGH t:BPFilter?	<filter_type>
TX FM - Right Channel DeEmphasis Filter	:CONFigure:FMAudio:FM:RIGH t:DEEMphasis <filter_type>	:CONFigure:FMAudio:FM:RIGH t:DEEMphasis?	<filter_type>
TX FM - Right Channel High Pass Filter	:CONFigure:FMAudio:FM:RIGH t:HPFilter <filter_type>	:CONFigure:FMAudio:FM:RIGH t:HPFilter?	<filter_type>
TX FM - Right Channel Low Pass Filter	:CONFigure:FMAudio:FM:RIGH t:LPFilter <filter_type>	:CONFigure:FMAudio:FM:RIGH t:LPFilter?	<filter_type>

## FM Measurement (Cont'd)

Function	Command	Query	Response
TX FM - Storage Count	:CONFigure:FMAudio:FM:STORage:COUNT <count>	:CONFigure:FMAudio:FM:STORage:COUNT?	<count>
TX FM - Storage Mode	:CONFigure:FMAudio:FM:STORage:MODE <mode>	:CONFigure:FMAudio:FM:STORage:MODE?	<mode>
TX FM - Audio Spectrum Wave Data	-----	:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT RIGHT?<format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - Audio Spectrum Wave Binary Data	-----	:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT RIGHT:BINary?<format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM - Both Audio Time Domain Wave Data	-----	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH?<format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - Both Audio Time Domain Wave Binary Data	-----	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH:BINary?<format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM - Audio Time Domain Wave Data	-----	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT RIGHT?<format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>

## FM Measurement (Cont'd)

Function	Command	Query	Response
TX FM - Audio Time Domain Wave Binary Data	-----	:FETCh:FMAudio:FM:AUDio:TI ME:TRACe:LEFT RIGHT:BINary ? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM - RF Spectrum Wave Data	-----	:FETCh:FMAudio:FM:RF:TRACe ? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - RF Spectrum Wave Binary Data	-----	:FETCh:FMAudio:FM:RF:TRACe :BINary? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM - Demodulate AF Deviation Summary for Stereo	-----	:FETCh:FMAudio:FM:DEMod:BO TH:DEVIation?	<deviation_plus_peak_current>,<deviation_minus_peak_current>,<deviation_peak_peak_current>,<deviation_rms_current>
TX FM - Demodulate AF Crosstalk Summary	-----	:FETCh:FMAudio:FM:DEMod:CR OSstalk?	<lr_level_ave1>,<lr_level_ave2>,...,<rl_level_ave11>,<rl_level_ave12>
TX FM - Demodulate AF Frequency/Level Summary	-----	:FETCh:FMAudio:FM:DEMod:LE FT RIGHT:AF?	<freq_ave_1>,<level_ave_1>,<freq_ave_2>,...,<level_ave_11>,<freq_ave_12>,<level_ave_12>

## FM Result

Function	Command	Query	Response
TX FM - Demodulate AF Analysis Summary	-----	:FETCh:FMAudio:FM:DEMod:LE FT RIGHT:ANALysis?	<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_ave>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>
TX FM - Demodulate AF Deviation Summary	-----	:FETCh:FMAudio:FM:DEMod:LE FT RIGHT:DEVIation?	<deviation_plus_peak_current>,<deviation_minus_peak_current>,<deviation_ppPer2_current>,<deviation_rms_current>
TX FM - Demodulate AF Pilot Signal Summary	-----	:FETCh:FMAudio:FM:DEMod:PI Lot?	<deviation_ave>,<deviation_max>,<deviation_min>,<level_ave>,<level_max>,<level_min>
TX FM - OBW	-----	:FETCh:FMAudio:FM:OBW?	<obw>
TX FM - OBW Frequency	-----	:FETCh:FMAudio:FM:OBW:FREQ uency? <pos>	<freq>

## FM Result (Cont'd)

Function	Command	Query	Response
TX FM - RDS Summary (Blocks)	-----	:FETCh:FMAudio:FM:RDS:BLOCKs?	<bit_num>,<block_num>,<block_error_rate>
TX FM - RDS Summary (Data)	-----	:FETCh:FMAudio:FM:RDS:DATA?	<block_num>,<group_name_1>,<information_1>,<check_offset_1>,...,<group_name_n>,<information_n>,<check_offset_n>
TX FM - RadioText	-----	:FETCh:FMAudio:FM:RDS:TEXT:HEXadecimal?	<rt_a>,<rt_b>
TX FM - RF Summary	-----	:FETCh:FMAudio:FM:RF?	<freq_ave>,<freq_max>,<freq_min>,<deviation_ave>,<deviation_max>,<deviation_min>,<level_ave>,<level_max>,<level_min>

## 3.2 Details of Commands

This section describes commands in alphabetic order.

### ■ Viewing command table

EX .....	Command name (header)
Example .....	Command function name
Function .....	Command function
Command.....	Programming command syntax
Query .....	Query syntax
Response .....	Response syntax
Parameter .....	Parameter definition
Details .....	Command restrictions and others
Example of Use.....	Command usage example
Related Commands .....	Introduction of related commands

### ■ Suffix code list

Suffix code	Unit	Suffix code	Unit
%	%	MHZ	MHz
DB	dB	MS	ms
DBFS	dBfs	MV	mV
DBM	dBm	MZ	MHz
GHZ	GHz	NS	ns
GZ	GHz	S	s
HZ	Hz	US	μs
KHZ	kHz	UV	μV
KZ	kHz	V	V

## :ABORt:FMAudio:MEASurement

Stop Measure

### Function

Stops measurement.

### Command

:ABORt:FMAudio:MEASurement

### Example of Use

To stop measurement:

:ABOR:FMA:MEAS

## :CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency

RX Audio - Analog - Left Channel AF Tone Frequency

### Function

Sets and queries AF tone frequency for left channel when outputting analog audio signal

### Command

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency <no>,<freq>
```

### Query

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency? <no>
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	20.00 to 20000.00 Hz
Resolution	0.01 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.00 Hz

### Details

The AF tone frequency can be set when using the following command to set the input/output direction of the audio port to output.

```
:ROUTe:PORT:AUDio:ROLE OUTPUT
```

### Example of Use

To set AF tone frequency of left channel at output of analog audio signal to 100.00 Hz

```
:CONF:FMA:AF:ANAL:GEN:LEFT:FREQ 1,100.00
```

To query AF tone frequency of left channel when outputting set analog audio signal

```
:CONF:FMA:AF:ANAL:GEN:LEFT:FREQ? 1
```

> 100.00

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel**

RX Audio - Analog - Left Channel AF Tone Level

**Function**

Sets and queries AF tone level for left channel at output of analog audio signal

**Command**`:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel <no>,<level>`**Query**`:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel? <no>`**Response**

&lt;level&gt;

Returns value in mV units without Suffix Code

**Parameter**

<no>	Tone Number	
Range	1 to 8	
Resolution	1	
<level>	Tone Level	
Range	1 to 5000 mV	
Resolution	1 mV	(501 to 5000 mV)
	0.1 mV	(50.1 to 500.0 mV)
	0.01 mV	(1.00 to 50.00 mV)
Suffix Code	V, MV, UV (uses MV when omitted)	
Default	1 mV	

**Details**

The AF tone level can be set when using the following command to set the input/output direction of the audio port to output.

`:ROUTe:PORT:AUDio:ROLE OUTPUT`**Example of Use**

To set AF tone level of left channel at output of analog audio signal to 1000 mV

`:CONF:FMA:AF:ANAL:GEN:LEFT:LEV 1,1000`

To query AF tone level of left channel when outputting set analog audio signal

`:CONF:FMA:AF:ANAL:GEN:LEFT:LEV? 1`

&gt; 1000

Remarks

An execution error occurs if MU887000A-002/102 is not installed.

- MU887000A-002/102

## :CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:OVER?

RX Audio - Analog - Left Channel AF Tone Level Setting State

Function

Queries tone level setting for AF signal for left channel when outputting analog audio signal

Query

:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:OVER?

Response

<state>

1 : Level-over occurred

0 : Normal

Example of Use

To query AF tone level setting for left channel when outputting set analog audio signal

:CONF:FMA:AF:ANAL:GEN:LEFT:OVER?

> 1

Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATe]**

RX Audio - Analog - Left Channel AF Tone

**Function**

Set and queries On/Off status of AF tone signal for left channel at output of analog audio signal

**Command**

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATe] <no>,<on_off>
```

**Query**

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATe]? <no>
```

**Response**

```
<on_off_res>
```

**Parameter**

<no>	Tone Number
Range	1 to 8
Resolution	1
<on_off>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Tone output On/Off
0	Output Off
1	Output On

**Details**

The AF tone output can be set On/Off when using the following command to set the input/output direction of the audio port to output.

```
:ROUTe:PORT:AUDio:ROLE OUTPUT
```

**Example of Use**

To set AF tone output for left channel to On when outputting analog audio signal

```
:CONF:FMA:AF:ANAL:GEN:LEFT 1,ON
```

To query AF tone On/Off output setting for left channel when outputting set analog audio signal

```
:CONF:FMA:AF:ANAL:GEN:LEFT? 1
```

> 1

Remarks

An execution error occurs if MU887000A-002/102 is not installed.

:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency

RX Audio - Analog - Right Channel AF Tone Frequency

**Function**  
Set and queries On/Off status of AF tone signal for right channel at output of analog audio signal

**Command**  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency <no>,<freq>

**Query**  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency? <no>

**Response**  
<freq>  
Returns value in Hz without Suffix Code

<b>Parameter</b>	
<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	20.00 to 20000.00 Hz
Resolution	0.01 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.00 Hz

**Details**  
The AF tone frequency can be set when using the following command to set the input/output direction of the audio port to output.  
:ROUTe:PORT:AUDio:ROLE OUTPUT

**Example of Use**  
To set AF tone frequency of right channel at output of analog audio signal to 100.00 Hz  
:CONF:FMA:AF:ANAL:GEN:RIGH:FREQ 1,100.00  
To query AF tone frequency of right channel when outputting set analog audio signal  
:CONF:FMA:AF:ANAL:GEN:RIGH:FREQ? 1  
> 100.00

**Remarks**  
An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel

RX Audio - Analog - Right Channel AF Tone Level

### Function

Sets and queries AF tone level for right channel at output of analog audio signal

### Command

:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel <no>,<level>

### Query

:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel? <no>

### Response

<level>

Returns value in mV units without Suffix Code

### Parameter

<no>	Tone Number	
Range	1 to 8	
Resolution	1	
<level>	Tone Level	
Range	1 to 5000 mV	
Resolution	1 mV	(501 to 5000 mV)
	0.1 mV	(50.1 to 500.0 mV)
	0.01 mV	(1.00 to 50.00 mV)
Suffix Code	V, MV, UV (uses MV when omitted)	
Default	1 mV	

### Details

The AF tone level can be set when using the following command to set the input/output direction of the audio port to output.

:ROUTe:PORT:AUDio:ROLE OUTPUT

### Example of Use

To set AF tone level of right channel at output of analog audio signal to 1000 mV

:CONF:FMA:AF:ANAL:GEN:RIGH:LEV 1,1000

To query AF tone level of right channel when outputting set analog audio signal

:CONF:FMA:AF:ANAL:GEN:RIGH:LEV? 1

> 1000

**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:OVER?**

RX Audio - Analog - Right Channel AF Tone Level Setting State

**Function**

Queries tone level setting for AF signal for right channel when outputting analog audio signal

**Query**

:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:OVER?

**Response**

<state>

1 : Level-over occurred

0 : Normal

**Example of Use**

To query AF tone level setting for right channel when outputting set analog audio signal

:CONF:FMA:AF:ANAL:GEN:RIGH:OVER?

> 1

**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt[:STATe]

RX Audio - Analog - Right Channel AF Tone

### Function

Set and queries On/Off status of AF tone signal for right channel at output of analog audio signal

### Command

```
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt[:STATe] <no>,<on_off>
```

### Query

```
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt[:STATe]? <no>
```

### Response

```
<on_off_res>
```

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<on_off>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Tone output On/Off
0	Output Off
1	Output On

### Details

The AF tone output can be set On/Off using the following command when setting the analog audio port input/output direction to output.

```
:ROUTe:PORT:AUDio:ROLE OUTPUT
```

### Example of Use

To set AF tone output for right channel to On when outputting analog audio signal

```
:CONF:FMA:AF:ANAL:GEN:RIGH 1,ON
```

To query AF tone On/Off output setting for right channel when outputting set analog audio signal

```
:CONF:FMA:AF:ANAL:GEN:RIGH? 1
```

```
> 1
```

Remarks

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:FREQuency

RX Audio - Digital - Left Channel AF Tone Frequency

### Function

Sets and queries AF tone frequency for left channel when outputting digital audio signal

### Command

```
:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:FREQuency <no>,<freq>
```

### Query

```
:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:FREQuency? <no>
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	[When sampling rate = 44.1 kHz, and 48 kHz] 20.00 to 20000.00 Hz [When sampling rate = 32 kHz] 20.00 to 14000.00 Hz [When sampling rate = 16 kHz] 20.00 to 7000.00 Hz
Resolution	0.01 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.00 Hz

### Details

The AF tone frequency can be set when using the following command to set the input/output direction of the audio port to output.

```
:ROUTe:PORT:AUDio:ROLE OUTPUT
```

When switching the sampling rate, values outside the frequency setting range are rounded to the largest number.

### Example of Use

To set AF tone frequency of left channel at output of digital audio signal to 100.00 Hz

```
:CONF:FMA:AF:DIG:GEN:LEFT:FREQ 1,100.00
```

To query AF tone frequency of left channel when outputting set digital audio signal  
:CONF:FMA:AF:DIG:GEN:LEFT:FREQ? 1  
> 100.00

**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:LEVel

RX Audio - Digital - Left Channel AF Tone Level

### Function

Sets and queries AF tone level for left channel at output of digital audio signal

### Command

:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:LEVel <no>,<level>

### Query

:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:LEVel? <no>

### Response

<level>

Returns value in dBfs units without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<level>	Tone Level
Range	−40.0 to 0.0 dBfs
Resolution	0.1 dBfs
Suffix Code	DBFS (uses DBFS when omitted)
Default	0.0 dBfs

### Details

The AF tone level can be set when using the following command to set the input/output direction of the audio port to output.

:ROUTe:PORT:AUDio:ROLE OUTPUT

### Example of Use

To set AF tone level of left channel at output of digital audio signal to −20.0 dBfs

:CONF:FMA:AF:DIG:GEN:LEFT:LEV 1,-20.0

To query AF tone level of left channel when outputting set digital audio signal

:CONF:FMA:AF:DIG:GEN:LEFT:LEV? 1

> -20.0

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:OVER?**

RX Audio - Digital - Left Channel AF Tone Level Setting State

**Function**

Queries tone level setting for AF signal for left channel when outputting digital audio signal

**Query**`:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:OVER?`**Response**`<state>`

1 : Level-over occurred

0 : Normal

**Example of Use**

To query AF tone level setting for left channel when outputting set analog audio signal

`:CONF:FMA:AF:DIG:GEN:LEFT:OVER?``> 1`**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT[:STATe]**

RX Audio - Digital - Left Channel AF Tone

**Function**

Set and queries On/Off status of AF tone signal for left channel at output of digital audio signal

**Command**`:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT[:STATe] <no>,<on_off>`**Query**`:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT[:STATe]? <no>`**Response**`<on_off_res>`

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<on_off>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Tone output On/Off
0	Output Off
1	Output On

### Details

The AF tone output can be set On/Off when using the following command to set the input/output direction of the digital port to output.

:ROUTe:PORT:AUDio:ROLE OUTPUT

### Example of Use

To set AF tone output for left channel to On when outputting digital audio signal

:CONF:FMA:AF:DIG:GEN:LEFT 1,ON

To query AF tone On/Off output setting for left channel when outputting set digital audio signal

:CONF:FMA:AF:DIG:GEN:LEFT? 1

> 1

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

:CONFigure:FMAudio:AF:DIGital:GENeration:RATE

RX Audio - Digital - Sampling Rate

Function  
Sets and queries sampling rate when outputting digital audio signal

Command  
:CONFigure:FMAudio:AF:DIGital:GENeration:RATE <rate>

Query  
:CONFigure:FMAudio:AF:DIGital:GENeration:RATE?

Response  
<rate>

Parameter	
<rate>	Sampling Rate
16K	16 kHz
32K	32 kHz
44.1K	44.1 kHz
48K	48 kHz
Default	48K

Details  
The sampling rate can be set when using the following command to set the input/output direction of the audio port to output.  
:ROUTe:PORT:AUDio:ROLE OUTPUT

Example of Use  
To set sampling rate to 16K when outputting digital audio signal  
:CONF:FMA:AF:DIG:GEN:RATE 16K  
  
To query sampling rate when outputting set digital audio signal  
:CONF:FMA:AF:DIG:GEN:RATE?  
> 16K

Remarks  
An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:FREQuency

RX Audio - Digital - Right Channel AF Tone Frequency

### Function

Sets and queries AF tone frequency for right channel when outputting digital audio signal

### Command

```
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:FREQuency <no>,<freq>
```

### Query

```
:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:FREQuency? <no>
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	[When sampling rate = 44.1 kHz, and 48 kHz] 20.00 to 20000.00 Hz [When sampling rate = 32 kHz] 20.00 to 14000.00 Hz [When sampling rate = 16 kHz] 20.00 to 7000.00 Hz
Resolution	0.01 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.00 Hz

### Details

The AF tone frequency can be set when using the following command to set the input/output direction of the audio port to output.

```
:ROUTe:PORT:AUDio:ROLE OUTPUT
```

When switching the sampling rate, values outside the frequency setting range are rounded to the largest number.

### Example of Use

To set AF tone frequency of right channel at output of digital audio signal to 100.00 Hz

```
:CONF:FMA:AF:DIG:GEN:RIGH:FREQ 1,100.00
```

To query AF tone frequency of right channel when outputting set digital audio signal  
:CONF:FMA:AF:DIG:GEN:RIGH:FREQ? 1  
> 100.00

**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:LEVel

RX Audio - Digital - Right Channel AF Tone Level

### Function

Sets and queries AF tone level for right channel at output of digital audio signal

### Command

:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:LEVel <no>,<level>

### Query

:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:LEVel? <no>

### Response

<level>

Returns value in dBfs units without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<level>	Tone Level
Range	−40.0 to 0.0 dBfs
Resolution	0.1 dBfs
Suffix Code	DBFS (uses DBFS when omitted)
Default	0.0 dBfs

### Details

The AF tone level can be set when using the following command to set the input/output direction of the audio port to output.

:ROUTe:PORT:AUDio:ROLE OUTPUT

### Example of Use

To set AF tone level of right channel at output of digital audio signal to −20.0 dBfs

:CONF:FMA:AF:DIG:GEN:RIGH:LEV 1,-20.0

To query AF tone level of right channel when outputting set digital audio signal

:CONF:FMA:AF:DIG:GEN:RIGH:LEV? 1

> -20.0

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT:OVER?**

RX Audio - Digital - Right Channel AF Tone Level Setting State

**Function**

Queries tone level setting for AF signal for right channel when outputting digital audio signal

**Query**`:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT:OVER?`**Response**`<state>`

1 : Level-over occurred

0 : Normal

**Example of Use**

To query AF tone level setting for right channel when outputting set analog audio signal

`:CONF:FMA:AF:DIG:GEN:RIGH:OVER?``> 1`**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT[:STATe]**

RX Audio - Digital - Right Channel AF Tone

**Function**

Set and queries On/Off status of AF tone signal for right channel at output of digital audio signal

**Command**`:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT[:STATe] <no>,<on_off>`**Query**`:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHT[:STATe]? <no>`**Response**`<on_off_res>`

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<on_off>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Tone output On/Off
0	Output Off
1	Output On

### Details

The AF tone output can be set On/Off when using the following command to set the input/output direction of the audio port to output.

:ROUTe:PORT:AUDio:ROLE OUTPUT

### Example of Use

To set AF tone output for right channel to On when outputting digital audio signal

:CONF:FMA:AF:DIG:GEN:RIGH 1,ON

To query AF tone On/Off output setting for right channel when outputting set digital audio signal

:CONF:FMA:AF:DIG:GEN:RIGH? 1

> 1

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:AF:LEFT:BPFilter**

TX Audio - Left Channel Band Pass Filter

**Function**

Sets and queries BPF for left channel when measuring audio signal

**Command**`:CONFigure:FMAudio:AF:LEFT:BPFilter <filter_type>`**Query**`:CONFigure:FMAudio:AF:LEFT:BPFilter?`**Response**`<filter_type>`**Parameter**

<code>&lt;filter_type&gt;</code>	Filter type
OFF	No filter
AWEIGHTING	A-weighting filter
CMESSAGE	C-message filter
CCITT	CCITT(ITU-T O.41) filter
Default	OFF

**Details**

The BPF type can be set when using the following command to set the input/output direction of the audio port to input.

`:ROUTe:PORT:AUDio:ROLE INPUT`**Example of Use**

To set BPF for left channel corresponding to demodulation signal when measuring audio signal to AWEIGHTING

`:CONF:FMA:AF:LEFT:BPFilter AWEIGHTING`

To query BPF for left channel corresponding to demodulation signal when measuring set audio signal

`:CONF:FMA:AF:LEFT:BPFilter?``> AWEIGHTING`**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

This setting can be used when the modulation method at audio signal measurement is MONO.

## :CONFigure:FMAudio:AF:LEFT:DEEMphasis

TX Audio - Left Channel DeEmphasis Filter

### Function

Sets and queries DeEmphasis Filter for left channel when measuring audio signal

### Command

```
:CONFigure:FMAudio:AF:LEFT:DEEMphasis <filter_type>
```

### Query

```
:CONFigure:FMAudio:AF:LEFT:DEEMphasis?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
US50	50 $\mu$ s filter
US75	75 $\mu$ s filter
US750	750 $\mu$ s filter
Default	OFF

### Details

The DeEmphasis Filter type can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set DeEmphasis Filter for left channel corresponding to demodulation signal when measuring audio signal to US75

```
:CONF:FMA:AF:LEFT:DEEM US75
```

To query DeEmphasis Filter for left channel corresponding to demodulation signal when measuring set audio signal

```
:CONF:FMA:AF:LEFT:DEEM?
```

```
> US75
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This setting can be used when the modulation method at audio signal measurement is MONO.

**:CONFigure:FMAudio:AF:LEFT:HPFilter**

TX Audio - Left Channel High Pass Filter

**Function**

Sets and queries HPF for left channel when measuring audio signal

**Command**`:CONFigure:FMAudio:AF:LEFT:HPFilter <filter_type>`**Query**`:CONFigure:FMAudio:AF:LEFT:HPFilter?`**Response**`<filter_type>`**Parameter**

<code>&lt;filter_type&gt;</code>	Filter type
OFF	No filter
HPF20	20 Hz filter
HPF100	100 Hz filter
HPF300	300 Hz filter
HPF400	400 Hz filter
Default	OFF

**Details**

The HPF type can be set when using the following command to set the input/output direction of the audio port to input.

`:ROUTE:PORT:AUDIO:ROLE INPUT`**Example of Use**

To set HPF for left channel corresponding to demodulation signal when measuring audio signal to HPF100

`:CONF:FMA:AF:LEFT:HPF HPF100`

To query HPF for left channel corresponding to demodulation signal when measuring set audio signal

`:CONF:FMA:AF:LEFT:HPF?``> HPF100`**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

This setting can be used when the modulation method at audio signal measurement is MONO.

## :CONFigure:FMAudio:AF:LEFT:LPFilter

TX Audio - Left Channel Low Pass Filter

### Function

Sets and queries LPF for left channel when measuring audio signal

### Command

```
:CONFigure:FMAudio:AF:LEFT:LPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:AF:LEFT:LPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
LPF3K	3 kHz filter
LPF15K	15 kHz filter
LPF20K	20 kHz filter
LPF30K	30 kHz filter
Default	OFF

### Details

The LPF type can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTE:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set LPF for left channel corresponding to demodulation signal when measuring audio signal to LPF20K

```
:CONF:FMA:AF:LEFT:LPF LPF20K
```

To query LPF for left channel corresponding to demodulation signal when measuring set audio signal

```
:CONF:FMA:AF:LEFT:LPF?
```

```
> LPF20K
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This setting can be used when the modulation method at audio signal measurement is MONO.

## :CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe

TX Audio - Analog - Input Level

### Function

Sets and queries input range at analog audio signal measurement

### Command

```
:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe <level>
```

### Query

```
:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe?
```

### Response

```
<level>
```

### Parameter

<level>	Input Range
50MV	50 mV (peak)
500MV	500 mV (peak)
5000MV	5000 mV (peak)
Default	5000MV

### Details

The input range can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set input range when measuring analog audio signal to 500MV

```
:CONF:FMA:AF:MEAS:ANAL:RANG 500MV
```

To query input range at set audio signal measurement

```
:CONF:FMA:AF:MEAS:ANAL:RANG?
```

```
> 500MV
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:MEASurement:MODulation

TX Audio - Modulation

### Function

Sets and queries modulation method at audio signal measurement

### Command

```
:CONFigure:FMAudio:AF:MEASurement:MODulation <mode>
```

### Query

```
:CONFigure:FMAudio:AF:MEASurement:MODulation?
```

### Response

```
<mode>
```

### Parameter

<mode>	Modulation Method
MONO	Mono
STEREO	Stereo
Default	STEREO

### Details

The modulation method can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set modulation method at audio signal measurement to STEREO

```
:CONF:FMA:AF:MEAS:MOD STEREO
```

To query modulation method at set audio signal measurement

```
:CONF:FMA:AF:MEAS:MOD?
```

```
> STEREO
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

:CONFigure:FMAudio:AF:MEASurement:RATE

TX Audio - Digital - Sampling Rate

Function  
Sets and queries sampling rate at digital signal audio measurement

Command  
:CONFigure:FMAudio:AF:MEASurement:RATE <rate>

Query  
:CONFigure:FMAudio:AF:MEASurement:RATE?

Response  
<rate>

Parameter	
<rate>	Sampling Rate
16K	16 kHz
32K	32 kHz
44.1K	44.1 kHz
48K	48 kHz
Default	48K

Details  
The sampling rate can be set when using the following command to set the input/output direction of the audio port to input.  
:ROUTe:PORT:AUDio:ROLE INPUT

Example of Use  
To set sampling rate at digital audio signal measurement to 16K  
:CONF:FMA:AF:MEAS:RATE 16K  
  
To query sampling rate at set digital audio signal measurement  
:CONF:FMA:AF:MEAS:RATE?  
> 16K

Remarks  
An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:RIGHt:BPFilter

TX Audio - Right Channel Band Pass Filter

### Function

Sets and queries BPF for right channel when measuring audio signal

### Command

```
:CONFigure:FMAudio:AF:RIGHt:BPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:AF:RIGHt:BPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
AWEIGHTING	A-weighting filter
CMESSAGE	C-message filter
CCITT	CCITT(ITU-T O.41) filter
Default	OFF

### Details

The BPF type can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set BPF for right channel corresponding to demodulation signal when measuring audio signal to AWEIGHTING

```
:CONF:FMA:AF:RIGH:BPf AWEIGHTING
```

To query BPF for right channel corresponding to demodulation signal when measuring set audio signal

```
:CONF:FMA:AF:RIGH:BPf?
```

```
> AWEIGHTING
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This command cannot be used when the modulation method at audio signal measurement is MONO.

:CONFigure:FMAudio:AF:RIGHT:DEEMphasis

TX Audio - Right Channel DeEmphasis Filter

Function  
Sets and queries DeEmphasis Filter for right channel when measuring audio signal

Command  
:CONFigure:FMAudio:AF:RIGHT:DEEMphasis <filter\_type>

Query  
:CONFigure:FMAudio:AF:RIGHT:DEEMphasis?

Response  
<filter\_type>

Parameter	
<filter_type>	Filter type
OFF	No filter
US50	50 $\mu$ s filter
US75	75 $\mu$ s filter
US750	750 $\mu$ s filter
Default	OFF

Details  
The DeEmphasis Filter type can be set when using the following command to set the input/output direction of the audio port to input.  
:ROUTe:PORT:AUDio:ROLE INPUT

Example of Use  
To set DeEmphasis Filter for right channel corresponding to demodulation signal when measuring audio signal to US75  
:CONF:FMA:AF:RIGH:DEEM US75  
To query DeEmphasis Filter for right channel corresponding to demodulation signal when measuring set audio signal  
:CONF:FMA:AF:RIGH:DEEM?  
> US75

Remarks  
An execution error occurs if MU887000A-002/102 is not installed.  
  
This command cannot be used when the modulation method at audio signal measurement is MONO.

## :CONFigure:FMAudio:AF:RIGHT:HPFilter

TX Audio - Right Channel High Pass Filter

### Function

Sets and queries HPF for right channel when measuring audio signal

### Command

```
:CONFigure:FMAudio:AF:RIGHT:HPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:AF:RIGHT:HPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
HPF20	20 Hz filter
HPF100	100 Hz filter
HPF300	300 Hz filter
HPF400	400 Hz filter
Default	OFF

### Details

The HPF type can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set HPF for right channel corresponding to demodulation signal when measuring audio signal to HPF100

```
:CONF:FMA:AF:RIGHT:HPF HPF100
```

To query HPF for right channel corresponding to demodulation signal when measuring set audio signal

```
:CONF:FMA:AF:RIGHT:HPF?
```

```
> HPF100
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This command cannot be used when the modulation method at audio signal measurement is MONO.

## :CONFigure:FMAudio:AF:RIGHT:LPFilter

TX Audio - Right Channel Low Pass Filter

### Function

Sets and queries LPF for right channel when measuring audio signal

### Command

```
:CONFigure:FMAudio:AF:RIGHT:LPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:AF:RIGHT:LPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
LPF3K	3 kHz filter
LPF15K	15 kHz filter
LPF20K	20 kHz filter
LPF30K	30 kHz filter
Default	OFF

### Details

The LPF type can be set when using the following command to set the input/output direction of the audio port to input.

```
:ROUTe:PORT:AUDio:ROLE INPUT
```

### Example of Use

To set LPF for right channel corresponding to demodulation signal when measuring audio signal to LPF20K

```
:CONF:FMA:AF:RIGHT:LPF LPF20K
```

To query LPF for right channel corresponding to demodulation signal when measuring set audio signal

```
:CONF:FMA:AF:RIGHT:LPF?
```

```
> LPF20K
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This command cannot be used when the modulation method at audio signal measurement is MONO.

:CONFigure:FMAudio:AF:STORage:COUNT

TX Audio - Storage Count

Function

Sets and queries data storage count when measuring audio signal

Command

:CONFigure:FMAudio:AF:STORage:COUNT <count>

Query

:CONFigure:FMAudio:AF:STORage:COUNT?

Response

<count>

Parameter

<count>	Data storage count
Range	2 to 100
Resolution	1
Default	2

Details

The data storage count can be set when using the following command to set the input/output direction of the audio port to input.

:ROUTe:PORT:AUDio:ROLE INPUT

Example of Use

To set data storage count when measuring audio signal to 100

:CONF:FMA:AF:STOR:COUN 100

To query data storage count when measuring set audio signal

:CONF:FMA:AF:STOR:COUN?

> 100

Remarks

An execution error occurs if MU887000A-002/102 is not installed.

## :CONFigure:FMAudio:AF:STORage:MODE

TX Audio - Storage Mode

### Function

Sets and queries data storage method when measuring audio signal

### Command

:CONFigure:FMAudio:AF:STORage:MODE <mode>

### Query

:CONFigure:FMAudio:AF:STORage:MODE?

### Response

<mode>

### Parameter

<mode>	Method for saving measurement results
OFF	Latest measurement result
AVERAGE	Average value calculated from total measurements
Default	OFF

### Details

The data storage method can be set when using the following command to set the input/output direction of the audio port to input.

:ROUTe:PORT:AUDio:ROLE INPUT

### Example of Use

To set data storage method when measuring audio signal to AVERAGE

:CONF:FMA:AF:STOR:MODE AVERAGE

To query data storage method when measuring set audio signal

:CONF:FMA:AF:STOR:MODE?

> AVERAGE

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

**:CONFigure:FMAudio:FM:GENeration**

RX FM - Signal Generation

**Function**

Sets and queries waveform generation On/Off when outputting FM signal

**Command**`:CONFigure:FMAudio:FM:GENeration <on_off>`**Query**`:CONFigure:FMAudio:FM:GENeration?`**Response**`<on_off_res>`**Parameters**

<code>&lt;on_off&gt;</code>	Waveform Generation On/Off
0	Waveform not generated
1	Waveform generated
OFF	Waveform not generated
ON	Waveform generated
Default	1
<code>&lt;on_off_res&gt;</code>	Waveform Generation On/Off
0	Waveform not generated
1	Waveform generated

**Details**

The waveform generation On/Off can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

When no waveform is generated, output the signal using the VSG function.

**Example of Use**

To set waveform generation On/Off to On at FM signal output

```
:CONF:FMA:FM:GEN ON
```

To query waveform generation On/Off setting at set FM signal output

```
:CONF:FMA:FM:GEN?
```

```
> 1
```

## :CONFigure:FMAudio:FM:GENeration:AM:DEPT<sub>h</sub>

RX FM - AM Depth

### Function

Sets and queries AM modulation depth for FM signal.

### Command

:CONFigure:FMAudio:FM:GENeration:AM:DEPT<sub>h</sub> <percent>

### Query

:CONFigure:FMAudio:FM:GENeration:AM:DEPT<sub>h</sub>?

### Response

<percent>

### Parameter

<percent>	AM Modulation Depth
Range	0.0 to 75.0%
Resolution	0.1%
Suffix Code	%
Default	0.0%

### Details

The AM modulation depth can be set when the input/output direction of the RF port is set to Output by the following command.

:ROUTe:PORT:RF:ROLE OUTPUT

### Example of Use

To set AM modulation depth for FM signal to 15%.

:CONF:FMA:FM:GEN:AM:DEPT 15%

To query AM modulation depth for FM signal.

:CONF:FMA:FM:GEN:AM:DEPT?

> 15.0

:CONFigure:FMAudio:FM:GENeration:AM:FREQuency

RX FM - AM Frequency

Function

Sets and queries AM modulation frequency for FM signal.

Command

:CONFigure:FMAudio:FM:GENeration:AM:FREQuency <freq>

Query

:CONFigure:FMAudio:FM:GENeration:AM:FREQuency?

Response

<freq>

Parameter

<freq>	AM Modulation Frequency
Range	0.0 to 15000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	400.0 Hz

Details

The AM modulation frequency can be set when the input/output direction of the RF port is set to Output by the following command.  
:ROUTe:PORT:RF:ROLE OUTPUT

Example of Use

To set AM modulation frequency for FM signal to 15 kHz.  
:CONF:FMA:FM:GEN:AM:FREQ 15KHZ

To query AM modulation frequency for FM signal.  
:CONF:FMA:FM:GEN:AM:FREQ?  
> 15000

## :CONFigure:FMAudio:FM:GENeration:AM[:STATe]

RX FM - AM Signal Modulation

### Function

Sets and queries AM modulation On/Off for FM signal.

### Command

```
:CONFigure:FMAudio:FM:GENeration:AM[:STATe] <on_off>
```

### Query

```
:CONFigure:FMAudio:FM:GENeration:AM[:STATe]?
```

### Response

```
<on_off_res>
```

### Parameters

<on_off>	AM Modulation On/Off
0	Modulation Off
1	Modulation On
OFF	Modulation Off
ON	Modulation On
Default	0
<on_off_res>	AM Modulation On/Off
0	Modulation Off
1	Modulation On

### Details

The AM modulation On/Off can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set AM modulation frequency for FM signal to On.

```
:CONF:FMA:FM:GEN:AM ON
```

To query AM modulation On/Off for FM signal.

```
:CONF:FMA:FM:GEN:AM?
```

```
> 1
```

**:CONFigure:FMAudio:FM:GENeration:LEFT:DEViation**

RX FM - Left Channel AF Tone Deviation

**Function**

Sets and queries AF tone frequency deviation for left channel at FM signal generation

**Command**`:CONFigure:FMAudio:FM:GENeration:LEFT:DEViation <no>,<freq>`**Query**`:CONFigure:FMAudio:FM:GENeration:LEFT:DEViation? <no>`**Response**`<freq>`

Returns value in Hz without Suffix Code

**Parameter**

<code>&lt;no&gt;</code>	Tone Number
Range	1 to 8
Resolution	1
<code>&lt;freq&gt;</code>	Tone Frequency deviation
Range	0.0 to 100000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	3500.0 Hz

**Details**

The AF tone frequency deviation can be set when the input/output direction of the RF port is set to Output by the following command.

`:ROUTe:PORT:RF:ROLE OUTPUT`**Example of Use**

To set AF tone frequency deviation for left channel at FM signal generation to 100.0 Hz

`:CONF:FMA:FM:GEN:LEFT:DEV 1,100.0`

To query AF tone frequency deviation for left channel at generation of set FM signal

`:CONF:FMA:FM:GEN:LEFT:DEV? 1``> 100.0`**Remarks**

This setting can be used when the modulation method at FM signal generation is MONO.

## :CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency

RX FM - Left Channel AF Tone Frequency

### Function

Sets and queries AF tone frequency for left channel at FM signal generation

### Command

```
:CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency <no>,<freq>
```

### Query

```
:CONFigure:FMAudio:FM:GENeration:LEFT:FREQuency? <no>
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	20.0 to 40000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.0 Hz

### Details

The AF tone frequency can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set AF tone frequency for left channel at FM signal generation to 100.0 Hz

```
:CONF:FMA:FM:GEN:LEFT:FREQ 1,100.0
```

To query AF tone frequency for left channel at generation of set FM signal

```
:CONF:FMA:FM:GEN:LEFT:FREQ? 1
```

> 100.0

### Remarks

This setting can be used when the modulation method at FM signal generation is MONO.

**:CONFigure:FMAudio:FM:GENeration:LEFT[:STATe]**

RX FM - Left Channel AF Tone

**Function**

Sets and queries On/Off status of AF tone signal for left channel at FM signal generation

**Command**`:CONFigure:FMAudio:FM:GENeration:LEFT[:STATe] <no>,<on_off>`**Query**`:CONFigure:FMAudio:FM:GENeration:LEFT[:STATe]? <no>`**Response**`<on_off_res>`**Parameter**

<code>&lt;no&gt;</code>	Tone Number
Range	1 to 8
Resolution	1
<code>&lt;on_off&gt;</code>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<code>&lt;on_off_res&gt;</code>	Tone output On/Off
0	Output Off
1	Output On

**Details**

The On/Off status of AF tone signal can be set when the input/output direction of the RF port is set to Output by the following command.

`:ROUTe:PORT:RF:ROLE OUTPUT`**Example of Use**

To set AF tone output for left channel at FM signal generation to On

`:CONF:FMA:FM:GEN:LEFT 1,ON`

To query AF tone On/Off output setting for left channel at generation of set FM signal

`:CONF:FMA:FM:GEN:LEFT? 1``> 1`

Remarks

This setting can be used when the modulation method at FM signal generation is MONO.

**:CONFigure:FMAudio:FM:GENeration:MODulation**

RX FM - Modulation

Function

Sets and queries modulation method at FM signal generation

Command

```
:CONFigure:FMAudio:FM:GENeration:MODulation <mode>
```

Query

```
:CONFigure:FMAudio:FM:GENeration:MODulation?
```

Response

```
<mode>
```

Parameter

<mode>	Modulation Method
MONO	Mono
STEREO	Stereo
Default	STEREO

Details

The modulation method can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

Example of Use

To set modulation method at FM signal generation to STEREO

```
:CONF:FMA:FM:GEN:MOD STEREO
```

To query modulation method at FM signal generation

```
:CONF:FMA:FM:GEN:MOD?
```

```
> STEREO
```

## :CONFigure:FMAudio:FM:GENeration:PILot:DEViation

RX FM - FM Pilot Deviation

### Function

Sets and queries pilot signal frequency deviation for FM signal.

### Command

```
:CONFigure:FMAudio:FM:GENeration:PILot:DEViation <freq>
```

### Query

```
:CONFigure:FMAudio:FM:GENeration:PILot:DEViation?
```

### Response

```
<freq>
```

### Parameter

<freq>	Pilot Signal Frequency Deviation
Range	0.0 to 10000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	7500.0 Hz

### Details

The pilot signal frequency deviation can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTE:PORT:RF:ROLE OUTPUT
```

### Remarks

This setting is not available when the modulation method for FM signal generation is MONO.

### Example of Use

To set pilot signal frequency deviation for FM signal to 4 kHz.

```
:CONF:FMA:FM:GEN:PIL:DEV 4KHZ
```

To query pilot signal frequency deviation for FM signal.

```
:CONF:FMA:FM:GEN:PIL:DEV?
```

```
> 4000
```

## :CONFigure:FMAudio:FM:GENeration:RIGHT:DEViation

RX FM - Right Channel AF Tone Deviation

### Function

Sets and queries AF tone frequency deviation for right channel at FM signal generation

### Command

```
:CONFigure:FMAudio:FM:GENeration:RIGHT:DEViation <no>,<freq>
```

### Query

```
:CONFigure:FMAudio:FM:GENeration:RIGHT:DEViation? <no>
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency Deviation
Range	0.0 to 100000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	3500.0 Hz

### Details

The AF tone frequency deviation can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTE:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set AF tone frequency deviation for right channel at FM signal generation to 100.0 Hz

```
:CONF:FMA:FM:GEN:RIGH:DEV 1,100.0
```

To query AF tone frequency deviation for right channel at generation of set FM signal

```
:CONF:FMA:FM:GEN:RIGH:DEV? 1
```

```
> 100.0
```

### Remarks

This setting cannot be used when the modulation method at FM signal generation is MONO.

**:CONFigure:FMAudio:FM:GENeration:RIGHt:FREQuency**

RX FM - Right Channel AF Tone Frequency

**Function**

Sets and queries AF tone frequency for right channel at FM signal generation

**Command**

:CONFigure:FMAudio:FM:GENeration:RIGHt:FREQuency &lt;no&gt;,&lt;freq&gt;

**Query**

:CONFigure:FMAudio:FM:GENeration:RIGHt:FREQuency? &lt;no&gt;

**Response**

&lt;freq&gt;

Returns value in Hz without Suffix Code

**Parameter**

<no>	Tone Number
Range	1 to 8
Resolution	1
<freq>	Tone Frequency
Range	20.0 to 40000.0 Hz
Resolution	0.1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	1000.0 Hz

**Details**

The AF tone frequency can be set when the input/output direction of the RF port is set to Output by the following command.

:ROUTe:PORT:RF:ROLE OUTPUT

**Example of Use**

To set AF tone frequency for right channel at FM signal generation to 100.0 Hz

:CONF:FMA:FM:GEN:RIGH:FREQ 1,100.0

To query AF tone frequency for right channel at generation of set FM signal

:CONF:FMA:FM:GEN:RIGH:FREQ? 1

&gt; 100.0

**Remarks**

This setting cannot be used when the modulation method at FM signal generation is MONO.

## :CONFigure:FMAudio:FM:GENeration:RIGHt[:STATe]

RX FM - Right Channel AF Tone

### Function

Sets and queries On/Off status of AF tone signal for right channel at FM signal generation

### Command

```
:CONFigure:FMAudio:FM:GENeration:RIGHt[:STATe] <no>,<on_off>
```

### Query

```
:CONFigure:FMAudio:FM:GENeration:RIGHt[:STATe]? <no>
```

### Response

```
<on_off_res>
```

### Parameter

<no>	Tone Number
Range	1 to 8
Resolution	1
<on_off>	Tone output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Tone output On/Off
0	Output Off
1	Output On

### Details

The On/Off status of AF tone signal can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set AF tone output for right channel at FM signal generation to On

```
:CONF:FMA:FM:GEN:RIGH 1,ON
```

To query AF tone On/Off output setting for right channel at generation of set FM signal

```
:CONF:FMA:FM:GEN:RIGH? 1
```

```
> 1
```

Remarks

This setting cannot be used when the modulation method at FM signal generation is MONO.

## :CONFigure:FMAudio:FM:LEFT:BPFilter

TX FM - Left Channel Band Pass Filter

### Function

Sets and queries BPF for left channel corresponding to demodulation signal when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:LEFT:BPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:FM:LEFT:BPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
AWEIGHTING	A-weighting filter
CMESSAGE	C-message filter
CCITT	CCITT(ITU-T O.41) filter
Default	OFF

### Details

The BPF type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set BPF for left channel corresponding to demodulation signal when measuring FM signal to AWEIGHTING

```
:CONF:FMA:FM:LEFT:BPFilter AWEIGHTING
```

To query BPF for left channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:LEFT:BPFilter?
```

```
> AWEIGHTING
```

### Remarks

This setting can be used when the modulation method at FM signal measurement is MONO.

## :CONFigure:FMAudio:FM:LEFT:DEEMphasis

TX FM - Left Channel DeEmphasis Filter

### Function

Sets and queries DeEmphasis Filter for left channel corresponding to demodulation signal when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:LEFT:DEEMphasis <filter_type>
```

### Query

```
:CONFigure:FMAudio:FM:LEFT:DEEMphasis?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
US50	50 $\mu$ s filter
US75	75 $\mu$ s filter
US750	750 $\mu$ s filter
Default	US50

### Details

The DeEmphasis Filter type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set DeEmphasis Filter for left channel corresponding to demodulation signal when measuring FM signal to US75

```
:CONF:FMA:FM:LEFT:DEEM US75
```

To query DeEmphasis Filter for left channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:LEFT:DEEM?
```

```
> US75
```

### Remarks

This setting can be used when the modulation method at FM signal measurement is MONO.

## :CONFigure:FMAudio:FM:LEFT:HPFilter

TX FM - Left Channel High Pass Filter

### Function

Sets and queries HPF for left channel corresponding to demodulation signal when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:LEFT:HPFilter <filter_type>
```

### Query

```
:CONFigure:FMAudio:FM:LEFT:HPFilter?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
HPF20	20 Hz filter
HPF100	100 Hz filter
HPF300	300 Hz filter
HPF400	400 Hz filter
Default	OFF

### Details

The HPF type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set HPF for left channel corresponding to demodulation signal when measuring FM signal to HPF100

```
:CONF:FMA:FM:LEFT:HPF HPF100
```

To query HPF for left channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:LEFT:HPF?
```

```
> HPF100
```

### Remarks

This setting can be used when the modulation method at FM signal measurement is MONO.

**:CONFigure:FMAudio:FM:LEFT:LPFilter**

TX FM - Left Channel Low Pass Filter

**Function**

Sets and queries LPF for left channel corresponding to demodulation signal when measuring FM signal

**Command**

```
:CONFigure:FMAudio:FM:LEFT:LPFilter <filter_type>
```

**Query**

```
:CONFigure:FMAudio:FM:LEFT:LPFilter?
```

**Response**

```
<filter_type>
```

**Parameter**

<filter_type>	Filter type
OFF	No filter
LPF3K	3 kHz filter
LPF15K	15 kHz filter
LPF20K	20 kHz filter
LPF30K	30 kHz filter
Default	OFF

**Details**

The LPF type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

**Example of Use**

To set LPF for left channel corresponding to demodulation signal when measuring FM signal to LPF20K

```
:CONF:FMA:FM:LEFT:LPF LPF20K
```

To query LPF for left channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:LEFT:LPF?
```

```
> LPF20K
```

**Remarks**

This setting can be used when the modulation method at FM signal measurement is MONO.

## :CONFigure:FMAudio:FM:MODulation

TX FM - Modulation

### Function

Sets and queries modulation method at FM signal measurement

### Command

```
:CONFigure:FMAudio:FM:MODulation <mode>
```

### Query

```
:CONFigure:FMAudio:FM:MODulation?
```

### Response

```
<mode>
```

### Parameter

<mode>	Modulation Method
MONO	Mono
STEREO	Stereo
Default	STEREO

### Details

The modulation method can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set modulation method at FM signal measurement to STEREO

```
:CONF:FMA:FM:MOD STEREO
```

To query modulation method at set FM signal measurement

```
:CONF:FMA:FM:MOD?
```

```
> STEREO
```

:CONFigure:FMAudio:FM:OBW:RATio

TX FM - Occupied Bandwidth Ratio

Function  
Sets and queries occupation ratio for band at OBW measurement at FM signal measurement

Command  
:CONFigure:FMAudio:FM:OBW:RATio <ratio>

Query  
:CONFigure:FMAudio:FM:OBW:RATio?

Response  
<ratio>

Parameter	
<ratio>	Occupied Bandwidth occupation ratio
Range	80.0 to 99.9
Resolution	0.1
Suffix Code	%
Default	99.0

Details  
The occupation ratio can be set when using the following command to set the input/output direction of the RF port to input.  
:ROUTe:PORT:RF:ROLE INPUT

Example of Use  
To set occupation ratio for band at OBW measurement at FM signal generation to 90.0  
:CONF:FMA:FM:OBW:RAT 90.0  
  
To query occupation ratio for band at OBW measurement at set FM signal measurement  
:CONF:FMA:FM:OBW:RAT?  
> 90.0

## :CONFigure:FMAudio:FM:RDS

TX FM - RDS Analysis

### Function

Sets and queries RDS analysis On/Off at FM signal measurement

### Command

```
:CONFigure:FMAudio:FM:RDS <on_off>
```

### Query

```
:CONFigure:FMAudio:FM:RDS?
```

### Response

```
<on_off_res>
```

### Parameter

<on_off>	Analysis On/Off
0	RDS Analysis Off
1	RDS Analysis On
OFF	RDS Analysis Off
ON	RDS Analysis On
Default	0
<on_off_res>	Analysis On/Off
0	RDS Analysis Off
1	RDS Analysis On

### Details

The RDS analysis On/Off can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set RDS analysis On/Off at FM signal generation when measuring FM signal to On

```
:CONF:FMA:FM:RDS ON
```

To query RDS analysis On/Off when measuring set FM signal

```
:CONF:FMA:FM:RDS?
```

```
> 1
```

**:CONFigure:FMAudio:FM:RIGHT:BPFilter**

TX FM - Right Channel Band Pass Filter

**Function**

Sets and queries BPF for right channel corresponding to demodulation signal when measuring FM signal

**Command**

```
:CONFigure:FMAudio:FM:RIGHT:BPFilter <filter_type>
```

**Query**

```
:CONFigure:FMAudio:FM:RIGHT:BPFilter?
```

**Response**

```
<filter_type>
```

**Parameter**

<filter_type>	Filter type
OFF	No filter
AWEIGHTING	A-weighting filter
CMESSAGE	C-message filter
CCITT	CCITT(ITU-T O.41) filter
Default	OFF

**Details**

The BPF type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

**Example of Use**

To set BPF for right channel corresponding to demodulation signal when measuring FM signal to AWEIGHTING

```
:CONF:FMA:FM:RIGH:BPFilter AWEIGHTING
```

To query BPF for right channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:RIGH:BPFilter?
```

```
> AWEIGHTING
```

**Remarks**

This setting cannot be used when the modulation method at FM signal measurement is MONO.

## :CONFigure:FMAudio:FM:RIGHT:DEEMphasis

TX FM - Right Channel DeEmphasis Filter

### Function

Sets and queries DeEmphasis Filter for right channel corresponding to demodulation signal when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:RIGHT:DEEMphasis <filter_type>
```

### Query

```
:CONFigure:FMAudio:FM:RIGHT:DEEMphasis?
```

### Response

```
<filter_type>
```

### Parameter

<filter_type>	Filter type
OFF	No filter
US50	50 $\mu$ s filter
US75	75 $\mu$ s filter
US750	750 $\mu$ s filter
Default	US50

### Details

The DeEmphasis Filter type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set DeEmphasis Filter for right channel corresponding to demodulation signal when measuring FM signal to US75

```
:CONF:FMA:FM:RIGH:DEEM US75
```

To query DeEmphasis Filter for right channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:RIGH:DEEM?  
> US75
```

### Remarks

This setting cannot be used when the modulation method at FM signal measurement is MONO.

**:CONFigure:FMAudio:FM:RIGHT:HPFilter**

TX FM - Right Channel High Pass Filter

**Function**

Sets and queries HPF for right channel corresponding to demodulation signal when measuring FM signal

**Command**

```
:CONFigure:FMAudio:FM:RIGHT:HPFilter <filter_type>
```

**Query**

```
:CONFigure:FMAudio:FM:RIGHT:HPFilter?
```

**Response**

```
<filter_type>
```

**Parameter**

<filter_type>	Filter type
OFF	No filter
HPF20	20 Hz filter
HPF100	100 Hz filter
HPF300	300 Hz filter
HPF400	400 Hz filter
Default	OFF

**Details**

The HPF type can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

**Example of Use**

To set HPF for right channel corresponding to demodulation signal when measuring FM signal to HPF100

```
:CONF:FMA:FM:RIGH:HPF HPF100
```

To query HPF for right channel corresponding to demodulation signal when measuring set FM signal

```
:CONF:FMA:FM:RIGH:HPF?
> HPF100
```

**Remarks**

This setting cannot be used when the modulation method at FM signal measurement is

MONO.

:CONFigure:FMAudio:FM:RIGHT:LPFilter

TX FM - Right Channel Low Pass Filter

**Function**  
Sets and queries LPF for right channel corresponding to demodulation signal when measuring FM signal

**Command**  
:CONFigure:FMAudio:FM:RIGHT:LPFilter <filter\_type>

**Query**  
:CONFigure:FMAudio:FM:RIGHT:LPFilter?

**Response**  
<filter\_type>

Parameter	
<filter_type>	Filter type
OFF	No filter
LPF3K	3 kHz filter
LPF15K	15 kHz filter
LPF20K	20 kHz filter
LPF30K	30 kHz filter
Default	OFF

**Details**  
The LPF type can be set when using the following command to set the input/output direction of the RF port to input.  
:ROUTe:PORT:RF:ROLE INPUT

**Example of Use**  
To set LPF for right channel corresponding to demodulation signal when measuring FM signal to LPF20K  
:CONF:FMA:FM:RIGH:LPF LPF20K  
To query LPF for right channel corresponding to demodulation signal when measuring set FM signal  
:CONF:FMA:FM:RIGH:LPF?  
> LPF20K

**Remarks**  
This setting cannot be used when the modulation method at FM signal measurement is MONO.

## :CONFigure:FMAudio:FM:STORage:COUNT

TX FM - Storage Count

### Function

Sets and queries data storage count when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:STORage:COUNT <count>
```

### Query

```
:CONFigure:FMAudio:FM:STORage:COUNT?
```

### Response

```
<count>
```

### Parameter

<count>	Data storage count
Range	2 to 100
Resolution	1
Default	2

### Details

The data storage count can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set data storage count when measuring FM signal to 100

```
:CONF:FMA:FM:STOR:COUN 100
```

To query data storage count when measuring set FM signal

```
:CONF:FMA:FM:STOR:COUN?
```

```
> 100
```

## :CONFigure:FMAudio:FM:STORage:MODE

TX FM - Storage Mode

### Function

Sets and queries data storage method when measuring FM signal

### Command

```
:CONFigure:FMAudio:FM:STORage:MODE <mode>
```

### Query

```
:CONFigure:FMAudio:FM:STORage:MODE?
```

### Response

```
<mode>
```

### Parameter

<mode>	Method for saving measurement results
OFF	Latest measurement result
AVERAGE	Average value calculated from total measurements
Default	OFF

### Details

The data storage method can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set data storage method when measuring FM signal to AVERAGE

```
:CONF:FMA:FM:STOR:MODE AVERAGE
```

To query data storage method when measuring set FM signal

```
:CONF:FMA:FM:STOR:MODE?
```

```
> AVERAGE
```

## :CONFigure:FMAudio:GENerator:BBMode

Modulation

### Function

Sets and queries RF signal output modulation

### Command

```
:CONFigure:FMAudio:GENerator:BBMode <on_off>
```

### Query

```
:CONFigure:FMAudio:GENerator:BBMode?
```

### Response

```
<on_off_res>
```

### Parameter

<on_off>	Modulation Setting
0	Modulation Off (CW)
1	Modulation On
OFF	Modulation Off (CW)
ON	Modulation On
Default	1
<on_off_res>	Modulation Setting
0	Modulation Off (CW)
1	Modulation On

### Details

The RF signal output modulation can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set RF signal modulation to On

```
:CONF:FMA:GEN:BBM ON
```

To query set RF signal modulation

```
:CONF:FMA:GEN:BBM?
```

```
> 1
```

:CONFigure:FMAudio:GENerator:RFSettings:FREQuency

Frequency - Downlink Frequency

Function

Sets or queries RF frequency

Command

:CONFigure:FMAudio:GENerator:RFSettings:FREQuency <freq>

Query

:CONFigure:FMAudio:GENerator:RFSettings:FREQuency?

Response

<freq>  
Returns value in Hz without Suffix Code

Parameter

<freq>	RF Frequency
Range	1.000000 to 3800.000000 MHz 1.000000 to 6000.000000 MHz (When MU887000A-001 is installed)
Resolution	1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	80.000000 MHz

Details

The RF frequency can be set when the input/output direction of the RF port is set to Output by the following command.  
:ROUTE:PORT:RF:ROLE OUTPUT

Example of Use

To set the RF frequency to 65 MHz:  
:CONF:FMA:GEN:RFS:FREQ 65MHZ

To query the RF frequency setting value:  
:CONF:FMA:GEN:RFS:FREQ?  
> 65000000

## :CONFigure:FMAudio:GENerator:RFSettings:LEVel

Level - Output Level

### Function

Sets or queries RF output level:

### Command

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel <level>
```

### Query

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel?
```

### Response

<level>

Returns value for units set by unit selection command without Suffix Code

### Parameter

<level>	Output Level
Range	[When set units = dBm] -130.0 to -10.0 dBm (Port1/Port2) -120.0 to 0.0 dBm (Port3/Port4) [When set units = dBμV (EMF)] -17.0 to +103.0 dBμV (Port1/Port2) -7.0 to +113.0 dBμV (Port3/Port4) [When set units = dBμV (term)] -230 to +97.0 dBμV (Port1/Port2) -13.0 to +103.0 dBμV (Port3/Port4)
Resolution	[When set units = dBm] 0.1 dBm [When set units = dBμV] 0.1 dBμV
Suffix Code	[When set units = dBm] DBM (uses dBm when omitted) [When set units = dBμV] DBUV (uses dBμV when omitted)
Default	-66.0 dBm

### Details

The RF output level can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

When the Cable Loss Calibration is ON, the cable loss is subtracted from the input level

setting range.

When the cable loss is 5 dB, the Port1/Port2 setting range is  $-125.0$  to  $-5.0$  dBm.

#### Example of Use

To set the RF output level to  $-10.0$  dBm:

```
:CONF:FMA:GEN:RFS:LEV -10.0
```

To query the RF output level setting value:

```
:CONF:FMA:GEN:RFS:LEV?
```

```
> -10.0
```

#### Related Commands

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT
```

```
[:ROUTE]:EXTLoss:TABLE:SWITCh
```

```
:CALCulate:EXTLoss:TABLE:SETTing
```

```
:CALCulate:EXTLoss:TABLE:VALue
```

For details of the commands, refer to the *MU887000A TRX Test Module Operation Manual*.

## :CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT

Level - Output Level Unit

### Function

Sets and queries output level units

### Command

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT <unit>
```

### Query

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT?
```

### Response

```
<unit>
```

### Parameter

<unit>	Output level units
DBM	dBm
DBUVEMF	dB $\mu$ V (EMF)
DBUVTERM	dB $\mu$ V (Term)
Default	DBM

### Details

The output level units can be set when the input/output direction of the RF port is set to Output by the following command.

```
:ROUTe:PORT:RF:ROLE OUTPUT
```

### Example of Use

To set output level units to dBm

```
:CONF:FMA:GEN:RFS:LEV:UNIT DBM
```

To query output level units setting

```
:CONF:FMA:GEN:RFS:LEV:UNIT?
```

```
> DBM
```

### Related Commands

```
:CONFigure:FMAudio:GENerator:RFSettings:LEVel
```

:CONFigure:FMAudio:GENerator:RFSettings:STATe

Level - Output Control

Function

Sets and queries RF signal output On/Off

Command

:CONFigure:FMAudio:GENerator:RFSettings:STATe <on\_off>

Query

:CONFigure:FMAudio:GENerator:RFSettings:STATe?

Response

<on\_off\_res>

Parameter

<on_off>	Output On/Off
0	Output Off
1	Output On
OFF	Output Off
ON	Output On
Default	0
<on_off_res>	Output On/Off
0	Output Off
1	Output On

Details

The RF signal output On/Off can be set when the input/output direction of the RF port is set to Output by the following command.  
:ROUTe:PORT:RF:ROLE OUTPUT

Example of Use

To set RF signal output On/Off to On  
:CONF:FMA:GEN:RFS:STAT ON

To query RF signal output On/Off setting  
:CONF:FMA:GEN:RFS:STAT?  
> 1

Related Commands

:ROUTe:PORT:CONNect:DIRection  
For details of the commands, refer to the *MU887000A TRX Test Module Operation Manual*.

## :CONFigure:FMAudio:MEASurement:RFSettings:FREQuency

Frequency - Uplink Frequency

### Function

Sets and queries Rx frequency

### Command

```
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency <freq>
```

### Query

```
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency?
```

### Response

<freq>

Returns value in Hz without Suffix Code

### Parameter

<freq>	Rx Frequency
Range	1.000000 to 3800.000000 MHz 1.000000 to 6000.000000 MHz (When MU887000A-001 is installed)
Resolution	1 Hz
Suffix Code	HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted)
Default	80.000000 MHz

### Details

The Rx frequency can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set Rx frequency to 65 MHz

```
:CONF:FMA:MEAS:RFS:FREQ 65MHZ
```

To query set Rx frequency

```
:CONF:FMA:MEAS:RFS:FREQ?
```

```
> 65000000
```

## :CONFigure:FMAudio:MEASurement:RFSettings:LEVel

Level - Input Level

### Function

Sets and and queries input level

### Command

```
:CONFigure:FMAudio:MEASurement:RFSettings:LEVel <level>
```

### Query

```
:CONFigure:FMAudio:MEASurement:RFSettings:LEVel?
```

### Response

<level>

Returns value for units set by unit selection command without Suffix Code

### Parameter

<level>	Input Level
Range	–65.0 to +35.0 dBm (Port1/Port2) –65.0 to +25.0 dBm (Port3/Port4)
Resolution	0.1 dBm
Suffix Code	DBM
Default	–10.0 dBm

### Details

The input level can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

When the Cable Loss Calibration is ON, the cable loss is added to the input level setting range.

When the cable loss is 5 dB, the Port1/Port2 setting range is –60.0 to +40.0 dBm.

### Example of Use

To set the input level to –10.0 dBm

```
:CONF:FMA:MEAS:RFS:LEV -10.0
```

To query input level setting

```
:CONF:FMA:MEAS:RFS:LEV?
```

```
> -10.0
```

Related Commands

:CONFigure:FMAudio:MEASurement:RFSettings:LEVel:UNIT

[:ROUTE]:EXTLoss:TABLE:SWITCh

:CALCulate:EXTLoss:TABLE:SETTing

:CALCulate:EXTLoss:TABLE:VALue

For details of the commands, refer to the *MU887000A TRX Test Module Operation Manual*.

:CONFigure:FMAudio:MEASurement:STANdard

Standard Select

Function

Sets or queries measurement standard.

Command

:CONFigure:FMAudio:MEASurement:STANdard <std>

Query

:CONFigure:FMAudio:MEASurement:STANdard?

Response

<std>

Parameter

<std>	Measurement standard
COMMON	Common Measurement
Default	COMMON

Details

Switches FM/Audio TRX Measurement standards  
If this command is sent during measurement, measurement stops to prepare for the new standard.

Example of Use

To switch the measurement standard to COMMON:  
:CONF:FMA:MEAS:STAN COMMON  
To query the current measurement standard:  
:CONF:FMA:MEAS:STAN?  
> COMMON

Remarks

When switching measurement standards, clear the measurement results before making the switch.

## :FETCh:FMAudio:AF:AUDio:CROStalk?

TX Audio - AF Crosstalk Summary

### Function

Queries crosstalk measurement results at audio signal measurement

### Query

:FETCh:FMAudio:AF:AUDio:CROStalk?

### Response

<lr\_level\_ave\_1>,<lr\_level\_ave\_2>, ...,<lr\_level\_ave\_12>,<rl\_level\_ave\_1>, ...  
<rl\_level\_ave\_11>,<rl\_level\_ave\_12>

### Parameter

<lr_level_ave_1>	L→R crosstalk level 1 (Average)
<lr_level_ave_2>	L→R crosstalk level 2 (Average)
:	:
<rl_level_ave_11>	R→L crosstalk level 11 (Average)
<rl_level_ave_12>	R→L crosstalk level 12 (Average)
Resolution	0.01 dB

### Example of Use

To query crosstalk measurement results at audio signal measurement

:FETCh:FMAudio:AF:AUDio:CROStalk?

>-99.87,-36.04,-29.84,-35.70,-25.39,-21.99,-19.70,-26.73,-5.67,-22.97,-17.30,-21.18,99.87,-3.28,5.67,-12.93,-9.90,-17.63,-25.46,-16.98,-12.23,-13.45,-29.32,-11.97

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

The response is invalid (\*\*\*) when the audio signal measurement modulation method is MONO.

When there are no measurement results, the response is the invalid value (\*\*\*)

**:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT|RIGHT?**

TX AF - Audio Spectrum Wave Data

**Function**

Queries spectrum waveform data at audio signal measurement

**Query**

```
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT|RIGHT?
<format>,<position>,<length>
```

**Response**

```
<data_1>,<data_2>, ... ,<data_length-1>,<data_length>
```

**Parameters**

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (datamax-1)
	Analog: datamax=32769
	Digital (48k): datamax=8193
	Digital (44.1k): datamax=8193
	Digital (32k): datamax=4097
	Digital (16k): datamax=2049
Resolution	1
<length>	Number of data to be read out
Range	1 to (datamax – position value)
	Analog: datamax=32769
	Digital (48k): datamax=8193
	Digital (44.1k): datamax=8193
	Digital (32k): datamax=4097
	Digital (16k): datamax=2049
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	At Analog: 0.01 dBV
	At Digital: 0.01 dBfs
	*fs stands for Full Scale.

### Example of Use

To query spectrum waveform data at left channel at audio signal measurement

```
:FETC:FMA:AF:AUD:FREQ:TRAC:LEFT? 1,0,10
```

```
>-59.05,-62.05,-109.26,-113.00,-112.51,-116.65,-115.63,-116.38,-117.23,-120.67
```

To query spectrum waveform data at right channel at audio signal measurement

```
:FETC:FMA:AF:AUD:FREQ:TRAC:RIGH? 1,0,10
```

```
>-53.38,-56.39,-119.98,-120.80,-121.52,-123.58,-125.50,-124.59,-125.33,-127.30
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT|RIGHT:BINary?**

TX AF - Audio Spectrum Wave Binary Data

### Function

Queries spectrum waveform binary data when measuring audio signal.

### Query

```
:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT|RIGHT:BINary?
```

```
<format>,<position>,<length>
```

### Response

```
#nmm...m<data_1><data_2>...<data_length-1><data_length>
```

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (datamax-1)
	Analog: datamax=32769
	Digital (48k): datamax=8193
	Digital (44.1k): datamax=8193
	Digital (32k): datamax=4097
	Digital (16k): datamax=2049
Resolution	1
<length>	Number of data to be read out
Range	1 to (datamax – position value)
	Analog: datamax=32769

	Digital (48k): datamax=8193
	Digital (44.1k): datamax=8193
	Digital (32k): datamax=4097
	Digital (16k): datamax=2049
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	At Analog: 0.01 dBV
	At Digital: 0.01 dBfs
	*fs stands for Full Scale.

**Remarks**

An execution error occurs if MU887000A-002/102 is not installed.

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

## :FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:AF?

TX Audio - AF Frequency/Level Summary

### Function

Queries tone frequency and level at audio signal measurement

### Query

:FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:AF?

### Response

<freq\_ave\_1>,<level\_ave\_1>,<freq\_ave\_2>,..., <level\_ave\_11>,<freq\_ave\_12>,<level\_ave\_12>

### Parameters

<freq_ave_1>	First Audio frequency (Average)
<level_ave_1>	First Audio level (Average)
<freq_ave_2>	Second Audio frequency (Average)
:	:
<level_ave_11>	11th Audio level (Average)
<freq_ave_12>	12th Audio frequency (Average)
<level_ave_12>	12th Audio level (Average)
Resolution	[Frequency] 0.01Hz [Level] At Analog: 0.01 mV At Digital: 0.00001 fs *fs stands for Full Scale.

### Example of Use

To query frequency and level of left channel at audio signal measurement

:FETC:FMA:AF:AUD:LEFT:AF?

>1000.00,3497.48,50.00,0.25,3000.00,0.13,149.99,0.10,1999.99,0.06,350.00,0.04,1249.94,0.02,549.96,0.02,1150.02,0.02,250.05,0.02,449.98,0.01,850.86,0.01

To query frequency and level of right channel at audio signal measurement

:FETC:FMA:AF:AUD:RIGHT:AF?

>2000.00,699.48,50.00,0.27,150.00,0.10,350.00,0.05,1249.97,0.02,14456.72,0.02,549.96,0.02,1149.91,0.02,949.98,0.02,250.02,0.02,449.98,0.01,4000.02,0.01

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:ANALysis?**

TX Audio - AF Analysis Summary

**Function**

Queries analysis results at audio signal measurement

**Query**

:FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:ANALysis?

**Response**

```
<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>
,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_a
ve>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>
```

**Parameters**

<snr_ave>	SN Ratio (Average)
<snr_max>	SN Ratio (Maximum)
<snr_min>	SN Ratio (Minimum)
Resolution	0.01 dB
<thd_db_ave>	Total harmonic distortion (Average)
<thd_db_max>	Total harmonic distortion (Maximum)
<thd_db_min>	Total harmonic distortion (Minimum)
Resolution	0.01 dB
<thd_per_ave>	Total harmonic distortion (Average)
<thd_per_max>	Total harmonic distortion (Maximum)
<thd_per_min>	Total harmonic distortion (Minimum)
Resolution	0.0001 %
<thdn_db_ave>	Total harmonic distortion + Noise (Average)
<thdn_db_max>	Total harmonic distortion + Noise (Maximum)
<thdn_db_min>	Total harmonic distortion + Noise (Minimum)
Resolution	0.01 dB
<thdn_per_ave>	Total harmonic distortion + Noise (Average)
<thdn_per_max>	Total harmonic distortion + Noise (Maximum)
<thdn_per_min>	Total harmonic distortion + Noise (Minimum)
Resolution	0.0001 %
<sinad_ave>	SINAD Sensitivity (Average)
<sinad_max>	SINAD Sensitivity (Maximum)
<sinad_min>	SINAD Sensitivity (Minimum)
Resolution	0.01 dB

#### Example of Use

To query analysis results of left channel at audio signal measurement

`:FETC:FMA:AF:AUD:LEFT:ANAL?`

`>81.71,81.76,81.68,-87.98,-87.93,-88.02,0.0040,0.0040,0.0040,-80.79,-80.76,-80.83,0.0091,0.0092,0.0091,80.79,80.83,80.76`

To query analysis results of right channel at audio signal measurement

`:FETC:FMA:AF:AUD:RIGHT:ANAL?`

`>67.29,67.31,67.26,-88.37,-88.02,-88.63,0.0038,0.0040,0.0037,-67.25,-67.23,-67.27,0.0434,0.0435,0.0433,67.25,67.27,67.23`

#### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:TOTal?**

TX Audio - AF Total Analysis Summary

**Function**

Queries Total level measurement results at audio signal measurement

**Query**`:FETCh:FMAudio:AF:AUDio:LEFT|RIGHT:TOTal?`**Response**`<total_level_plus_p_current>,<total_level_minus_p_current>,<total_level_p+pPer2_current>,<total_level_rms_current>`**Parameters**

<code>&lt;total_level_plus_p_current&gt;</code>	Total Level +P [mV] or [FS]
<code>&lt;total_level_minus_p_current&gt;</code>	Total Level-P [mV] or [FS]
<code>&lt;total_level_p+pPer2_current&gt;</code>	Total Level (P+P) / 2 [mV] or [FS]
<code>&lt;total_level_rms_current&gt;</code>	Total Level (RMS) [mV] or [FS]
Resolution	Level (At Analog): 0.01 mV Level (At Digital): 0.00001 fs *fs stands for Full Scale.

**Example of Use**

To query Total level measurement results at left channel audio signal measurement

`:FETC:FMA:AF:AUD:LEFT:TOT?``> 4942.02,-4939.32,4940.53,3493.14`

To query Total level measurement results at right channel audio signal measurement

`:FETC:FMA:AF:AUD:RIGHT:TOT?``> 992.05,-987.40,989.58,699.53`**Remarks**

When there are no measurement results, the response is the invalid value (\*\*\*).

## :FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT|RIGHT?

TX AF - Audio Time Domain Wave Data

### Function

Queries time domain waveform data at audio signal measurement

### Query

```
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT|RIGHT?
<format>,<position>,<length>
```

### Response

```
<data_1>,<data_2>,...,<data_length-1>,<data_length>
```

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (datamax-1)
	Analog : datamax=19201
	Digital (48k) : datamax=4801
	Digital (44.1k) : datamax=4411
	Digital (32k) : datamax=3201
	Digital (16k) : datamax=1601
Resolution	1
<length>	Number of data to be read out
Range	1 to (datamax – position value)
	Analog : datamax=19201
	Digital (48k) : datamax=4801
	Digital (44.1k) : datamax=4411
	Digital (32k) : datamax=3201
	Digital (16k) : datamax=1601
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	At Analog: 0.01 mV
	At Digital: 0.00001 fs
	*fs stands for Full Scale.

**Example of Use**

To query time domain waveform data at left channel at audio signal measurement

:FETC:FMA:AF:AUD:TIME:TRAC:LEFT? 1,0,10

> 4940.29,4940.87,4936.01,4925.91,4910.72,4889.96,4864.19,4832.97,4796.96,4755.49

To query time domain waveform data at right channel at audio signal measurement

:FETC:FMA:AF:AUD:TIME:TRAC:RIGH? 1,0,10

> -430.31,-371.15,-310.61,-248.24,-185.27,-121.25,-57.00,7.86,72.38,136.77

**Remarks**

When there are no measurement results, the response is the invalid value (\*\*).

## :FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT|RIGHT:BINary?

TX AF - Audio Time Domain Wave Binary Data

### Function

Queries time domain waveform binary data when measuring audio signal.

### Query

```
:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT|RIGHT:BINary?
<format>,<position>,<length>
```

### Response

```
#nmm...m<data_1><data_2>...<data_length-1><data_length>
```

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (datamax-1)
	Analog : datamax=19201
	Digital (48k) : datamax=4801
	Digital (44.1k) : datamax=4411
	Digital (32k) : datamax=3201
	Digital (16k) : datamax=1601
Resolution	1
<length>	Number of data to be read out
Range	1 to (datamax – position value)
	Analog : datamax=19201
	Digital (48k) : datamax=4801
	Digital (44.1k) : datamax=4411
	Digital (32k) : datamax=3201
	Digital (16k) : datamax=1601
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	At Analog: 0.01 mV
	At Digital: 0.00001 fs
	*fs stands for Full Scale.

Remarks

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

## :FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT|RIGHT?

TX FM - Audio Spectrum Wave Data

### Function

Queries spectrum waveform data for demodulation signal at FM signal measurement

### Query

```
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT|RIGHT?
<format>,<position>,<length>
```

### Response

```
<data_1>,<data_2>,...,<data_length-1>,<data_length>
```

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (32769-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (32769-position value)
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
:	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 dB
	*75 kHz frequency deviation = 0 dB

### Example of Use

Queries spectrum waveform data (left channel) of demodulation signal when measuring FM signal.

```
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT? 1,0,10
```

```
> -63.32,-62.83,-67.05,-93.59,-71.59,-70.96,-63.27,-42.41,-34.09,-38.41
```

Queries spectrum waveform data (right channel) of demodulation signal when measuring FM signal.

```
> -63.02,-62.93,-67.16,-63.86,-63.76,-68.30,-68.46,-49.45,-51.75,-45.05
```

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT|RIGHT:BINary?**

TX FM - Audio Spectrum Wave Binary Data

**Function**

Queries spectrum waveform binary data of demodulation signal when measuring FM signal.

**Query**

```
:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT|RIGHT:BINary?
<format>,<position>,<length>
```

**Response**

#nmm...m&lt;data\_1&gt;&lt;data\_2&gt;...&lt;data\_length-1&gt;&lt;data\_length&gt;

**Parameters**

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (32769-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (32769-position value)
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 dB
	*75 kHz frequency deviation = 0 dB

**Remarks**

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

## :FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH?

TX FM – Both Audio Time Domain Wave Data

### Function

Queries time domain waveform (Stereo pre-separation) for demodulation signal at FM signal measurement

### Query

:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH? <format>,<position>,<length>

### Response

<data\_1>,<data\_2>,...,<data\_length-1>,<data\_length>

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (15201-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (15201-position value)
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
:	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 Hz

### Example of Use

To query time domain waveform (Stereo pre-separation) for demodulation signal at FM signal measurement

:FETC:FMA:FM:AUD:TIME:TRAC:BOTH? 1,0,10

> -98.37,-103.40,-75.45,-69.83,-71.79,-69.61,-71.03,-48.50,-41.25,-43.21

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

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

TX FM - Both Audio Time Domain Wave Binary Data

**Function**

Queries time domain waveform binary data (before stereo separation) of demodulation signal when measuring FM signal.

**Query**

```
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH:BINary?
<format>,<position>,<length>
```

**Response**

```
#nmm...m<data_1><data_2>...<data_length-1><data_length>
```

**Parameters**

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (15201-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (15201-position value)
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
:	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 Hz

**Remarks**

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

## :FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT|RIGHT?

TX FM - Audio Time Domain Wave Data

### Function

Queries time domain waveform for demodulation signal at FM signal measurement

### Query

```
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT|RIGHT?
<format>,<position>,<length>
```

### Response

```
<data_1>,<data_2>,...,<data_length-1>,<data_length>
```

### Parameters

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (15201-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (15201-position value)
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 Hz

### Example of Use

Queries time domain waveform data (left channel) of demodulation signal when measuring FM signal.

```
:FETC:FMA:FM:AUD:TIME:TRAC:LEFT? 1,0,10
```

```
> 2544.89,2940.58,3407.24,4981.72,8602.76,14136.62,20695.63,26923.32,31619.95,33822.91
```

Queries time domain waveform data (right channel) of demodulation signal when measuring FM signal.

```
:FETC:FMA:FM:AUD:TIME:TRAC:RIGH? 1,0,10
```

```
>-7155.24,-2024.20,4275.53,10639.16,15642.55,18460.54,19034.41,17962.89,16234.63,15210.67
```

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT|RIGHT:BINary?**

TX FM - Audio Time Domain Wave Binary Data

**Function**

Queries time domain waveform binary data of demodulation signal when measuring FM signal.

**Query**

```
:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT|RIGHT:BINary?
<format>,<position>,<length>
```

**Response**

```
#nmm...m<data_1><data_2>...<data_length-1><data_length>
```

**Parameters**

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (15201-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (15201-position value)
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
:	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 Hz

**Remarks**

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

## :FETCh:FMAudio:FM:DEMod:BOTH:DEViatioN?

TX FM - Demodulate AF Deviation Summary for Stereo

### Function

Queries frequency deviation measurement results (Stereo pre-separation) for demodulation signal at FM signal measurement

### Query

:FETCh:FMAudio:FM:DEMod:BOTH:DEViatioN?

### Response

<deviation\_plus\_peak\_current>,<deviation\_miuns\_peak\_current>,<deviation\_peak\_peak\_curr  
ent>,<deviation\_rms\_current>

### Parameter

<deviation_plus_peak_current>	+Peak result
<deviation_miuns_peak_current>	–Peak result
<deviation_peak_peak_current>	(Peak to Peak)/2 result
<deviation_rms_current>	RMS result
Resolution	0.01 Hz

### Example of Use

To query frequency deviation measurement results (Stereo pre-separation) for demodulation signal at FM signal measurement

:FETC:FMA:FM:DEM:BOTH:DEV?

>106630.73,-110414.92,108522.82,54090.37

### Remarks

When there are no measurement results, the response is the invalid value (\*\*\*).

:FETCh:FMAudio:FM:DEMod:CROStalk?

TX FM - Demodulate AF Crosstalk Summary

**Function**  
Queries demodulation signal crosstalk measurement results at FM signal measurement

**Query**  
:FETCh:FMAudio:FM:DEMod:CROStalk?

**Response**  
<lr\_level\_ave\_1>,<lr\_level\_ave\_2>, ...,<lr\_level\_ave\_12>,<rl\_level\_ave\_1>, ...  
<rl\_level\_ave\_11>,<rl\_level\_ave\_12>

**Parameter**

<lr_level_ave_1>	L→R crosstalk level 1 (Average)
<lr_level_ave_2>	L→R crosstalk level 2 (Average)
	:
<rl_level_ave_11>	R→L crosstalk level 11 (Average)
<rl_level_ave_12>	R→L crosstalk level 12 (Average)
Resolution	0.01 dB

**Example of Use**  
To query demodulation signal crosstalk measurement results at FM signal measurement  
:FETC:FMA:FM:DEM:CROS?  
>0.02,-22.46,-17.66,1.14,-0.56,-11.53,-13.34,-0.51,-3.60,-0.65,1.91,2.63,-0.02,-1.14,-7.65,0.56,-9.8  
6,-18.70,-4.67,-5.40,-2.63,-9.21,-5.79,0.51

**Remarks**  
The response is invalid (\*\*\*) when the FM signal measurement modulation method is MONO.  
  
When there are no measurement results, the response is the invalid value (\*\*\*)

## :FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:AF?

TX FM - Demodulate AF Frequency/Level Summary

### Function

Queries tone frequency and level for demodulation signal at FM signal measurement

### Query

:FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:AF?

### Response

<freq\_ave\_1>,<level\_ave\_1>,<freq\_ave\_2>, ... ,<level\_ave\_11>,<freq\_ave\_12>,<level\_ave\_12>

### Parameter

<freq_ave_1>	First Tone Frequency (Average)
<level_ave_1>	First Tone Level (Average)
<freq_ave_2>	Second Tone Frequency (Average)
:	:
<level_ave_11>	11th Tone Level (Average)
<freq_ave_12>	12th Tone Frequency (Average)
<level_ave_12>	12th Tone Level (Average)
Resolution	[Frequency] 0.01 Hz [Level] 0.01 Hz

### Example of Use

To query tone frequency and level of left channel at FM signal measurement

:FETC:FMA:FM:DEM:LEFT:AF?

>1000.00,50397.44,1018.65,2554.64,18.87,1498.53,981.54,1437.82,1056.69,1386.69,2018.41,1149.93,4018.23,1035.53,943.33,1009.38,6980.55,962.90,57.24,848.56,3018.92,795.32,5980.60,788.01

To query tone frequency and level of right channel at FM signal measurement

:FETC:FMA:FM:DEM:RIGHT:AF?

>1000.00,50537.97,980.78,1613.73,2981.29,1411.43,1056.64,1314.93,6018.49,1160.07,8018.29,1158.89,3018.36,1157.66,7018.86,1130.53,5980.83,1017.75,9018.56,1006.79,4980.99,1000.67,943.38,945.23

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:ANALysis?**

TX FM - Demodulate AF Analysis Summary

**Function**

Queries analysis results for demodulation signal at FM signal measurement

**Query**

:FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:ANALysis?

**Response**

```
<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>
,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_a
ve>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>
```

**Parameter**

<snr_ave>	SN Ratio (Average)
<snr_max>	SN Ratio (Maximum)
<snr_min>	SN Ratio (Minimum)
Resolution	0.01 dB
<thd_db_ave>	Total harmonic distortion (Average)
<thd_db_max>	Total harmonic distortion (Maximum)
<thd_db_min>	Total harmonic distortion (Minimum)
Resolution	0.01 dB
<thd_per_ave>	Total harmonic distortion (Average)
<thd_per_max>	Total harmonic distortion (Maximum)
<thd_per_min>	Total harmonic distortion (Minimum)
Resolution	0.0001 %
<thdn_db_ave>	Total harmonic distortion + Noise (Average)
<thdn_db_max>	Total harmonic distortion + Noise (Maximum)
<thdn_db_min>	Total harmonic distortion + Noise (Minimum)
Resolution	0.01 dB
<thdn_per_ave>	Total harmonic distortion + Noise (Average)
<thdn_per_max>	Total harmonic distortion + Noise (Maximum)
<thdn_per_min>	Total harmonic distortion + Noise (Minimum)
Resolution	0.0001 %
<sinad_ave>	SINAD Sensitivity (Average)
<sinad_max>	SINAD Sensitivity (Maximum)
<sinad_min>	SINAD Sensitivity (Minimum)
Resolution	0.01 dB

#### Example of Use

To query analysis results of left channel at FM signal measurement

:FETC:FMA:FM:DEM:LEFT:ANAL?

>26.47,26.47,26.47,-23.00,-23.00,-23.00,7.0794,7.0794,7.0794,-21.39,-21.39,-21.39,8.5249,8.5249,8.5249,21.39,21.39,21.39

To query analysis results of right channel at FM signal measurement

:FETC:FMA:FM:DEM:RIGH:ANAL?

>29.62,29.62,29.62,-21.55,-21.55,-21.55,8.3686,8.3686,8.3686,-20.92,-20.92,-20.92,8.9974,8.9974,8.9974,20.92,20.92,20.92

#### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:DEVIation?**

TX FM - Demodulate AF Deviation Summary

**Function**

Queries demodulation signal frequency deviation for demodulation signal at FM signal measurement

**Query**

```
:FETCh:FMAudio:FM:DEMod:LEFT|RIGHT:DEVIation?
```

**Response**

```
<deviation_plus_peak_current>,<deviation_miuns_peak_current>,<deviation_p+pPer2_curren  
t>,<deviation_rms_current>
```

**Parameter**

<deviation_plus_peak_current>	+Peak result
<deviation_miuns_peak_current>	–Peak result
<deviation_peak_peak_current>	(Peak to Peak)/2 result
<deviation_rms_current>	RMS result
Resolution	0.01 Hz

**Example of Use**

To query frequency deviation measurement results of left channel for demodulation signal at FM signal measurement

```
:FETC:FMA:FM:DEM:LEFT:DEV?  
> 111906.93,-110652.98,111279.95,53996.25
```

To query frequency deviation measurement results of right channel for demodulation signal at FM signal measurement

```
:FETC:FMA:FM:DEM:RIGH:DEV?  
> 106630.73,-110414.92,108522.82,54090.37
```

**Remarks**

When there are no measurement results, the response is the invalid value (\*\*\*).

## :FETCh:FMAudio:FM:DEMod:PILot?

TX FM - Demodulate AF Pilot Signal Summary

### Function

Queries demodulation signal pilot frequency deviation and level at FM signal measurement

### Query

:FETCh:FMAudio:FM:DEMod:PILot?

### Response

<deviation\_ave>,<deviation\_max>,<deviation\_min>,<level\_ave>,<level\_max>,<level\_min>

### Parameter

<deviation_ave>	Pilot frequency deviation (Average)
<deviation_max>	Pilot frequency deviation (Maximum)
<deviation_min>	Pilot frequency deviation (Minimum)
Resolution	0.01 Hz
<level_ave>	Pilot frequency level (Average)
<level_max>	Pilot frequency level (Maximum)
<level_min>	Pilot frequency level (Minimum)
Resolution	0.01 Hz

### Example of Use

To query demodulation signal pilot frequency deviation and level at FM signal measurement

:FETC:FMA:FM:DEM:PIL?

> 18.59,18.59,18.59,812.37,812.37,812.37

### Remarks

When there are no measurement results, the response is the invalid value (\*\*\*).

:FETCh:FMAudio:FM:OBW?

TX FM - OBW

Function

Queries OBW measurement results at FM signal measurement

Query

:FETCh:FMAudio:FM:OBW?

Response

<obw>

Parameter

<obw>	Occupied Band Width
Resolution	0.001
Suffix Code	KHZ

Example of Use

To query OBW measurement results at FM signal measurement  
:FETC:FMA:FM:OBW?  
> 219.920

Remarks

When there are no measurement results, the response is the invalid value (\*\*\*).

## :FETCh:FMAudio:FM:OBW:FREQuency?

TX FM - OBW Frequency

### Function

Queries OBW measurement results (frequency) at FM signal measurement

### Query

:FETCh:FMAudio:FM:OBW:FREQuency? <pos>

### Response

<freq>

### Parameter

<pos>	Frequency
UPPER	Upper Frequency
LOWER	Lower Frequency
CENTER	Center Frequency
<freq>	Frequency
Resolution	0.001
Suffix Code	KHZ

### Example of Use

To query OBW measurement results (frequency) at FM signal measurement

:FETC:FMA:FM:OBW:FREQ? CENTER

> -4.974

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

:FETCh:FMAudio:FM:RDS:BLOCks?

TX FM - RDS Summary (Blocks)

Function  
Queries RDS measurement results (Block Information) at FM signal measurement

Query  
:FETCh:FMAudio:FM:RDS:BLOCks?

Response  
<bit\_num>,<block\_num>,<block\_error\_rate>

Parameter		
<bit_num>	RDS Bit count	
Resolution	1	
<block_num>	RDS Block Count	
Resolution	1	
<block_error_rate>	RDS Block Error Rate	
Resolution	1%	

Example of Use  
To query RDS measurement results (Block Information) at FM signal measurement  
:FETC:FMA:FM:RDS:BLOC?  
>1195,44,0

Remarks  
When there are no measurement results, the response is the invalid value (0,0,\*\*\*).

## :FETCh:FMAudio:FM:RDS:DATA?

TX FM - RDS Summary (Data)

### Function

Queries RDS measurement results (Data) at FM signal measurement

### Query

:FETCh:FMAudio:FM:RDS:DATA?

### Response

<block\_num>,<gourp\_name\_1>,<information\_1>,<check\_offset\_1>,...,<gourp\_name\_n>,<information\_n>,<check\_offset\_n>

### Parameter

<block_num>	RDS Block Count
Resolution	1
<gourp_name_1>	First Group Name "0A to 15A",or "0B to 15B"
<information_1>	First RDS Information 2-Byte Hexadecimal
<check_offset_1>	First Check Word + Offset 2-Byte Hexadecimal (Actual data = 10 bit) :
<gourp_name_n>	nth Group Name "0A to 15A",or "0B to 15B"
<information_n>	nth RDS Information 2-Byte Hexadecimal
<check_offset_n>	nth Check Word + Offset 2-Byte Hexadecimal (Actual data = 10 bit)

### Example of Use

To query RDS measurement results (Data) at FM signal measurement

:FETC:FMA:FM:RDS:DATA?

> 44,00A,0111,226,...,00A,3030,068

### Remarks

When there are no measurement results, the response is 0.

:FETCh:FMAudio:FM:RDS:TEXT:HEXadecimal?

TX FM - RadioText

Function  
Queries radio test at FM signal measurement

Query  
:FETCh:FMAudio:FM:RDS:TEXT:HEXadecimal?

Response  
<rt\_a>,<rt\_b>

Parameter

<rt_a>	2A Group Radio Text Hexadecimal number of up to 64 bytes
<rt_b>	2B Group Radio Text Hexadecimal number of up to 32 bytes

Example of Use  
To query radio test at FM signal measurement  
FETC:FMA:FM:RDS:TEXT:HEX?  
>3132333435363738393031323334350d

Remarks  
When there are no measurement results, the response is the invalid value (\*\*\*).

## :FETCh:FMAudio:FM:RF?

TX FM - RF Summary

### Function

Queries RF measurement results at FM signal measurement

### Query

:FETCh:FMAudio:FM:RF?

### Response

<freq\_ave>,<freq\_max>,<freq\_min>,<deviation\_ave>,<deviation\_max>,<deviation\_min>,<level\_ave>,<level\_max>,<level\_min>

### Parameter

<freq_ave>	Carrier Frequency (Average)
<freq_max>	Carrier Frequency (Maximum)
<freq_min>	Carrier Frequency (Minimum)
Resolution	0.1 Hz
<deviation_ave>	Frequency Deviation (Average)
<deviation_max>	Frequency Deviation (Maximum)
<deviation_min>	Frequency Deviation (Minimum)
Resolution	0.1 Hz
<level_ave>	Level (Average)
<level_max>	Level (Maximum)
<level_min>	Level (Minimum)
Resolution	0.01 dB or 0.01 dBμV

### Example of Use

To query RF measurement results at FM signal measurement  
:FETC:FMA:FM:RF?  
> 79999995.3,79999995.3,79999995.3,-4.7,-4.7,-4.7,3.85,3.85,3.85

### Remarks

When there are no measurement results, the response is the invalid value (\*\*).

**:FETCh:FMAudio:FM:RF:TRACe?**

TX FM - RF Spectrum Wave Data

**Function**

Queries spectrum waveform data at FM signal measurement

**Query**

:FETCh:FMAudio:FM:RF:TRACe? &lt;format&gt;,&lt;position&gt;,&lt;length&gt;

**Response**

&lt;data\_1&gt;,&lt;data\_2&gt;, ... ,&lt;data\_length-1&gt;,&lt;data\_length&gt;

**Parameters**

<format>	Format
1	Waveform data for specified range
<position>	Starting point of waveform data
Range	0 to (16385-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (16385-position value)
Resolution	1
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 dB

**Example of Use**

To query spectrum waveform data at FM signal measurement

:FETC:FMA:FM:RF:TRAC? 1,0,10

&gt; -68.67,-67.67,-66.25,-67.10,-70.82,-77.43,-85.27,-87.29,-86.96,-87.03

**Remarks**

When there are no measurement results, the response is the invalid value (\*\*).

## :FETCh:FMAudio:FM:RF:TRACe:BINary?

TX FM - RF Spectrum Wave Data

### Function

Queries spectrum waveform binary data when measuring FM signal.

### Query

:FETCh:FMAudio:FM:RF:TRACe:BINary? <format>,<position>,<length>

### Response

#nmm...m<data\_1><data\_2>...<data\_length-1><data\_length>

### Parameters

<format>	Format
1	Waveform data of the specified range
<position>	Starting point of waveform data
Range	0 to (16385-1)
Resolution	1
<length>	Number of data to be read out
Range	1 to (16385-position value)
Resolution	1
n	Digit number of binary data length
mm...m	Binary data length (byte)
<data_1>	First waveform data
<data_2>	Second waveform data
	:
<data_length-1>	(Length-1)th waveform data
<data_length>	(Length)th waveform data
Resolution	0.01 dB

### Remarks

Each of the waveform data <data\_1> to <data\_length> is a 4-byte single-precision floating point number.

When there are no measurement results, the response is #10.

:FETCh:FMAudio:MEASurement:STATe?

Measurement State

Function

Queries measurement status.

Query

:FETCh:FMAudio:MEASurement:STATe?

Response

<state>

Parameter

<state>	Measurement status
0	Completed measurement
2	Over level
9	Measurement in progress or not measured
12	Measurement timeout

Details

This can be used either during measurement or while measurement is stopped.

Example of Use

To query the current measurement status:  
:FETC:FMA:MEAS:STAT?  
> 9

## :INITiate:FMAudio:MEASurement:SINGLE

Single Measurement

### Function

Executes one measurement

### Command

```
:INITiate:FMAudio:MEASurement:SINGLE
```

### Details

Sending this command executes one measurement.

Sending the command during measurement, aborts measurement once and restarts it.

The measurement questionable register must be polled or sync processing via \*WAI is required for the timing of measurement completion.

### Example of Use

To start measurement:

```
:INIT:FMA:MEAS:SING
```

### Related Commands

```
:STATus:QUEStionable:MEASure[:EVENT]
```

For the details of the questionable register and command, refer to the *MU887000A TRX Test Module Operation Manual*.

:INSTrument[:SElect]

Application Select

Function  
Sets or queries type of application software.

Command  
:INSTrument[:SElect] <app>

Query  
:INSTrument[:SElect]?

Response  
<app>

Parameter	
app	Type of application software
CELLULAR	MX887010A, MX887011A, MX887012A, MX887013A, MX887014A, MX887015A, MX887016A, or MX887017A
FMAUDIO	MX887070A
SRW	MX887030A, MX887031A, MX887040A, or MX887050A

Details  
Set the parameter to FMAUDIO and send the command before using the MX887070A features.

Example of Use  
To set the application software to FM/Audio TRX measurement:  
:INST FMAUDIO  
:INST?  
> FMAUDIO

## :ROUTe:PORT:AUDio:DIGital:INPut:WLENgth

I<sup>2</sup>S Input Data Bit Width

### Function

Sets and queries I<sup>2</sup>S (Digital Audio) input data bit count

### Command

```
:ROUTe:PORT:AUDio:DIGital:INPut:WLENgth <bit>
```

### Query

```
:ROUTe:PORT:AUDio:DIGital:INPut:WLENgth?
```

### Response

```
<bit>
```

### Parameter

<bit>	I <sup>2</sup> S (Digital Audio) input data bit count
16	16 bits
24	24 bits
Default	24

### Example of Use

To set I<sup>2</sup>S (Digital Audio) input data bit count to 16

```
:ROUT:PORT:AUD:DIG:INP:WLEN 16
```

To query I<sup>2</sup>S (Digital Audio) input data bit count

```
:ROUT:PORT:AUD:DIG:INP:WLEN?
```

```
> 16
```

:ROUTe:PORT:AUDio:DIGital:MCK:DIRection

I<sup>2</sup>S Master Clock Direction

Function  
Sets and queries I<sup>2</sup>S (Digital Audio) Master Clock (MCK) input/output direction

Command  
:ROUTe:PORT:AUDio:DIGital:MCK:DIRection <inf>

Query  
:ROUTe:PORT:AUDio:DIGital:MCK:DIRection?

Response  
<inf>

Parameter	
<inf>	Input/Output Direction
INPUT	Input
OUTPUT	Output
DISABLE	Do not use
Default	INPUT

Example of Use  
To set I<sup>2</sup>S Master Clock input/output direction to INPUT  
:ROUT:PORT:AUD:DIG:MCK:DIR INPUT

To query I<sup>2</sup>S Master Clock input/output direction  
:ROUT:PORT:AUD:DIG:MCK:DIR?  
> INPUT

Remarks  
When SCK is set to INPUT, only INPUT can be selected for MCK.

## :ROUTe:PORT:AUDio:DIGital:OUTPut:WLENgth

I<sup>2</sup>S Output Data Bit Width

### Function

Sets and queries I<sup>2</sup>S (Digital Audio) output data bit count

### Command

```
:ROUTe:PORT:AUDio:DIGital:OUTPut:WLENgth <bit>
```

### Query

```
:ROUTe:PORT:AUDio:DIGital:OUTPut:WLENgth?
```

### Response

```
<bit>
```

### Parameter

<bit>	I <sup>2</sup> S (Digital Audio) output data bit count
16	16 bits
24	24 bits
Default	24

### Example of Use

To set I<sup>2</sup>S (Digital Audio) output data bit count to 16

```
:ROUT:PORT:AUD:DIG:OUTP:WLEN 16
```

To query I<sup>2</sup>S (Digital Audio) output data bit count

```
:ROUT:PORT:AUD:DIG:OUTP:WLEN?
```

```
> 16
```

:ROUTe:PORT:AUDio:DIgital:SCK:DIRection

I<sup>2</sup>S Serial Clock/Word Select Direction

**Function**  
Sets and queries I<sup>2</sup>S (Digital Audio) Serial Clock (SCK), and Word Select (WS) input/output direction

**Command**  
:ROUTe:PORT:AUDio:DIgital:SCK:DIRection <inf>

**Query**  
:ROUTe:PORT:AUDio:DIgital:SCK:DIRection?

**Response**  
<inf>

Parameter	
<inf>	Input/Output Direction
INPUT	Input
OUTPUT	Output
Default	INPUT

**Example of Use**  
To set I<sup>2</sup>S Serial Clock, and Word Select input/output direction to INPUT  
:ROUT:PORT:AUD:DIG:SCK:DIR INPUT

To query I<sup>2</sup>S Serial Clock, and Word Select input/output direction  
:ROUT:PORT:AUD:DIG:SCK:DIR?  
> INPUT

## :ROUTe:PORT:AUDio:INPut:SElect

Audio Interface for Input

### Function

Sets and queries input audio port type

### Command

```
:ROUTe:PORT:AUDio:INPut:SElect <kind>
```

### Query

```
:ROUTe:PORT:AUDio:INPut:SElect?
```

### Response

```
<kind>
```

### Parameter

<kind>	Type
ANALOG	Analog
DIGITAL	Digital
Default	ANALOG

### Example of Use

To set input audio port type to ANALOG

```
:ROUT:PORT:AUD:INP:SEL ANALOG
```

To query set input audio port type

```
:ROUT:PORT:AUD:INP:SEL?
```

```
> ANALOG
```

### Related Commands

```
:ROUTe:PORT:AUDio:OUTPut:SElect
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

When changing the input audio port type, the related output side is changed automatically to the same type.

## :ROUTe:PORT:AUDio:OUTPut:SElect

Audio Interface for Output

### Function

Sets and queries output audio port type

### Command

```
:ROUTe:PORT:AUDio:OUTPut:SElect <kind>
```

### Query

```
:ROUTe:PORT:AUDio:OUTPut:SElect?
```

### Response

```
<kind>
```

### Parameter

<kind>	Type
ANALOG	Analog
DIGITAL	Digital
Default	ANALOG

### Example of Use

To set output audio port type to ANALOG

```
:ROUT:PORT:AUD:OUTP:SEL ANALOG
```

To query set output audio port type

```
:ROUT:PORT:AUD:OUTP:SEL?
```

```
> ANALOG
```

### Related Commands

```
:ROUTe:PORT:AUDio:INPut:SElect
```

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

When changing the output audio port type, the related input side is changed automatically to the same type.

## :ROUTe:PORT:AUDio:ROLE

Test Set Role - Audio Port

### Function

Sets and queries audio port input/output direction

### Command

:ROUTe:PORT:AUDio:ROLE <inf>

### Query

:ROUTe:PORT:AUDio:ROLE?

### Response

<inf>

### Parameter

<inf>	Input/Output Direction
INPUT	Input
OUTPUT	Output
Default	OUTPUT

### Example of Use

To set the audio port input/output direction to INPUT

:ROUT:PORT:AUD:ROLE INPUT

To query audio port input/output direction

:ROUT:PORT:AUD:ROLE?

> INPUT

### Related Commands

:ROUTe:PORT:RF:ROLE

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This cannot be set to the same setting as the RF test port.

When changing the audio port, the related RF test port is changed automatically.

When INPUT is changed to OUTPUT, measurement of the audio signal is discontinued and the measurement status becomes measurement stopped.

When OUTPUT is changed to INPUT, output of the audio signal stops.

**:ROUTe:PORT:CONNeCT:DIRection**

Set Direction of RF Connector

**Function**

Sets or queries connectors for RF signals input/output.

**Command**`:ROUTe:PORT:CONNeCT:DIRection <input>,<output>`**Query**`:ROUTe:PORT:CONNeCT:DIRection?`**Response**`<input>,<output>`**Parameter**

<code>&lt;input&gt;</code>	Test Port number
PORT1	Test Port1
PORT2	Test Port2
PORT3	Test Port3
PORT4	Test Port4
Default	PORT1
<code>&lt;output&gt;</code>	Test Port number
PORT1	Test Port1
PORT2	Test Port2
PORT3	Test Port3
PORT4	Test Port4
Default	PORT1

**Details**

Test Port1 and Test Port2 can be set for both input and output.

Test Port3 and Test Port4 can be set for either input or output.

Not initialized by \*RST command

**Example of Use**

To set Test Port1 for input RF signals and Test Port2 for output RF signals:

`:ROUTe:PORT:CONNeCT:DIRection PORT1,PORT2``:ROUTe:PORT:CONNeCT:DIRection?``> PORT1,PORT2`

## :ROUTe:PORT:RF:ROLE

Test Set Role - RF Test Port

### Function

Sets and queries RF test port input/output direction

### Command

:ROUTe:PORT:RF:ROLE <inf>

### Query

:ROUTe:PORT:RF:ROLE?

### Response

<inf>

### Parameter

<inf>	Input/Output Direction
INPUT	Input
OUTPUT	Output
Default	INPUT

### Example of Use

To set the RF test port input/output direction to INPUT

:ROUT:PORT:RF:ROLE INPUT

To query RF test port port input/output direction

:ROUT:PORT:RF:ROLE?

> INPUT

### Related Commands

:ROUTe:PORT:AUDio:ROLE

### Remarks

An execution error occurs if MU887000A-002/102 is not installed.

This cannot be set to the same setting as the audio port.

When changing the RF test port, the related audio port is changed automatically.

When INPUT is changed to OUTPUT, measurement of the RF signal is discontinued and the measurement status becomes measurement stopped.

When OUTPUT is changed to INPUT, output of the VSG signal stops (VSG signal output becomes OFF).

:SYSTem:LANGuage

Language Selection of Remote Command

Function  
Switches language mode of remote control command

Command  
:SYSTem:LANGuage <mode>

Query  
:SYSTem:LANGuage?

Response  
<mode>

Parameter	
<mode>	Language mode
NAT	Native
SCPI	SCPI
Default	NAT

Remarks  
Not initialized by \*RST command

Example of Use  
To set the remote control command language mode to Native:  
:SYST:LANG NAT  
SYST:LANG?  
>NAT

## :TRIGger:FMAudio:MEASurement:DElay

Trigger - Trigger Delay

### Function

Sets or queries trigger delay time

### Command

:TRIGger:FMAudio:MEASurement:DElay <time>

### Query

:TRIGger:FMAudio:MEASurement:DElay?

### Response

<time>

Returns value in ms without Suffix Code

### Parameter

<time>	Trigger delay time
Range	0.000 to 10.000 ms
Resolution	0.01 ms
Suffix Code	NS, US, MS, S (uses ms when omitted)
Default	0.00 ms

### Details

The trigger delay time can be set when using the following command to set the input/output direction of the RF port to input.

:ROUTE:PORT:RF:ROLE INPUT

### Example of Use

To set the trigger delay time to 10.00 ms:

:TRIG:FMA:MEAS:DEL 10.00

Queries set trigger delay time

:TRIG:FMA:MEAS:DEL?

> 10.00

## :TRIGger:FMAudio:MEASurement:SOURce

Trigger - Trigger Source

### Function

Sets or queries measurement start trigger.

### Command

```
:TRIGger:FMAudio:MEASurement:SOURce <source>
```

### Query

```
:TRIGger:FMAudio:MEASurement:SOURce?
```

### Response

```
<source>
```

### Parameter

<source>	Trigger source
FREERUN	No trigger
PWR	Signal level
Default	FREERUN

### Details

The measurement start trigger can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTe:PORT:RF:ROLE INPUT
```

### Example of Use

To set the parameter to no trigger:

```
:TRIG:FMA:MEAS:SOUR FREERUN
```

Queries set trigger source

```
:TRIG:FMA:MEAS:SOUR?
```

```
> FREERUN
```

## :TRIGger:FMAudio:MEASurement:THReshold

Trigger - Trigger Level

### Function

Sets or queries trigger level.

### Command

```
:TRIGger:FMAudio:MEASurement:THReshold <level>
```

### Query

```
:TRIGger:FMAudio:MEASurement:THReshold?
```

### Response

```
<level>
```

Returns value in dB without Suffix Code

### Parameter

<level>	Trigger Level
Range	–40 to 0 dB
Resolution	1 dB
Suffix Code	DB (uses dB when omitted)
Default	–10 dB

### Details

The trigger level can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTE:PORT:RF:ROLE INPUT
```

### Example of Use

To set the trigger level to –10 dB:

```
:TRIG:FMA:MEAS:THR -10
```

Queries set trigger level

```
:TRIG:FMA:MEAS:THR?
```

```
> -10
```

## :TRIGger:FMAudio:MEASurement:TOUT

Trigger - Trigger Timeout

### Function

Sets or queries trigger timeout.

### Command

```
:TRIGger:FMAudio:MEASurement:TOUT <time>
```

### Query

```
:TRIGger:FMAudio:MEASurement:TOUT?
```

### Response

```
<time>
```

Returns value in s without Suffix Code

### Parameter

<time>	Timeout
Range	1 to 60 s
Resolution	1 s
Suffix Code	NS, US, MS, S (uses s when omitted)
Default	10 s

### Details

The trigger timeout can be set when using the following command to set the input/output direction of the RF port to input.

```
:ROUTE:PORT:RF:ROLE INPUT
```

### Example of Use

To set the trigger timeout to 5 s:

```
:TRIG:FMA:MEAS:TOUT 5
```

Queries set trigger timeout

```
:TRIG:FMA:MEAS:TOUT?
```

```
> 5
```



## *Chapter 4 Native Command Reference*

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This chapter describes the details of Native commands.

To switch to the Native command mode, send the command :SYST:LANG NAT.

4.1	List of Commands .....	4-2
4.2	Correspondence with SCPI Commands .....	4-14

## 4.1 List of Commands

### System

Function	Command	Query	Response
Application Select	SYSSEL <app>	SYSSEL?	<app>
Language Selection of Remote Command	SYST:LANG <mode>	SYST:LANG?	<mode>

### Common

Function	Command	Query	Response
Standard Select	CONF:FMA:MEAS:STAN <std>	CONF:FMA:MEAS:STAN?	<std>

### Measurement

Function	Command	Query	Response
Stop Measure	ABOR:FMA:MEAS	-----	-----
Measurement State	-----	FETC:FMA:MEAS:STAT?	<state>
Single Measurement	INIT:FMA:MEAS:SING	-----	-----

## Common Parameters

Function	Command	Query	Response
Modulation	CONF:FMA:GEN:BBM <on off>	CONF:FMA:GEN:BBM?	<on off res>
Frequency - Downlink Frequency	CONF:FMA:GEN:RFS:FREQ <freq>	CONF:FMA:GEN:RFS:FREQ?	<freq>
Level - Output Level	CONF:FMA:GEN:RFS:LEV <level>	CONF:FMA:GEN:RFS:LEV?	<level>
Level - Output Level Unit	CONF:FMA:GEN:RFS:LEV:UNIT <unit>	CONF:FMA:GEN:RFS:LEV:UNIT ?	<unit>
Level - Output Control	CONF:FMA:GEN:RFS:STAT <on_off>	CONF:FMA:GEN:RFS:STAT?	<on_off_res>
Frequency - Uplink Frequency	CONF:FMA:MEAS:RFS:FREQ <freq>	CONF:FMA:MEAS:RFS:FREQ?	<freq>
Level - Input Level	CONF:FMA:MEAS:RFS:LEV <level>	CONF:FMA:MEAS:RFS:LEV?	<level>
I <sup>2</sup> S Master Clock Direction	ROUT:PORT:AUD:DIG:MCK:DIR <inf>	ROUT:PORT:AUD:DIG:MCK:DIR ?	<inf>
I <sup>2</sup> S Serial Clock/Word Select Direction	ROUT:PORT:AUD:DIG:SCK:DIR <inf>	ROUT:PORT:AUD:DIG:SCK:DIR ?	<inf>
Audio Interface for Input	ROUT:PORT:AUD:INP:SEL <kind>	ROUT:PORT:AUD:INP:SEL?	<kind>
Audio Interface for Output	ROUT:PORT:AUD:OUTP:SEL <kind>	ROUT:PORT:AUD:OUTP:SEL?	<kind>
I <sup>2</sup> S Input Data Bit Width	ROUT:PORT:AUD:DIG:INP:WLEN <bit>	ROUT:PORT:AUD:DIG:INP:WLEN?	<bit>
I <sup>2</sup> S Output Data Bit Width	ROUT:PORT:AUD:DIG:OUTP:WLEN <bit>	ROUT:PORT:AUD:DIG:OUTP:WLEN?	<bit>

## Common Parameters

Function	Command	Query	Response
Test Set Role - Audio Port	ROUT:PORT:AUD:ROLE <inf>	ROUT:PORT:AUD:ROLE?	<inf>
Set Connect Port Direction	PORT <input>,<output>	PORT?	<input>,<output>
Test Set Role - RF Test Port	ROUT:PORT:RF:ROLE <inf>	ROUT:PORT:RF:ROLE?	<inf>
Trigger - Trigger Delay	TRIG:FMA:MEAS:DEL <time>	TRIG:FMA:MEAS:DEL?	<time>
Trigger - Trigger Source	TRIG:FMA:MEAS:SOUR <source>	TRIG:FMA:MEAS:SOUR?	<source>
Trigger - Trigger Level	TRIG:FMA:MEAS:THR <level>	TRIG:FMA:MEAS:THR?	<level>
Trigger - Trigger Timeout	TRIG:FMA:MEAS:TOUT <time>	TRIG:FMA:MEAS:TOUT?	<time>

## Audio Generator

Function	Command	Query	Response
RX Audio - Analog - Left Channel AF Tone Frequency	CONF:FMA:AF:ANAL:GEN:LEFT:FREQ <no>,<freq>	CONF:FMA:AF:ANAL:GEN:LEFT:FREQ? <no>	<freq>
RX Audio - Analog - Left Channel AF Tone Level	CONF:FMA:AF:ANAL:GEN:LEFT:LEV <no>,<level>	CONF:FMA:AF:ANAL:GEN:LEFT:LEV? <no>	<level>
RX Audio - Analog - Left Channel AF Tone Level Setting State	-----	CONF:FMA:AF:ANAL:GEN:LEFT:OVER?	-----
RX Audio - Analog - Left Channel AF Tone	CONF:FMA:AF:ANAL:GEN:LEFT<no>,<on_off>	CONF:FMA:AF:ANAL:GEN:LEFT? <no>	<on_off_res>
RX Audio - Analog - Right Channel AF Tone Frequency	CONF:FMA:AF:ANAL:GEN:RIGH:FREQ <no>,<freq>	CONF:FMA:AF:ANAL:GEN:RIGH:FREQ? <no>	<freq>
RX Audio - Analog - Right Channel AF Tone Level	CONF:FMA:AF:ANAL:GEN:RIGH:LEV <no>,<level>	CONF:FMA:AF:ANAL:GEN:RIGH:LEV? <no>	<level>

## Audio Generator

Function	Command	Query	Response
RX Audio - Analog - Right Channel AF Tone Level Setting State	-----	CONF:FMA:AF:ANAL:GEN:RIGHT:OVER?	-----
RX Audio - Analog - Right Channel AF Tone	CONF:FMA:AF:ANAL:GEN:RIGHT<no>,<on_off>	CONF:FMA:AF:ANAL:GEN:RIGHT?<no>	<on_off_res>
RX Audio - Digital - Left Channel AF Tone Frequency	CONF:FMA:AF:DIG:GEN:LEFT:FREQ<no>,<freq>	CONF:FMA:AF:DIG:GEN:LEFT:FREQ?<no>	<freq>
RX Audio - Digital - Left Channel AF Tone Level	CONF:FMA:AF:DIG:GEN:LEFT:LEV<no>,<level>	CONF:FMA:AF:DIG:GEN:LEFT:LEV?<no>	<level>
RX Audio - Digital - Left Channel AF Tone Level Setting State	-----	CONF:FMA:AF:DIG:GEN:LEFT:OVER?	-----
RX Audio - Digital - Left Channel AF Tone	CONF:FMA:AF:DIG:GEN:LEFT<no>,<on_off>	CONF:FMA:AF:DIG:GEN:LEFT?<no>	<on_off_res>
RX Audio - Digital - Sampling Rate	CONF:FMA:AF:DIG:GEN:RATE<rate>	CONF:FMA:AF:DIG:GEN:RATE?	<rate>
RX Audio - Digital - Right Channel AF Tone Frequency	CONF:FMA:AF:DIG:GEN:RIGHT:FREQ<no>,<freq>	CONF:FMA:AF:DIG:GEN:RIGHT:FREQ?<no>	<freq>
RX Audio - Digital - Right Channel AF Tone Level	CONF:FMA:AF:DIG:GEN:RIGHT:LEV<no>,<level>	CONF:FMA:AF:DIG:GEN:RIGHT:LEV?<no>	<level>
RX Audio - Digital - Right Channel AF Tone Level Setting State	-----	CONF:FMA:AF:DIG:GEN:RIGHT:OVER?	-----
RX Audio - Digital - Right Channel AF Tone	CONF:FMA:AF:DIG:GEN:RIGHT<no>,<on_off>	CONF:FMA:AF:DIG:GEN:RIGHT?<no>	<on_off_res>

## Audio Measurements

Function	Command	Query	Response
TX Audio - Left Channel Band Pass Filter	CONF:FMA:AF:LEFT:BPF <filter_type>	CONF:FMA:AF:LEFT:BPF?	<filter_type>
TX Audio - Left Channel DeEmphasis Filter	CONF:FMA:AF:LEFT:DEEM <filter_type>	CONF:FMA:AF:LEFT:DEEM?	<filter_type>
TX Audio - Left Channel High Pass Filter	CONF:FMA:AF:LEFT:HPF <filter_type>	CONF:FMA:AF:LEFT:HPF?	<filter_type>
TX Audio - Left Channel Low Pass Filter	CONF:FMA:AF:LEFT:LPF <filter_type>	CONF:FMA:AF:LEFT:LPF?	<filter_type>
TX Audio - Analog - Input Level	CONF:FMA:AF:MEAS:ANA:RANG <level>	CONF:FMA:AF:MEAS:ANA:RANG?	<level>
TX Audio - Modulation	CONF:FMA:AF:MEAS:MOD <mode>	CONF:FMA:AF:MEAS:MOD?	<mode>
TX Audio - Digital - Sampling Rate	CONF:FMA:AF:MEAS:RATE <rate>	CONF:FMA:AF:MEAS:RATE?	<rate>
TX Audio - Right Channel Band Pass Filter	CONF:FMA:AF:RIGH:BPF <filter_type>	CONF:FMA:AF:RIGH:BPF?	<filter_type>
TX Audio - Right Channel DeEmphasis Filter	CONF:FMA:AF:RIGH:DEEM <filter_type>	CONF:FMA:AF:RIGH:DEEM?	<filter_type>
TX Audio - Right Channel High Pass Filter	CONF:FMA:AF:RIGH:HPF <filter_type>	CONF:FMA:AF:RIGH:HPF?	<filter_type>
TX Audio - Right Channel Low Pass Filter	CONF:FMA:AF:RIGH:LPF <filter_type>	CONF:FMA:AF:RIGH:LPF?	<filter_type>
TX Audio - Storage Count	CONF:FMA:AF:STOR:COUN <count>	CONF:FMA:AF:STOR:COUN?	<count>
TX Audio - Storage Mode	CONF:FMA:AF:STOR:MODE <mode>	CONF:FMA:AF:STOR:MODE?	<mode>

## Audio Measurements (Cont'd)

Function	Command	Query	Response
TX AF - Audio Spectrum Wave Data	-----	FETC:FMA:AF:AUD:FREQ:TRAC:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX AF - Audio Spectrum Wave Binary Data	-----	FETC:FMA:AF:AUD:FREQ:TRAC:LEFT RIGHT:BIN? <format>,<position>,<length>	#nm...m<data[1]><data[2]>...<data[length]>
TX AF - Audio Time Domain Wave Data	-----	FETC:FMA:AF:AUD:TIME:TRAC:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX AF - Audio Time Domain Wave Binary Data	-----	FETC:FMA:AF:AUD:TIME:TRAC:LEFT RIGHT:BIN? <format>,<position>,<length>	#nm...m<data[1]><data[2]>...<data[length]>

## Audio Results

Function	Command	Query	Response
TX Audio - AF Crosstalk Summary	-----	FETC:FMA:AF:AUD:CROS?	<lr_level_ave>,<lr_level_max>,<lr_level_min>,<rl_level_ave>,<rl_level_max>,<rl_level_min>
TX Audio - AF Frequency/Level Summary	-----	FETC:FMA:AF:AUD:LEFT RIGHT:AF?	<freq_ave_1>,<level_ave_1>,<freq_ave_2>,...,<level_ave_11>,<freq_ave_12>,<level_ave_12>
TX Audio - AF Analysis Summary	-----	FETC:FMA:AF:AUD:LEFT RIGHT:ANAL?	<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_ave>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>
TX Audio - AF Total Level Summary	-----	FETC:FMA:AF:AUD:LEFT RIGHT:TOT?	<total_level_plus_p_current>,<total_level_minus_p_current>,<total_level_p+per2_current>,<total_level_rms_current>

## FM Generator

Function	Command	Query	Response
RX FM - Signal Generation	CONF:FMA:FM:GEN <on off>	CONF:FMA:FM:GEN?	<on off res>
RX FM - Left Channel AF Tone Deviation	CONF:FMA:FM:GEN:LEFT:DEV <no>,<freq>	CONF:FMA:FM:GEN:LEFT:DEV? <no>	<freq>
RX FM - Left Channel AF Tone Frequency	CONF:FMA:FM:GEN:LEFT:FREQ <no>,<freq>	CONF:FMA:FM:GEN:LEFT:FREQ ? <no>	<freq>
RX FM - Left Channel AF Tone	CONF:FMA:FM:GEN:LEFT <no>,<on off>	CONF:FMA:FM:GEN:LEFT? <no>	<on_off_res>
RX FM - Modulation	CONF:FMA:FM:GEN:MOD <mode>	CONF:FMA:FM:GEN:MOD?	<mode>
RX FM - Right Channel AF Tone Deviation	CONF:FMA:FM:GEN:RIGH:DEV <no>,<freq>	CONF:FMA:FM:GEN:RIGH:DEV? <no>	<freq>
RX FM - Right Channel AF Tone Frequency	CONF:FMA:FM:GEN:RIGH:FREQ <no>,<freq>	CONF:FMA:FM:GEN:RIGH:FREQ ? <no>	<freq>
RX FM - Right Channel AF Tone	CONF:FMA:FM:GEN:RIGH <no>,<on off>	CONF:FMA:FM:GEN:RIGH? <no>	<on_off_res>
RX FM - AM Signal Modulation	CONF:FMA:FM:GEN:AM <on off>	CONF:FMA:FM:GEN:AM?	<on_off_res>
RX FM - AM Depth	CONF:FMA:FM:GEN:AM:DEPT <percent>	CONF:FMA:FM:GEN:AM:DEPT?	<percent>
RX FM - AM Frequency	CONF:FMA:FM:GEN:AM:FREQ <freq>	CONF:FMA:FM:GEN:AM:FREQ?	<freq>
RX FM - FM Pilot Deviation	CONF:FMA:FM:GEN:PIL:DEV <freq>	CONF:FMA:FM:GEN:PIL:DEV?	<freq>

## FM Measurements

Function	Command	Query	Response
TX FM - Left Channel Band Pass Filter	CONF:FMA:FM:LEFT:BPF <filter_type>	CONF:FMA:FM:LEFT:BPF?	<filter_type>
TX FM - Left Channel DeEmphasis Filter	CONF:FMA:FM:LEFT:DEEM <filter_type>	CONF:FMA:FM:LEFT:DEEM?	<filter_type>
TX FM - Left Channel High Pass Filter	CONF:FMA:FM:LEFT:HPF <filter_type>	CONF:FMA:FM:LEFT:HPF?	<filter_type>
TX FM - Left Channel Low Pass Filter	CONF:FMA:FM:LEFT:LPF <filter_type>	CONF:FMA:FM:LEFT:LPF?	<filter_type>
TX FM - Modulation	CONF:FMA:FM:MOD <mode>	CONF:FMA:FM:MOD?	<mode>
TX FM - Occupied Bandwidth Ratio	CONF:FMA:FM:OBW:RAT <ratio>	CONF:FMA:FM:OBW:RAT?	<ratio>
TX FM - RDS Analysis	CONF:FMA:FM:RDS <on_off>	CONF:FMA:FM:RDS?	<on_off_res>
TX FM - Right Channel Band Pass Filter	CONF:FMA:FM:RIGH:BPF <filter_type>	CONF:FMA:FM:RIGH:BPF?	<filter_type>
TX FM - Right Channel DeEmphasis Filter	CONF:FMA:FM:RIGH:DEEM <filter_type>	CONF:FMA:FM:RIGH:DEEM?	<filter_type>
TX FM - Right Channel High Pass Filter	CONF:FMA:FM:RIGH:HPF <filter_type>	CONF:FMA:FM:RIGH:HPF?	<filter_type>
TX FM - Right Channel Low Pass Filter	CONF:FMA:FM:RIGH:LPF <filter_type>	CONF:FMA:FM:RIGH:LPF?	<filter_type>
TX FM - Storage Count	CONF:FMA:FM:STOR:COUN <count>	CONF:FMA:FM:STOR:COUN?	<count>
TX FM - Storage Mode	CONF:FMA:FM:STOR:MODE <mode>	CONF:FMA:FM:STOR:MODE?	<mode>

## FM Measurements (Cont'd)

Function	Command	Query	Response
TX FM - Audio Spectrum Wave Data	-----	FETC:FMA:FM:AUD:FREQ:TRAC:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - Audio Spectrum Wave Binary Data	-----	FETC:FMA:FM:AUD:FREQ:TRAC:LEFT RIGHT:BIN? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM – Both Audio Time Domain Wave Data	-----	FETC:FMA:FM:AUD:TIME:TRAC:BOTH? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - Both Audio Time Domain Wave Binary Data	-----	FETC:FMA:FM:AUD:TIME:TRAC:BOTH:BIN? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM –Audio Time Domain Wave Data	-----	FETC:FMA:FM:AUD:TIME:TRAC:LEFT RIGHT? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>
TX FM - Audio Time Domain Wave Binary Data	-----	FETC:FMA:FM:AUD:TIME:TRAC:LEFT RIGHT:BIN? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>...<data[length]>
TX FM - RF Spectrum Wave Data	-----	FETC:FMA:FM:RF:TRAC? <format>,<position>,<length>	<data_1>,<data_2>,...,<data_length-1>,<data_length>

## FM Measurements (Cont'd)

Function	Command	Query	Response
TX FM - RF Spectrum Wave Binary Data	-----	FETC:FMA:FM:RF:TRAC:BIN? <format>,<position>,<length>	#nmm...m<data[1]><data[2]>... <data[length]>

## FM Results

Function	Command	Query	Response
TX FM - Demodulate AF Deviation Summary for Stereo	-----	FETC:FMA:FM:DEM:BOTH:DEV?	<deviation_plus_peak_current>,<deviation_minus_peak_current>,<deviation_peak_peak_current>,<deviation_rms_current>
TX FM - Demodulate AF Crosstalk Summary	-----	FETC:FMA:FM:DEM:CROS?	<lr_level_ave1>,<lr_level_ave2>,...,<rl_level_ave1>,<rl_level_ave2>
TX FM - Demodulate AF Frequency/Level Summary	-----	FETC:FMA:FM:DEM:LEFT RIGHT:AF?	<freq_ave_1>,<level_ave_1>,<freq_ave_2>,...,<level_ave_11>,<freq_ave_12>,<level_ave_12>
TX FM - Demodulate AF Analysis Summary	-----	FETC:FMA:FM:DEM:LEFT RIGHT:ANAL?	<snr_ave>,<snr_max>,<snr_min>,<thd_db_ave>,<thd_db_max>,<thd_db_min>,<thd_per_ave>,<thd_per_max>,<thd_per_min>,<thdn_db_ave>,<thdn_db_max>,<thdn_db_min>,<thdn_per_ave>,<thdn_per_max>,<thdn_per_min>,<sinad_ave>,<sinad_max>,<sinad_min>

## FM Results (Cont'd)

Function	Command	Query	Response
TX FM - Demodulate AF Deviation Summary	-----	FETC:FMA:FM:DEM:LEFT RIGHT:DEV?	<deviation_plus_peak_current>,<deviation_minus_peak_current>,<deviation_ppPer2_current>,<deviation_rms_current>
TX FM - Demodulate AF Pilot Signal Summary	-----	FETC:FMA:FM:DEM:PIL?	<deviation_ave>,<deviation_max>,<deviation_min>,<level_ave>,<level_max>,<level_min>
TX FM - OBW	-----	FETC:FMA:FM:OBW?	<obw>
TX FM - OBW Frequency	-----	FETC:FMA:FM:OBW:FREQ? <pos>	<freq>
TX FM - RDS Summary (Blocks)	-----	FETC:FMA:FM:RDS:BLOC?	<bit_num>,<block_num>,<block_error_rate>
TX FM - RDS Summary (Data)	-----	FETC:FMA:FM:RDS:DATA?	<block_num>,<group_name_1>,<information_1>,<check_offset_1>,...,<group_name_n>,<information_n>,<check_offset_n>
TX FM - RadioText	-----	FETC:FMA:FM:RDS:TEXT:HEX?	<rt>
TX FM - RF Summary	-----	FETC:FMA:FM:RF?	<freq_ave>,<freq_max>,<freq_min>,<deviation_ave>,<deviation_max>,<deviation_min>,<level_ave>,<level_max>,<level_min>

## 4.2 Correspondence with SCPI Commands

Native Command parameters have the same parameters as corresponding SCPI Commands. Refer to the explanation of corresponding SCPI Commands.

Native Command	Corresponding SCPI Command
ABOR:FMA:MEAS	:ABORt:FMAudio:MEASurement
CONF:FMA:AF:ANAL:GEN:LEFT:FREQ	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency
CONF:FMA:AF:ANAL:GEN:LEFT:LEV	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel
CONF:FMA:AF:ANAL:GEN:LEFT:OVER?	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:OVER?
CONF:FMA:AF:ANAL:GEN:LEFT	:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT[:STATe]
CONF:FMA:AF:ANAL:GEN:RIGH:FREQ	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt:FREQuency
CONF:FMA:AF:ANAL:GEN:RIGH:LEV	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt:LEVel
CONF:FMA:AF:ANAL:GEN:RIGH:OVER?	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt:OVER?
CONF:FMA:AF:ANAL:GEN:RIGH	:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHt[:STATe]
CONF:FMA:AF:DIG:GEN:LEFT:FREQ	:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:FREQuency
CONF:FMA:AF:DIG:GEN:LEFT:LEV	:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:LEVel
CONF:FMA:AF:DIG:GEN:LEFT:OVER?	:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT:OVER?
CONF:FMA:AF:DIG:GEN:LEFT	:CONFigure:FMAudio:AF:DIGital:GENeration:LEFT[:STATe]
CONF:FMA:AF:DIG:GEN:RATE	:CONFigure:FMAudio:AF:DIGital:GENeration:RATE
CONF:FMA:AF:DIG:GEN:RIGH:FREQ	:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:FREQuency
CONF:FMA:AF:DIG:GEN:RIGH:LEV	:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:LEVel
CONF:FMA:AF:DIG:GEN:RIGH:OVER?	:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt:OVER?
CONF:FMA:AF:DIG:GEN:RIGH	:CONFigure:FMAudio:AF:DIGital:GENeration:RIGHt[:STATe]

Native Command	Corresponding SCPI Command
CONF:FMA:AF:LEFT:BPF	:CONFigure:FMAudio:AF:LEFT:BPFilter
CONF:FMA:AF:LEFT:DEEM	:CONFigure:FMAudio:AF:LEFT:DEEMphasis
CONF:FMA:AF:LEFT:HPF	:CONFigure:FMAudio:AF:LEFT:HPFilter
CONF:FMA:AF:LEFT:LPF	:CONFigure:FMAudio:AF:LEFT:LPFilter
CONF:FMA:AF:MEAS:ANAL:RANG	:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe
CONF:FMA:AF:MEAS:MOD	:CONFigure:FMAudio:AF:MEASurement:MODulation
CONF:FMA:AF:MEAS:RATE	:CONFigure:FMAudio:AF:MEASurement:RATE
CONF:FMA:AF:RIGH:BPF	:CONFigure:FMAudio:AF:RIGHT:BPFilter
CONF:FMA:AF:RIGH:DEEM	:CONFigure:FMAudio:AF:RIGHT:DEEMphasis
CONF:FMA:AF:RIGH:HPF	:CONFigure:FMAudio:AF:RIGHT:HPFilter
CONF:FMA:AF:RIGH:LPF	:CONFigure:FMAudio:AF:RIGHT:LPFilter
CONF:FMA:AF:STOR:COUN	:CONFigure:FMAudio:AF:STORage:COUNt
CONF:FMA:AF:STOR:MODE	:CONFigure:FMAudio:AF:STORage:MODE
CONF:FMA:FM:GEN	:CONFigure:FMAudio:FM:GENeration
CONF:FMA:FM:GEN:AM:DEPT	:CONFigure:FMAudio:FM:GENeration:AM:DEPT
CONF:FMA:FM:GEN:AM:FREQ	:CONFigure:FMAudio:FM:GENeration:AM:FREQ
CONF:FMA:FM:GEN:AM	:CONFigure:FMAudio:FM:GENeration:AM[:STATe]
CONF:FMA:FM:GEN:LEFT:DEV	:CONFigure:FMAudio:FM:GENeration:LEFT:DEViation
CONF:FMA:FM:GEN:LEFT:FREQ	:CONFigure:FMAudio:FM:GENeration:LEFT:FREQ
CONF:FMA:FM:GEN:LEFT	:CONFigure:FMAudio:FM:GENeration:LEFT[:STATe]
CONF:FMA:FM:GEN:MOD	:CONFigure:FMAudio:FM:GENeration:MODulation
CONF:FMA:FM:GEN:PIL:DEV	:CONFigure:FMAudio:FM:GENeration:PILOt:DEViation
CONF:FMA:FM:GEN:RIGH:DEV	:CONFigure:FMAudio:FM:GENeration:RIGHT:DEViation

Native Command	Corresponding SCPI Command
CONF:FMA:FM:GEN:RIGH:FREQ	:CONFigure:FMAudio:FM:GENeration:RIGHT:FREQuency
CONF:FMA:FM:GEN:RIGH	:CONFigure:FMAudio:FM:GENeration:RIGHT[:STATe]
CONF:FMA:FM:LEFT:BPF	:CONFigure:FMAudio:FM:LEFT:BPFfilter
CONF:FMA:FM:LEFT:DEEM	:CONFigure:FMAudio:FM:LEFT:DEEMphasis
CONF:FMA:FM:LEFT:HPF	:CONFigure:FMAudio:FM:LEFT:HPFilter
CONF:FMA:FM:LEFT:LPF	:CONFigure:FMAudio:FM:LEFT:LPFilter
CONF:FMA:FM:MOD	:CONFigure:FMAudio:FM:MODulation
CONF:FMA:FM:OBW:RAT	:CONFigure:FMAudio:FM:OBW:RATio
CONF:FMA:FM:RDS	:CONFigure:FMAudio:FM:RDS
CONF:FMA:FM:RIGH:BPF	:CONFigure:FMAudio:FM:RIGHT:BPFfilter
CONF:FMA:FM:RIGH:DEEM	:CONFigure:FMAudio:FM:RIGHT:DEEMphasis
CONF:FMA:FM:RIGH:HPF	:CONFigure:FMAudio:FM:RIGHT:HPFilter
CONF:FMA:FM:RIGH:LPF	:CONFigure:FMAudio:FM:RIGHT:LPFilter
CONF:FMA:FM:STOR:COUN	:CONFigure:FMAudio:FM:STORage:COUNt
CONF:FMA:FM:STOR:MODE	:CONFigure:FMAudio:FM:STORage:MODE
CONF:FMA:GEN:BBM	:CONFigure:FMAudio:GENerator:BBMode
CONF:FMA:GEN:RFS:FREQ	:CONFigure:FMAudio:GENerator:RFSettings:FREQuency
CONF:FMA:GEN:RFS:LEV	:CONFigure:FMAudio:GENerator:RFSettings:LEVel
CONF:FMA:GEN:RFS:LEV:UNIT	:CONFigure:FMAudio:GENerator:RFSettings:LEVel:UNIT
CONF:FMA:GEN:RFS:STAT	:CONFigure:FMAudio:GENerator:RFSettings:STATe
CONF:FMA:MEAS:RFS:FREQ	:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency
CONF:FMA:MEAS:RFS:LEV	:CONFigure:FMAudio:MEASurement:RFSettings:LEVel
CONF:FMA:MEAS:STAN	:CONFigure:FMAudio:MEASurement:STANdard

Native Command	Corresponding SCPI Command
FETC:FMA:AF:AUD:CROS?	:FETCh:FMAudio:AF:AUDio:CROStalk?
FETC:FMA:AF:AUD:FREQ:TRACe:LEFT   RIGH?	:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT   RIGHt?
FETC:FMA:AF:AUD:FREQ:TRAC:LEFT   RIGH:BIN?	:FETCh:FMAudio:AF:AUDio:FREQuency:TRACe:LEFT   RIGHt:BINary?
FETC:FMA:AF:AUD:LEFT   RIGH:AF?	:FETCh:FMAudio:AF:AUDio:LEFT   RIGHt:AF?
FETC:FMA:AF:AUD:LEFT   RIGH:ANAL?	:FETCh:FMAudio:AF:AUDio:LEFT   RIGHt:ANALysis?
FETC:FMA:AF:AUD:LEFT   RIGH:TOT?	:FETCh:FMAudio:AF:AUDio:LEFT   RIGHt:TOTal?
FETC:FMA:AF:AUD:TIME:TRACe:LEFT   RIGH?	:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT   RIGHt?
FETC:FMA:AF:AUD:TIME:TRAC:LEFT   RIGH:BIN?	:FETCh:FMAudio:AF:AUDio:TIME:TRACe:LEFT   RIGHt:BINary?
FETC:FMA:FM:AUD:FREQ:TRAC:LEFT   RIGH?	:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT   RIGHt?
FETC:FMA:FM:AUD:FREQ:TRAC:LEFT   RIGH:BIN?	:FETCh:FMAudio:FM:AUDio:FREQuency:TRACe:LEFT   RIGHt:BINary?
FETC:FMA:FM:AUD:TIME:TRAC:BOTH?	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH?
FETC:FMA:FM:AUD:TIME:TRAC:BOTH:BIN?	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:BOTH:BINary?
FETC:FMA:FM:AUD:TIME:TRAC:LEFT   RIGH?	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT   RIGHt?
FETC:FMA:FM:AUD:TIME:TRAC:LEFT   RIGH:BIN?	:FETCh:FMAudio:FM:AUDio:TIME:TRACe:LEFT   RIGHt:BINary?
FETC:FMA:FM:DEM:BOTH:DEV?	:FETCh:FMAudio:FM:DEMod:BOTH:DEViation?
FETC:FMA:FM:DEM:CROS?	:FETCh:FMAudio:FM:DEMod:CROStalk?
FETC:FMA:FM:DEM:LEFT   RIGH:DEV?	:FETCh:FMAudio:FM:DEMod:LEFT   RIGHt:DEViation?
FETC:FMA:FM:DEM:LEFT   RIGH:AF?	:FETCh:FMAudio:FM:DEMod:LEFT   RIGHt:AF?

Native Command	Corresponding SCPI Command
FETC:FMA:FM:DEM:LEFT RIGHT:ANAL?	:FETCh:FMAudio:FM:DEMod:LEFT RIGHT:ANALysis?
FETC:FMA:FM:DEM:PIL?	:FETCh:FMAudio:FM:DEMod:PILot?
FETC:FMA:FM:OBW?	:FETCh:FMAudio:FM:OBW?
FETC:FMA:FM:OBW:FREQ?	:FETCh:FMAudio:FM:OBW:FREQuency?
FETC:FMA:FM:RDS:BLOC?	:FETCh:FMAudio:FM:RDS:BLOCKs?
FETC:FMA:FM:RDS:DATA?	:FETCh:FMAudio:FM:RDS:DATA?
FETC:FMA:FM:RDS:TEXT:HEX?	:FETCh:FMAudio:FM:RDS:TEXT:HEXadecimal?
FETC:FMA:FM:RF?	:FETCh:FMAudio:FM:RF?
FETC:FMA:FM:RF:TRAC?	:FETCh:FMAudio:FM:RF:TRACe?
FETC:FMA:FM:RF:TRAC:BIN?	:FETCh:FMAudio:FM:RF:TRACe:BINary?
FETC:FMA:MEAS:STAT?	:FETCh:FMAudio:MEASurement:STATe?
INIT:FMA:MEAS:SING	:INITiate:FMAudio:MEASurement:SINGle
PORT	:ROUTe:PORT:CONNeCT:DIRection
ROUT:PORT:AUD:DIG:INP:WLEN	:ROUTe:PORT:AUDio:DIGital:INPut:WLENgth
ROUT:PORT:AUD:DIG:MCK:DIR	:ROUTe:PORT:AUDio:DIGital:MCK:DIRection
ROUT:PORT:AUD:DIG:SCK:DIR	:ROUTe:PORT:AUDio:DIGital:SCK:DIRection
ROUT:PORT:AUD:DIG:OUTP:WLEN	:ROUTe:PORT:AUDio:DIGital:OUTPut:WLENgth
ROUT:PORT:AUD:INP:SEL	:ROUTe:PORT:AUDio:INPut:SELeCt
ROUT:PORT:AUD:OUTP:SEL	:ROUTe:PORT:AUDio:OUTPut:SELeCt
ROUT:PORT:AUD:ROLE	:ROUTe:PORT:AUDio:ROLE
ROUT:PORT:RF:ROLE	:ROUTe:PORT:RF:ROLE
SYSSEL	:INSTrument[:SELeCt]
SYST:LANG	:SYSTem:LANGuage
TRIG:FMA:MEAS:DEL	:TRIGger:FMAudio:MEASurement:DELay
TRIG:FMA:MEAS:SOUR	:TRIGger:FMAudio:MEASurement:SOURce
TRIG:FMA:MEAS:THR	:TRIGger:FMAudio:MEASurement:THReshold
TRIG:FMA:MEAS:TOUT	:TRIGger:FMAudio:MEASurement:TOUT

## Chapter 5 Performance Tests

---

This chapter describes the measuring instruments, connection setup and test procedure, which are required for performance tests using the MX887070A FM/Audio TRX Measurement.

5.1	Outline.....	5-2
5.2	Instruments for Testing Performance .....	5-3
5.3	Performance Test for Each Measurement.....	5-4
5.3.1	Calibrating the signal generator (CW) .....	5-4
5.3.2	Calibrating the signal generator (MOD).....	5-6
5.3.3	Calibrating the output level of the audio signal generator .....	5-7
5.4	FM Signal Input Performance Test.....	5-9
5.4.1	Connection setup.....	5-9
5.4.2	Input level accuracy.....	5-10
5.4.3	Carrier frequency accuracy .....	5-12
5.4.4	Residual vector error .....	5-14
5.5	FM Signal Output Performance Test .....	5-16
5.5.1	Connection setup.....	5-16
5.5.2	Waveform distortion.....	5-16
5.6	Audio Signal Measurement Performance Test.....	5-19
5.6.1	Connection setup.....	5-19
5.6.2	Input level accuracy.....	5-20
5.6.3	Input waveform distortion .....	5-22
5.6.4	Crosstalk.....	5-24
5.7	Audio Signal Output Performance Test .....	5-26
5.7.1	Connection setup.....	5-26
5.7.2	Checking output level .....	5-27
5.7.3	Total harmonic distortion and noise .....	5-29
5.8	Sample format for performance test result sheet .....	5-31
5.8.1	Calibrating the signal generator level .....	5-32
5.8.2	FM signal input .....	5-33
5.8.3	FM signal output .....	5-37
5.8.4	Audio signal measurement.....	5-38
5.8.5	Audio signal output .....	5-41
5.9	Servicing .....	5-43

## 5.1 Outline

The performance tests are performed to assure that the MU887000A performance does not deteriorate. Test the performance of the MU887000A at the initial acceptance inspection, at periodic inspections, and after repairs. Test important items periodically to assure the performance. This chapter explains the following test items.

We recommend testing the performance periodically once or twice a year. If the test results do not meet the specifications, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the DVD version.



### CAUTION

---

**Warm-up the MU887000A and the required measuring instruments for at least 30 minutes (except when specified otherwise) to stabilize them. To achieve the highest accuracy, the test should be performed at room temperature using a power supply with as little voltage fluctuation as possible in an environment free from noise, vibration, dust and humidity.**

---

## 5.2 Instruments for Testing Performance

The following table lists the measuring instruments required for testing the MU887000A performance and the specifications for each instrument.

**Table 5.2-1 Measuring Instruments for Performance Test**

Test Item	Required Performance* <sup>1</sup>	Recommended Instrument (Model, Manufacturer)
FM Signal Output	Signal Generator <ul style="list-style-type: none"> <li>• Frequency Range: 64 to 110 MHz</li> <li>Resolution: 1 Hz</li> <li>• Output Level Range</li> <li>CW: -35 to +25 dBm</li> <li>Resolution: 0.01 dB</li> </ul> Power Meter <ul style="list-style-type: none"> <li>• Measurement Accuracy: ±0.02 dB</li> <li>• Frequency Range: 60 to 120 MHz</li> <li>• Resolution: 0.01 dB</li> </ul> Power Sensor <ul style="list-style-type: none"> <li>• Frequency Range: 60 to 120 MHz</li> <li>• Measured Power Range: -40 to +20 dBm</li> <li>• Connector: N type</li> </ul> Power Sensor (Thermal Sensor) <ul style="list-style-type: none"> <li>• Frequency Range: 60 to 120 MHz</li> <li>• Measured Power Range: -20 to +20 dBm</li> <li>• Connector: N type</li> </ul> 3 dB Attenuator	Vector Signal Generator (MG3710A, Anritsu) 1st RF High Power Extension (MG3710A-041, Anritsu)  Power Meter (ML2437A, Anritsu)  Power Sensor (MA2442D, Anritsu)  Power Sensor (MA24002A, Anritsu)  3 dB Attenuator (AT-403, Hirose Electric)
Audio Signal Measurement	Audio Signal Generator <ul style="list-style-type: none"> <li>• Frequency Range: 20 Hz to 20 kHz</li> <li>• Measured Level Range: 10 to 5000 mV peak</li> <li>• Resolution: 0.1 mV</li> <li>• Impedance: 50 Ω</li> </ul>	Audio Analyzer (U8903A, Agilent Technology)
Audio Signal Output	Audio Analyzer <ul style="list-style-type: none"> <li>• Frequency Range: 20 Hz to 20 kHz</li> <li>• Level Range: 10 to 5000 mV peak</li> <li>• Measurement Accuracy: ±2%</li> <li>• Flatness: ±0.01 dB</li> </ul>	Audio Analyzer (U8903A, Agilent Technology)

\*1: The performance covers the test item measurement range.

## 5.3 Performance Test for Each Measurement

### 5.3.1 Calibrating the signal generator (CW)

This procedure captures the calibration value for measurements using an unmodulated waveform (CW).

(1) Measuring instruments

- Vector signal generator: MG3710A
- Power meter: ML2437A
- Power sensor: MA2442D
- 3-dB Attenuator: AT-403 (2 sets)

(2) Setup

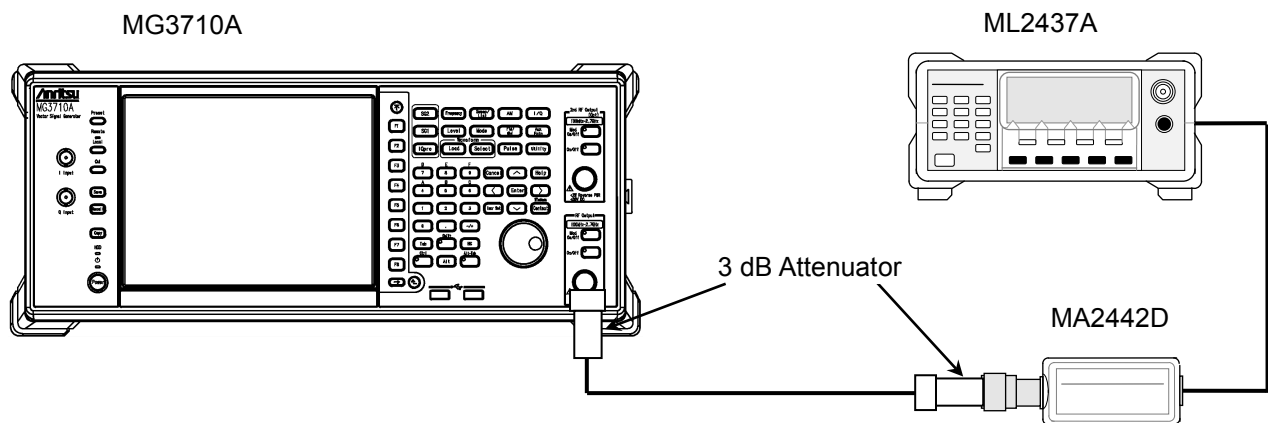


Figure 5.3.1-1 Connection Diagram for Calibrating the Output Level of the Signal Generator (CW)

(3) Procedure

1. Setup the instruments as shown in Figure 5.3.1-1.
2. Output a CW 65 MHz signal from the Vector signal generator (SG) at a level of +21 dBm.
3. Measure the level with the ML2437A power meter and adjust the SG so that the output level is +15 dBm. The SG setting level at this time is calibration value.
4. Change the frequency as shown in Table 5.3.1-1 “Measurement Point and Frequency” and perform the same measurement to obtain the calibration value.
5. In the same way as steps 3 and 4, change the frequency and measure to obtain the calibration value (30 points in total) for measurement point 2 and later shown in Table 5.3.1-2 “Measurement Point and Level”.

**Table 5.3.1-1 Measurement Point and Frequency**

Meas. Point	Frequency (MHz)
1	64.99
2	89.99
3	109.99

**Table 5.3.1-2 Measurement Point and Level**

Meas. Point	Level (dBm)
1	0
2	-10
3	-25
4	-30

## 5.3.2 Calibrating the signal generator (MOD)

This procedure captures the calibration value for measurement using a modulated waveform.

### (1) Measuring instruments

- Vector signal generator: MG3710A
- Power meter: ML2437A
- Power sensor: MA24002A
- 3-dB Attenuator: AT-403 (2 sets)

### (2) Setup

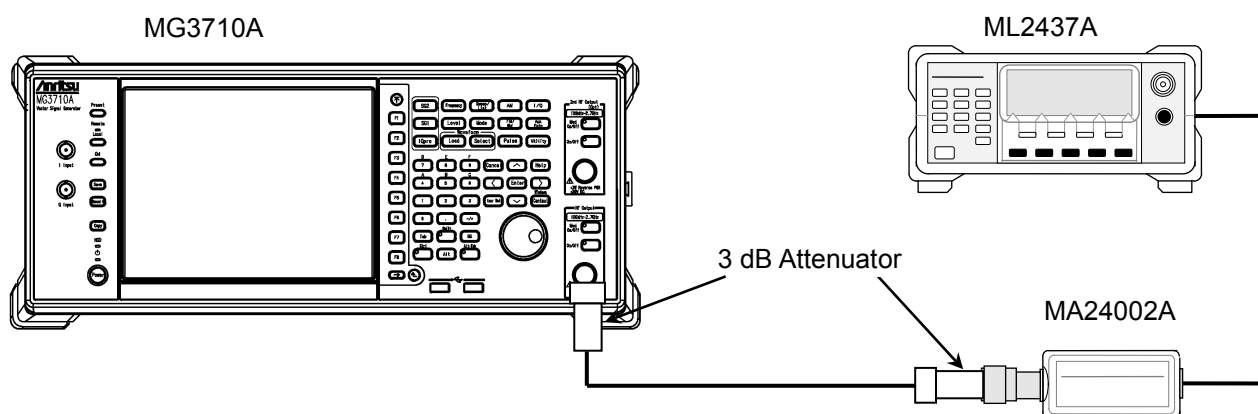


Figure 5.3.2-1 Connection Diagram for Calibrating the Output Level of the Signal Generator (MOD)

### (3) Procedure

1. Setup the instruments as shown in Figure 5.3.2-1.
2. Output a modulation signal of 65.00 MHz and +6 dBm level from the SG.  
ARB: Waveform file with FM Mono modulation and 1-kHz tone frequency
3. Measure the level with the ML2437A Power Meter and adjust the SG so that the output level is 0 dBm. The SG setting level at this time is calibration value.
4. Change the frequency as shown in Table 5.3.2-1 “Measurement Point and Frequency” and perform the same measurements to obtain the calibration value.

Table 5.3.2-1 Measurement Point and Frequency

Meas. Point	Frequency (MHz)
1	65.00
2	90.00
3	110.00

5.3.3 Calibrating the output level of the audio signal generator

- (1) Measuring instrument
- Audio Analyzer:

U8903A
- (2) Setup

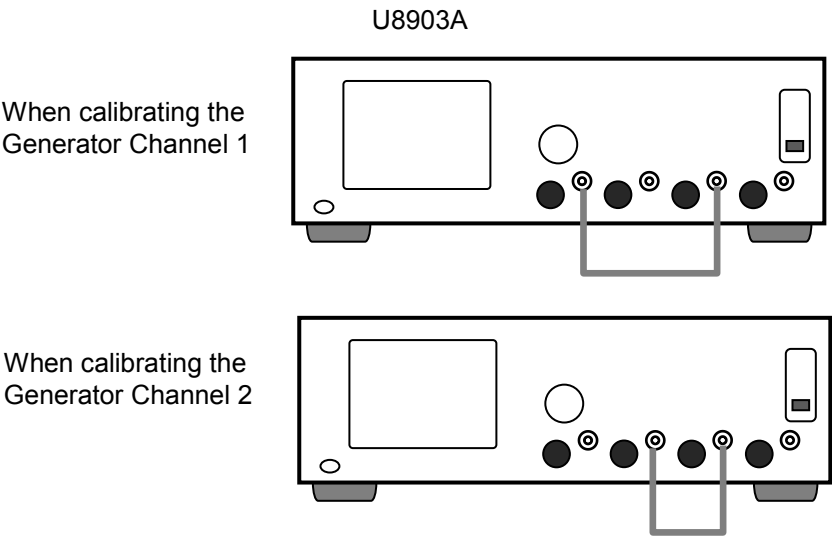


Figure 5.3.3-1 Connection Diagram for Calibrating the Output Level of the Audio Signal Generator

- (3) Procedure

Table 5.3.3-1 Measurement Point and Level

Meas. Point	Level (mV rms)
1	3535.5
2	353.55
3	35.355
4	7.071

1. Set Channel 1 of the U8903A Analyzer as follows:
- HPF:

OFF

LPF:

80 kHz

Range:

AUTO

Measurement Mode:

AC

Detection Mode:

RMS
2. Use a coaxial cable to connect the Generator Channel 1 and the Analyzer Channel 1.
3. Set the Generator Channel 1 as follows:
- Output Frequency:

5 kHz

Output Level: 3.535 V rms  
Output Waveform: Sine  
DC Offset: 0 V  
Output Type: Unbal  
Output Impedance: 50  $\Omega$

4. Adjust the output level of Generator Channel 1 so that the measured level at Analyzer Channel 1 is 3.535 V rms. This value is the 3.535 V rms calibration value.
5. Change the level setting for Generator Channel 1 so that the Analyzer Channel 1 measured level is as shown in No. 2 and later of Table 5.3.3-1 “Measurement Point and Level” and obtain the calibration value.
6. Connect Generator Channel 2 and Analyzer Channel 1 of the U8903A using coaxial cable.
7. Repeat steps 3 to 6 for Generator Channel 2.

## 5.4 FM Signal Input Performance Test

### 5.4.1 Connection setup

Figure 5.4.1-1 shows the connection diagram for using the MG3710A Vector Signal Generator as the signal generator. Connect a 3-dB attenuator to each MG3710A and MU887000A.

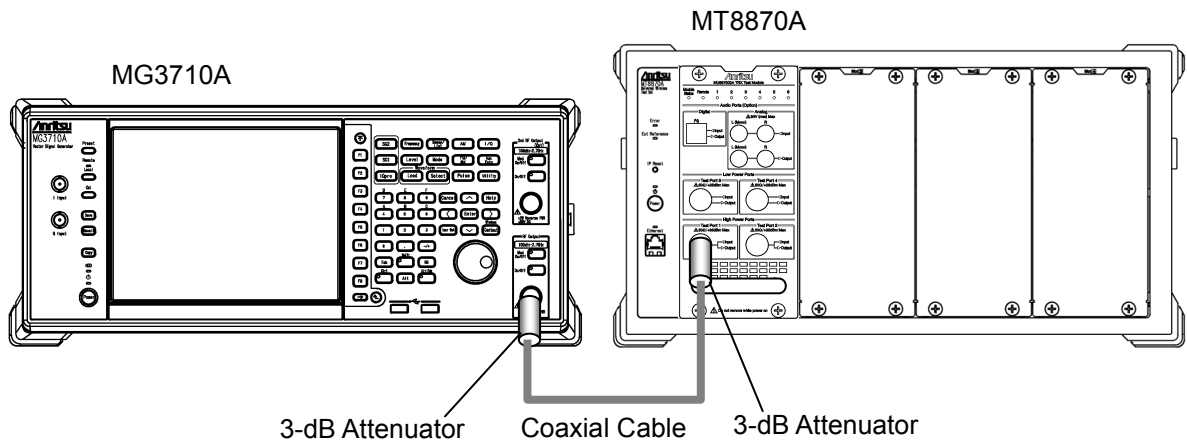


Figure 5.4.1-1 Connection Diagram for FM Signal Input Test (When Testing the Port 1)

At the FM signal input test, test from MU887000A Port 1 to Port 4. Change the coaxial cable connection when changing the test port.

## 5.4.2 Input level accuracy

### (1) Specifications

Table 5.4.2-1 Specification

Port	Specification	Conditions
Port1, Port2	$\pm 0.7$ dB	$-30 \leq \text{Level} \leq +15$ dBm, 10 to 40°C
Port3, Port4	$\pm 0.7$ dB	$-30 \leq \text{Level} \leq +15$ dBm, 10 to 40°C

### (2) Test Procedure

Table 5.4.2-2 Frequency Setting

No.	MT8870A RX Frequency (MHz)	MG3710A Output Frequency (MHz)
1	65.00	64.99
2	90.00	89.99
3	110.00	109.99

Table 5.4.2-3 Level Setting

No.	MT8870A Input Level (dBm)	MG3710A Output Level* (dBm)
1	15	0
2	10	0
3	5	0
4	0	0
5	-5	-10
6	-10	-10
7	-15	-25
8	-20	-25
9	-25	-25
10	-30	-30

\*: Level input to MT8870A connector shown in Figure 5.4.1-1. Set the calibration value obtained as described in 5.3.1 “Calibrating the signal generator (CW)” to MG3710A.

For Port1

- To test the Port 1, connect the equipment as shown in Figure 5.4.1-1.
- Initialize the MT8870A.  
\*RST
- Set the language mode to SCPI.  
SYST:LANG SCPI
- Initialize the MG3710A.
- Set the application to FM/Audio.

- 
- ```
:INSTRument:SElect FMAUDIO
```
6. Set the MT8870A RF signal output to Off.  

```
:CONFigure:FMAudio:GENerator:RFSettings:STATe off
```
  7. Set the output and input port to Port 1.  

```
:ROUTE:PORT:CONNect:DIREction PORT1,PORT1
```
  8. Set the MG3710A parameters as follows:  
Modulation: Off  
Output: ON
  9. Set the MG3710A output frequency to 64.99 MHz.
  10. Set the MT8870A Rx Frequency to 65 MHz.  

```
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency  
65MHZ
```
  11. Set the MG3710A output level so that the input level to the MT8870A becomes 0 dBm.
  12. Set the MT8870A input level to +15 dBm.  

```
:CONFigure:FMAudio:MEASurement:RFSettings:LEVel 15dBm
```
  13. Measure FM/Audio.  

```
:INITiate:FMAudio:MEASurement:SINGLE  
  
*WAI
```
  14. Read the Rx level.  

```
:FETCh:FMAudio:FM:RF?
```
  15. Calculate the input level accuracy using the following formula. The MG3710A output level is the value recorded in the right column of Table 5.4.2-3.  

$$\text{Input Level Accuracy} = \text{Rx Level} - \text{MG3710A Output Level}$$
  16. Set the level shown at No. 2 and later of Table 5.4.2-3 at the MG3710A and MT8870A and repeat steps 13 to 15.
  17. Set the frequency shown at No. 2 and later of Table 5.4.2-2 at the MG3710A and MT8870A and repeat steps 11 to 16.
  18. Set the MG3710A output to Off.
- Perform the same test for Port 2, Port 3 and Port 4.

### 5.4.3 Carrier frequency accuracy

#### (1) Specification

Table 5.4.3-1 Specification

| Specification                                                                              | Conditions                                                          |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| $\pm(\text{Setting frequency} \times \text{Reference oscillator accuracy} + 1 \text{ Hz})$ | At FM Mono modulation,<br>1 kHz tone frequency,<br>75 kHz deviation |

#### (2) Test Procedure

Table 5.4.3-2 Frequency Settings

| No. | MT8870A Rx Frequency (MHz) | MG3710A Output Frequency (MHz) |
|-----|----------------------------|--------------------------------|
| 1   | 65.00                      | 65.00                          |
| 2   | 90.00                      | 90.00                          |
| 3   | 110.00                     | 110.00                         |

Table 5.4.3-3 Level Setting

| No. | MT8870A Input Level (dBm) | MG3710A Output Level* (dBm) |
|-----|---------------------------|-----------------------------|
| 1   | 0                         | 0                           |

\*: Level input to MT8870A connector shown in Figure 5.4.1-1. Set the calibration value obtained as described in 5.3.2 “Calibrating the signal generator (MOD)” to MG3710A.

For Port 1

- To test Port 1 connect as shown in Figure 5.4.1-1.
- Initialize the MT8870A.  
\*RST
- Set the language mode to SCPI.  
SYST:LANG SCPI
- Initialize the MG3710A.
- Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
- Set the FM signal output to Off.  
:CONFigure:FMAudio:GENerator:RFSettings:STATe OFF
- Set the FM signal measurement parameters as follows:  
Modulation: Mono  
HPF: Off, LPF: Off, BPF: Off  
De-emphasis Filter: 50  $\mu$ s

- Averaging Count: 10
- ```
:CONFigure:FMAudio:FM:MODulation MONO
:CONFigure:FMAudio:FM:LEFT:HPFilter OFF
:CONFigure:FMAudio:FM:LEFT:LPFilter OFF
:CONFigure:FMAudio:FM:LEFT:BPFilter OFF
:CONFigure:FMAudio:FM:LEFT:DEEmphasis US50
:CONFigure:FMAudio:FM:STORage:MODE AVERAGE
:CONFigure:FMAudio:FM:STORage:COUNt 10
```
8. Set the output and input port to Port 1.  
:ROUTe:PORT:CONNect:DIREction PORT1,PORT1
  9. Set the MG3710A parameters as follows:  
ARB: Waveform file with FM Mono modulation and 1 kHz tone frequency  
Modulation: On  
Output: On
  10. Set the MG3710A output frequency to 65 MHz.
  11. Set the MT8870A Rx frequency to 65 MHz.  
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency 65MHZ
  12. Set the MG3710A output level so that the input level to the MT8870A is 0 dB.
  13. Set the MT8870A input level to 0 dBm.  
:CONFigure:FMAudio:MEASurement:RFSettings:LEVel 0dBm
  14. Measure FM/Audio.  
:INITiate:FMAudio:MEASurement:SINGLE  
\*WAI
  15. Read the carrier frequency.  
:FETCh:FMAudio:FM:RF?
  16. Calculate the carrier frequency accuracy using the following formula.  
$$\text{Carrier Frequency Accuracy} = \text{Measured Frequency} - \text{Frequency Set at MG3710A}$$
  17. Set the level at No. 2 and later of Table 5.4.3-3 at the MG3710A and MT8870A and repeat steps 14 to 16.
  18. Set the frequency at No. 2 and later of Table 5.4.3-2 at the MG3710A and MT8870A and repeat steps 12 to 17.
  19. Set the MG3710A output to Off.
- Perform the same test for Port 2, Port 3 and Port 4.

## 5.4.4 Residual vector error

### (1) Specification

**Table 5.4.4-1 Specification**

Specification	Conditions
>55 dB	At FM Mono modulation, 1 kHz tone frequency, 75 kHz deviation, 20 Hz to 15 kHz demodulation bane and 50 $\mu$ s de-emphasis filter

### (2) Test Procedure

**Table 5.4.4-2 Frequency Settings**

No.	MT8870A Rx Frequency (MHz)	MG3710A Output Frequency (MHz)
1	65.00	65.00
2	90.00	90.00
3	110.00	110.00

**Table 5.4.4-3 Level Setting**

No.	MT8870A Input Level (dBm)	MG3710A Output Level* (dBm)
1	0	0

\*: Level input to MT8870A connector shown in Figure 5.4.1-1. Set the calibration value obtained as described in 5.3.2 “Calibrating the signal generator (MOD)” to MG3710A.

For Port 1

- To test Port 1, connect as shown in Figure 5.4.1-1.
- Initialize the MT8870A.  
\*RST
- Set the language mode to SCPI.  
SYST:LANG SCPI
- Initialize the MG3710A.
- Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
- Set the FM signal output to Off.  
:CONFigure:FMAudio:GENerator:RFSettings:STATe OFF
- Set the FM signal measurement parameters as follows:  
Modulation: Mono  
HPF: Off, LPF: Off, BPF: Off  
De-emphasis Filter: 50  $\mu$ s

- Averaging Count: 10
- ```
:CONFigure:FMAudio:FM:MODulation MONO
:CONFigure:FMAudio:FM:LEFT:HPFilter OFF
:CONFigure:FMAudio:FM:LEFT:LPFilter OFF
:CONFigure:FMAudio:FM:LEFT:BPFilter OFF
:CONFigure:FMAudio:FM:LEFT:DEEMphasis US50
:CONFigure:FMAudio:FM:STORage:MODE AVERAGE
:CONFigure:FMAudio:FM:STORage:COUNt 10
```
8. Set the output and input port to Port 1.  
:ROUTE:PORT:CONNect:DIREction PORT1,PORT1
  9. Set the MG3710A parameters as follows:  
ARB: Waveform file with FM Mono modulation and 1 kHz tone frequency  
Modulation: On  
Output: On
  10. Set the MG3710A output frequency to 65 MHz.
  11. Set the MT8870A Rx frequency to 65 MHz.  
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency 65MHZ
  12. Set the MG3710A output level so that the input level to the MT8870A is 0 dB.
  13. Set the MT8870A input level to 0 dBm.  
:CONFigure:FMAudio:MEASurement:RFSettings:LEVel 0dBm
  14. Measure FM/Audio.  
:INITiate:FMAudio:MEASurement:SINGLE  
\*WAI
  15. Read SNR(Avg.). This value is the measured residual vector error.  
:FETCh:FMAudio:FM:DEMod:LEFT:ANALysis?
  16. Set the frequency at No. 2 and later of Table 5.4.4 -2 at the MG3710A and MT8870A and repeat steps 12 to 15.
  17. Set the MG3710A output to Off.
- Perform the same test for Port 2 , Port 3 and Port 4.

## 5.5 FM Signal Output Performance Test

### 5.5.1 Connection setup

To test the FM signal output, connect Port 3 and Port 4 using a coaxial cable.

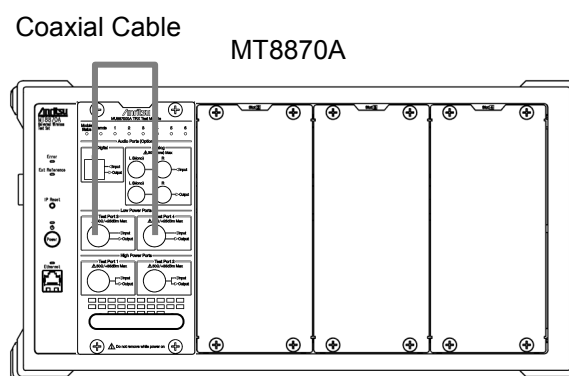


Figure 5.5.1-1 Connection Diagram for FM Signal Output Test

### 5.5.2 Waveform distortion

#### (1) Specification

Table 5.5.2-1 Specification

| Specification | Conditions                                                                                                                    |
|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| >50 dB        | 65 to 110 MHz RF frequency (SINAD, 20 Hz to 20 kHz frequency, Emphasis On, Mono, 75 kHz Tone Deviation, 1 kHz tone frequency) |

#### (2) Test Procedure

Table 5.5.2-2 Frequency Settings

| No. | Port 3 Output Frequency (MHz) | Port 4 Rx Frequency (MHz) |
|-----|-------------------------------|---------------------------|
| 1   | 65.00                         | 65.00                     |
| 2   | 90.00                         | 90.00                     |
| 3   | 110.00                        | 110.00                    |

Table 5.5.2-3 Level Setting

| No. | Port 3 Output Level (dBm) | Port 4 Input Level (dBm) |
|-----|---------------------------|--------------------------|
| 1   | 0                         | 0                        |

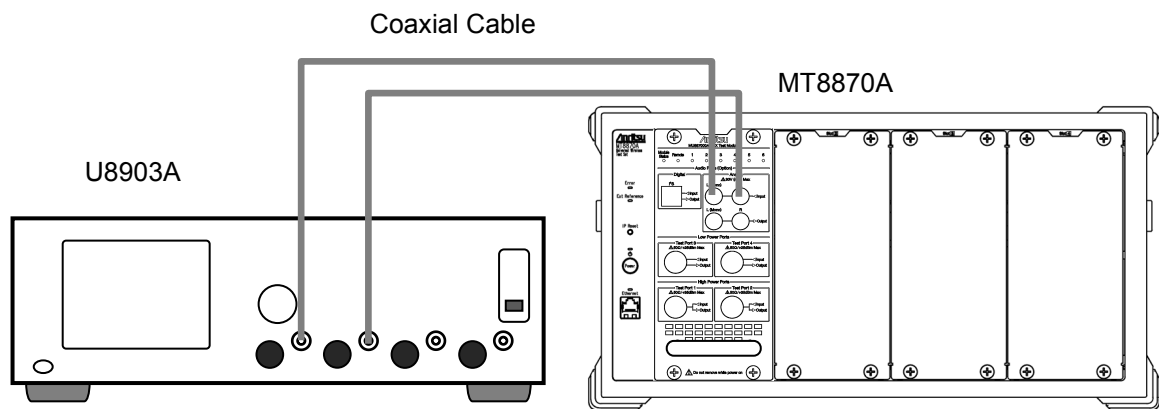
1. Connect the equipment as shown in Figure 5.5.1-1.
2. Initialize the MT8870A.  
\*RST
3. Set the language mode to SCPI.  
SYST:LANG SCPI
4. Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
5. Set the following FM signal parameters for output at Port 3.  
Modulation: Mono  
Tone Frequency: 1 kHz  
Frequency Deviation: 75 kHz  
Amplitude Modulation: OFF  
Output: ON  
:ROUTe:PORT:RF:ROLE OUTPUT  
:CONFIgure:FMAudio:FM:GENErator:MODUlation MONO  
:CONFIgure:FMAudio:FM:GENErator:LEFT:FREQuency 1,1kHz  
:CONFIgure:FMAudio:FM:GENErator:LEFT:DEVIation 1,75kHz  
:CONFIgure:FMAudio:FM:GENErator:AM OFF  
:CONFIgure:FMAudio:FM:GENErator:LEFT 1,ON
6. Set the following FM signal measurement parameters for Port 4.  
Modulation: Mono  
HPF: 20 Hz, LPF: 20 kHz, BPF: Off  
De-emphasis Filter: 50  $\mu$ s  
Averaging Count: 10  
:ROUTe:PORT:RF:ROLE INPUT  
:CONFIgure:FMAudio:FM:MODUlation MONO  
:CONFIgure:FMAudio:FM:LEFT:HPFilter HPF20  
:CONFIgure:FMAudio:FM:LEFT:LPFilter LPF22K  
:CONFIgure:FMAudio:FM:LEFT:BPFfilter OFF  
:CONFIgure:FMAudio:FM:LEFT:DEEMphasis US50  
:CONFIgure:FMAudio:FM:STORage:MODE AVERAGE  
:CONFIgure:FMAudio:FM:STORage:COUNt 10
7. Set the output and input port to Port 3 and Port 4.  
:ROUTe:PORT:CONNect:DIREction PORT3,PORT4
8. Set the Port 4 Rx frequency to 65 MHz and the input level to 0 dBm.  
:CONFIgure:FMAudio:MEASurement:RFSettings:FREQuency 65MHZ  
:CONFIgure:FMAudio:MEASurement:RFSettings:LEVel 0dBm

9. Using the VSG function, set modulation of the signal output from Port 3.  
:SOUR:GPRF:GEN:STAT ON  
:SOUR:GPRF:GEN:ARB:WAV:DEL:ALL  
:SOUR:GPRF:GEN:ARB:FILE:LOAD "FMTemporary"  
\*OPC?  
:SOUR:GPRF:GEN:ARB:FILE:PATT:SEL "FMTemporary",1,1  
\*OPC?  
:SOUR:GPRF:GEN:BBM ARB
10. Set the frequency of the signal output from Port 3 to 65 MHz and input level to 0 dBm.  
:SOUR:GPRF:GEN:RFS:FREQ 65MHz  
:SOUR:GPRF:GEN:RFS:LEV 0DBM
11. Measure FM/Audio.  
:INITiate:FMAudio:MEASurement:SINGLE  
\*WAI
12. Read SINAD(Avg.). This value is the measured waveform distortion.  
:FETCh:FMAudio:FM:DEMod:LEFT:ANALysis?
13. Set the frequency at No. 2 and later of Table 5.5.2-2 at Port 3 and Port 4 and repeat steps 11 and 12.  
:CONFigure:FMAudio:MEASurement:RFSettings:FREQuency  
<freq>  
:SOUR:GPRF:GEN:RFS:FREQ <freq>
14. Set the Port 3 output to Off.  
:SOUR:GPRF:GEN:STAT OFF

## 5.6 Audio Signal Measurement Performance Test

### 5.6.1 Connection setup

Figure 5.6.1-1 shows the connection diagram for using the U8903A as the audio signal source.



**Figure 5.6.1-1 Connection Diagram for Audio Signal Measurement Test**

Connect Generator Channel 1 of the U8903A and the Analog Input (L (Mono)).

Connect Generator Channel 2 of the U8903A and the Analog Input (R).

## 5.6.2 Input level accuracy

### (1) Specification

Table 5.6.2-1 Specification

| Specification | Condition  |
|---------------|------------|
| $\pm 0.4$ dB  | 20 to 30°C |

### (2) Test Procedure

Table 5.6.2-2 Level Settings

| No. | MT8870A Level range<br>(mV peak) | U8903A Output Level<br>(mV rms) |
|-----|----------------------------------|---------------------------------|
| 1   | 5000                             | 3535.5*                         |
| 2   | 500                              | 353.55*                         |
| 3   | 50                               | 35.355*                         |
| 4   | 50                               | 7.071*                          |

\*: Level input to MT8870A in Figure 5.6.1-1. Set the calibration value obtained in 5.3.3 “Calibrating the output level of the audio signal generator” at the U8903A.

\*: System Cal is the cable loss calibration value.

Table 5.6.2-3 Frequency Settings

| No. | Frequency<br>(Hz) | No. | Frequency<br>(Hz) | No. | Frequency<br>(Hz) |
|-----|-------------------|-----|-------------------|-----|-------------------|
| 1   | 20                | 21  | 10000             | 31  | 20000             |
| 2   | 50                | 22  | 11000             |     |                   |
| 3   | 100               | 23  | 12000             |     |                   |
| 4   | 200               | 24  | 13000             |     |                   |
| 5   | 300               | 25  | 14000             |     |                   |
| 6   | 500               | 26  | 15000             |     |                   |
| 7   | 1000              | 27  | 16000             |     |                   |
| 8   | 2000              | 28  | 17000             |     |                   |
| 9   | 3000              | 29  | 18000             |     |                   |
| 10  | 5000              | 30  | 19000             |     |                   |

1. Connect as shown in Figure 5.6.1-1.
2. Initialize the MT8870A.  
\*RST
3. Set the language mode to SCPI.  
SYST:LANG SCPI
4. Initialize the U8903A.
5. Set the application to FM/Audio.  
:INSTRUMENT:SElect FMAUDIO

6. Set the audio port interface to Analog input.  
`:ROUTe:PORT:AUDio:ROLE INPUT`  
`:ROUTe:PORT:AUDio:OUTPut:SElect ANALOG`
7. Set the audio port input to Stereo.  
`:CONFigure:FMAudio:AF:MEASurement:MODulation STEREO`
8. Set the audio port filter as follows:  
 HPF: Off, LPF: Off, BPF: Off  
 De-emphasis Filter: Off  
`:CONFigure:FMAudio:AF:LEFT:LPFilter OFF`  
`:CONFigure:FMAudio:AF:LEFT:HPFilter OFF`  
`:CONFigure:FMAudio:AF:LEFT:BPFilter OFF`  
`:CONFigure:FMAudio:AF:LEFT:DEEMphasis OFF`  
`:CONFigure:FMAudio:AF:RIGHT:LPFilter OFF`  
`:CONFigure:FMAudio:AF:RIGHT:HPFilter OFF`  
`:CONFigure:FMAudio:AF:RIGHT:BPFilter OFF`  
`:CONFigure:FMAudio:AF:RIGHT:DEEMphasis OFF`
9. Set the audio port input range to 5 V peak.  
`:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGE 5000MV`
10. Set Generator Channel 1 and Generator Channel 2 of the U8903A as follows:  
 Output Level: 3535.5 mV rms  
 Impedance: 50  $\Omega$   
 Signal Output: On
11. Set the frequency of Generator Channel 1 and Generator Channel 2 of the U8903A to 20 Hz.
12. Measure FM/Audio.  
`:INITiate:FMAudio:MEASurement:SINGLE`  
`*WAI`
13. Read the measured level (avg).  
`:FETCh:FMAudio:AF:AUDio:LEFT:AF?`  
`:FETCh:FMAudio:AF:AUDio:RIGHT:AF?`
14. Calculate the input level accuracy as follows:  
 Input Level Accuracy =  $20 \times \log(\text{MT8870A Measured Value} / \text{U8903A Setting})$
15. Set the frequency at No. 2 and later of Table 5.6.2-3 at the U8903A and repeat steps 12 to 14.
16. Set the level at No. 2 and later of Table 5.6.2-2 at the U8903A and MT8870A and repeat steps 11 to 15.
17. Set the U8903A output to Off.

### 5.6.3 Input waveform distortion

(1) Specification

**Table 5.6.3-1 Specification**

| Specification | Conditions |
|---------------|------------|
| <−60 dB       | 20 to 30°C |

(2) Test Procedure

- Connect as shown in Figure 5.6.1-1.
- Initialize the MT8870A.  
\*RST
- Set the language mode to SCPI.  
SYST:LANG SCPI
- Initialize the U8903A.
- Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
- Set the audio port interface to Analog Input.  
:ROUTE:PORT:AUDio:ROLE INPUT  
:ROUTE:PORT:AUDio:OUTPut:SElect ANALOG
- Set the audio port input to Stereo.  
:CONFigure:FMAudio:AF:MEASurement:MODulation STEREO
- Set the audio port filters as follows:  
HPF: Off, LPF: Off, BPF: Off  
De-emphasis filter: Off  
:CONFigure:FMAudio:AF:LEFT:LPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:HPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:BPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:DEEMphasis OFF  
:CONFigure:FMAudio:AF:RIGHT:LPFilter OFF  
:CONFigure:FMAudio:AF:RIGHT:HPFilter OFF  
:CONFigure:FMAudio:AF:RIGHT:BPFilter OFF  
:CONFigure:FMAudio:AF:RIGHT:DEEMphasis OFF
- Set the audio port input range to 5 V peak.  
:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGE 5000MV
- Set Generator Channel 1 and Generator Channel 2 of the U8903A as follows:  
Frequency: 1 kHz  
Output Level: 2 V peak  
Impedance: 50 Ω  
Signal Output: On

11. Measure FM/Audio.  
:INITiate:FMAudio:MEASurement:SINGle  
\*WAI
12. Read THD+N(avg.). This value is the measured input distortion value.  
:FETCh:FMAudio:AF:AUDio:LEFT:AF?  
:FETCh:FMAudio:AF:AUDio:RIGHT:AF?
13. Set the U8903A output to Off.

## 5.6.4 Crosstalk

### (1) Specification

**Table 5.6.4-1 Specification**

| Specification | Condition  |
|---------------|------------|
| >60 dB        | 20 to 30°C |

### (2) Test Procedure

**Table 5.6.4-2 Frequency Settings**

| No. | U8903A Output Frequency (Hz) |
|-----|------------------------------|
| 1   | 20                           |
| 2   | 100                          |
| 3   | 1000                         |
| 4   | 10000                        |
| 5   | 20000                        |

1. Connect as shown in Figure 5.6.1-1.
2. Initialize the MT8870A.  
\*RST
3. Set the language mode to SCPI.  
SYST:LANG SCPI
4. Initialize the U8903A.
5. Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
6. Set the audio port interface to Analog Input.  
:ROUTe:PORT:AUDio:ROLE INPUT  
:ROUTe:PORT:AUDio:OUTPut:SElect ANALOG
7. Set the audio port input to Stereo.  
:CONFigure:FMAudio:AF:MEASurement:MODulation STEREO
8. Set the audio port filter as follows:  
HPF: Off, LPF: Off, BPF: Off  
De-emphasis Filter: Off  
:CONFigure:FMAudio:AF:LEFT:LPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:HPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:BPFilter OFF  
:CONFigure:FMAudio:AF:LEFT:DEEmphasis OFF  
:CONFigure:FMAudio:AF:RIGHT:LPFilter OFF  
:CONFigure:FMAudio:AF:RIGHT:HPFilter OFF  
:CONFigure:FMAudio:AF:RIGHT:BPFilter OFF

- :CONFigure:FMAudio:AF:RIGHT:DEEMphasis OFF
9. Set the audio port input range to 5 V peak.
 

:CONFigure:FMAudio:AF:MEASurement:ANALog:RANGe 5000MV
10. Set Generator Channel 1 and Channel 2 of the U8903A as follows:
 

Frequency: 20 Hz

Output Level: 5 V peak

Impedance: 50 Ω
11. Set the output of Generator Channel 1 of the U8903A to Off.
12. Set the output of Generator Channel 2 of the U8903A to On.
13. Measure FM/Audio.
 

:INITiate:FMAudio:MEASurement:SINGLE

\*WAI
14. Read the level (mV rms) of the left channel.
 

:FETCh:FMAudio:AF:AUDio:LEFT:AF?
15. Calculate the crosstalk (R → L) as follows:
 
$$\text{Crosstalk} = -20 \times \log(\text{Measured value}/5000) + 3.0103$$
16. Set the frequency at No. 2 and later of Table 5.6.4-2 at Generator Channel 2 of the U8903A and repeat steps 13 to 15.
17. Set the output of Generator Channel 1 of the U8903A to On.
18. Set the output of Generator Channel 2 of the U8903A to Off.
19. Measure FM/Audio.
 

:INITiate:FMAudio:MEASurement:SINGLE

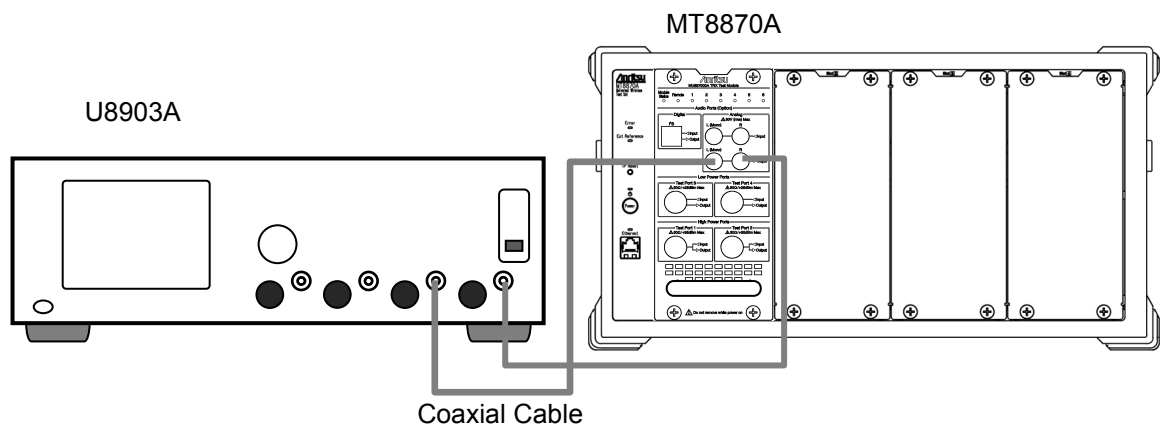
\*WAI
20. Read the level (mV rms) of the right channel.
 

:FETCh:FMAudio:AF:AUDio:RIGHT:AF?
21. Calculate the crosstalk (L → R ) as follows:
 
$$\text{Crosstalk} = -20 \times \log(\text{Measured value}/5000) + 3.0103$$
22. Set the frequency at No. 2 and later of Table 5.6.4-2 at the Generator Channel 1 of the U8903A and repeat steps 19 to 21.
23. Set the U8903A output to Off.

## 5.7 Audio Signal Output Performance Test

### 5.7.1 Connection setup

Figure 5.7.1-1 shows the connection diagram for using the U8903A as the audio analyzer.



**Figure 5.7.1-1 Connection Diagram for Audio Signal Test**

Connect Analyzer Channel 1 of the U8903A to the Analog Output (L (Mono)).

Connect Analyzer Channel 2 of the U8903A to the Analog Output (R).

5.7.2 Checking output level

(1) Specification

Table 5.7.2-1 Specification

| Specification | Conditions                            |
|---------------|---------------------------------------|
| ±0.3 dB       | 1 kHz, 100 kΩ Termination, 20 to 30°C |

(2) Test Procedure

Table 5.7.2-2 Level Settings

| No. | MT8870A Output Level<br>(mV peak) |
|-----|-----------------------------------|
| 1   | 5000                              |
| 2   | 500                               |
| 3   | 10                                |

1. Connect the instruments as shown in Figure 5.7.1-1.
2. Initialize the MT8870A.  
\*RST
3. Set the language mode to SCPI.  
SYST:LANG SCPI
4. Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
5. Set the audio port interface to Analog Output.  
:ROUTE:PORT:AUDio:ROLE OUTPUT  
:ROUTE:PORT:AUDio:OUTPut:SElect ANALOG
6. Set the audio port signal output to Off.  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,OFF  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,OFF
7. Initialize the U8903A.
8. Set the U8903A Analyzer LPF to Off for both Analyzer Channel 1 and Analyzer Channel 2.
9. Set the MT8870A audio signal as follows:  
Frequency: 1 kHz  
Output Level: 5000 mV peak  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency 1,1000  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel 1,5000  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency 1,1000

```
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel  
1,5000
```

10. Set the audio signal output to On.

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,ON  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,ON
```

11. Measure the level (mV rms) at Analyzer Channel 1 of the U8903A.

12. Measure the level (mV rms) at Analyzer Channel 2 of the U8903A.

13. Calculate each output level accuracy as follows:

Output Level Accuracy =  $20 \times \log(\text{Measured value}/\text{Output level}) + 3.0103$

14. Set the frequency at No. 2 and later of Table 5.6.2-2 at the MT8870A and repeat steps 11 to 13.

15. Set the level at No. 2 and later of Table 5.7.2-2 and repeat steps 11 to 14.

16. Set the audio signal output to Off.

```
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,OFF  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,OFF
```

5.7.3 Total harmonic distortion and noise

(1) Specification

Table 5.7.3-1 Specification

| Specification | Conditions                                                               |
|---------------|--------------------------------------------------------------------------|
| <-60 dB       | At 1 kHz, 100 kΩ termination, 1 V peak, 20 Hz to 20 kHz band, 20 to 30°C |

(2) Test Procedure

1. Connect the instruments as shown in Figure 5.7.1-1.
2. Initialize the MT8870A.  
\*RST
3. Set the language mode to SCPI.  
SYST:LANG SCPI
4. Set the application to FM/Audio.  
:INSTrument:SElect FMAUDIO
5. Set the audio port interface to Analog Output.  
:ROUTE:PORT:AUDio:ROLE OUTPUT  
:ROUTE:PORT:AUDio:OUTPut:SElect ANALOG
6. Set the audio port signal output to Off.  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,OFF  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,OFF
7. Initialize the U8903A.
8. Set the audio signal as follows:  
Frequency: 1 kHz  
Output Level: 1000 mV peak  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:FREQuency 1,1000  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT:LEVel 1,1000  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:FREQuency 1,1000  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT:LEVel 1,1000
9. Set the U8903A Analyzer LPF to 30 kHz for both Analyzer Channel 1 and Analyzer Channel 2.
10. Set the audio signal output to On.  
:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,ON  
:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,ON
11. Measure THD+N (dB) at Analyzer Channel 1 of the U8903A.

12. Measure THD+N (dB) at Analyzer Channel 2 of the U8903A.

13. Set the audio signal output to Off.

`:CONFigure:FMAudio:AF:ANALog:GENeration:LEFT 1,OFF`

`:CONFigure:FMAudio:AF:ANALog:GENeration:RIGHT 1,OFF`

## 5.8 Sample format for performance test result sheet

Use the following test result sheet when performing the MX887070A performance tests. Duplicate this sheet as necessary for tests.

|               |       |                     |          |
|---------------|-------|---------------------|----------|
| Test location | _____ | Document No.        | _____    |
|               | _____ | Date                | _____    |
|               | _____ | Person-in-charge    | _____    |
|               | _____ | Ambient temperature | _____ °C |
|               | _____ | Relative humidity   | _____ %  |

|               |          |
|---------------|----------|
| Model Name    |          |
| Serial number | _____    |
| Power Supply  |          |
| Frequency     | _____ Hz |

|               |          |
|---------------|----------|
| Model Name    |          |
| Serial number | _____    |
| Power Supply  |          |
| Frequency     | _____ Hz |

|               |          |
|---------------|----------|
| Model Name    |          |
| Serial number | _____    |
| Power Supply  |          |
| Frequency     | _____ Hz |

|               |          |
|---------------|----------|
| Model Name    |          |
| Serial number | _____    |
| Power Supply  |          |
| Frequency     | _____ Hz |

|         |       |
|---------|-------|
| Remarks | _____ |
|         | _____ |
|         | _____ |

## 5.8.1 Calibrating the signal generator level

Calibrating the Signal Generator (CW)

Table 5.8.1-1 SG Calibration Value (dB)

| Power Meter Level (dBm) | Frequency (MHz) |       |        |
|-------------------------|-----------------|-------|--------|
|                         | 64.99           | 89.99 | 109.99 |
| 0                       |                 |       |        |
| -10                     |                 |       |        |
| -25                     |                 |       |        |
| -30                     |                 |       |        |

Calibrating the Signal Generator (MOD)

Table 5.8.1-2 SG Calibration Value (dB)

| Power Meter Level (dBm) | Frequency (MHz) |       |        |
|-------------------------|-----------------|-------|--------|
|                         | 65.00           | 90.00 | 110.00 |
| 0                       |                 |       |        |

Calibrating Audio Signal Generator Output Level

Table 5.8.1-3 Set Voltage (mV rms)

| Measured Level (mV rms) | Generator Channel |   |
|-------------------------|-------------------|---|
|                         | 1                 | 2 |
| 3535.5                  |                   |   |
| 353.55                  |                   |   |
| 35.355                  |                   |   |
| 7.071                   |                   |   |

## 5.8.2 FM signal input

Input Level Accuracy

Table 5.8.2-1 Port 1 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 15                     |                            |       |        |
| 10                     |                            |       |        |
| 5                      |                            |       |        |
| 0                      |                            |       |        |
| -5                     |                            |       |        |
| -10                    |                            |       |        |
| -15                    |                            |       |        |
| -20                    |                            |       |        |
| -25                    |                            |       |        |
| -30                    |                            |       |        |

Min. specification: -0.7 dB

Max. specification: +0.7 dB

Table 5.8.2-2 Port 2 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 15                     |                            |       |        |
| 10                     |                            |       |        |
| 5                      |                            |       |        |
| 0                      |                            |       |        |
| -5                     |                            |       |        |
| -10                    |                            |       |        |
| -15                    |                            |       |        |
| -20                    |                            |       |        |
| -25                    |                            |       |        |
| -30                    |                            |       |        |

Min. specification: -0.7 dB

Max. specification: +0.7 dB

**Table 5.8.2-3 Port 3 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 15                     |                            |       |        |
| 10                     |                            |       |        |
| 5                      |                            |       |        |
| 0                      |                            |       |        |
| -5                     |                            |       |        |
| -10                    |                            |       |        |
| -15                    |                            |       |        |
| -20                    |                            |       |        |
| -25                    |                            |       |        |
| -30                    |                            |       |        |

Min specification: -0.7 dB

Max. specification: +0.7 dB

**Table 5.8.2-4 Port 4 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 15                     |                            |       |        |
| 10                     |                            |       |        |
| 5                      |                            |       |        |
| 0                      |                            |       |        |
| -5                     |                            |       |        |
| -10                    |                            |       |        |
| -15                    |                            |       |        |
| -20                    |                            |       |        |
| -25                    |                            |       |        |
| -30                    |                            |       |        |

Min. specification: -0.7 dB

Max. specification: +0.7 dB

Carrier Frequency Accuracy

$$f = \text{Set frequency} \times \text{Reference oscillator accuracy} + 1 \text{ Hz}$$

The specification values are as follows when the reference oscillator accuracy is 0.1 ppm.

| Rx Frequency | Specification                                              |
|--------------|------------------------------------------------------------|
| 65.00 MHz    | $f = 65 \times 10^6 \times 10^{-7} + 1 = 7.5 \text{ (Hz)}$ |
| 90.00 MHz    | $f = 90 \times 10^6 \times 10^{-7} + 1 = 10 \text{ (Hz)}$  |
| 110.00 MHz   | $f = 110 \times 10^6 \times 10^{-7} + 1 = 12 \text{ (Hz)}$ |

In this case, the max. specification for an Rx frequency of 65.00 MHz is +7.5 Hz and the min. specification is -7.5 Hz.

Table 5.8.2-5 Port 1 Measured Value (Hz)

| Level Setting (dBm) | MT8870A Rx Frequency (MHz) |       |        |
|---------------------|----------------------------|-------|--------|
|                     | 65.00                      | 90.00 | 110.00 |
| 0                   |                            |       |        |

Table 5.8.2-6 Port 2 Measured Value (Hz)

| Level Setting (dBm) | MT8870A Rx Frequency (MHz) |       |        |
|---------------------|----------------------------|-------|--------|
|                     | 65.00                      | 90.00 | 110.00 |
| 0                   |                            |       |        |

Table 5.8.2-7 Port 3 Measured Value (Hz)

| Level Setting (dBm) | MT8870A Rx Frequency (MHz) |       |        |
|---------------------|----------------------------|-------|--------|
|                     | 65.00                      | 90.00 | 110.00 |
| 0                   |                            |       |        |

Table 5.8.2-8 Port 4 Measured Value (Hz)

| Level Setting (dBm) | MT8870A Rx Frequency (MHz) |       |        |
|---------------------|----------------------------|-------|--------|
|                     | 65.00                      | 90.00 | 110.00 |
| 0                   |                            |       |        |

Residual Vector Error

**Table 5.8.2-9 Port 1 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 55 dB

**Table 5.8.2-10 Port 2 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 55 dB

**Table 5.8.2-11 Port 3 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A Rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 55 dB

**Table 5.8.2-12 Port 4 Measured Value (dB)**

| Level Setting<br>(dBm) | MT8870A rx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 55 dB

5.8.3 FM signal output

Waveform Distortion

Table 5.8.3-1 Port 1 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Tx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 50 dB

Table 5.8.3-2 Port 2 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Tx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 50 dB

Table 5.8.3-3 Port 3 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Tx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 50 dB

Table 5.8.3-4 Port 4 Measured Value (dB)

| Level Setting<br>(dBm) | MT8870A Tx Frequency (MHz) |       |        |
|------------------------|----------------------------|-------|--------|
|                        | 65.00                      | 90.00 | 110.00 |
| 0                      |                            |       |        |

Min. specification: 50 dB

## 5.8.4 Audio signal measurement

Input Level Accuracy

Table 5.8.4-1 Left Measured Value (dB)

| Frequency<br>(Hz) | Level Setting (mV rms) |        |        |       |
|-------------------|------------------------|--------|--------|-------|
|                   | 3535.5                 | 353.55 | 35.355 | 7.071 |
| 20                |                        |        |        |       |
| 50                |                        |        |        |       |
| 100               |                        |        |        |       |
| 200               |                        |        |        |       |
| 300               |                        |        |        |       |
| 500               |                        |        |        |       |
| 1000              |                        |        |        |       |
| 2000              |                        |        |        |       |
| 3000              |                        |        |        |       |
| 5000              |                        |        |        |       |
| 10000             |                        |        |        |       |
| 11000             |                        |        |        |       |
| 12000             |                        |        |        |       |
| 13000             |                        |        |        |       |
| 14000             |                        |        |        |       |
| 15000             |                        |        |        |       |
| 16000             |                        |        |        |       |
| 17000             |                        |        |        |       |
| 18000             |                        |        |        |       |
| 19000             |                        |        |        |       |
| 20000             |                        |        |        |       |

Min. specification:      –0.4 dB

Max. specification:      +0.4 dB

5.8 Sample format for performance test result sheet

Table 5.8.4-2 Right Measured Value (dB)

| Frequency<br>(Hz) | Level Setting (mV rms) |        |        |       |
|-------------------|------------------------|--------|--------|-------|
|                   | 3535.5                 | 353.55 | 35.355 | 7.071 |
| 20                |                        |        |        |       |
| 50                |                        |        |        |       |
| 100               |                        |        |        |       |
| 200               |                        |        |        |       |
| 300               |                        |        |        |       |
| 500               |                        |        |        |       |
| 1000              |                        |        |        |       |
| 2000              |                        |        |        |       |
| 3000              |                        |        |        |       |
| 5000              |                        |        |        |       |
| 10000             |                        |        |        |       |
| 11000             |                        |        |        |       |
| 12000             |                        |        |        |       |
| 13000             |                        |        |        |       |
| 14000             |                        |        |        |       |
| 15000             |                        |        |        |       |
| 16000             |                        |        |        |       |
| 17000             |                        |        |        |       |
| 18000             |                        |        |        |       |
| 19000             |                        |        |        |       |
| 20000             |                        |        |        |       |

Min. specification: -0.4 dB

Max. specification: +0.4 dB

5

Performance Test

Input Waveform Distortion

Table 5.8.4-3 Measured Value (dB)

| Channel | Min.<br>Specification | Measured<br>Value | Max.<br>Specification |
|---------|-----------------------|-------------------|-----------------------|
| Left    |                       |                   | -60                   |
| Right   |                       |                   | -60                   |

Crosstalk

Table 5.8.4-4 Right → Left

| Frequency<br>(Hz) | Crosstalk (dB)        |                   |                       |
|-------------------|-----------------------|-------------------|-----------------------|
|                   | Min.<br>Specification | Measured<br>Value | Max.<br>Specification |
| 20                | 60                    |                   |                       |
| 100               | 60                    |                   |                       |
| 1000              | 60                    |                   |                       |
| 10000             | 60                    |                   |                       |
| 20000             | 60                    |                   |                       |

Table 5.8.4-5 Left → Right

| Frequency<br>(Hz) | Crosstalk (dB)        |                   |                       |
|-------------------|-----------------------|-------------------|-----------------------|
|                   | Min.<br>Specification | Measured<br>Value | Max.<br>Specification |
| 20                | 60                    |                   |                       |
| 100               | 60                    |                   |                       |
| 1000              | 60                    |                   |                       |
| 10000             | 60                    |                   |                       |
| 20000             | 60                    |                   |                       |

5.8.5 Audio signal output

Output Level Accuracy

Table 5.8.5-1 Left Measured Value (dB)

| Frequency<br>(Hz) | Level Setting (mV peak) |     |    |
|-------------------|-------------------------|-----|----|
|                   | 5000                    | 500 | 10 |
| 20                |                         |     |    |
| 50                |                         |     |    |
| 100               |                         |     |    |
| 200               |                         |     |    |
| 300               |                         |     |    |
| 500               |                         |     |    |
| 1000              |                         |     |    |
| 2000              |                         |     |    |
| 3000              |                         |     |    |
| 5000              |                         |     |    |
| 10000             |                         |     |    |
| 11000             |                         |     |    |
| 12000             |                         |     |    |
| 13000             |                         |     |    |
| 14000             |                         |     |    |
| 15000             |                         |     |    |
| 16000             |                         |     |    |
| 17000             |                         |     |    |
| 18000             |                         |     |    |
| 19000             |                         |     |    |
| 20000             |                         |     |    |

Min. specification:        −0.4 dB  
Max. specification:        +0.4 dB

**Table 5.8.5-2 Right Measured Value (dB)**

| Frequency<br>(Hz) | Level Setting (mV peak) |     |    |
|-------------------|-------------------------|-----|----|
|                   | 5000                    | 500 | 10 |
| 20                |                         |     |    |
| 50                |                         |     |    |
| 100               |                         |     |    |
| 200               |                         |     |    |
| 300               |                         |     |    |
| 500               |                         |     |    |
| 1000              |                         |     |    |
| 2000              |                         |     |    |
| 3000              |                         |     |    |
| 5000              |                         |     |    |
| 10000             |                         |     |    |
| 11000             |                         |     |    |
| 12000             |                         |     |    |
| 13000             |                         |     |    |
| 14000             |                         |     |    |
| 15000             |                         |     |    |
| 16000             |                         |     |    |
| 17000             |                         |     |    |
| 18000             |                         |     |    |
| 19000             |                         |     |    |
| 20000             |                         |     |    |

Min. specification:      –0.4 dB

Max. specification:      +0.4 dB

## 5.9 Servicing

If MU887000A is damaged or does not meet the specifications, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the DVD version.

When requesting repair, supply the following information:

- (a) Model name, and serial number located on the rear panel
- (b) Symptoms
- (c) Name of contact who knows failure and to be notified upon completion of repair
- (d) Software version



## Appendix A Specifications

Appendix A describes the MX887070A specifications. Refer to Section 1.3 “Product Configuration for the product configuration, options, and application parts”.

These specifications assume use of the system at a constant temperature after warming-up the instruments for 30 minutes.

**Table A-1 Transmission Measurement**

| Items                          | Specifications                                                                                                                                                                                                                                                    |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Target Measurements            | FM/FM Stereo/RDS (Radio Data System) signals                                                                                                                                                                                                                      |
| Frequency Range                | 65 to 110 MHz                                                                                                                                                                                                                                                     |
| Measurement Functions          | Amplitude, Carrier Frequency, Frequency Deviation, Occupied Bandwidth, Pilot Frequency Deviation, Audio Frequency Deviation, Audio Frequency, Pilot Frequency, THD, THD+N/SINAD, SNR                                                                              |
| Audio filter                   | Low pass filter: OFF, 3 kHz, 15 kHz, 20 kHz, 30 kHz<br>High pass filter: OFF, 20 Hz, 100 Hz, 300 Hz, 400 Hz<br>De-emphasis filter: OFF, 50 $\mu$ s, 75 $\mu$ s, 750 $\mu$ s<br>Band pass filter: OFF, A-weighting (IEC 61672:2003), C-message, CCITT (ITU-T O.41) |
| Input Level Range              | –30 to +15 dBm (Test Port 1/2)<br>–30 to +15 dBm (Test Port 3/4)                                                                                                                                                                                                  |
| Level Accuracy                 | Test port 1,2: $\pm 0.7$ dB* <sup>1</sup><br>Test port 3,4: $\pm 0.7$ dB* <sup>1</sup>                                                                                                                                                                            |
| Carrier Frequency Accuracy     | $\pm (\text{Frequency Setting} \times \text{Reference oscillator accuracy} + 1 \text{ Hz})^{*2}$                                                                                                                                                                  |
| FM Deviation Measurement Range | 1 to 100 kHz                                                                                                                                                                                                                                                      |
| Residual FM                    | >55 dB* <sup>3</sup>                                                                                                                                                                                                                                              |
| Demodulation Signal Analysis   | No. of FFT Points: 65536<br>Sampling Rate: 152 kHz<br>FFT Window Function: Hanning                                                                                                                                                                                |

\*1: At 1.2 MHz measurement bandwidth, 10 to 40°C,  $-30 \text{ dBm} \leq \text{Level} \leq +15 \text{ dBm}$

\*2: At FM Mono modulation, 1-kHz tone frequency, 75-kHz deviation

\*3: Using Mono, 1-kHz tone frequency, 75-kHz deviation, 20 Hz to 15 kHz demodulation band, and 50- $\mu$ s de-emphasis

**Table A-2 Reception Measurement**

| Items                      | Specifications                                                              |
|----------------------------|-----------------------------------------------------------------------------|
| Target Measurements        | FM/FM Stereo/RDS (Radio Data System) signals                                |
| Frequency Range            | 65 to 110 MHz                                                               |
| Measurement Functions      | FM Modulation waveform output                                               |
| Modulation Method          | FM Mono, FM Stereo                                                          |
| Frequency Deviation        |                                                                             |
| Setting Range              | 20 to 100 kHz                                                               |
| Distortion                 | >50 dB (SINAD)* <sup>1</sup>                                                |
| Resolution                 | 0.1 Hz                                                                      |
| Internal Modulation Signal | AF Tone<br>Left channel (Mono): 1 to 8 tones<br>Right channel: 1 to 8 tones |
| Frequency Range            | 20 Hz to 20 kHz                                                             |
| Resolution                 | 0.1 Hz                                                                      |

\*1: 65 to 110 MHz RF modulation, (SINAD, 20 Hz to 15 kHz frequency, Emphasis On, Mono, 75-kHz tone deviation, 1-kHz tone frequency)

**Table A-3 Audio Transmission Measurement\*<sup>1</sup>**

| Items                              | Specifications                                                                                                                                                               |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurement Functions              | Amplitude, Frequency, Crosstalk, THD, THD+N/SINAD, SNR                                                                                                                       |
| Analog Measurements* <sup>2</sup>  |                                                                                                                                                                              |
| Impedance                          | 100 k $\Omega$ , AC Coupling                                                                                                                                                 |
| Frequency Measurement              |                                                                                                                                                                              |
| Frequency Range                    | 20 Hz to 20 kHz                                                                                                                                                              |
| Level                              |                                                                                                                                                                              |
| Measurement range                  | 1 mV <sub>peak</sub> to 5 V <sub>peak</sub> (30 V <sub>rms</sub> max.)                                                                                                       |
| Input Range Setting                | 50 mV <sub>peak</sub> , 500 mV <sub>peak</sub> , 5 V <sub>peak</sub>                                                                                                         |
| Level Accuracy                     | $\pm 0.4$ dB (20 to 30°C)                                                                                                                                                    |
| THD+N* <sup>3</sup>                | <-60 dB                                                                                                                                                                      |
| Crosstalk (L,R)                    | >60 dB                                                                                                                                                                       |
| AF Signal Analysis                 | Sampling Rate: 192 kHz<br>No. of FFT Points: 65536<br>FFT Window Function: Hanning                                                                                           |
| Digital Measurements* <sup>2</sup> |                                                                                                                                                                              |
| Word Length                        | 16/24 bits                                                                                                                                                                   |
| Sampling Rate                      | 16 kHz, 32 kHz, 44.1 kHz, 48 kHz                                                                                                                                             |
| AF Signal Analysis                 | No. of FFT Points: 16384 points (Sampling rate 44.1 kHz, 48 kHz)<br>8192 points (Sampling rate 32 kHz)<br>4096 points (Sampling rate 16 kHz)<br>FFT Window Function: Hanning |

\*1: Requires MU887000A-002/102 Audio Measurement Hardware

\*2: All standard values at single tone measurement

\*3: At 1 kHz, 2 V<sub>peak</sub>, 20 Hz to 20kHz band, 5 V<sub>peak</sub> range, 20 to 30°C

**Table A-4 Audio Reception Measurement\*<sup>1</sup>**

| Items                              | Specifications                                                                                                                      |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Analog Measurements* <sup>2</sup>  |                                                                                                                                     |
| Impedance                          | 1 $\Omega$ (nominal), AC Coupling                                                                                                   |
| Output Waveform                    | Single Tone/Multi-tone                                                                                                              |
| Frequency                          |                                                                                                                                     |
| Frequency Range                    | 20 Hz to 20 kHz                                                                                                                     |
| Frequency Resolution               | 0.01 Hz                                                                                                                             |
| Output Level                       |                                                                                                                                     |
| Level Range* <sup>3</sup>          | 0 (off), 1 mV to 5 V <sub>peak</sub>                                                                                                |
| Level Resolution                   | 1 mV ( $\leq 5$ V <sub>peak</sub> )<br>100 $\mu$ V ( $\leq 500$ mV <sub>peak</sub> )<br>10 $\mu$ V ( $\leq 50$ mV <sub>peak</sub> ) |
| Level Accuracy* <sup>4</sup>       | $\pm 0.3$ dB                                                                                                                        |
| Max. Output Current* <sup>5</sup>  | 100 mA (nominal)                                                                                                                    |
| THD+N* <sup>4,6</sup>              | $< -60$ dB                                                                                                                          |
| Digital Measurements* <sup>2</sup> |                                                                                                                                     |
| Output Waveform                    | Single Tone/Multi-tone                                                                                                              |
| Frequency                          |                                                                                                                                     |
| Frequency Range                    | 20 Hz to 20 kHz (Sampling rate 44.1 kHz, 48 kHz)<br>20 Hz to 14 kHz (Sampling rate 32 kHz)<br>20 Hz to 7 kHz (Sampling rate 16 kHz) |
| Frequency Resolution               | 0.01 Hz                                                                                                                             |
| Output Level                       |                                                                                                                                     |
| Level Range                        | Full Scale to (Full Scale – 40 dB)                                                                                                  |
| Level Resolution                   | 0.1 dB                                                                                                                              |
| Word Length                        | 16/24 bits                                                                                                                          |
| Sampling Rate                      | 16 kHz, 32 kHz, 44.1 kHz, 48 kHz                                                                                                    |

\*1: Requires MU887000A-002/102 Audio Measurement Hardware

\*2: All standard values at single tone measurement

\*3: 100 k $\Omega$  termination

\*4: At 1 kHz, 100-k $\Omega$  termination, 20 to 30°C

\*5: No short circuit

\*6: 1 V<sub>peak</sub>, 20 Hz to 20 kHz band

# Appendix B Digital Interface

## B.1 Pin Assignment and Electrical Characteristics

This section describes the pin assignment of the digital interface and the electrical characteristics. For the connector location, refer to 2.1.2 “Setting the ports”.

Figure B.1-1 shows the connector pinout.

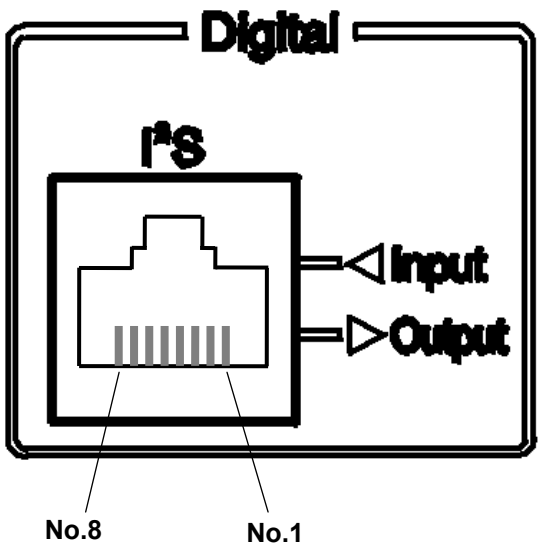


Figure B.1-1 Digital Interface Connector (RJ45) Pinout

Table B.1-1 lists the digital interface pin signal assignment.

Table B.1-1 Digital Interface Connector Pin Assignment

| Pin No. | Signal Name | Details                 | Input/Output |
|---------|-------------|-------------------------|--------------|
| 1       | SD          | serial data             | Input/Output |
| 2       | GND         | ground                  | Output       |
| 3       | WS          | word select             | Input/Output |
| 4       | GND         | ground                  | Output       |
| 5       | SCK         | continuous serial clock | Input/Output |
| 6       | GND         | ground                  | Output       |
| 7       | MCK         | master clock            | Input/Output |
| 8       | GND         | ground                  | Output       |

Table B.1-2 lists the electrical characteristics of the digital interface connector.

**Table B.1-2 Electrical Specifications**

| <b>Signal Name</b> | <b>Input/Output</b> | <b>Specification</b>                                                                                         |
|--------------------|---------------------|--------------------------------------------------------------------------------------------------------------|
| SD                 | Input/Output        | Output Level: 3.3 V-CMOS<br>Input Level: TTL (5 V-tolerant)<br>Data Rate: 16, 32, 44.1, 48 ksample/s         |
| WS                 | Input/Output        | Output Level: 3.3 V-CMOS<br>Input Level: TTL (5 V-tolerant)<br>Frequency: 16, 32, 44.1, 48 kHz               |
| SCK                | Input/Output        | Output Level: 3.3 V-CMOS<br>Input Level: TTL (5 V-tolerant)<br>Frequency: WS x 64 (at output from MU887000A) |
| MCK                | Input/Output        | Output Level: 3.3 V-CMOS<br>Input Level: TTL (5 V-tolerant)<br>Frequency: WS x 128                           |

## B.2 Functions and Restrictions

This section explains the digital interface functions and restrictions.

Table B.2-1 lists the digital interface functions.

**Table B.2-1 Functions**

| Mode                                       | Setting        | Explanation of Function                                                                                                              |
|--------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| DUT Type                                   | FM Receiver    | The MU887000A panel Audio Port Input lamp lights when the Digital Audio Input Mode is entered.                                       |
|                                            | FM Transmitter | The MU887000A panel Audio Port Output lamp lights when the Digital Audio Output Mode is entered.                                     |
| I <sup>2</sup> S SCK/WS Direction          | Input          | Uses clocked input signal at connector as SCK, WS.                                                                                   |
|                                            | Output         | Uses internal clock as SCK, WS and outputs from connector.                                                                           |
| I <sup>2</sup> S MCK Direction             | Input          | Uses clocked input signal at connector as MCK.                                                                                       |
|                                            | Output         | Uses internal clock as MCK, and outputs from connector.                                                                              |
|                                            | Disable        | Uses internal clock as MCK but does not output from connector. Does not use as MCK even when inputting external signal to connector. |
| I <sup>2</sup> S Input Word Length (bits)  | 16             | Assigns 16 bits as word length per sample for SD input signal.                                                                       |
|                                            | 24             | Assigns 24 bits as word length per sample for SD input signal.                                                                       |
| I <sup>2</sup> S Output Word Length (bits) | 16             | Assigns 16 bits as word length per sample for SD output signal.                                                                      |
|                                            | 24             | Assigns 24 bits as word length per sample for SD output signal.                                                                      |

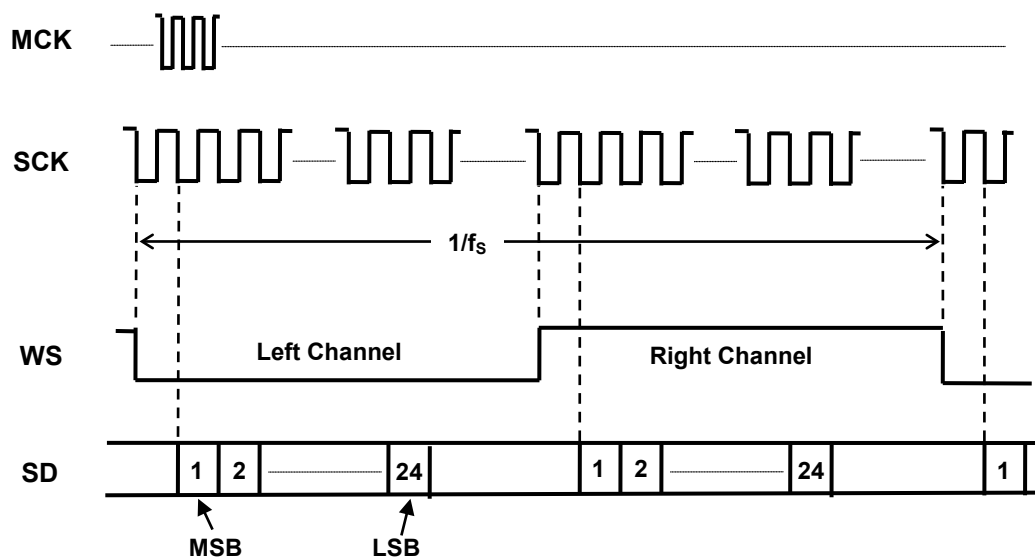
### Restrictions

- When the digital interface input/output direction is set to output, do not input an external signal.
- When the I<sup>2</sup>S SCK/WS input/output direction is set to input, only input can be selected for the I<sup>2</sup>S MCK input/output direction. This requires the MCK signal input.
- The MCK clock frequency is 128 times the sampling frequency. The multiplier cannot be changed.
- When the I<sup>2</sup>S SCK/WS input/output direction is set to output, the SCK clock frequency output from the MU887000A is 64 times the sampling frequency. When the input/output direction is set to input, there is no special restriction.

## B.3 Digital Audio Data Format

This section explains the digital audio data format.

The MU887000A-002/102 supports the I<sup>2</sup>S digital audio data format.



The MCK is 128 times of the WS frequency ( $f_s$ ) and there are no phase limits.

When the MU887000A outputs SCK, the SCK frequency is 64 times of the WS frequency ( $f_s$ ). There are no special restrictions when the MU887000A inputs SCK.

$f_s$ : Sampling frequency

Figure B.3-1 Digital Audio Data Format (When I<sup>2</sup>S Output Word Length Is Set to 24 bits)

## B.4 Data Input/Output Timing

This section shows the digital interface SD input/output data and the SCK, WS clock timing.

### B.4.1 Timing at Digital Audio Input

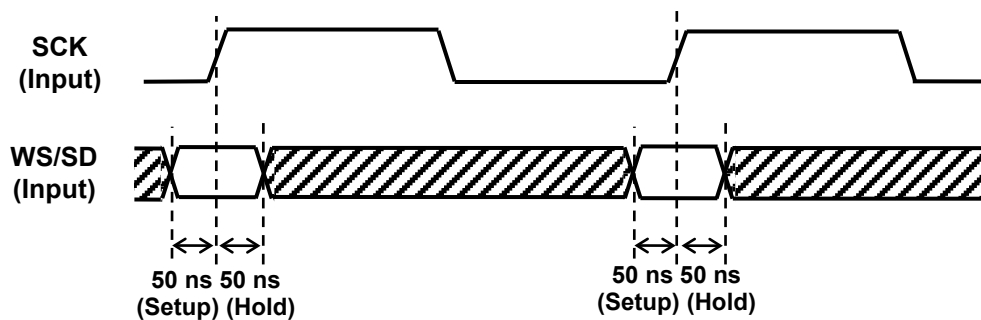


Figure B.4.1-1 WS/SD Input Timing When I<sup>2</sup>S SCK/WS Input/Output Direction is Input

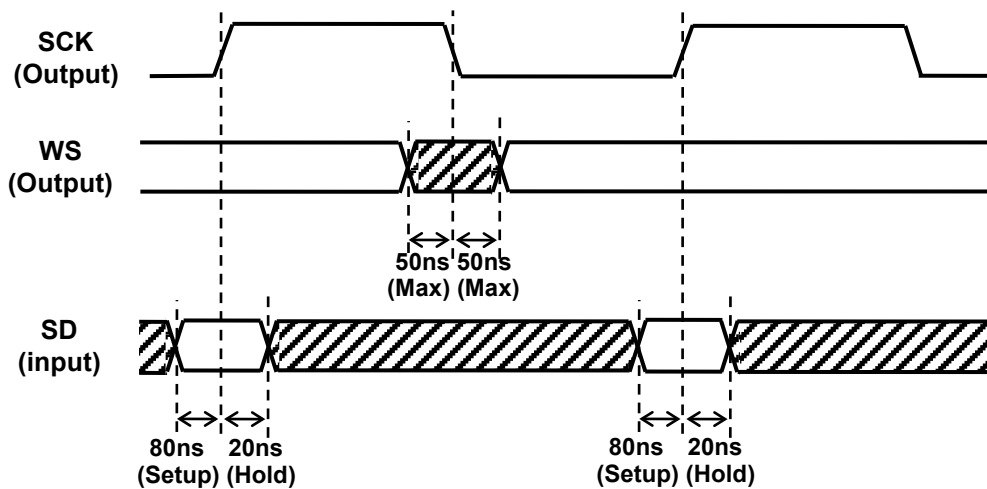


Figure B.4.1-2 WS/SD Input/Output Timing When I<sup>2</sup>S SCK/WS Input/Output Direction is Output

## B.4.2 Timing at Digital Audio Output

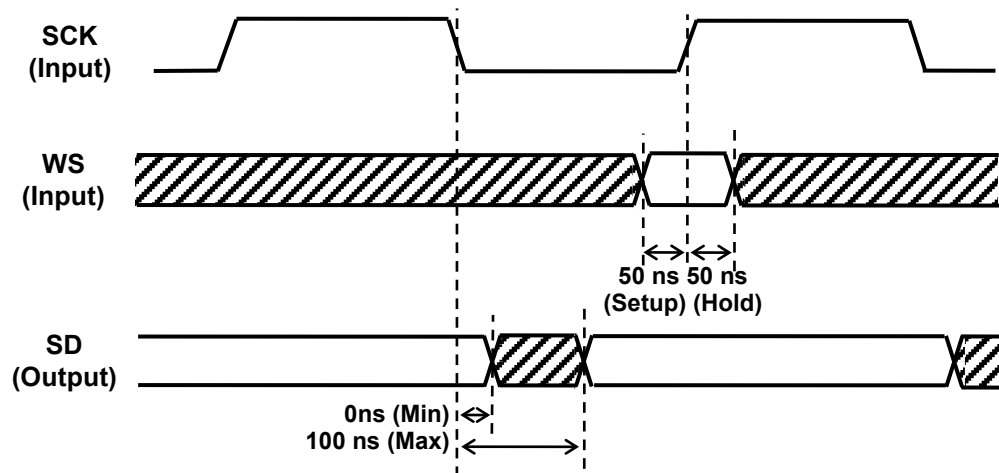


Figure B.4.2-1 WS/SD Input/Output Timing When I<sup>2</sup>S SCK/WS Input/Output Direction is Input

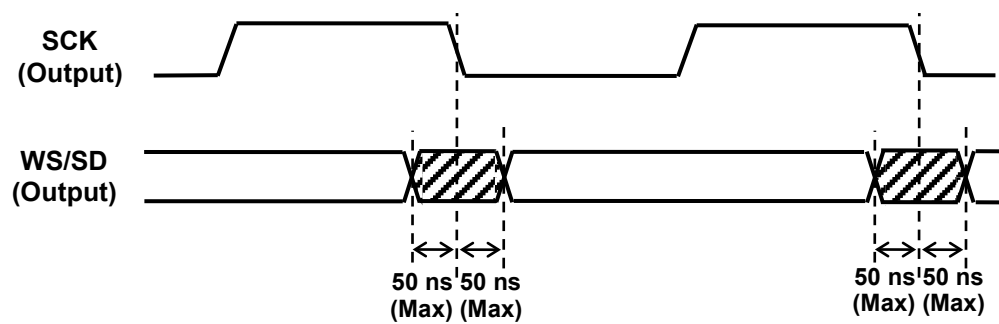


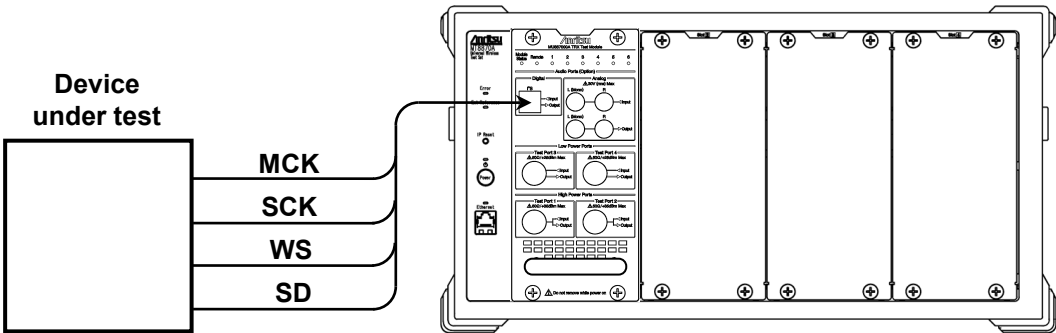
Figure B.4.2-2 WS/SD Output Timing When I<sup>2</sup>S SCK/WS Input/Output Direction is Output

## B.5 Connection Method

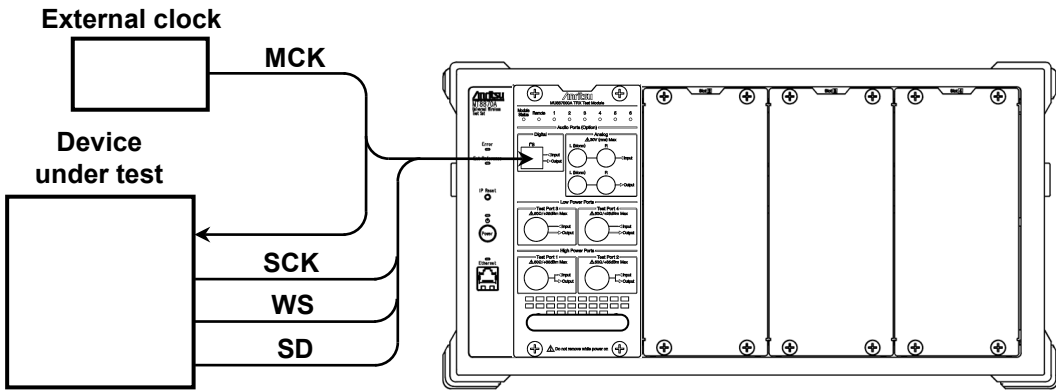
This section shows how to connect the DUT and MU887000A.

### B.5.1 Digital Audio Input for SCK Clock Input

Figure B.5.1-1 shows how to connect the digital audio input when inputting the SCK clock to the digital port.



(1) When outputting MCK from DUT

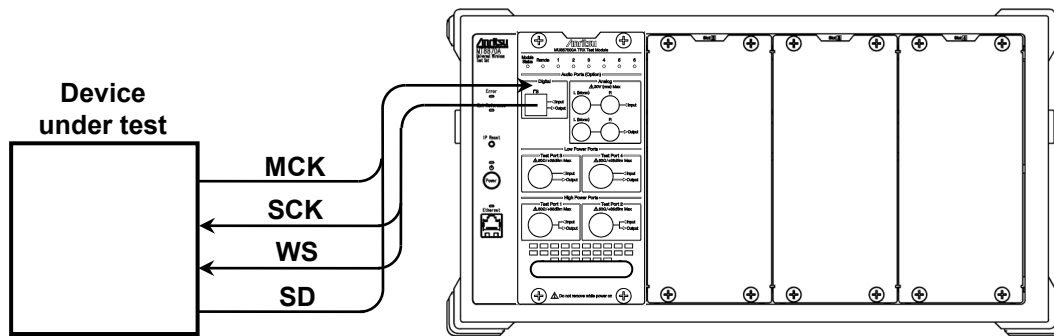


(2) When inputting MCK to DUT

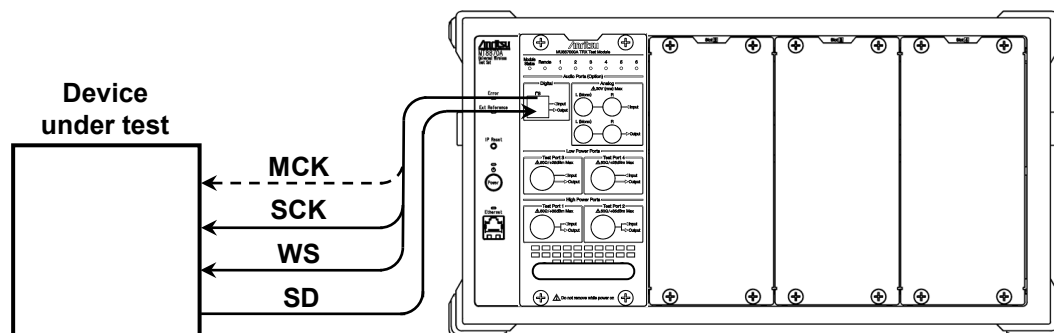
Figure B.5.1-1 Digital Audio Input Connection for SCH Clock Input

## B.5.2 Digital Audio Input for SCK Clock Output

Figure B.5.2-1 shows how to connect the digital audio input when outputting the SCK clock from the digital port.



(1) When outputting MCK from DUT

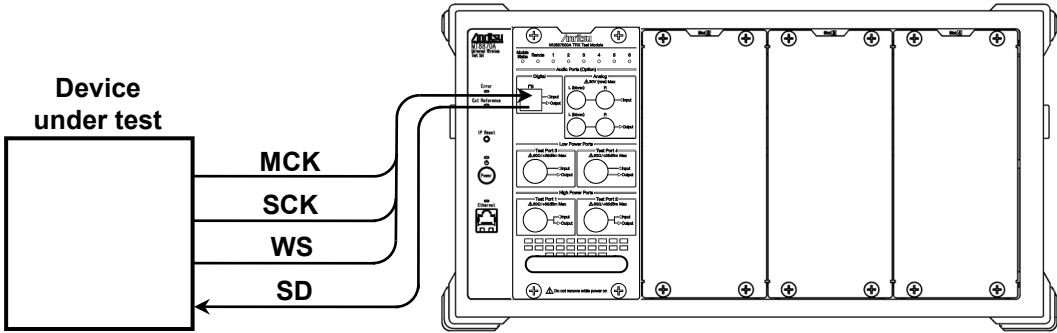


(2) When inputting MCK to DUT or not using MCK

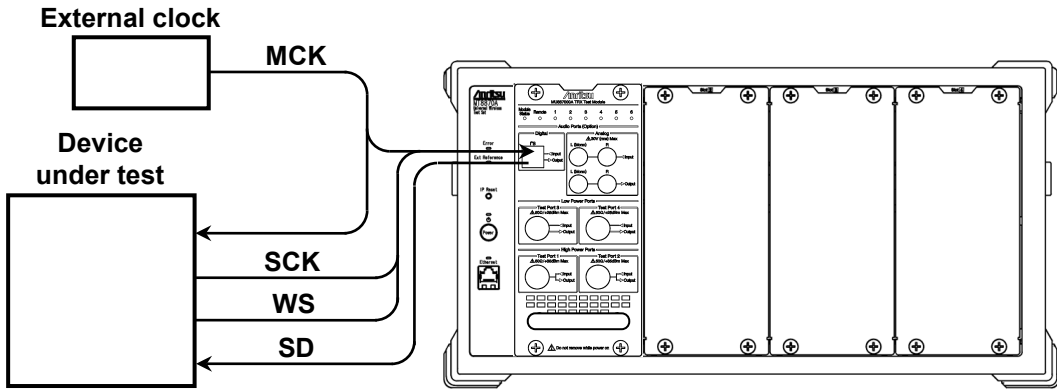
Figure B.5.2-1 Digital Audio Input Connection for SCH Clock Output

B.5.3 Digital Audio Output for SCK Clock Input

Figure B.5.3-1 shows how to connect the digital audio output when inputting the SCK clock to the digital port.



(1) When outputting MCK from DUT

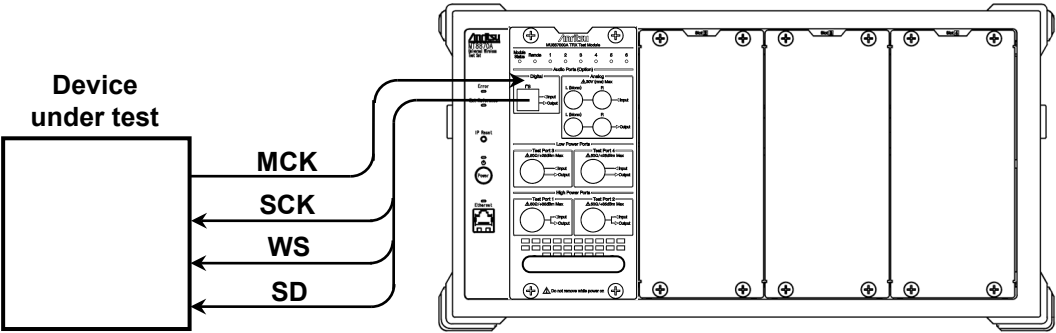


(2) When inputting MCK to DUT

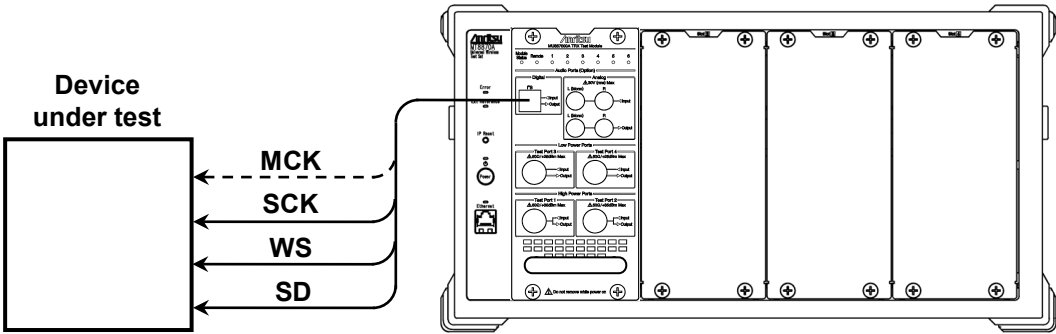
Figure B.5.3-1 Digital Audio Output Connection for SCH Clock Input

B.5.4 Digital Audio Output for SCK Clock Output

Figure B.5.4-1 shows how to connect the digital audio output when inputting the SCK clock to the digital port.



(1) When outputting MCK from DUT



(2) When inputting MCK to DUT or not using MCK

Figure B.5.4-1 Digital Audio Output Connection for SCK Clock Output

References are page numbers.

## **A**

AM modulation ..... 2-9  
audio signal measurement..... 2-45  
audio signal output ..... 2-37

## **B**

Band pass filter ..... 2-17  
binary data..... 2-24, 2-48

## **C**

Crosstalk ..... 2-22

## **D**

De-Emphasis filter ..... 2-17

## **H**

High pass filter ..... 2-17

## **L**

Low pass filter ..... 2-17

## **M**

Measuring FM Signals..... 2-17

## **P**

performance tests ..... 5-2  
pilot signal ..... 2-9

## **S**

SINAD ..... 2-22  
SNR ..... 2-21  
Suffix code list ..... 3-16

## **T**

THD ..... 2-21  
THD+N..... 2-21  
Tone signal ..... 2-9  
Transmitting FM Signals..... 2-8  
Trigger..... 2-4  
trigger level..... 2-4  
trigger source..... 2-4  
Trigger Timeout..... 2-4

## **W**

Waveform pattern..... 2-8

