"Maple Bus 1.0"
Peripheral Hardware Specifications
maxi

Rev 0.80

<u>Revision:</u>

0.40	September 16 1998	Preview Version
0.50	September 30 1998	First distribution
0.70	October 26 1998	Vibration motor is determined as vibration source
		Modified minimum and maximum number of vibrations for constituent elements
		Added restrictions for mode of single-pulse vibration
		Appended setting example for number of vibrations in Data Formats
		Added voltage values and modified connection method in Fixed Device Status
0.80	December 9 1998	Proscribed use of vibration intensity setting of "1".
		Inserted "Free Device Status".

* Items added in the latest revision are indicated by . Items deleted in the latest revision are indicated by ▬.

CONTENTS:

1   CONFIGURATION OF maxi

1.1   Definition of maxi

It conforms to the "Maple Bus 1.0" Standard Specifications and belongs to Function Type "FT_8 : Vibration".

1.2   Function elements

The function elements used with maxi are defined by function type 'FT_8' and are as follows.

Vibration source No.	number of vibration sources that can be concurrently selected
1	1

Fig. 1.1   Function elements

Equipped with one "Vibration motor".

1.3   Detailed description of constituent elements

The following is a detailed description of the function elements used in maxi.

Vibration source	: 1	VN='0001'
Vibration source position	: Front	VP='00'
Source vibration axis	: none	VD='00'
Vibration intensity variable	: 8 levels	PF='1'
Continuous vibration	: Possible	CV='1'
Direction configuration	: Possible	PD='1'
Arbitrary vibration waveform	: Not possible	OWF='0'

Vibration attribute flag	: Maximum minimum Setting	VA='0000'
Minimum settable vibration frequency :		Fmin='07h' (4Hz)
Maximum settable vibration frequency :		Fmax='3Bh' (30Hz)

■ For direction settings, + direction results in forward rotation, - direction results in reverse rotation.

2   maxi OPERATION AND LIMITATIONS

Maxi conforms to the "FT_8:Viblation" mode.
The vibration source uses 1 "vibration motor".
A vibration intensity setting of "1" may result in no vibration, either with single-pulse or continuous vibration. Therefore, always use an intensity setting of at least "2".

2.1   Default configuration

The mode after power is supplied or after reset is as follows:
- Vibration is stopped.
- Automatic vibration stop time is 5.0 seconds.

2.2   Mode of single-pulse vibration

Only 1 cycle of vibration is generated.
Once the specification vibration action has been completed, vibration stops.
It is recommended that single-pulse vibration is used at 10Hz (Fm=13h) or less. If more than 10Hz is used, the motor may not rotate in some instances. (This is more pronounced as the frequency gets higher.)

2.3   Mode of continuous vibration

Vibration configured for 1 cycle is repeated.
Vibration continues until a stop command is issued or vibration auto-stop time is invoked.

2.4   Mode of continuous (divergent) vibration

Convergence and divergence cannot take place concurrently.
Continuous vibration can be specified. For example, a convergent vibration which gradually diminishes from a large vibration until it stops can be repeated again from another large vibration.
If continuous vibration is specified, convergence and divergence continues until a vibration stop command is issued or vibration auto-stop time is invoked.
Once the specification vibration action has been completed, vibration stops.

2.5   Automatic vibration stop time

Automatic vibration stop time functions only when vibration is continuous.
Vibration stops automatically when this time has passed, as measured from when the vibration starts.

2.6   Arbitrary vibration waveform

Arbitrary vibration waveform may not be specified.

3   Device ID

In accordance with the device ID definition in the "Maple Bus 1.0" Standard Specifications.
The notation is that of the host's memory image.

3.1   Configuration of the "Maple Bus 1.0" device ID.

The device ID consists of 16 bytes (128 bits).

bit	7	6	5	4	3	2	1	0
1st Data	0	0	0	0	0	0	0	0
2nd Data	0	0	0	0	0	0	0	0
3rd Data	0	0	0	0	0	0	0	1
4th Data	0	0	0	0	0	0	0	0
5th Data	0	0	0	0	0	0	0	1
6th Data	0	0	0	0	0	0	0	1
7th Data	0	0	0	0	0	0	0	0
8th Data	0	0	0	0	0	0	0	0
9th Data	0	0	0	0	0	0	0	0
10th Data	0	0	0	0	0	0	0	0
11th Data	0	0	0	0	0	0	0	0
12th Data	0	0	0	0	0	0	0	0
13th Data	0	0	0	0	0	0	0	0
14th Data	0	0	0	0	0	0	0	0
15th Data	0	0	0	0	0	0	0	0
16th Data	0	0	0	0	0	0	0	0

Fig. 3.1   Device ID

1st Data～4th Data	: Designates type of function that the peripheral is equipped with.	(FT)
5th Data～8th Data	: Designates the function definition block of the first function.	(FD1)
9th Data～12th Data	: Designates the function definition block of the second function.	(FD2)
13th Data～16th Data	: Designates the function definition block of the third function.	(FD3)

① FT_0～FT_{31}: Function type

Designates the function that the peripheral is equipped with.
There are 32 function types altogether.

② FD_{31}～FD_0: Function definition block

This is for the block defining the individual elements making up the function.

4   DATA FORMATS

The following chapter uses vibration functions to explain maxi data formats.
The notation is that of the host's memory image.

4.1   Vibration source information

Obtains vibration source information and characteristics.

Data Address	Data	Setting example	Description
+0000h	Command code	0Ah	Specifies Get_Media_Info.
+0001h	Destination AP	01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP	00h	Port A
+0003h	Data size	02h	Data size is 8 bytes.
+0004h	Function type	00h	The function type specifies the vibration.
+0005h		00h	
+0006h		01h	
+0007h		00h	
+0008h	VN	01h	Specifies Vibration Source -1.
+0009h	Phase	00h	Fixed value
+000Ah	Block No.	0000h	Fixed value
+000Bh			

Fig. 4.1   Example of vibration source information acquisition

Vibration source information must always be obtained with this command before vibration can be specified.
An error occurs if the number of vibration sources (VN) exceeds the number indicated by FD.

Data returned is as follows.

Data Address	Data		Setting example	Description
+0000h	Command code		08h	Specifies Data Transfer.
+0001h	Destination AP		00h	Port A
+0002h	Origin AP		01h	Expansion device (LM-Bus No.1)
+0003h	Data size		02h	Data size is 8 bytes.
+0004h	Function type		00h	The function type specifies the vibration.
+0005h			00h	
+0006h			01h	
+0007h			00h	
+0008h	Vibration source information	Vset0	10h	Vibration source -1, front, no vibration axis
+0009h		Vset1	E0h	Continuous, direction, minimum maximum
+000Ah		Fm0	07h	Minimum 4Hz
+000Bh		Fm1	3Bh	Maximum 30Hz

Fig. 4.2   Example of vibration source information

4.2   Vibration settings

4.2.1   Forward rotation settings

The following example illustrates forward rotation settings

Data Address	Data		Setting example	Description
+0000h	Command code		0Eh	Specifies Set Condition.
+0001h	Destination AP		01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP		00h	Port A
+0003h	Data size		02h	Data size is 8 bytes.
+0004h	Function type		00h	The function type specifies the vibration.
+0005h			00h	
+0006h			01h	
+0007h			00h	
+0008h	Vibration setting	CTRL	11h	Vibration source -1 Continuous vibration
+0009h		POW	70h	Intensity +7
+000Ah		Freq	27h	Vibration frequency 20Hz
+000Bh		Inc	00h	No vibration inclination

Fig. 4.3   Example of forward rotation settings

This command makes Vibration Source-1 continue rotation in the forward direction for the duration of the time specified for continuous vibration.

In order to change the rotation direction, the command for reverse rotation should be issued.
It is not necessary to stop Vibration Source -1 before doing so. At this time, the recoil results in a crashing sensation.
If the stop command (intensity 0) is issued, vibration stops.

4.2.2   Reverse rotation settings

The following example illustrates reverse rotation settings

Data Address	Data		Setting example	Description
+0000h	Command code		0Eh	Specifies Set Condition.
+0001h	Destination AP		01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP		00h	Port A
+0003h	Data size		02h	Data size is 8 bytes.
+0004h	Function type		00h	The function type specifies the vibration.
+0005h			00h	
+0006h			01h	
+0007h			00h	
+0008h	Vibration setting	CTRL	11h	Vibration source -1 Continuous vibration
+0009h		POW	07h	Intensity -7
+000Ah		Freq	27h	Vibration frequency 20Hz
+000Bh		Inc	00h	No vibration inclination

Fig. 4.4   Example of reverse rotation settings

This command makes Vibration Source -1 continue rotation in the reverse direction for the duration of the time specified for continuous vibration.

In order to change the rotation direction, the command for forward rotation should be issued.
It is not necessary to stop Vibration Source -1 before doing so. At this time, the recoil results in a crashing sensation.
If the stop command (intensity 0) is issued, vibration stops.

4.2.3   Rotation stop setting

The following example illustrates rotation stop settings for Vibration Source -1

Data Address	Data		Setting example	Description
+0000h	Command code		0Eh	Specifies Set Condition.
+0001h	Destination AP		01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP		00h	Port A
+0003h	Data size		02h	Data size is 8 bytes.
+0004h	Function type		00h	The function type specifies the vibration.
+0005h			00h	
+0006h			01h	
+0007h			00h	
+0008h	Vibration setting	CTRL	10h	Vibration Source -1 No continuous vibration
+0009h		POW	00h	Intensity 0
+000Ah		Freq	27h	Vibration frequency 20Hz
+000Bh		Inc	00h	No vibration inclination

Fig. 4.5   Rotation stop setting example

This command makes Vibration Source -1 stop rotation.

■ If the intensity is specified at '0', all settings for continuous vibration, vibration frequency (Freq) and vibration inclination frequency (Inc) are ignored.

4.3   Checking the current vibration settings

The following example illustrates checking the current vibration setting for the vibration source.

Data Address	Data	Setting example	Description
+0000h	Command code	09h	Specifies Get Condition.
+0001h	Destination AP	01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP	00h	Port A
+0003h	Data size	01h	Data size is 4 bytes.
+0004h	Function type	00h	The function type specifies the vibration.
+0005h		00h	
+0006h		01h	
+0007h		00h	

Fig. 4.6   Example of checking current vibration settings

This command makes it possible to check the settings for the current vibration settings.
The reply to this command will be the vibration setting specified by the previous Set Condition command.
If Get Condition is issued before Set Condition is sent, all response data will be '00h'.

4.4   Setting vibration auto-stop time

The following example illustrates vibration auto-stop time settings.

Data Address	Data	Setting example	Description
+0000h	Command code	0Ch	Specifies Block_Write.
+0001h	Destination AP	01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP	00h	Port A
+0003h	Data size	03h	Data size is 12 bytes.
+0004h	Function type	00h	The function type specifies the vibration.
+0005h		00h	
+0006h		01h	
+0007h		00h	
+0008h	VN	00h	Specifies vibration auto-stop time.
+0009h	Phase	00h	Fixed value
+000Ah	Block No.	0000h	Fixed value
+000Bh			
+000Ch	ASR	0002h	Specifies Vibration Source -1.
+000Dh			
+000Eh	AST 1	13h	Time setting (approx. 5.0 seconds)
+000Fh	Dummy	00h	Fixed value

Fig. 4.7   Example of vibration auto-stop time settings

This command makes it possible to change the vibration auto-stop time settings.

In this example, the vibration auto-stop time is specified as 5.0 seconds.

The following shows a detailed description of the settings for AST.

Auto-stop time	AST	AST_7	AST_6	AST_5	AST_4	AST_3	AST_2	AST_1	AST_0
0.25 seconds	00h	0	0	0	0	0	0	0	0
0.50 seconds	01h	0	0	0	0	0	0	0	1
0.75 seconds	02h	0	0	0	0	0	0	1	0
1.00 seconds	03h	0	0	0	0	0	0	1	1
:	:	:	:	:	:	:	:	:	:
5.00 seconds	13h	0	0	0	1	0	0	1	1
:	:	:	:	:	:	:	:	:	:
10.0 seconds	27h	0	1	1	0	0	1	1	1
:	:	:	:	:	:	:	:	:	:
30.0 seconds	77h	0	1	1	1	0	1	1	1
:	:	:	:	:	:	:	:	:	:
60.0 seconds	EFh	1	1	1	0	1	1	1	1
:	:	:	:	:	:	:	:	:	:
64.0 seconds	FFh	1	1	1	1	1	1	1	1

Fig. 4.8   Bit configuration for vibration auto-stop time setting

4.5   Checking vibration auto-stop time settings

The following example illustrates checking the vibration auto-stop time.

Data Address	Data	Setting example	Description
+0000h	Command code	0Bh	Specifies Block_Read.
+0001h	Destination AP	01h	Expansion device (LM-Bus No.1)
+0002h	Origin AP	00h	Port A
+0003h	Data size	02h	Data size is 8 bytes.
+0004h	Function type	00h	The function type specifies the vibration.
+0005h		00h	
+0006h		01h	
+0007h		00h	
+0008h	VN	00h	Specifies vibration auto-stop time
+0009h	Phase	00h	Fixed value
+000Ah	Block No.	0000h	Fixed value
+000Bh			

Fig. 4.9   Example of checking vibration auto-stop time

This command makes it possible to check the current vibration auto-stop time setting.
The reply to this command will be the data specified by the previous [Block_Write] command.

4.6   Specifying and checking arbitrary vibration waveform settings

This product does not allow the specifying or checking of arbitrary vibration waveforms.
The issuance of a settings command results in the error message [Command Unknown].

5   maxi INFORMATION

This chapter describes device-specific information (Device Status).

5.1   Types

Fixed Device Status

This is a set form of device status, consisting of 112 bytes in all, that must be designated.

Free Device Status

The individual devices can use this status freely.

It consists of 40 bytes.

5.2   Fixed Device Status

The Fixed Device Status records the following information.

① Device ID

Capacity	: 16 bytes	
Description	: Function type	"FT$_8$" only
	Function definition 1st	1 vibration source, 1 vibration that can be concurrently selected.
	Function definition 2nd	none
	Function definition 3rd	none
Data	: 00h-00h-01h-00h -01h-01h-00h-00h -00h-00h-00h-00h -00h-00h-00h-00h	

② Destination

Capacity	: 1 byte
Description	: Worldwide
Data	: FFh

③ Connection direction

Capacity	: 1byte
Description	: Expansion socket upward direction
Data	: 00h

④ Product name

Capacity	: 30 bytes
Description	: Designates "Puru Puru Pack" ~~(tentative)~~ in half-width characters.
	A space code (20h) is inserted for unused space.

⑤ License
Capacity   : 60 bytes
Description   : Generally,   it   designates   "Produced   By   or   Under   License   From   SEGA
                  ENTERPRISES,LTD."
                  A space code (20h) is inserted for unused space.

⑥ Standby current consumption
Capacity   : 2 bytes
Description   : 20mA
Data   : 00h-C8h

⑦ Maximum current consumption
Capacity   : 2 bytes
Description   : 160mA
Data   : 06h-40h

5.3   Free Device Status

The Free Device Status area is available for product planners, developers, designers and programmers
to enter any information the wish. The host obtains this status by the All Device Request.

maxi designates the following 40 byte data:
"Version 1.000,1998/11/10,315-6211-AH   ,"
"Vibration Motor:1,Fm:4 – 30Hz,Pow:7   "

6   AFTERWORD

Until the official version (Rev. 1.0) is distributed, contents are subject to revision.