

Waveform File for IEEE 802.15.4 Application 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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These indicate that the marked part should be recycled.

Waveform File for IEEE 802.15.4 Application
Operation Manual

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1. Product Model

Software: MV887060A 802.15.4 Waveforms

2. Applied Directive and Standards

When the MV887060A 802.15.4 Waveforms is installed in the MU887000A and MT8870A, the applied directive and standards of this unit conform to those of the MT8870A Universal Wireless Test Set.

PS: About main frame

Please contact Anritsu for the latest information on the MT8870A Universal Wireless Test Set to be used with the MV887060A 802.15.4 Waveforms.

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C-Tick marking



1. Product Model

Software: MV887060A 802.15.4 Waveforms

2. Applied Directive and Standards

When the MV887060A 802.15.4 Waveforms is installed in the MU887000A and MT8870A, the applied directive and standards of this unit conform to those of the MT8870A Universal Wireless Test Set.

PS: About main frame


Please contact Anritsu for the latest information on the MT8870A Universal Wireless Test Set to be used with the MV887060A 802.15.4 Waveforms.

About This Manual

This manual mainly describes the operation of the Waveform File for IEEE802.15.4 Application.

Products relevant to the MT8870A Universal Wireless Test Set include:

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

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

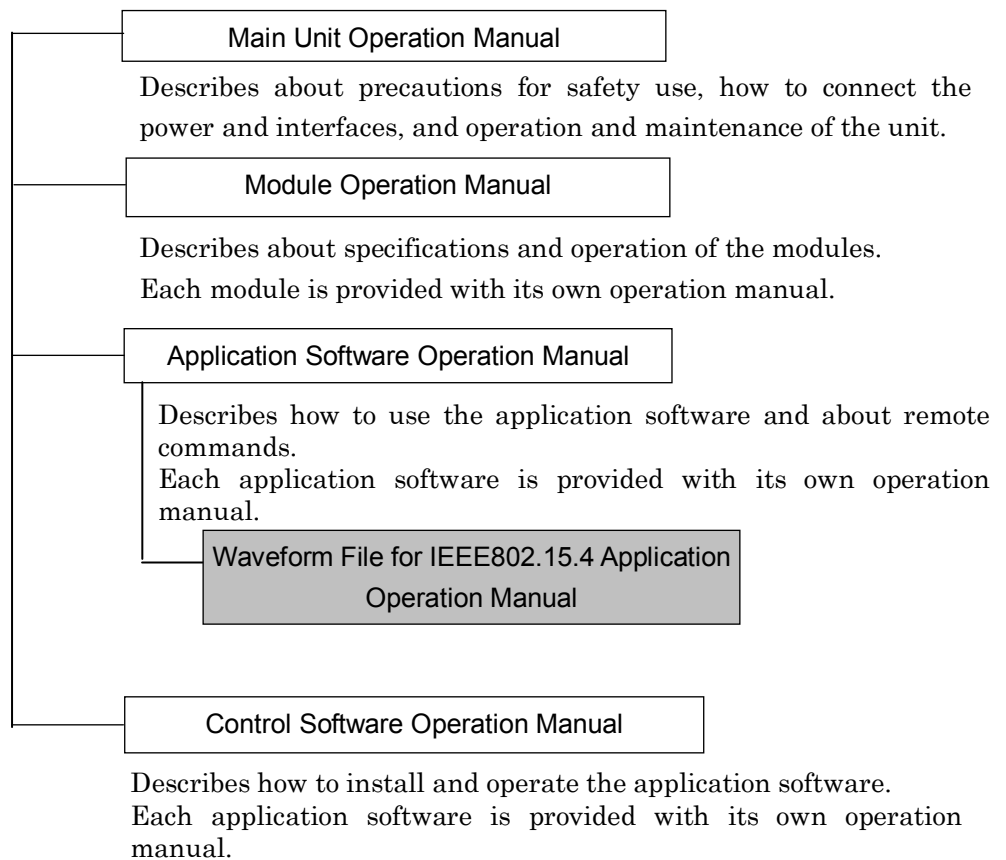


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Chapter 1 Outline

This chapter outlines the IEEE 802.15.4 Application waveform files and explains the product composition.

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1.1 Introduction to Waveform Files

The MT8870A Universal Wireless Test Set (hereafter MT8870A) output digital modulation signals by loading IQ data saved in files.

The IEEE 802.15.4 Application waveform files provide the IQ data for outputting the modulation signal specified in the mobile communications standards.

The mobile station performance is tested by loading the IEEE 802.15.4 Application waveform files into the MT8870A and outputting the digital modulation signal.

Table 1.1-1 IEEE 802.15.4 Application Waveform Files

Model	Product Name
MV887060A	IEEE 802.15.4 Waveforms

1.2 Product Composition

The IEEE 802.15.4 Application waveform files have the following composition. The electronic files are stored in one or more storage media (DVD, etc.).

Table 1.2-1 MV887060A Product Composition

Model/Code	Product Name	Remarks
MV887060A	IEEE 802.15.4 Waveforms	—
W3745AE	Waveform File for IEEE 802.15.4 Application Operation Manual	English

1.3 Specifications

The waveform file specifications are listed in the following tables.

Table 1.3-1 MV887060A

Item	Specification
EVM	$\leq 3\%$ rms at 440 MHz \leq Frequency \leq 2500 MHz

1.4 Abbreviations

The abbreviations in this manual are listed in Table 1.4-1.

Table 1.4-1 Abbreviations

Abbreviation	Formal Name
IEEE	The Institute of Electrical and Electronics Engineers, Inc
AVG	Average
PER	Packet Error Rate
SHR	synchronization header
SFD	start-of-frame delimiter
PHR	PHY header
PPDUs	PHY protocol data units
PSD	power spectral density
LR-WPANs	Low-Rate Wireless Personal Area Networks
EVM	Error Vector Magnitude
OQPSK	Offset Quadrature Phase Shift Keying
RC	Raised Cosine

Chapter 2 Before Use

This chapter explains the preparations before using the IEEE 802.15.4 Application waveform files.

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2.1 Equipment

The following equipment is required to use the IEEE 802.15.4 Application waveform files.

Table 2.1-1 Required Equipment

Model	Product
MT8870A	Universal Wireless Test Set
MU887000A	TRX Test Module

2.2 Installing Waveform Files

To use the waveform files stored on the storage media, move the files to the MU887000A.

1. Copy the waveform files on the storage media to PC.
2. Start the MX887900A Utility Tools software provided with the MU887000A.

Refer to Chapter 8 “Utility Tools” in the *MU887000A TRX Test Module Operation Manual* for a description of how to use the MX887900A Utility Tools.

3. Move the waveform files to the MU887000A using the Utility Tools Waveform File Transfer function.

To perform separate transfer of waveform files to MU887000A, refer to 8.3.9 “Transferring files” in the *MU887000A TRX Test Module Operation Manual*.

To perform batch transfer of waveform files to MU887000A, refer to 8.3.12 “Transferring waveform files” in the *MU887000A TRX Test Module Operation Manual*.

Files moved to the MU887000A are saved in non-volatile memory so it is not necessary to move the files when the MT8870A is switched off and on again.

2.3 Using Waveform Files

2.3.1 Using MU887000A commands

This section explains the command for using waveform files. For details of the commands, refer to the *MU887000A TRX Test Module Operation Manual*.

To output the modulation signal by using the waveform files, load the waveform file from non-volatile memory into the waveform memory.

- To load waveform file
:SOURce:GPRF:GENerator:ARB:FILE:LOAD
- To confirm waveform loading status
:SOURce:GPRF:GENerator:ARB:FILE:LOAD:STATUS
- To stop loading waveform file
:SOURce:GPRF:GENerator:ARB:FILE:LOAD:CANCEL

Waveform files cannot be loaded into waveform memory if the memory has insufficient free space.

In this case, delete waveform files that are not being used from memory to increase the available free space.

- To query the memory free space
:SOURce:GPRF:GENerator:ARB:WAVEform:FREE
- To defragment waveform memory
:SOURce:GPRF:GENerator:ARB:WAVEform:DEFrag
- To query the number of files
:SOURce:GPRF:GENerator:ARB:WAVEform:COUNt
- To query the file name
:SOURce:GPRF:GENerator:ARB:WAVEform:NAME
- To delete the waveform file
:SOURce:GPRF:GENerator:ARB:WAVEform:DELeTe
:SOURce:GPRF:GENerator:ARB:WAVEform:DELeTe:ALL

Specify the waveform to reproduce from the waveform files in the waveform memory.

- To query the waveform file version
:SOURce:GPRF:GENerator:ARB:FILE:VERSIon
- To query the number of group information units
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:COUNt
- To query the group number
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern
- To query the pattern name
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:NAME

- To select the waveform data to be played
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:SElect
- To restart the waveform
:SOURce:GPRF:GENerator:ARB:WAVEform:REStart

Usage Example

The following example specifies waveform file MV887060A_ZB2450_0001 of Group Number 1.

1. Set the operation mode to Normal mode.
:SOURce:GPRF:GENerator:MODE NORMAL
2. Set modulation (any waveform) to On.
:SOURce:GPRF:GENerator:BBMode ARB
3. Load the waveform file into waveform to memory.
:SOURce:GPRF:GENerator:ARB:FILE:LOAD
"MV887060A_ZB2450_0001"
4. Query the waveform file group number.
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:COUNT?
"MV887060A_ZB2450_0001"
> 1
5. Query the group title of group number 1.
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:NAME?
"MV887060A_ZB2450_0001",1
> "ZigBee, OffsetQPSK, Band=2450, Chip Rate=2000kchip/s,
Filter=half-sine"
6. Specify the waveform.
:SOURce:GPRF:GENerator:ARB:WAVEform:PATtern:SElect
"MV887060A_ZB2450_0001",1,1

Chapter 3 Waveform File Details

This chapter explains the detailed specifications of the waveform files for the IEEE 802.15.4 Application.

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3.1 IEEE 802.15.4 Waveform File

The specifications of the IEEE802.15.4 Waveform File are listed in the following table.

3.1.1 MV887060A_ZB2450_0001

Table 3.1.1-1 MV887060A_ZB2450_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB2450_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	2450
Data Rate	250 kb/s
Chip Rate	2000 kchip/s
Filter	half-sine
Signal Length	1664 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 01 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.2 MV887060A_ZB915_0001

Table 3.1.2-1 MV887060A_ZB915_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB915_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	915
Data Rate	250 kb/s
Chip Rate	1000 kchip/s
Filter	half-sine
Signal Length	832 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 01 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.3 MV887060A_ZB868_0001

Table 3.1.3-1 MV887060A_ZB868_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB868_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	868
Data Rate	100 kb/s
Chip Rate	400 kchip/s
Filter	half-sine
Signal Length	832 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 01 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.4 MV887060A_ZB780_0001

Table 3.1.4-1 MV887060A_ZB780_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB780_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	780
Data Rate	250 kb/s
Chip Rate	1000 kchip/s
Filter	Raised Cosine (roll-off 0.8)
Signal Length	832 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 01 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.5 MV887060A_ZB2450_0002

Table 3.1.5-1 MV887060A_ZB2450_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB2450_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	2450
Data Rate	250 kb/s
Chip Rate	2000 kchip/s
Filter	half-sine
Signal Length	1024 chips
Burst Interval	20 ms
PHY Payload size	10 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C

3.1.6 MV887060A_ZB915_0002

Table 3.1.6-1 MV887060A_ZB915_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB915_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	915
Data Rate	250 kb/s
Chip Rate	1000 kchip/s
Filter	half-sine
Signal Length	1024 chips
Burst Interval	20 ms
PHY Payload size	26 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23 23 02 84 18 72 AA

3.1.7 MV887060A_ZB868_0002

Table 3.1.7-1 MV887060A_ZB868_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB868_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	868
Data Rate	100 kb/s
Chip Rate	400 kchip/s
Filter	half-sine
Signal Length	1024 chips
Burst Interval	20 ms
PHY Payload size	26 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23 23 02 84 18 72 AA

3.1.8 MV887060A_ZB780_0002

Table 3.1.8-1 MV887060A_ZB780_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB780_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	O-QPSK PHY
Band	780
Data Rate	250 kb/s
Chip Rate	1000 kchip/s
Filter	Raised Cosine (roll-off 0.8)
Signal Length	1024 chips
Burst Interval	20 ms
PHY Payload size	26 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23 23 02 84 18 72 AA

3.1.9 MV887060A_ZB915_BPSK_0001

Table 3.1.9-1 MV887060A_ZB915_BPSK_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB915_BPSK_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	BPSK PHY
Band	915
Data Rate	40 kb/s
Chip Rate	600 kchip/s
Filter	Raised Cosine
Signal Length	5520 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.10 MV887060A_ZB868_BPSK_0001

Table 3.1.10-1 MV887060A_ZB868_BPSK_0001 Composition

Item	Specification
Waveform File Name	MV887060A_ZB868_BPSK_0001
Group Number	1
Standard	IEEE 802.15.4
PHY	BPSK PHY
Band	868
Data Rate	20 kb/s
Chip Rate	300 kchip/s
Filter	Raised Cosine
Signal Length	5520 chips
Burst Interval	20 ms
PHY Payload size	20 Octets
PHY Payload (Octets)	HEX: 21 00 01 FF C1 FB E8 4C 90 72 8B E7 B3 51 89 63 AB 23

3.1.11 MV887060A_ZB915_BPSK_0002

Table 3.1.11-1 MV887060A_ZB915_BPSK_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB915_BPSK_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	BPSK PHY
Band	915
Data Rate	40 kb/s
Chip Rate	600 kchip/s
Filter	Raised Cosine
Signal Length	1080 chips
Burst Interval	20 ms
PHY Payload size	3 Octets
PHY Payload (Octets)	HEX: 21 00 01

3.1.12 MV887060A_ZB868_BPSK_0002

Table 3.1.12-1 MV887060A_ZB868_BPSK_0002 Composition

Item	Specification
Waveform File Name	MV887060A_ZB868_BPSK_0002
Group Number	1
Standard	IEEE 802.15.4
PHY	BPSK PHY
Band	868
Data Rate	20 kb/s
Chip Rate	300 kchip/s
Filter	Raised Cosine
Signal Length	1080 chips
Burst Interval	20 ms
PHY Payload size	3 Octets
PHY Payload (Octets)	HEX: 21 00 01

3.2 ZERO Waveform File

The specifications of the ZERO Waveform File are listed in the following table.

3.2.1 ZERO_16000KHZ_16000P

Table 3.2.1-1 ZERO_16000KHZ_16000P Composition

Item	Specification
Waveform File Name	ZERO_16000KHZ_16000P
Group Number	1
Sampling Rate	16 MHz
Sample points	16000 points

3.2.2 ZERO_8000KHZ_8000P

Table 3.2.2-1 ZERO_8000KHZ_8000P Composition

Item	Specification
Waveform File Name	ZERO_8000KHZ_8000P
Group Number	1
Sampling Rate	8 MHz
Sample points	8000 points

3.2.3 ZERO_3200KHZ_3200P

Table 3.2.3-1 ZERO_3200KHZ_3200P Composition

Item	Specification
Waveform File Name	ZERO_3200KHZ_3200P
Group Number	1
Sampling Rate	3.2 MHz
Sample points	3200 points

3.2.4 ZERO_4800KHZ_4800P

Table 3.2.4-1 ZERO_4800KHZ_4800P Composition

Item	Specification
Waveform File Name	ZERO_4800KHZ_4800P
Group Number	1
Sampling Rate	4.8 MHz
Sample points	4800 points

3.2.5 ZERO_2400KHZ_2400P

Table 3.2.5-1 ZERO_2400KHZ_2400P Composition

Item	Specification
Waveform File Name	ZERO_2400KHZ_2400P
Group Number	1
Sampling Rate	2.4 MHz
Sample points	2400 points

3.3 Combination of Waveform Files

When using the Packet Transmitter function of the MX880056A, use ZERO Waveform File combining with IEEE 802.15.4 Waveform File of the same sampling rate.

The table below shows available combinations.

Table 3.3-1 Combination of Waveform Files

Sampling Rate [MHz]	IEEE 802.15.4 Waveform File	ZERO Waveform File
16 MHz	MV887060A_ZB2450_0001	ZERO_16000KHZ_16000P
	MV887060A_ZB2450_0002	
8 MHz	MV887060A_ZB915_0001	ZERO_8000KHZ_8000P
	MV887060A_ZB915_0002	
3.2 MHz	MV887060A_ZB868_0001	ZERO_3200KHZ_3200P
	MV887060A_ZB868_0002	
8 MHz	MV887060A_ZB780_0001	ZERO_8000KHZ_8000P
	MV887060A_ZB780_0002	
4.8 MHz	MV887060A_ZB915_BPSK_0001	ZERO_4800KHZ_4800P
	MV887060A_ZB915_BPSK_0002	
2.4 MHz	MV887060A_ZB868_BPSK_0001	ZERO_2400KHZ_2400P
	MV887060A_ZB868_BPSK_0002	