

MX887090A Multi-DUT Measurement Scheduler Operation Manual

Second 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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MX887090A
Multi-DUT Measurement Scheduler
Operation Manual

31 July 2014 (First Edition)
28 November 2014 (Second Edition)

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1. Product Model

Software: MX887090A Multi-DUT Measurement Scheduler

2. Applied Directive and Standards

When the MX887090A Multi-DUT Measurement Scheduler 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 MX887090A can be used with.

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C-Tick marking



1. Product Model

Software: MX887090A Multi-DUT Measurement Scheduler

2. Applied Directive and Standards

When the MX887090A Multi-DUT Measurement Scheduler 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 MX887090A can be used with.


About This Manual

This manual mainly describes the operation of the MX887090A Multi-DUT Measurement Scheduler.

Products related to the MT8870A Universal Wireless Test Set include:

- MT8870A Universal Wireless Test Set (main unit)
- Modules installed in the MT8870A
- Application software installed in the modules
- Control software installed in a PC controller

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

 this manual

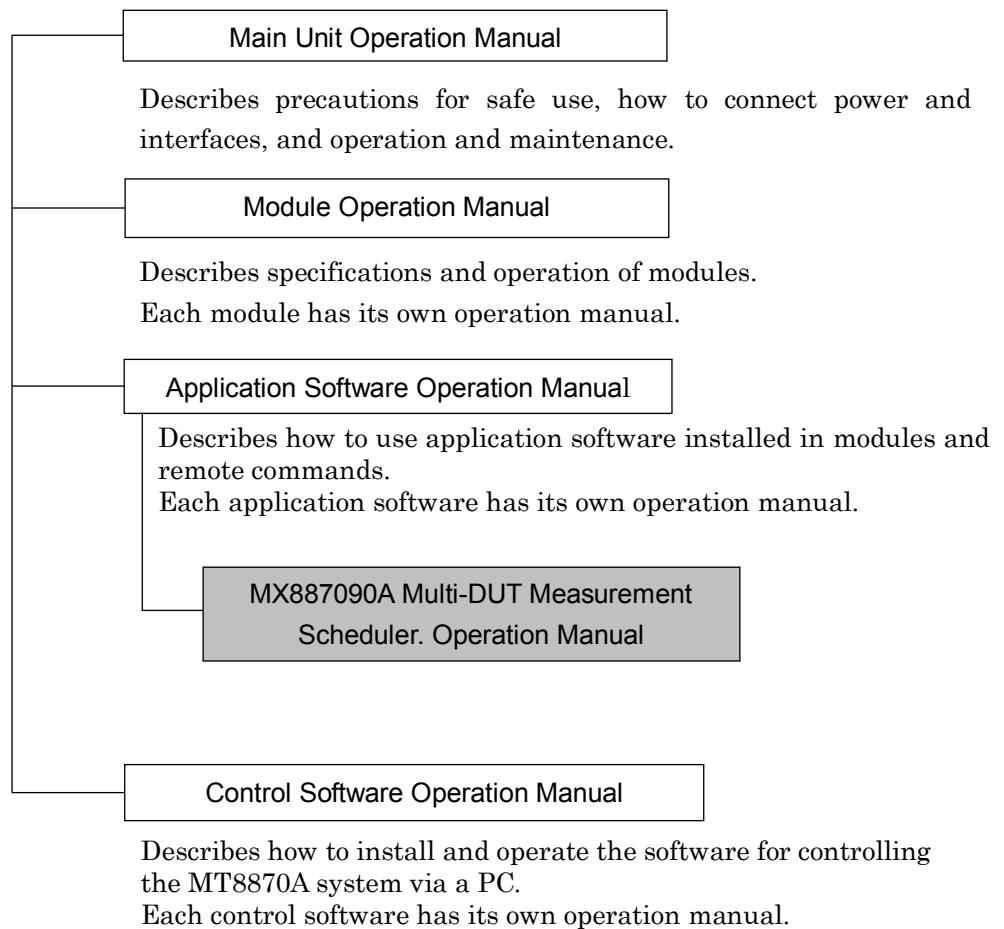


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Chapter 1 Outline

This chapter outlines the functions of the MX887090A Multi-DUT Measurement Scheduler, product configuration and License registration. For performance specifications and functions, refer to Appendix A “Specifications”.

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1.1 MX887090A Outline

The MX887090A Multi DUT Measurement Scheduler (hereafter this software) is the software to realize RF-Semaphore function in the MT8870A Universal Wireless Test Set (hereafter MT8870A).

By installing this software in addition to the application software, the entire measurement time can be shortened when multiple DUTs are measured (RF-Semaphore function).

The MX887090A has the following functions:

- Multiple DUTs are controlled by switching multiple virtual instruments (hereafter VI) inside the measuring instrument.
- The average measurement time per DUT is shortened by segmentalizing measurement process to increase the operation time of the measuring instrument.

Figure 1.1-1 shows how the measurement time is shortened and Figure 1.1-2 shows the connection of devices in RF-Semaphore operation.

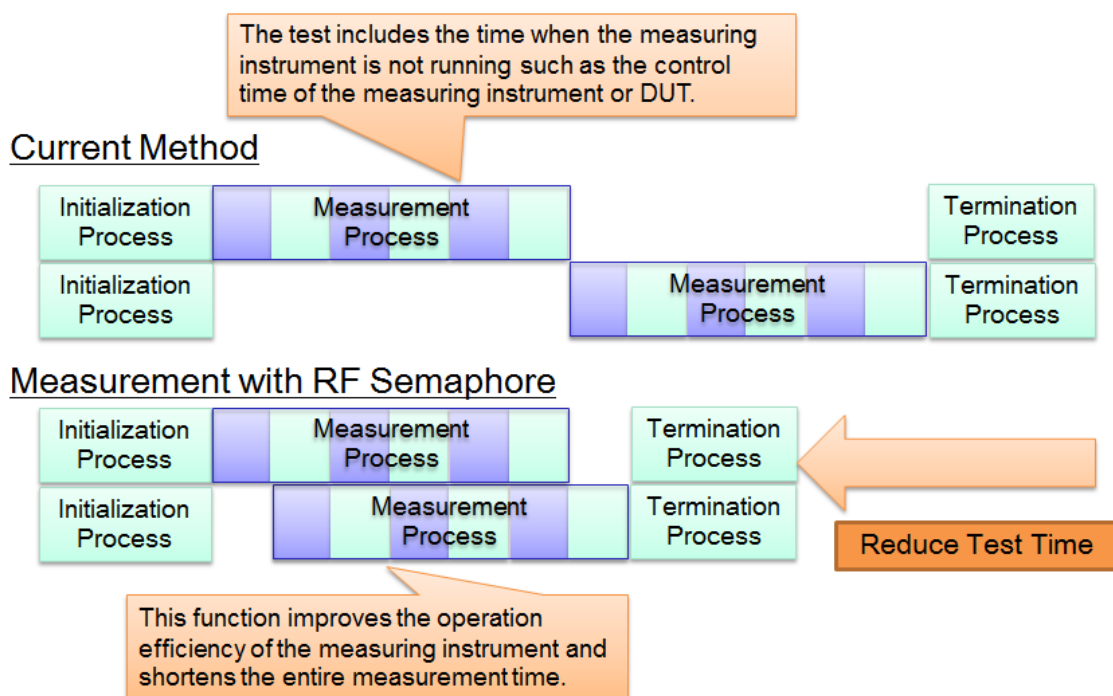


Figure 1.1-1 Reducing Measurement Time in RF-Semaphore Operation

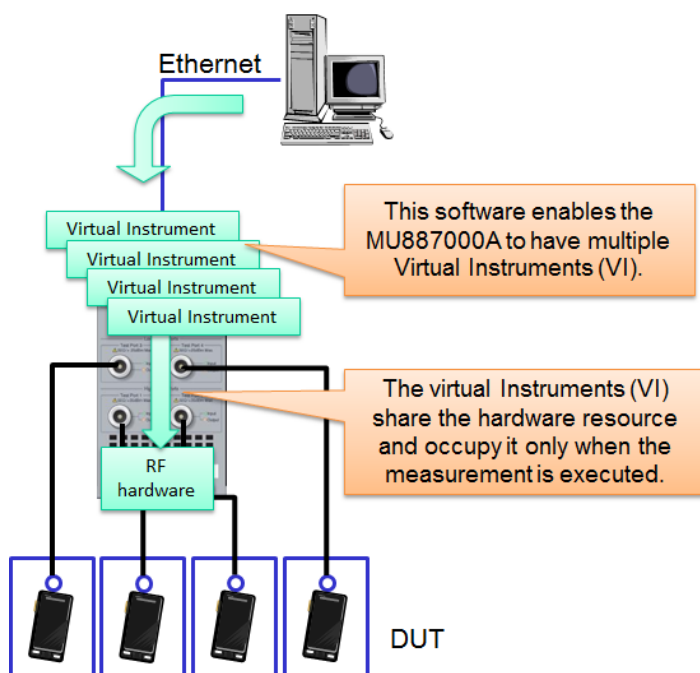


Figure 1.1-2 Connection of Devices in RF-Semaphore Operation

1.2 Features

The software features:

- The measurement throughput can be improved by using the MU887000A most efficiently without making a special program.

1.3 Product Configuration

The standard MX887090A configuration is listed in the following table.

Table 1.3-1 Standard Configuration

Items	Model/Symbol	Product name	Qty	Items
Main Object		DVD	1	
	MX887090A	Multi-DUT Measurement Scheduler		On DVD
	W3727AE	MX887090A Multi-DUT Measurement Scheduler Operation Manual		English, on DVD

1.4 License Registration

A license is required to use the MX887090A 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.

Chapter 2 Before Use

This chapter explains the basic functions of the MX887090A. For details of commands, refer to 4 “SCPI Command Reference” and 5 “Native Command Reference”.

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2.1 Connection with Virtual Instruments

This software has multiple virtual instruments (VI) inside the measuring instrument to realize RF-Semaphore function. Multiple DUTs can be controlled by switching those VIs.

2.1.1 Outline of Multiple Sessions

This software provides multiple sessions for VXI-11*¹ and Raw-Socket*² fixing each session to one Virtual Instrument (VI), so that multiple control PCs can control their connected Virtual Instruments (VI) individually. Also, the remote server of this software controls connectable session number by RF Mode and changes visible VI number from the control PC. The relation between devices and VIs and the limit of VI number visible from the control PC when the control PC is connected to the MT8870A are as below.

- *1: When connecting by VXI-11, set only one connection by VISA viOpen function to each device (inst, inst0 to 3). When a query is sent to multiple connections simultaneously, a response may not be returned to the right source.
- *2: GPIB is usable for a single session, but unusable for multiple sessions.

Table 2.1.1-1 Relation Between Devices and VIs for VXI-11

Device Names for VXI-11	VI
inst or inst0	VI #1
inst1	VI #2
inst2	VI #3
inst3	VI #4

Table 2.1.1-2 Relation Between TCP/IP Port Number and VI for Raw-Socket

TCP/IP Port Number for Raw-Socket	VI
Specified port number	VI #1
Specified port number+1	VI #2
Specified port number+2	VI #3
Specified port number+3	VI #4

Note:

The default of the specified port number is 56001.

Table 2.1.1-3 VI Number Visible from the Control PC

RF Mode	VI Number Visible from the Control PC	Effective Device Number
NORMAL	1	0
RFSEMAPHORE	4	0, 1, 2, 3

2.1.2 Multiplied Registers

The current MT8870A has only one register for status register, etc. However, because this software has up to four Virtual Instruments (VI), one register is required for each VI for allowing control from the control PCs. Thus, all registers that the MT8870A has are multiplied.

Also, each VI has its own register for common states such as power On, and the bits are not cleared until they are read from the connected control PC.

Table 2.1.2-1 List of Multiplied Registers (SCPI Mode)

Register	Description
STB	Status byte register
ESR	Standard event status register
Operation Status Register	Operation status register
	Operation status condition register
	Transition filter
	Operation status event register
	Operation status enable register
Questionable Register	Questionable status register
	Questionable status condition register
	Transition filter
	Questionable event register
	Questionable enable register

Table 2.1.2-2 List of Multiplied Registers (Native Mode)

Register	Description
STB	Status byte register
ESR	Standard event status register
ESR0	Event status register 0
ESR1	Event status register 1
ESR2	Event status register 2
ESR3	Event status register 3

2.1.3 Multiplied Queues

Because there are four VIs, error and event queues are required for each Virtual Instrument (VI) for allowing control from the control PCs. Thus, error and event queues are multiplied to be assigned to each VI.

Because the command queue is multiplied, a command can be processed by VI. Therefore, the execution of synchronous command including *WAI and *OPC? does not influence other VI control.

2.1.4 Device Clear, *CLS

When receiving Device Clear or *CLS command, the operation is as below. This operation influences only the received sessions and does not influence others. Also, the reception buffer is not cleared.

Table 2.1.4-1 Operation at Device Clear/*CLS Reception

Received Command	Description
*CLS	<ul style="list-style-type: none">▪ Release from waiting for operation completion▪ Register clear
Device Clear	<ul style="list-style-type: none">▪ Stopping process of each application software▪ Release from waiting for operation completion▪ Register clear

2.2 Multiplied Application

In this software, application software is multiplied inside the measuring instrument and each application is connected to one Virtual Instrument (VI) fixedly.

The application software for

Cellular application (MX887010A/11A/12A/13A/14A/15A/16A/17A),

SRW application (MX887030A/31A/40A/50A),

and Vector Signal Generator is multiplied.

Other application software is common for all VIs.

2.3 Switching RF Mode

NORMAL Mode for the existing operation and RFSEMAPHORE Mode for RF-Semaphore operation can be switched by RF Mode command (refer to Chapter 4 and 5 for command details). Every application software is initialized when the mode is changed. When changing from RFSEMAPHORE Mode to NORMAL Mode, the session connected to VI#2 to 4 (device number 1 to 3) will be disabled (disconnected from the MT8870A).

■ Flow of switching RF Mode

1. Receiving RF Mode command.
2. The platform initializes the entire device. However, for some operations such as BAND calibration that cannot be initialized during execution, the platform will wait until the processing is completed. All control rights are released.
3. The remote server aborts unnecessary session and controls connectable session number.

During RF-Semaphore operation, a command to initialize the entire equipment and a command to initialize only the device in control are required.

The table below shows initialization command and operation in each mode.

Table 2.3-1 RF Mode and Initialization

RF Mode	Initialization Command	Operation
NORMAL	*RST	Same as initialization in the existing operation (No change).
RFSEMAPHORE	GLRST	Initializes the entire equipment.
	*RST	Initializes every VI.

2.3.1 Difference in RF Mode

Because RFSEMAPHORE Mode controls the operation exclusively by acquisition and release of control right, the machine behavior in this mode is different from that in NORMAL Mode. The tables below show the difference between the two modes.

■ LVL Command

LVL command is used to acquire the control right for internal setting, but the acquisition may be hindered by the status of other virtual instruments (VI). Thus, the command has differences depending on RF Mode as below.

Table 2.3.1-1 Difference in LVL Command

	NORMAL Mode	RFSEMAPHORE Mode
Default	ON	OFF
Application Software Change	Value before change	OFF
Measurement Specification Change		

The tables below show the examples of the LVL command difference.

Table 2.3.1-2 LVL Command Default

NORMAL Mode	RFSEMAPHORE Mode
*RST	*RST
LVL?	LVL?
ON	OFF

Table 2.3.1-3 LVL Command Application Software Change

NORMAL Mode	RFSEMAPHORE Mode
SYSSEL CELLULAR	SYSSEL CELLULAR
LVL ON	LVL ON
SYSSEL SRW	SYSSEL SRW
...	...
SYSSEL CELLULAR	SYSSEL CELLULAR
LVL?	LVL?
ON	OFF

Table 2.3.1-4 LVL Command Measurement Specification Change

NORMAL mode	RFSEMAPHORE mode
STDSEL COMMON LVL ON STDSEL SEQUENCE ... STDSEL COMMON LVL? ON	STDSEL COMMON LVL ON STDSEL SEQUENCE ... STDSEL COMMON LVL? OFF

2.4 Control Right Management

Up to four Virtual Instruments (VI) can operate in parallel, but because the actual RF is only one, exclusive management is required. The mechanism of acquisition/release of control rights is used for the exclusive management.

Some control rights are automatically specified internally (for internal setting) and others are specified externally (for external setting). A control right can be specified for SA and SG individually both in internal and external settings. Additionally, a control right should be acquired for executing Band Calibration or Full Calibration and for using FM/Audio application.

The control rights for internal setting are automatically acquired interlocking with the SA measurement start commands such as SINGLS or SG output On command and are released interlocking with the SA measurement end or SG output Off command. Because acquisition and release are executed automatically, the user does not need to think about it.

On the contrary, the user can manage a control right for external setting when he wants to set by using the acquisition (RF Lock) and release (RF Unlock) commands. Because it is for user setting, acquisition and release are not executed automatically. When executing Band Calibration and Full Calibration, the control rights should be acquired in advance by using these commands.

The control rights are managed in connection with the device numbers. When acquiring a control right by internal setting at measurement start, it can be acquired immediately if a control right was already acquired for the same device number by external setting. In other words, the measurement can be started during RF Lock by the same device number. Additionally, the control rights connected to the device numbers are released by initialization command (Refer to Table 2.3-1).

Table 2.4-1 shows the control right types.

Table 2.4-1 Control Right Types

Control Right Types	Manageable Control Right	Description
For Internal Setting	Can be specified for SA and SG individually.	The control rights are acquired automatically interlocking with the SA measurement start command and SG output On command, and are released interlocking with the SA measurement end or SG output Off command.
For External Setting	Can be specified for SA and SG individually.	When setting a control right, the user controls it by using the acquisition (RF Lock) and release (RF Unlock) commands.

2.4.1 The control rights for internal setting

The control rights for internal setting are acquired and released in the conditions below.

Table 2.4.1-1 Acquisition/Release of SA Control Right

Acquisition/Release	Commands	Operation
Control Right Acquisition	<ul style="list-style-type: none">• SNGLS• :INIT:CELL:MEAS:SING• SEQEXECTX• :INIT:CELL:SEQ:EXEC:TX• SNGLSTX_RX_FREQ• SNGLSPREDISTQ• SWP• SWPMPMEAS• SWPMRFPWR• SWPPREDISTQ• SWPTX_RX_FREQ• INIT:SRW	Automatically acquires SA control right when one of the commands in the left column is received.
Control Right Release	<ul style="list-style-type: none">• MEASSTOP• :ABOR:CELL:MEAS• ABORT:SRW• RFMODE• *RST• GLRST	Automatically releases a control right when one of the commands in the left column is received. However, RFMODE is released only when the mode is changed.
	<ul style="list-style-type: none">• Measurement completion	A control right is released after the measurement is completed.
	<ul style="list-style-type: none">• Session disconnection	A control right is released when the session is disconnected and the measurement is stopped.

Table 2.4.1-2 Acquisition/Release of SG Control Right

Acquisition /Release	Commands		Operation
Control Right Acquisition	<ul style="list-style-type: none"> • SNGLSTX_RX_FREQ • SWPTX_RX_FREQ • :SOUR:GPRF:GEN:STAT ON • :SOUR:GPRF:GEN:ARB:FILE:LOAD • :SOUR:GPRF:GEN:ARB:WAV:DEFR • :SOUR:GPRF:GEN:ARB:WAV:DEL • :SOUR:GPRF:GEN:ARB:WAV:DEL:ALL • :SOUR:GPRF:GEN:ARB:WAV:PATT:GAP • :SOUR:GPRF:GEN:ARB:WAV:GEN:ZVSP • :SOUR:GPRF:GEN:SEQ:EXEC • LVL ON • RXSWP START 		Automatically acquires SG control right when one of the commands in the left column is received.
Control Right Release	<ul style="list-style-type: none"> • :SOUR:GPRF:GEN:STAT OFF • LVL OFF 		Releases the control right acquired by :SOUR:GPRF:GEN:STAT ON or LVL ON when one of the commands in the left column is received.
	<ul style="list-style-type: none"> • RXSWP STOP 		Releases the control right acquired by RXSWP START when one of the commands in the left column is received.
	<ul style="list-style-type: none"> • :SOUR:GPRF:GEN:ARB:FILE:LOAD • :CANC 		Releases the control right acquired by :SOUR:GPRF:GEN:ARB:FILE:LOAD when one of the commands in the left column is received.
	<ul style="list-style-type: none"> • Waveform-related process is completed. 	<ul style="list-style-type: none"> • :SOUR:GPRF:GEN:ARB:FILE:LOAD • :SOUR:GPRF:GEN:ARB:WAV:DEFR • :SOUR:GPRF:GEN:ARB:WAV:DEL • :SOUR:GPRF:GEN:ARB:WAV:DEL:ALL • :SOUR:GPRF:GEN:ARB:WAV:PATT:GAP • :SOUR:GPRF:GEN:ARB:WAV:GEN:ZVSP 	Automatically releases the control right when one of the below commands is received and the waveform-related process is completed.
	<ul style="list-style-type: none"> • RFMODE • *RST • GLRST 		When one of the commands in the left column is received, the cellular application releases the control right automatically. However, RFMODE is released only when the mode is changed.
	<ul style="list-style-type: none"> • Session Disconnection 		The control right is released when the session is disconnected and one of the following operation is executed. <ul style="list-style-type: none"> • Stop SG output • Stop sequence operation • Cancel waveform process However, if the defragmentation of the waveform is in progress, the control right is released after the process is completed.

2.4.2 Control Right Combination Function

Each Virtual Instrument (VI) acquires or releases a control right of either SA or SG automatically, but a deadlock may be caused by waiting for acquisition depending on the user’s control method (Refer to Table 2.4.2-1).

This software can specify operation to acquire and release SA and SG simultaneously to avoid a deadlock in advance by RF Lock Combination command (Refer to Table 2.4.2-2).

Additionally, a deadlock can be avoided by specifying acquisition or release of control right for SA or SG by RF Lock and RF Unlock commands.

Table 2.4.2-1 Deadlock by Waiting for Control Right Acquisition

inst0	inst1	SA Control Right	SG Control Right	
LVL ON		0	1	inst0 acquired the control right of SG.
RFSTAT?		0	1	
1		0	1	
	SNGLS	1	1	inst1 acquired the control right of SA.
	RFSTAT?	1	1	
	2	1	1	
SNGLS		1	1	inst0 waits for control right acquisition of SA.
RFSTAT?		1	1	
1		1	1	
	LVL ON	1	1	inst1 waits for control right acquisition of SG.
	RFSTAT?	1	1	
	2	1	1	
				A deadlock occurs after inst0 and inst1 are waiting for acquisition for a while.
RFSTAT?		1	1	
1		1	1	
	RFSTAT?	1	1	
	2	1	1	

Table 2.4.2-2 Deadlock Prevention by Control Right Combination Function

inst0	inst1	SA Control Right	SG Control Right	
RFLOCKCOMB SASG		0	1	Command to unite the control rights of SA and SG.
LVL ON		1	1	inst0 acquired the control rights of SA and SG
RFSTAT?		1	1	
3		1	1	
	SNGLS	1	1	inst1 waits for control right acquisition of SA
	RFSTAT?	1	1	
	0	1	1	
SNGLS		1	1	SA control right is already acquired and the processing can be advanced.
RFSTAT?		1	1	
3		1	1	
	RFSTAT?	1	1	
	0	1	1	
		1	1	
(Measurement completed)		1	1	SA control right is not released after the measurement is completed.
		1	1	
LVL OFF		0	0	Release SA and SG at the last release of control rights.
	RFSTAT?	1	0	inst0 released the SA control right, and inst1 acquired it.
	2	1	0	

2.5 Port Number Management

The table below shows PORT Mode, Virtual Instrument (VI), PORT setting, and Test Port actually used.

Table 2.5-1 Port Mode, VI, Port Setting and Test Port

PORT Mode	VI	Port Setting	Test Port
FIXED (PORT Fixed Mode)	VI #1	IN: PORT1, OUT: PORT1	Both input and output are fixed to PORT1.
		IN: PORT1, OUT: PORT3	PORT1 for input PORT3*1 for output
	VI #2	IN: PORT1, OUT: PORT1	Both input and output are fixed to PORT2.
		IN: PORT1, OUT: PORT3	PORT2 for input PORT4*1 for output
	VI #3	IN: PORT1, OUT: PORT1	When MU887000A is used, PORT3 for input PORT4 for output When MU887001A is used, Both input and output are fixed to PORT3.
	VI #4		When MU887000A is used, PORT3 for input PORT4 for output When MU887001A is used, Both input and output are fixed to PORT4.
	Common		A parameter error occurs.
NONFIXED (PORT Setting Mode)	VI #1	Free setting is allowed.	PORT setting is allowed for input and output individually.
	VI #2		PORT setting is allowed for input and output individually.
	VI #3		PORT setting is allowed for input and output individually.
	VI #4		PORT setting is allowed for input and output individually.

*1: When PORT1 is specified for input and PORT3 for output, the VI #1 uses PORT1 for input and PORT3 for output, and the VI #2 uses PORT2 for input and PORT4 for output.(Refer to Figure 2.5-4)

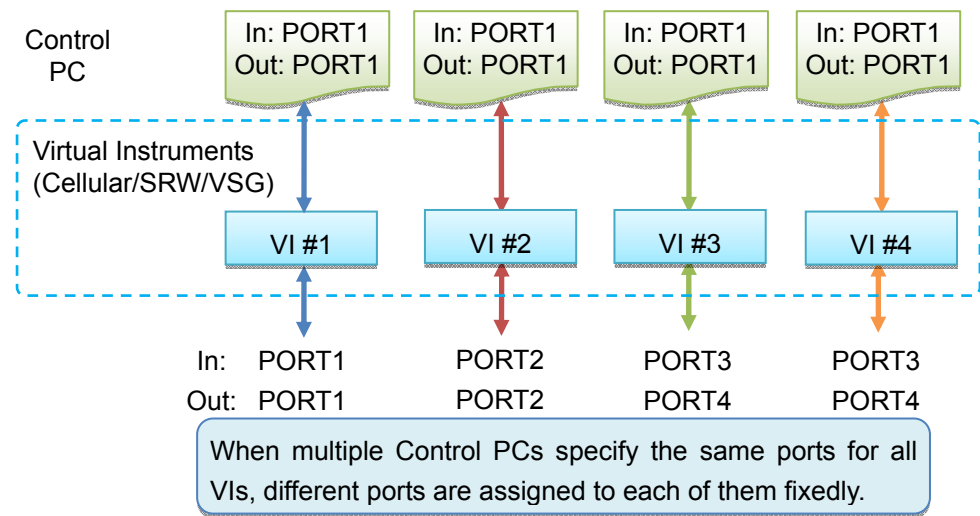


Figure 2.5-1 Operation in Fixed Mode for MU887000A

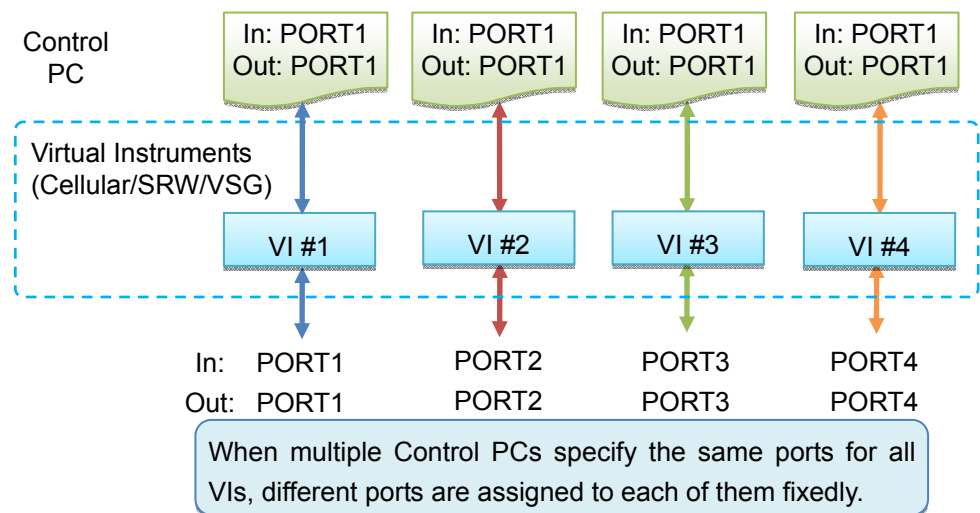


Figure 2.5-2 Operation in Fixed Mode for MU887001A

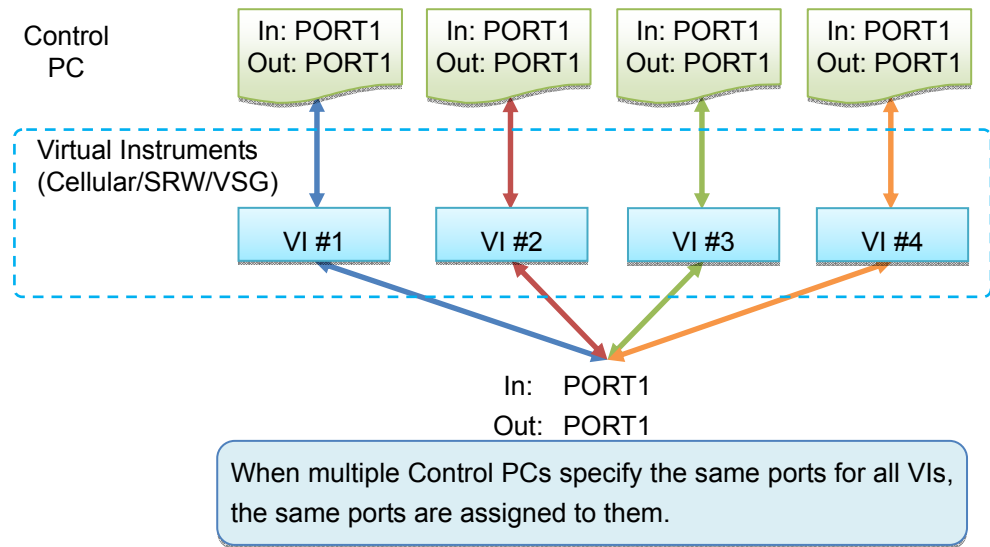


Figure 2.5-3 Operation in Nonfixed Mode

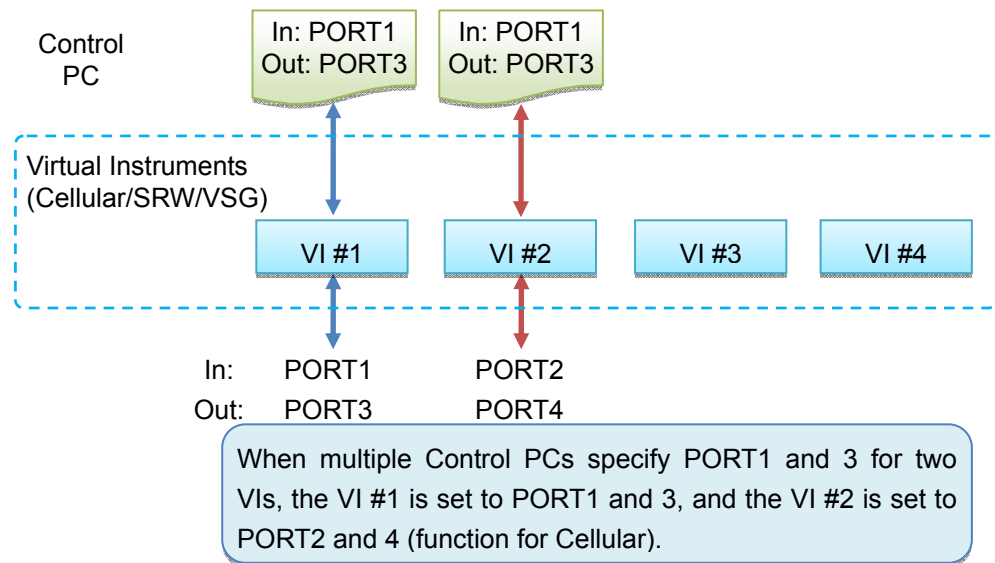


Figure 2.5-4 PORT1 and PORT3 Specification in Fixed Mode

2.6 External Loss

For external loss table setting, each device has 16 tables (16 tables \times 4). It is easy to use because each Virtual Instrument (VI) follows the existing operation individually.

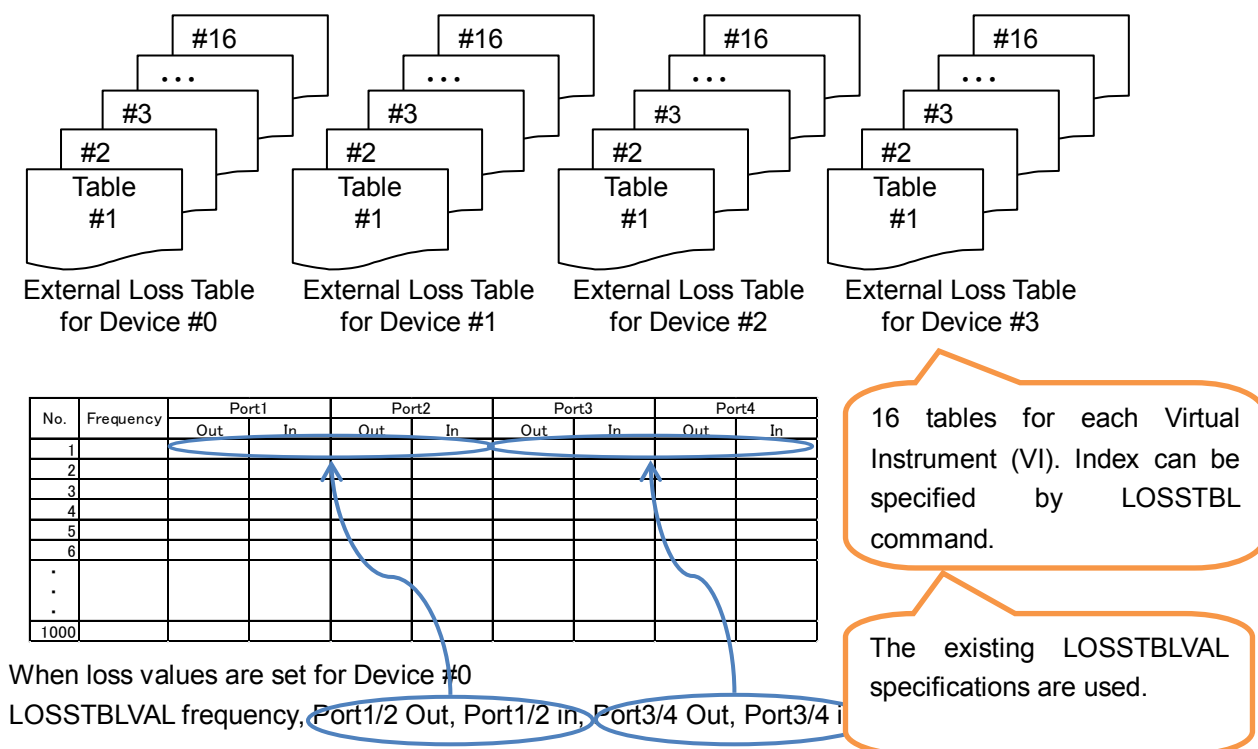


Figure 2.6-1 External Loss Table

2.7 Others

2.7.1 Switching timing of external trigger

Because the external trigger does not depend on control right, the application software switches at the timing when the external trigger is used (the last setting is valid).

2.7.2 GTL

When the GTL command is received, return all session states to local and turn off the remote LED regardless of RF Mode state (NORMAL or RFSEMAPHORE). However, the sessions are not aborted.

2.7.3 Remote LED

When RF Mode is RFSEMAPHORE, the remote LED functions as below.

- Blinks when an error occurs at least in one session.
- Lights up again when all sessions in error are aborted.
- Blinks when a session in error is reconnected.

2.7.4 Setting common parameters

For the system-related parameters such as beep sound, frequency standard signal source, network setting, and terminator setting, one common parameter can be set for all VIs. If the parameter is set by multiple sessions, the last set value is valid.

2.7.5 SYSERR?

Each Virtual Instrument (VI) has an error buffer.

The operation visible from the device control software on the Control PC is the same in all VIs regardless of RF Mode.

Chapter 3 Usage examples

This chapter explains usage examples.
Commands for remote controlling of a module have two language modes: the SCPI command mode, and the Native command mode.
For details of commands used here, refer to Chapter 4 “SCPI Command Reference” and Chapter 5 “Native Command Reference”.

- 3.1 Acquisition/Release (VSG) of Control Rights.....3-2
- 3.2 Acquisition/Release (SA) of Control Rights.....3-3
- 3.3 Control Right Acquisition During BAND Calibration.....3-5
- 3.4 Control Right Acquisition When Loading Waveform File
.....3-6

3.1 Acquisition/Release (VSG) of Control Rights

The example below is in Native Mode.

inst0	inst1
. . . PACKAGE 'MV887011A_WCDMA_0002' DLPAT PAT4 MOD OFF DLFREQ 2140.2000MHZ ULFREQ 1950.0000MHZ LVL ON RFSTAT? 1 MOD OFF OLVL -30.00DBM LVL OFF PACKAGE? MV887011A_WCDMA_0002 PACKAGE 'MV887011A_WCDMA_0002' DLPAT PAT4 STDSEL? WCDMA ALLMEASITEMS_OFF EXTLOSSW COMMON PWR_SET ON,5 . . .	. . . PACKAGE 'MV887011A_WCDMA_0002' DLPAT PAT4 MOD OFF DLFREQ 2140.2000MHZ ULFREQ 1950.0000MHZ LVL ON RFSTAT? 0 RFSTAT? 0 RFSTAT? 1 MOD OFF OLVL -30.00DBM LVL OFF PACKAGE? MV887011A_WCDMA_0002 PACKAGE 'MV887011A_WCDMA_0002' DLPAT PAT4 STDSEL? . . .

Orange shows the period that a control right is acquired.

Figure 3.1-1 Acquisition/Release (VSG) of Control Right

3.2 Acquisition/Release (SA) of Control Rights

The example below is in Native Mode.

inst0	inst1
·	·
·	·
·	·
TX_RX_FLT BW5MHZ	TX_RX_FLT BW5MHZ
TX_RX_SEG_DURATION 4	TX_RX_SEG_DURATION 4
TX_RX_MW 10, 80	TX_RX_MW 10, 80
TX_RX_INV_RSLT_OUT ON	TX_RX_INV_RSLT_OUT ON
REGTX_RX_FREQ 1000.00,1950.00	REGTX_RX_FREQ 1000.00,1950.00
REGMTXREF	REGMTXREF
ON,17.00,28,-2.72,57,-23.14,72,31.00,99,11.62,127,-8.49	ON,17.00,28,-2.72,57,-23.14,72,31.00,99,11.62,127,-8.49
TX_RX_TRG_LVL -40	TX_RX_TRG_LVL -40
REGMRXPWR -90	REGMRXPWR -90
MOD OFF	MOD OFF
*CLS	*CLS
*OPC?	*OPC?
1	1
SNGLSTX_RX_FREQ 152,1	SNGLSTX_RX_FREQ 152,1
ESR2?	ESR2?
2	0
ESR2?	ESR2?
0	0
ESR2?	ESR2?
2	0
MSTAT?	ESR2?
9	0
MSTAT?	ESR2?
9	0
MSTAT?	ESR2?
0	0
TX_RX_FREQ?	ESR2?
17.23,16.76,16.04,14.29,13.38,12.07...	0
SYSEL CELLULAR	ESR2?
STDSEL COMMON	2
MEASSEL TRXFREQ	MSTAT?
LVL ON	9
RFSTAT?	MSTAT?
0	9
RFSTAT?	MSTAT?
0	9
RFSTAT?	MSTAT?
0	9
RFSTAT?	MSTAT?
0	9
RFSTAT?	MSTAT?

Figure 3.2-1 Acquisition/Release (SA) of Control Right (1/2)

inst0	inst1
--- Continued ---	
0	9
RFSTAT?	MSTAT?
1	0
TX_RX_FLT BW5MHZ	TX_RX_FREQ?
TX_RX_SEG_DURATION 4	17.23,16.76,16.04,14.29,13.38,12.07...
.	.
.	.
.	.

Figure 3.2-1 Acquisition/Release (SA) of Control Right (2/2)

3.3 Control Right Acquisition During BAND Calibration

The example below is in Native Mode.

inst0	inst1
. . . MOD OFF DLFREQ 2140.2000MHZ ULFREQ 1950.0000MHZ LVL ON RFSTAT? 0 RFSTAT? 0 RFSTAT? 0 RFSTAT? 0 RFSTAT? 0 RFSTAT? 1	. . . DELLOSSTBL PORT PORT1,PORT1 RFLOCK SASG RFSTAT? 3 BANDCAL_TEMP 2.0 RFUNLOCK SASG
MOD OFF OLVL -30.00DBM LVL OFF PACKAGE? MV887011A_WCDMA_0002 PACKAGE 'MV887011A_WCDMA_0002' . . .	DELLOSSTBL LOSSTBLVAL 710.000MHZ,7.28,7.28,7.28 LOSSTBLVAL 750.000MHZ,7.36,7.36,7.36 LOSSTBLVAL 810.000MHZ,7.21,7.21,7.21 LOSSTBLVAL 950.000MHZ,7.52,7.52,7.52 LOSSTBLVAL 1710.000MHZ,8.05,8.05,8.05 LOSSTBLVAL 1790.000MHZ,8.07,8.07,8.07 . . .

When executing BANDCAL, the control rights for SA and SG should be acquired by RFLOCK in advance.

Orange shows the period that a control right is acquired.

After BANDCAL is completed, the control rights for SA and SG should be released by RFUNLOCK.

3

Usage examples

Figure 3.3-1 Control Right Acquisition During BAND Calibration

3.4 Control Right Acquisition When Loading Waveform File

The example below is in Native Mode.

inst0	inst1
.	.
.	.
.	.
SNGLSTX_RX_FREQ 152,1	SYSSEL CELLULAR
ESR2?	STDSEL?
0	COMMON
ESR2?	SOUR:GPRF:GEN:ARB:FILE:LOAD?
0	'MV887013A_LTEFDD_0002'
ESR2?	1
2	SOUR:GPRF:GEN:ARB:FILE:LOAD
MSTAT?	'MV887013A_LTEFDD_0002'
9	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
MSTAT?	1
9	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
MSTAT?	1
9	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
MSTAT?	1
9	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
MSTAT?	1
0	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
PACKAGE 'MV887011A_WCDMA_0002'	1
	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
	1
	SOUR:GPRF:GEN:ARB:FILE:LOAD:STAT?
	0
	DATETIME?
	2013,11,27,23,19,22
.	.
.	.
.	.

Figure 3.4-1 Control Right Acquisition When Loading Waveform File

Chapter 4 SCPI Command Reference

This chapter describes the details of SCPI commands.

- 4.1 List of Commands4-2
 - 4.1.1 Commands4-2
- 4.2 Details of Commands.....4-3
 - 4.2.1 Commands4-4

4.1 List of Commands

4.1.1 Commands

Function	Command	Query	Response
Preset All	:SYSTem:PRESet:ALL	-----	-----
RF Mode	:SYSTem:RF:MODE <mode>	:SYSTem:RF:MODE?	<mode> : NORMAL, RFSEMAPHORE
RF Port Mode	:SYSTem:RF:PORT <mode>	:SYSTem:RF:PORT?	<mode> : FIXED, NONFIXED
RF Lock Combination	:SYSTem:RF:LOCK:COMBINati on <control>	:SYSTem:RF:LOCK:COMBination?	<control>: NONE, SASG
RF Lock	:SYSTem:RF:LOCK <control>	-----	<control>: SA, SG, SASG
RF Unlock	:SYSTem:RF:UNLock <control>	-----	<control>: SA, SG, SASG
RF Status	-----	:SYSTem:RF:STATUs?	bit0, bit1

4.2 Details of Commands

This section explains the SCPI commands in alphabetical order.

■ Viewing the 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
DBM	dBm	MHZ	MHz
DBUVEMF	dB μ V (emf)	MS	ms
DBUVTERM	dB μ V (Term)	MZ	MHz
GZ	GHz	NS	ns
GHZ	GHz	S	s
HZ	Hz	US	μ s
KZ	kHz	Z	Hz
KHZ	kHz		

4.2.1 Commands

:SYSTem:PRESet:ALL

Preset All

Function

This command initializes the entire instrument.

Command

:SYSTem:PRESet:ALL

Details

The entire instrument is initialized when RF Mode is RFSEMAPHORE. All Virtual Instruments (VI) are initialized and the control rights are released. The setting, date, time, RF Mode, and RF Port Mode that concern the communications (IPv4, IPv6, GPIB) are not initialized.

This command operates as *RST when RF Mode is Normal.

Remarks

Executes initialization of the entire instrument.

:SYST:PRESet:ALL

:SYSTem:RF:MODE <mode>

RF Mode

Function

This command sets or queries RF operation mode.

Command

```
:SYSTem:RF:MODE <mode>
```

Query

```
:SYSTem:RF:MODE?
```

Response

```
<mode>
```

Parameter

<mode>	RF Operation Mode
NORMAL	Normal Mode (default)
RFSEMAPHORE	RF-Semaphore Mode

Details

To change the mode for 1 chassis 4 modules, the setting is enabled after sending the RF Mode command to each module.

Example of Use

To set the RF operation mode to RF-Semaphore.

```
:SYST:RF:MODE RFSEMAPHORE
:SYST:RF:MODE?
> RFSEMAPHORE
```

Remarks

This setting is stored in the module.

It is not initialized by *RST, :SYSTem:PRESet:ALL, power Off/On, or restart.

This is a common command for the entire instrument, and not for an individual Virtual Instrument (VI). The entire instrument is set only by sending the command to one of the VIs in connection.

Because the virtual device number changes according to the mode setting, the connectable device number changes as well.

When changed from RFSEMAPHORE to NORMAL, the sessions except device number 0 will be disabled (device number 1 to 3 are disconnected from the MT8870A). Table 4.2.1-1 shows the relation of virtual device count and device number in mode setting.

Table 4.2.1-1 Relation of Virtual Device Count and Device Number with RF Mode

Mode to set in RF Mode	Virtual Device Count	Device No.*
NORMAL	1	0
RFSEMAPHORE	4	0
		1
		2
		3

*: Device number is the number added to the end of device name.
The device name when specifying the device number 0 by VXI-11 is inst0.

:SYSTem:RF:PORT <mode>

RF Port Mode

Function

This command selects whether to use the fixed port or the specified port for each virtual instrument.

Command

```
:SYSTem:RF:PORT <mode>
```

Query

```
:SYSTem:RF:PORT?
```

Response

```
<mode>
```

Parameters

<mode>	Port Mode
FIXED	Port Fixed Mode (default)
NONFIXED	Port Specified Mode

Details

FIXED (Port Fixed) Mode is used when the software running on the Control PC controls multiple ports by the same program including specifying ports. For example, when the programs to control VI #1 and VI #2 are the same and Port 1 is specified for both input and output, VI #1 uses Port1 and VI #2 uses Port2 fixedly.

In NONFIXED (Port Specified) Mode, ports for VIs can be specified from the Control PC freely. The same ports can be specified for multiple VIs. For example, the parameter is set to NONFIXED Mode when the user wants to specify Port3 and 4 for both VI #1 and VI #2.

Example of Use

```
To set Port Mode to FIXED.
:SYST:RF:PORT FIXED
:SYST:RF:PORT?
> FIXED
```

Remarks

This setting is stored in the module.

This setting is not initialized by *RST, :SYSTem:PRESet:ALL, power Off/On, or restart.

This is a common command for the entire instrument, and not for an individual Virtual Instrument (VI). The entire instrument is set only by sending the command to one of the VIs in connection.

:SYSTem:RF:LOCK:COMBination <control>

RF Lock Combination

Function

This command specifies the combination method of control rights.

Command

```
:SYSTem:RF:LOCK:COMBination <control>
```

Query

```
:SYSTem:RF:LOCK:COMBination?
```

Response

```
<control>
```

Parameters

<control>	Combination method of control rights
NONE	No combination of control rights (default). The control rights of SA and SG function independently.
SASG	The control rights of SA and SG are combined and function as a set.

Details

This command is used for controlling the control rights of SA and SG as a set without using RF Lock/RF Unlock.

For example, when multiple sessions that use Cellular application and VSG application are running, each application acquires and releases a control right of SA or SG. However, multiple sessions may compete to acquire a control right and fall into waiting state. In that case, by sending this command in advance, the control rights of SA and SG are acquired and released at once, and waiting state can be avoided.

Example of Use

To set the combination of the control rights.

```
:SYST:RF:LOCK:COMB SASG  
:SYST:RF:LOCK:COMB?  
> SASG
```

Remarks

The setting is initialized by *RST when RF Mode is NORMAL, :SYSTem:PRESet:ALL when RF Mode is RFSEMAPHORE, Restart, or Power On.

The setting is not initialized by RF Mode switch, RF Port Mode switch, or Disconnect remote control.

This command can be set for each Virtual Instrument (VI).

:SYSTEM:RF:LOCK <control>

RF Lock

Function

This command acquires the control right of the specified RF.

Command

```
:SYSTEM:RF:LOCK <control>
```

Parameters

<control>	Control right types
SA	Acquires the control right of SA.
SG	Acquires the control right of SG.
SASG	Acquires the control rights of SA and SG.

Details

This command is sent in the below cases followed by the query RFSTAT?/:SYSTEM:RF:STATus? to confirm the acquisition of control right.

- The user wants to acquire a control right arbitrarily.
- Before using FM/Audio and SmallCell applications.

Note:

When RF Mode is NORMAL, the command is received, but will not be processed.

When RF Mode is not NORMAL and RF Lock Combination is SASG, the parameter of this command is an error except SASG (Execution Error = -200).

Example of Use

To acquire the control right of SG.

```
:SYST:RF:LOCK SG
```

Remarks

Release Conditions: RF Unlock, *RST, or :SYSTEM:PRESet:ALL is received, or Remote control is disconnected.

:SYSTem:RF:UNLock <control>

RF Unlock

Function

This command releases the control right of the specified RF.

Command

:SYSTem:RF:UNLock <control>

Parameters

<control>	Control right types
SA	Releases the control right of SA.
SG	Releases the control right of SG.
SASG	Releases the control rights of SA and SG.

Details

This command is sent in the below cases followed by the query.

- The user wants to release a control right arbitrarily.
- After using FM/Audio and SmallCell applications.

Note:

When RF Mode is NORMAL, the command is received, but will not be processed.

When RF Mode is not NORMAL and RF Lock Combination is SASG, the parameter of this command is an error except SASG (Execution Error = -200).

Example of Use

To release the control right of SG.

:SYST:RF:UNL SG

:SYSTem:RF:STATus?

RF Status?

Function

This command queries if the control right of RF was acquired.

Query

:SYSTem:RF:STATus?

Response

<status>

Parameters

<status> Control right register

Value = bit0 + bit1

bit0 SG control right status 0: Not acquired 1: Acquired

bit1 SA control right status 0: Not acquired 1: Acquired

Details

Queries if the control right is acquired after the control right acquisition request is sent.

Note:

When RF Mode is NORMAL, 3 is always returned (1 for both bit0 and bit1).

Example of Use

To query if the control right of SG was acquired.

:SYST:RF:STAT?

> 1

Chapter 5 Native Command Reference

This chapter describes the details of Native commands.

5.1	List of Commands	5-2
5.1.1	Commands	5-2
5.2	Details of Commands	5-3
5.2.1	Commands	5-4

5.1 List of Commands

5.1.1 Commands

Function	Command	Query	Response
Preset	*RST	-----	-----
Preset All	GLRST	-----	-----
RF Mode	RFMODE mode	RFMODE?	mode: NORMAL, RFSEMAPHORE
RF Port Mode	RFPORTMODE mode	RFPORTMODE?	mode: FIXED, NONFIXED
RF Lock Combination	RFLOCKCOMB control	RFLOCKCOMB?	control: NONE, SASG
RF Lock	RFLOCK control	-----	control: SA, SG, SASG
RF Unlock	RFUNLOCK control	-----	control: SA, SG, SASG
RF Status	-----	RFSTAT?	bit0, bit1

5.2 Details of Commands

This section explains the Native commands in alphabetical 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
GZ	GHz
KZ	kHz
MZ	MHz
Z	Hz

5.2.1 Commands

***RST**

Preset

Function

This command executes initialization.

Command

*RST

Details

When RF Mode is RFSEMAPHORE, each Virtual Instrument (VI) is initialized individually.

The only VIs that received the command are initialized.

The command functions as normal *RST when RF Mode is Normal.

Example of Use

To execute initialization of the entire instrument.

*RST

GLRST

Preset All

Function

This command initializes the entire instrument.

Command

GLRST

Details

The entire instrument is initialized when RF Mode is RFSEMAPHORE. All Virtual Instruments (VI) are initialized and the control rights are released. The setting, date, time, RF Mode, and RF Port Mode that concern the communications (IPv4, IPv6, GPIB) are not initialized.

The command functions as *RST when RF Mode is Normal.

Example of Use

To execute initialization of the entire instrument.

GLRST

RFMODE

RF Mode

Function

This command sets or queries RF operation mode.

Command

RFMODE mode

Query

RFMODE?

Response

mode

Parameter

mode	RF Operation Mode
NORMAL	Normal Mode (default)
RFSEMAPHORE	RF-Semaphore Mode

Details

To change mode for the MT8870A of 1 chassis 4 modules, RF Mode command should be sent to each module.

Example of Use

To set RF operation mode to RF-Semaphore.

```
RFMODE RFSEMAPHORE
```

```
RFMODE?
```

```
> RFSEMAPHORE
```

Related Commands

This setting is saved in the module.

It is not initialized by *RST, GLRST, RFRST, power Off/On, or restart.

This is a common command for the entire instrument, and not for an individual Virtual Instrument (VI). The entire instrument is set only by sending the command to one of the VIs in connection.

Because the virtual device number changes according to the mode setting, the connectable device number changes as well.

When changed from RFSEMAPHORE to NORMAL, the sessions except device number 0 will be disabled (device number 1 to 3 are disconnected from the MT8870A). Table 5.2.1-1 shows the relation of virtual device count and device number with mode setting.

Table 5.2.1-1 Relation of Virtual Device Count and Device Number with RF Mode

Mode to set in RF Mode	Virtual Device Count	Device No.* ¹
NORMAL	1	0
RFSEMAPHORE	4	0
		1
		2
		3

*1: Device number means the number added to the end of a device name.

The device name when specifying the device number 0 by VXI-11 is inst0.

RFPORTMODE

RF Port Mode

Function

This command selects whether to use ports fixed to virtual instruments or use the specified ports.

Command

RFPORTMODE mode

Query

RFPORTMODE?

Response

mode

Parameters

mode	PORT Mode
FIXED	PORT Fixed Mode (default)
NONFIXED	PORT Specified Mode

Details

FIXED (PORT Fixed) Mode is used when the software running on the control PC controls multiple ports by the same program including specifying ports. For example, when the programs to control VI #1 and VI #2 are the same and Port 1 is specified for input and output, VI #1 uses Port1 and VI #2 uses Port2 fixedly.

In NONFIXED (Port Specified) Mode, a port for each VI can be specified from the Control PC freely. The same ports can be specified. For example, this is set to NONFIXED Mode when the user wants to use Port3 and 4 by VI #2 while using Port3 and 4 by VI #1.

Example of Use

```
To set Port Specified Mode to FIXED.  
RFPORTMODE FIXED  
RFPORTMODE?  
> FIXED
```

Remarks

This setting is saved in the module.

It is not initialized by *RST, GLRST, power Off/On, or restart.

This is a common command for the entire instrument, and not for an individual Virtual Instrument (VI). The entire instrument is set only by sending the command to one of the VIs in connection.

RFLOCKCOMB

RF Lock Combination

Function

This command specifies the combination method of control rights.

Command

RFLOCKCOMB control

Query

RFLOCKCOMB?

Response

control

Parameters

control	Combination method of control right
NONE	No combination of control rights (default).
	The control rights of SA and SG function independently.
SASG	The control rights of SA and SG are combined.
	The control rights of SA and SG function as a set.

Details

This command is used for controlling the control rights of SA and SG as a set without using RF Lock/RF Unlock.

For example, when multiple sessions that use Cellular application and VSG application are running, each application acquires and releases SA or SG control right. However, one session may try to acquire a control right of another and fall into waiting condition. In that case, by sending this command in advance, the control rights of SA and SG are acquired and released at once, and waiting condition can be avoided.

Example of Use

To set the combination of the control rights.

RFLOCKCOMB SASG

RFLOCKCOMB?

> SASG

Remarks

The setting is initialized by *RST when RF Mode is NORMAL, GLRST when RF Mode is RFSEMAPHORE, Restart, or Power On.

The setting is not initialized by RF Mode switch, RF Port Mode switch, or Disconnect remote control.

This command can be set for each Virtual Instrument (VI).

RFLOCK

RF Lock

Function

This command acquires the control right of the specified RF.

Command

RFLOCK control

Parameters

control	Control right types
SA	Acquires the control right of SA
SG	Acquires the control right of SG.
SASG	Acquires the control right of SA and SG.

Details

This command is issued in the following cases.

The acquisition of control right is queried by RFSTAT?/:SYSTem:RF:STATus? after issuing this command.

- The user desires to acquire a control right arbitrarily.
- Before using FM/Audio and SmallCell applications

Note:

When RF Mode is NORMAL, the command is received, but not processed.

When RF Mode is not NORMAL and RF Lock Combination is SASG, the parameter of this command is an error except SASG (Execution Error = -200).

Example of Use

To acquire the control right of SG.

RFLOCK SG

Remarks

Release Conditions: RF Unlock, *RST, or GLRST is received, or Remote control is disconnected.

RFUNLOCK

RF Unlock

Function

This command releases the control right of the specified RF.

Command

RFUNLOCK control

Parameters

<control>	Control right type
SA	Releases the control right of SA.
SG	Releases the control right of SG.
SASG	Releases the control right of SA and SG.

Details

This command is issued in the following cases.

The acquisition of control right is queried by RFSTAT?/:SYSTem:RF:STATus? after issuing this command.

- The user desires to acquire a control right arbitrarily.
- After using FM/Audio and SmallCell applications.

Note:

When RF Mode is NORMAL, the command is received, but not processed.

When RF Mode is not NORMAL and RF Lock Combination is SASG, the parameter of this command is an error except SASG (Execution Error = -200).

Example of Use

To release the control right of SG.

RFUNLOCK SG

RFSTAT?

RF Status?

Function

This command queries if the control right of RF was acquired.

Query

RFSTAT?

Response

status

Parameters

status Control right register

Value = bit0 + bit1

bit0 SG control right status 0: Not acquired, 1: Acquired

bit1 SA control right status 0: Not acquired, 1: Acquired

Details

Queries if the control right is acquired after the control right acquisition request is issued.

Note:

When RF Mode is NORMAL, 3 is always returned (1 for both bit0 and bit1).

Example of Use

To query if the control right of SG was acquired.

RFSTAT?

> 1

Appendix A Specifications

This appendix describes the specifications. For the product configurations, options, and application parts, refer to Section 1.3 “Product Configuration”.

Table A-1 Input/Output Terminal

Item	Specifications
Function	By installing in the MT8870A Universal Wireless Test Set, supplies functions for scheduling measurement of multiple DUTs in the MU887000A TRX Test Module.
Number of Virtual Instruments	Max. 4
Target Application	MX887010A/11A/12A/13A/14A/15A/16A/17A (Cellular Application) MX887030A/31A/40A/50A (SRW Application)
Remote Control Interface	By using VXI-11 device name or Raw Socket port number, each virtual instrument can be controlled individually.

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