□Maple Bus 1.0□
Function Type Specifications
FT_3:Timer Function

Revision 0.80

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1 Overview of Timer Function

1.1Definition of Timer Function

The Timer Function can measure time either through the installation of a real time clock or by counting the passage of time.
In addition to measuring time, the Timer Function can include an alarm function and time setting buttons.
The Timer Function must satisfy the conditions listed below.

1) The Timer Function must be able to read and write time data. There are no restrictions concerning its external appearance.
2) The time function must continue to update the time data as long as power is supplied.
3) The Timer Function must conform with the Maple Bus 1.0 Standard Specifications.

1.2Timer Function Features and Restrictions

The features and restrictions of the Timer Function are listed below:

1) The Timer Function can set the time.
   The time that is set is saved by the function, and is incremented each second.
2) The Timer Function can read out timer data.
   When the data is read out, it is read in the sequence year, month, day, hour, minute, second.
3) The time data is maintained by a timekeeping backup power supply.
4) Up to two alarms can be sounded simultaneously.
5) The volume of the alarms cannot be adjusted.
6) The function can support time setting buttons so that the time can be set independently.

1.3Initial Settings for the Timer Function

The initial settings for the Timer Function are as shown below.

1) If there is no timekeeping backup power supply, the time data will be undefined each time that the power is turned on.
2) After the timekeeping power supply is applied (or after a reset), the time is set to Thursday, 00:00:00, January 1, 1998. The time is not initialized by the reset pattern or by a "Device Reset."
3) The alarms are off.
   Any alarms that are sounding are turned off by the reset pattern or by a "Device Reset."

2 Device IDs

Device IDs conform with the device ID stipulations in the Maple Bus 1.0 Standard Specifications. The notation used is the memory image in the host.

2.1Device ID Configuration

In Maple Bus 1.0, device IDs are configured as shown below.

bit	7	6	5	4	3	2	1	0
1st Data	FT_{31}	FT_{30}	FT_{29}	FT_{28}	FT_{27}	FT_{26}	FT_{25}	FT_{24}
2nd Data	FT_{23}	FT_{22}	FT_{21}	FT_{20}	FT_{19}	FT_{18}	FT_{17}	FT_{16}
3rd Data	FT_{15}	FT_{14}	FT_{13}	FT_{12}	FT_{11}	FT_{10}	FT_9	FT_8
4th Data	FT_7	FT_6	FT_5	FT_4	FT_3	FT_2	FT_1	FT_0
5th Data	$FD1_{31}$	$FD1_{30}$	$FD1_{29}$	$FD1_{28}$	$FD1_{27}$	$FD1_{26}$	$FD1_{25}$	$FD1_{24}$
6th Data	$FD1_{23}$	$FD1_{22}$	$FD1_{21}$	$FD1_{20}$	$FD1_{19}$	$FD1_{18}$	$FD1_{17}$	$FD1_{16}$
7th Data	$FD1_{15}$	$FD1_{14}$	$FD1_{13}$	$FD1_{12}$	$FD1_{11}$	$FD1_{10}$	$FD1_9$	$FD1_8$
8th Data	$FD1_7$	$FD1_6$	$FD1_5$	$FD1_4$	$FD1_3$	$FD1_2$	$FD1_1$	$FD1_0$
9th Data	$FD2_{31}$	$FD2_{30}$	$FD2_{29}$	$FD2_{28}$	$FD2_{27}$	$FD2_{26}$	$FD2_{25}$	$FD2_{24}$
10th Data	$FD2_{23}$	$FD2_{22}$	$FD2_{21}$	$FD2_{20}$	$FD2_{19}$	$FD2_{18}$	$FD2_{17}$	$FD2_{16}$
11th Data	$FD2_{15}$	$FD2_{14}$	$FD2_{13}$	$FD2_{12}$	$FD2_{11}$	$FD2_{10}$	$FD2_9$	$FD2_8$
12th Data	$FD2_7$	$FD2_6$	$FD2_5$	$FD2_4$	$FD2_3$	$FD2_2$	$FD2_1$	$FD2_0$
13th Data	$FD3_{31}$	$FD3_{30}$	$FD3_{29}$	$FD3_{28}$	$FD3_{27}$	$FD3_{26}$	$FD3_{25}$	$FD3_{24}$
14th Data	$FD3_{23}$	$FD3_{22}$	$FD3_{21}$	$FD3_{20}$	$FD3_{19}$	$FD3_{18}$	$FD3_{17}$	$FD3_{16}$
15th Data	$FD3_{15}$	$FD3_{14}$	$FD3_{13}$	$FD3_{12}$	$FD3_{11}$	$FD3_{10}$	$FD3_9$	$FD3_8$
16th Data	$FD3_7$	$FD3_6$	$FD3_5$	$FD3_4$	$FD3_3$	$FD3_2$	$FD3_1$	$FD3_0$

Fig 2.1 Device IDs

FT: Indicates the peripheral function type.
FD1: First function definition block.
FD2: Second function definition block.
FD3: Third function definition block.

1) FT_{31} to FT_0: Function type
Indicates the functions supported by the peripheral device. There are a total of 32 function types.

2) FD_{31} to FD_0: Function definition block
This block defines the individual elements that comprise a function. (Up to three different functions can be implemented for a single peripheral device.)

2.2Function Types

This section describes the function type (FT) within the device ID. The Timer Function function type is defined by FT_3 = 1.

bit	7	6	5	4	3	2	1	0
1st Data	FT_{31}	FT_{30}	FT_{29}	FT_{28}	FT_{27}	FT_{26}	FT_{25}	FT_{24}
2nd Data	FT_{23}	FT_{22}	FT_{21}	FT_{20}	FT_{19}	FT_{18}	FT_{17}	FT_{16}
3rd Data	FT_{15}	FT_{14}	FT_{13}	FT_{12}	FT_{11}	FT_{10}	FT_9	FT_8
4th Data	FT_7	FT_6	FT_5	FT_4	1	FT_2	FT_1	FT_0

Fig. 2.2 Timer Function Type

For example, in the case of a peripheral device for which only the Timer Function is implemented, the function type is defined by FT = 00-00-00-08h.
If other functions are implemented in a peripheral device, the function type bit that corresponds to that function is set to "1."

2.3Function Definition Block

This section describes the function definition block (FD) within the device ID.

The function definition block is a 32-bit data table that is inherent to each function. The elements that comprise a function, the data transmission and reception methods, etc., are all determined on the basis of this data.

The following table shows the configuration of the function definition block for the Timer Function.

bit	7	6	5	4	3	2	1	0
1st Data	TR_7	TR_6	TR_5	TR_4	TR_3	TR_2	TR_1	TR_0
2nd Data	TW_7	TW_6	TW_5	TW_4	TW_3	TW_2	TW_1	TW_0
3rd Data	SB_7	SB_6	SB_5	SB_4	SB_3	SB_2	SB_1	SB_0
4th Data	AL_1	AL_0	FD_5	FD_4	FD_3	FD_2	FD_1	FD_0

Fig. 2.3 Timer Function Definition Block Configuration

TR: Time read setting
This indicates the time units that are read out by the function.

Bit	7	6	5	4	3	2	1	0
TR	TR_7	TR_6	TR_5	TR_4	TR_3	TR_2	TR_1	TR_0
Time unit	-	Year	Month	Day	Hour	Minute	Second	Day of the week
Cannot be read	0	0	0	0	0	0	0	0
Can be read	-	1	1	1	1	1	1	1

Fig. 2.4 TR Values

TW: Time write setting

This indicates the units for which the time can be set by the timer function.

bit	7	6	5	4	3	2	1	0
TW	TW_7	TW_6	TW_5	TW_4	TW_3	TW_2	TW_1	TW_0
Time unit	-	Year	Month	Day	Hour	Minute	Second	Day of the week
Cannot be read	0	0	0	0	0	0	0	0
Can be read	-	1	1	1	1	1	1	1

Fig. 2.5 TW Value

Unit

Year: Indicates the year by the western calendar.
Month: Indicates the month.
Day: Indicates the day.
Hour: Indicates the hour.
Minute: Indicates the minute.
Second: Indicates the second.
Day of the week: Indicates the day of the week.

Bit 7 is fixed to "0."

SB: Setting buttons

This indicates the availability of the time setting buttons.

Bit	7	6	5	4	3	2	1	0
SB	SB_7	SB_6	SB_5	SB_4	SB_3	SB_2	SB_1	SB_0
Button	S	C	B	A	R	L	D	U
Enabled	1	1	1	1	1	1	1	1
Disabled	0	0	0	0	0	0	0	0

Fig. 2.6 SB Values

Button

S: Indicates the "Start" (example function: Pause, etc.) button.
C: Indicates the "C" (example function: Menu, etc.) button.
B: Indicates the "B" (example function: Cancel, etc.) button.
A: Indicates the "A" (example function: Enter, etc.) button.
R: Indicates the "Right" button on the cross-shaped directional button.
L: Indicates the "Left" button on the cross-shaped directional button.
D: Indicates the "Down" button on the cross-shaped directional button.
U: Indicates the "Up" button on the cross-shaped directional button.

AL: Alarm flags
This indicates whether an alarm is on or not.

Alarm	AL_1	AL_0
Alarm 1 on	-	1
Alarm 1 off	-	0
Alarm 2 on	1	-
Alarm 2 off	0	-

Fig. 2.7 Alarm Flag Values

Two alarms (alarm 1 and alarm 2) can be used simultaneously. In this case, AL = "11."

FD: Reserved
This value should be "0."

3 Timer Specifications

3.1Time Units

The minimum unit of operation for the Timer Function is 1 second.
The Timer Function can keep track of time in the following units: year, month, day, hour, minute, second.
The following table describes the parameters for how each unit is measured (set).

Unit	Size	Display	Settings
Year	2byte	From 0 to 9999	'0000h' □ '2F0Fh'
Month	1byte	From 1 to 12	'01h' □ '0Ch'
Day	1byte	From 1 to 31	'01h' □ '1Fh'
Hour	1byte	From 0 to 23	'00h' □ '17h'
Minute	1byte	From 0 to 59	'00h' □ '3Bh'
Second	1byte	From 0 to 59	'00h' □ '3Bh'

Fig. 3.8 Time Settings

The Timer Function automatically counts seconds and carries up to the next unit.
Years are expressed under the western calendar.
One year is 365 days.
One day is 24 hours.
One hour is 60 minutes.
One minute is 60 seconds.

In a non-leap year, the number of days in each month is as follows:
1, 3, 5, 7, 8, 10 and 12: 31 days
4, 6, 9, and 11: 30 days
2: 28 days

The setting format is entirely hexadecimal.

[Block_Write] is used to set the Timer Function, and [Block_Read] is used to read the Timer Function. The time units that can be set and that can be read are each declared in the function definition block. If an attempt is made to set a value outside of the settable range, the error command [Transmit Again] is returned.

3.1.1 Day of the Week

If writing the day of the week is enabled in the function definition block, the Timer Function automatically keeps track of the day of the week.
The size of the day of the week setting is 1 byte.

Day of the week	Value
Monday	00h
Tuesday	01h
Wednesday	02h
Thursday	03h
Friday	04h
Saturday	05h
Sunday	06h

Fig. 3.9 Day of the Week Settings

A week starts with Monday and ends with Sunday.
The Timer Function increments the value of this setting by one each day until Sunday ("06h") is reached. After Sunday ("06h") is reached, the value on the next day returns to Monday ("00h").

3.1.2 Leap Years

The Timer Function automatically keeps track of leap years.
If the year can be divided evenly by 4, that year is a leap year.
If the year can be divided evenly by 100, that year is not a leap year.
If the year can be divided evenly by 400, that year is a leap year.
(Example: The year 2000 is a leap year. The year 1900 was not a leap year.)
In a leap year, February has 29 days.

3.2Alarms

An alarm is buzzer output produced by a pulse generator that is controlled by the Timer Function's built-in counter. The Timer Function can support a maximum of two alarm types.
The alarm types that can be used are declared in the function definition block. The volume of the alarms cannot be adjusted.

bit	7	6	5	4	3	2	1	0
ALw0	$ALw0_7$	$ALw0_6$	$ALw0_5$	$ALw0_4$	$ALw0_3$	$ALw0_2$	$ALw0_1$	$ALw0_0$
ALd0	$ALd0_7$	$ALd0_6$	$ALd0_5$	$ALd0_4$	$ALd0_3$	$ALd0_2$	$ALd0_1$	$ALd0_0$
ALw1	$ALw1_7$	$ALw1_6$	$ALw1_5$	$ALw1_4$	$ALw1_3$	$ALw1_2$	$ALw1_1$	$ALw1_0$
ALd1	$ALd1_7$	$ALd1_6$	$ALd1_5$	$ALd1_4$	$ALd1_3$	$ALd1_2$	$ALd1_1$	$ALd1_0$

Fig. 3.10 Alarm Settings

ALw0□ALd0: Alarm 1
ALw1□ALd1: Alarm 2

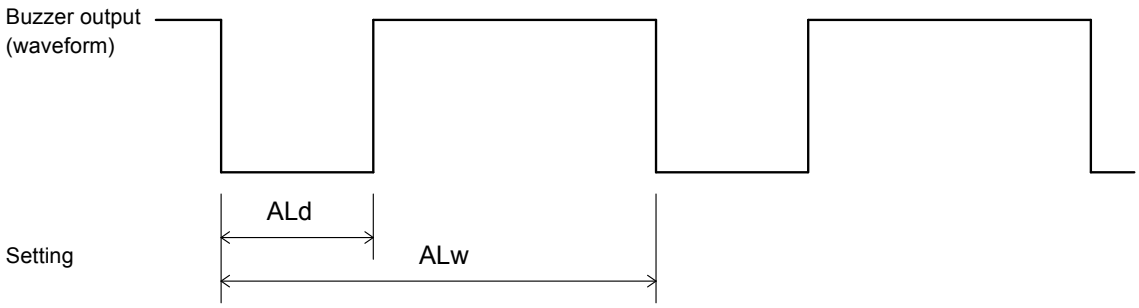

Fig. 3.11 Relationship between the Setting and Buzzer Output

The pitch of alarm output can be changed by altering the cycle and duty ratio. The "ALw" value specifies the cycle.
The duty ratio is expressed by the following formula:

Duty = □ALd □ ALw□□100□□%□

Typically, the duty ratio should be 50%.

The settings must be such that "ALd" is less than or equal to "ALw."

Once the alarm settings are made, they are retained until they are changed.
Therefore, when changing the pitch, etc., the new value becomes the setting for the function immediately. To stop the sounding of an alarm, set the value of "ALw" to "00h." When this value is set, the Timer Function stops sounding the alarm, (i.e., turns the output off). (In this case, "ALd" must also be set to "00h.")

Alarms are turned off as a result of a reset (or after initialization).

The [Set Condition] command is used to make settings for the Timer Function.

3.3Setting Buttons

Peripherals in which the Timer Function is implemented can include setting buttons that are used to set the time independently. The setting buttons that can be used are declared in the function definition block.

bit	7	6	5	4	3	2	1	0
BT	S	C	B	A	R	L	D	U
OFF	1	1	1	1	1	1	1	1
ON	0	0	0	0	0	0	0	0

Fig. 3.12 Button Data

BT (Buttons)
- S: Indicates the "Start" button.
- C: Indicates the "C" button.
- B: Indicates the "B" button.
- A: Indicates the "A" button.
- R: Indicates the "Right" button on the cross-shaped directional button.
- L: Indicates the "Left" button on the cross-shaped directional button.
- D: Indicates the "Down" button on the cross-shaped directional button.
- U: Indicates the "Up" button on the cross-shaped directional button.

If a button is pressed, it enters the ON state; if it is not pressed, it enters the OFF state. On the function side, "R" and "L" cannot be ON at the same time, and "D" and "U" cannot be ON at the same time. The "Start" and "C" buttons are used for auxiliary applications; all operations can be performed by using the "A" and "B" buttons.

The [Get Condition] command is used in order to get button information from the Timer Function.

4 Commands

This section describes those commands that the Timer Function supports out of the commands included in the Maple Bus 1.0 Standard Specifications.
All of the setting examples assume that the Timer Function is connected to LM-Bus No. 1 of port A.

4.1Control Commands

4.1.1 Block_Read

Issuing authority:	Host	
Command code:	0Bh	
Data size:	02h□□8byte□	
Data:	Function type:	4byte
	PT:	1byte
	Phase:	1byte
	Block No.:	2byte
Expected return value:	[Data Transfer]	
Description:	This command requests the data in the specified block number from a function. With the Timer Function, this command is used to read the time. For the Timer Function, "PT" and "Phase" are fixed at "00h," and "Block No." is also fixed at "0000h." An example of this command is shown below.	

Data Address	Data	Example setting	Description
+0000h	Command code	0Bh	Specifies [Block_Read].
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	02h	The data size is 8 bytes.
+0004h	Function type	00h	Specifies the function type as "Timer."
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h	PT	00h	Fixed value
+0009h	Phase	00h	Fixed value
+000Ah	Block No.	0000h	Fixed value
+000Bh			

Fig. 4.13 Block_Read Command Example

If a value other than "00h" is specified for "PT" or "Phase," or a value other than "0000h" is specified for "Block No.," the error command [Transmit Again] is returned.

Data that was read by means of [Block_Read] is sent by [Data Transfer].
In the Timer Function, this data becomes the time data.
The data that is returned is described below.

Data Address	Data	Example setting	Description
+0000h	Command code	08h	Specifies [Data Transfer]
+0001h	Receiver AP	00h	Port A
+0002h	Sender AP	01h	Expansion device (LM-Bus No. 1)
+0003h	Data size	03h	The data size is 12 bytes
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h	Year		Year setting
+0009h			
+000Ah	Month		Month setting
+000Bh	Day		Day setting
+000Ch	Hour		Hour setting
+000Dh	Minute		Minute setting
+000Eh	Second		Second setting
+000Fh	Day of the week		Day of the week setting

Fig. 4.14□Block_Read Return Command Example

For details on the time settings, refer to section 3.1, "Time Units."

The value "00h" is returned for those time settings that cannot be set according to the function definition block.

4.1.2 Block_Write

Issuing authority: Host
Command code: 0Ch
Data size: 04h□16byte□
Data: Function type: 4byte
PT: 1byte
Phase: 1byte
Block No.: 2byte
Write data: 8byte
Expected return value: [Device Reply]
Description: This command writes data in the specified "Block No." for the Timer Function; this command is used to set the time.
For the Timer Function, "PT" and "Phase" are fixed at "00h," and "Block No." is also fixed at "0000h."
An example of this command is shown below

Data Address	Data	Example setting	Description
+0000h	Command code	0Ch	Specifies [Block_Write]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	04h	The data size is 16 bytes
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h	PT	00h	Fixed value
+0009h	Phase	00h	Fixed value
+000Ah	Block No.	0000h	Fixed value
+000Bh			
+000Ch	Year		Year setting
+000Dh			
+000Eh	Month		Month setting
+000Fh	Day		Day setting
+0010h	Hour		Hour setting
+0011h	Minute		Minute setting
+0012h	Second		Second setting
+0013h	Day of the week		Day of the week setting

Fig. 4.15□Block_Write Command Example

For details on the time settings, refer to section 3.1, "Time Units."
No error results even if a value is written to a time setting that is specified as not being settable in the function definition block.
If this data is processed normally on the function side, [Device Reply] is returned; if an error occurs, [Transmit Again] is returned.

4.1.3 Get Condition

Issuing authority: Host
Command code: 09h
Data size: 01h
Data area: Function type: 4Byte
Expected return value: [Data Transfer]
Description: This command requests the physical status of a function (i.e., the status of the buttons, keys, and levers).
This command is used to get the setting button data from the Timer Function.

Data Address	Data	Example setting	Description
+0000h	Command code	09h	Specifies [Get Condition]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	01h	The data size is 4 bytes
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	

Fig. 4.16 Get Condition Command Example

Data that was read by [Get Condition] is sent by [Data Transfer].
In the Timer Function this becomes the setting button data.
The data that is sent in response to the [Get Condition] command is described below.

Data Address	Data	Example setting	Description
+0000h	Command code	08h	Specifies [Data Transfer]
+0001h	Receiver AP	00h	Port A
+0002h	Sender AP	01h	Expansion device (LM-Bus No. 1)
+0003h	Data size	02h	The data size is 8 bytes
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h	BT		Button data
+0009h	Fixed value	00h	
+000Ah		00h	
+000Bh		00h	

Fig. 4.17 Get Condition Return Command Example

For details on the button data, refer to section 3.3, "Setting Buttons."

4.1.4 Set Condition

Issuing authority: Host
Command code: 0Eh
Data size: 02h
Data area: Function type :4byte
Alarm data :4byte
Expected return value: [Device Reply]
Description: This command sets the physical status of the function.
In the case of the Timer function, this command is used to sound an alarm.

Data Address	Data	Example setting	Description
+0000h	Command code	0Eh	Specifies [Set Condition]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	02h	The data size is 8 bytes
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h	ALw0		Alarm 1 data
+0009h	ALd0		
+000Ah	ALw1		Alarm 2 data
+000Bh	ALd1		

Fig. 4.18□Set Condition Command Example

For details on the alarm data, refer to section 3.2, "Alarms."

The reply from the function is [Device Reply].
If there is an error in the settings, [Transmit Again] is returned.

4.1.5 Data Transfer

Issuing authority: Timer Function
Command code: 08h
Data size: 01h + n (4 bytes + n x 4 bytes)
Data: Function type: 4byte
Data: n□4 byte
Description: This command returns data in response to a request from the host.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	08h	Specifies [Data Transfer]
+0001h	Receiver AP	00h	Port A
+0002h	Sender AP	01h	Expansion device (LM-Bus No. 1)
+0003h	Data size	01h + n	
+0004h	Function type	00h	Specifies the function type as "Timer"
+0005h		00h	
+0006h		00h	
+0007h		08h	
+0008h □	Data		

Fig. 4.19□Data_Transfer Command Example

4.1.6 Device Reply

Issuing authority: Timer Function
Command code: 07h
Data size: 00h
Data: none
Description: This command is returned to the host as the reply command if the command that the host sent was processed normally by the Timer Function.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	07h	Specifies [Device Reply]
+0001h	Receiver AP	00h	Port A
+0002h	Sender AP	01h	Expansion device (LM-Bus No. 1)
+0003h	Data size	00h	The data size is 0 bytes

Fig. 4.20□Device Reply Command Example

4.1.7 Device Request

Issuing authority: Host
Command code: 01h
Data size: 00h
Data: none
Expected return value: [Device Status]
Description: This command requests [Device Status] from the receiver AP peripheral device.
After initialization, the Timer Function does not respond to any other commands until it receives this command.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	01h	Specifies [Device Request]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	00h	The data size is 0 bytes

Fig. 4.21□Device Request Command Example

4.1.8 All Status Request

Issuing authority: Host
Command code: 02h
Data size: 00h
Data area: none
Expected return value: [Device All Status]
Description: This command requests all device statuses (both Fixed Device Status and Free Device Status) from the receiver AP peripheral device.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	02h	Specifies [All Status Request]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	00h	The data size is 0 bytes

Fig. 4.22□All Status Request Command Example

4.1.9 Device Reset

Issuing authority: Host
Command code: 03h
Data size: 00h
Data area: none
Expected return value: [Device Reply]
Operation sequence: (1)[Device Reply] is returned.
(2)The peripheral is initialized.
Description: This command can be used to initialize the device specified as the Receiver AP.
The time data is not initialized.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	03h	Specifies [Device Reset]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	00h	The data size is 0 bytes

Fig. 4.23□Device Reset Command Example

4.1.10 Device Kill

Issuing authority: Host
Command code: 04h
Data size: 00h
Data area: none
Expected return value: [Device Reply]
Operation sequence: (1)[Device Reply] is returned
(2)The peripheral stops operating
Description: This command does not request any operation on the part of the peripheral device that is specified as the Receiver AP.
Although any alarms that are sounding stop, timekeeping operations do not.
The Timer Function goes into standby (consuming only the standby current), and does not accept any commands.
In order to make the Timer Function resume operations, it is necessary either to execute a hard reset or to turn off the power and then restart.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	04h	Specifies [Device Kill]
+0001h	Receiver AP	01h	Expansion device (LM-Bus No. 1)
+0002h	Sender AP	00h	Port A
+0003h	Data size	00h	The data size is 0 bytes

Fig. 4.24□Device Kill Command Example

4.1.11 Device Status

Issuing authority: Peripheral device
Command code: 05h
Data size: 1Ch
Data area: Device ID: 16Byte
Region code: 1Byte
Manufacturer's name: 31Byte
License: 60Byte
Standby current consumption: 2Byte
Maximum current consumption: 2Byte
Description: This command returns the Fixed Device Status data in response to a [Device Request] command from the host.
An example of this command is shown below.

Data Address	Data	Example setting	Description
+0000h	Command code	05h	Specifies [Device Status]
+0001h	Receiver AP	00h	Port A
+0002h	Sender AP	01h	Expansion device (LM-Bus No. 1)
+0003h	Data size	1Ch	The data size is 112 bytes
+0004h □ +0013h	Device ID		Specifies the device ID
+0014h	Region code		Specifies the region code
+0015h □ +0033h	Manufacturer's name		Specifies the manufacturer's name
+0034h □ +006Fh	License		Specifies the license information
+0070h	Standby current consumption		Specifies the standby current consumption
+0071h			
+0072h	Maximum current consumption		Specifies the maximum current consumption
+0073h			

Fig. 4.25□Device Status Command Example

4.1.12 Device All Status

Issuing authority:	Peripheral device
Command code:	06h
Data size:	1Ch + n
Data area:	Fixed Device Status: 112 bytes
	Device ID: 16Byte
	Region code: 1Byte
	Manufacturer's name: 31Byte
	License: 60Byte
	Standby current consumption: 2Byte
	Maximum current consumption: 2Byte
	Free Device Status: n x 4 bytes
Description:	This command returns both the Fixed Device Status and Free Device Status in response to the [All Status Request] command from the host.

4.2Error Commands

4.2.1 Function Type Unknown

Issuing authority:	Peripheral device
Command code:	FEh
Data size:	00h
Data area:	none
Description:	This error command is returned when the function type that was received does not exist for the peripheral device.
Possible causes:	(1)The function type specification is incorrect. (2)The data description is incorrect. (3)The device ID was garbled. (4)The data became garbled during transmission.
Action:	(1)Correct the function type specification. (2)Correct the data description. (3)Send [Device Request] again to get the device ID. (4)Try the transmission again. (Retry three times, and then handle in the same manner as a time out.)

4.2.2 Command Unknown

Issuing authority:	Timer Function
Command code:	FDh
Data size:	00h
Data area:	none
Description:	This error command is returned when the command that was received is not supported by the Timer Function.
Possible causes:	(1)The command specification is incorrect. (2)The data description is incorrect. (3)The device ID was garbled. (4)The data became garbled during transmission.
Action:	(1)Correct the command specification. (2)Correct the data description. (3)Send [Device Request] again to get the device ID. (4)Try the transmission again. (Retry three times, and then handle in the same manner as a time out.)

4.2.3 Transmit Again

Issuing authority:	Host, Timer Function
Command code:	FCh
Data size:	00h
Data area:	none
Description:	This error command requests that the same data be transmitted again when some type of error was found in data that was received.
Possible causes:	(1)A parity error occurred. (2)A data overflow occurred. (3)The data became garbled during transmission. (4)Other cause.
Action:	Send the data again. (Retry three times, and then handle in the same manner as a time out.)

5 Protocol Flow

The following diagram provides a general overview of the basic communications protocol between the host and the Timer Function.

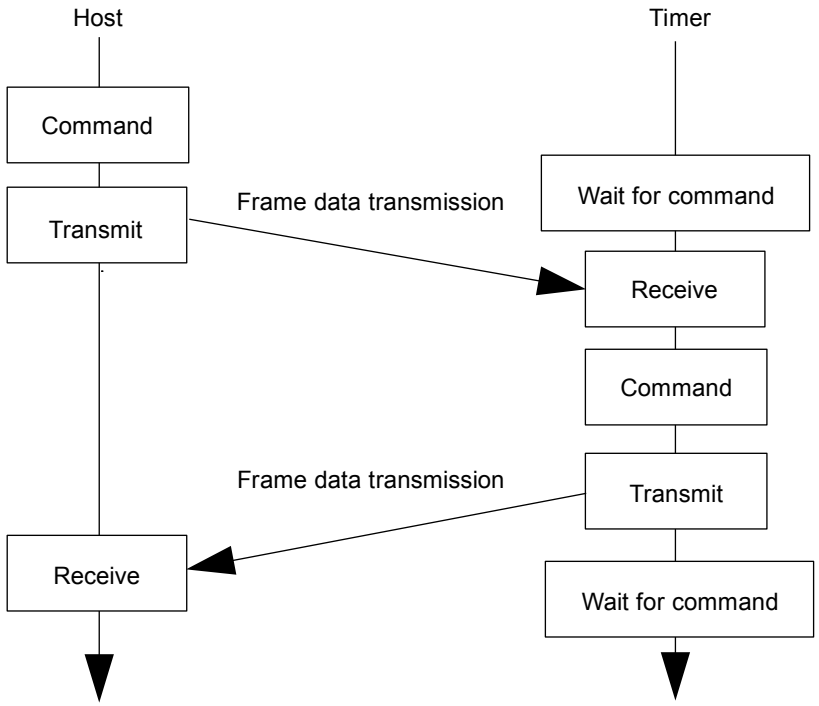

Fig. 5.1 Time Read Processing Flow

5.1Time Read Processing Flow

The flow of processing for the time read operation is shown below.

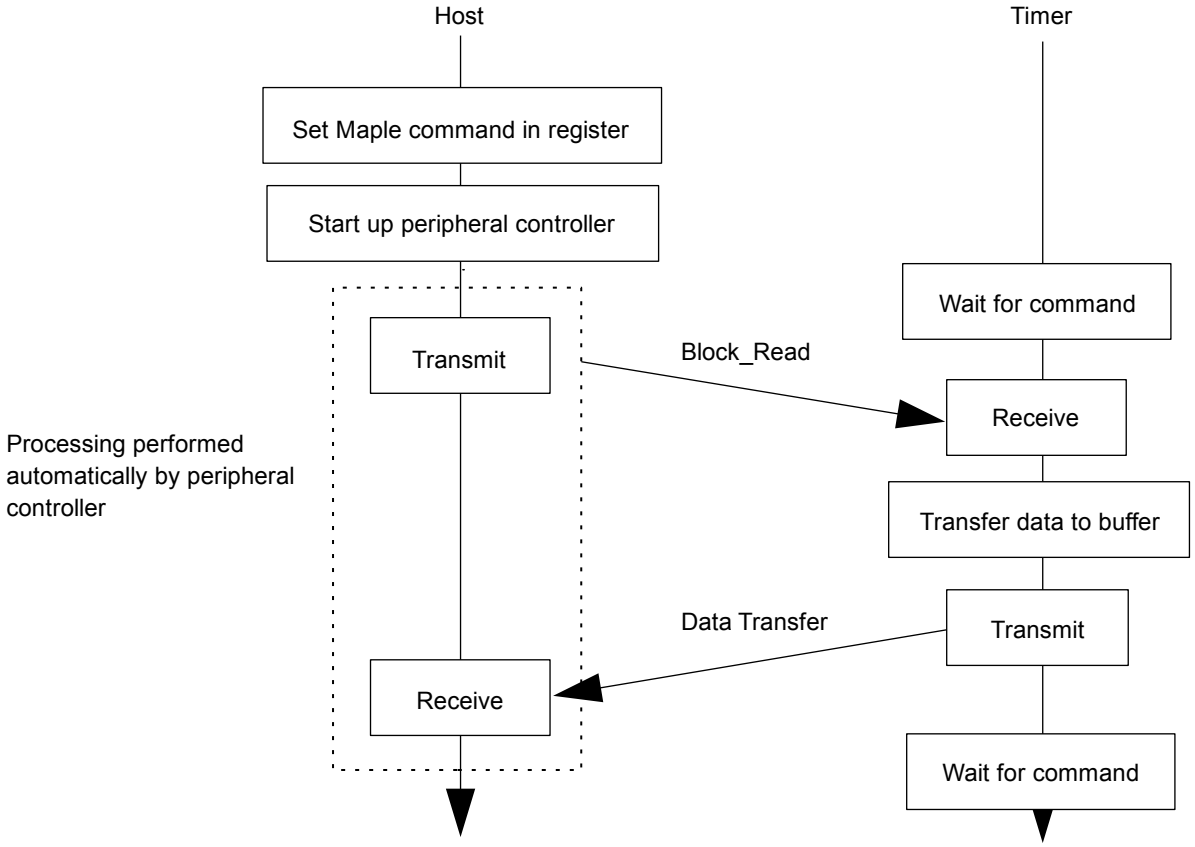

Fig. 5.2 Overview of Time Read Processing Flow

5.2Time Setting Processing Flow

The flow of processing for the time setting operation is shown below.

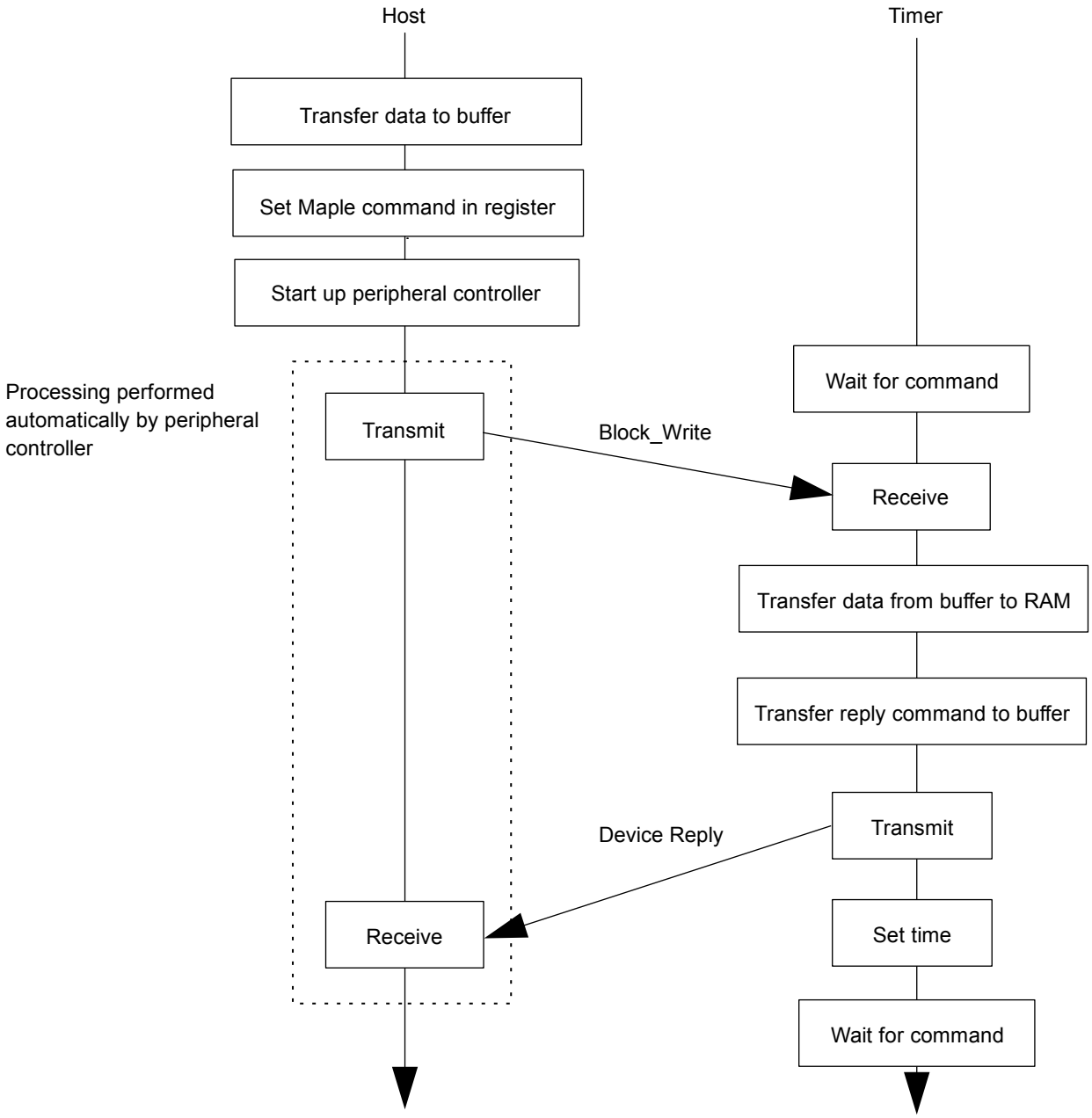

Fig. 5.3□Overview of Time Setting Processing Flow

5.3Alarm Setting Processing Flow

The flow of processing for the alarm setting operation is shown below.

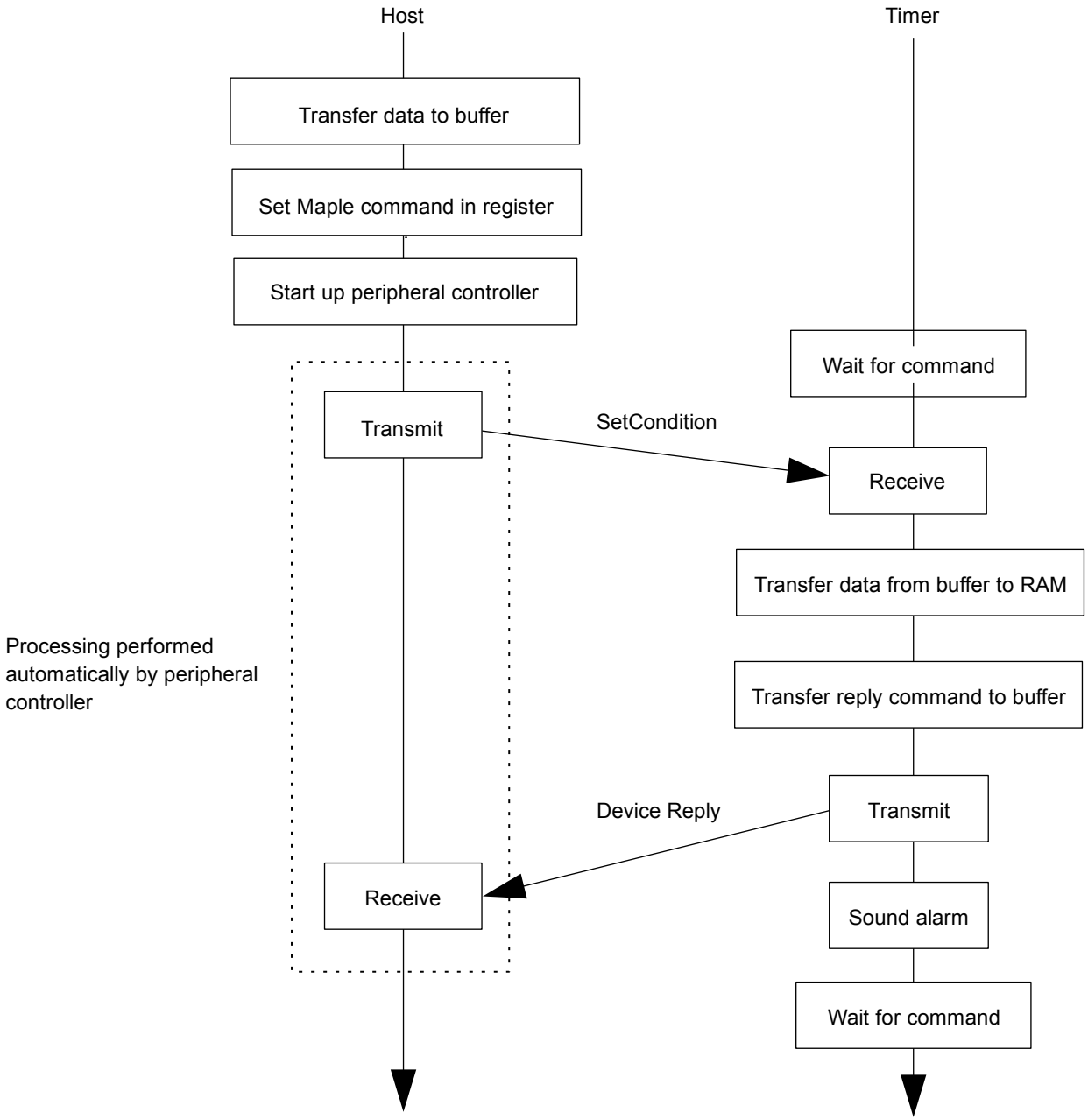

Fig. 5.4□Overview of Alarm Setting Processing Flow

5.4Button Data Read Processing Flow

The flow of processing for the button data read operation is shown below.

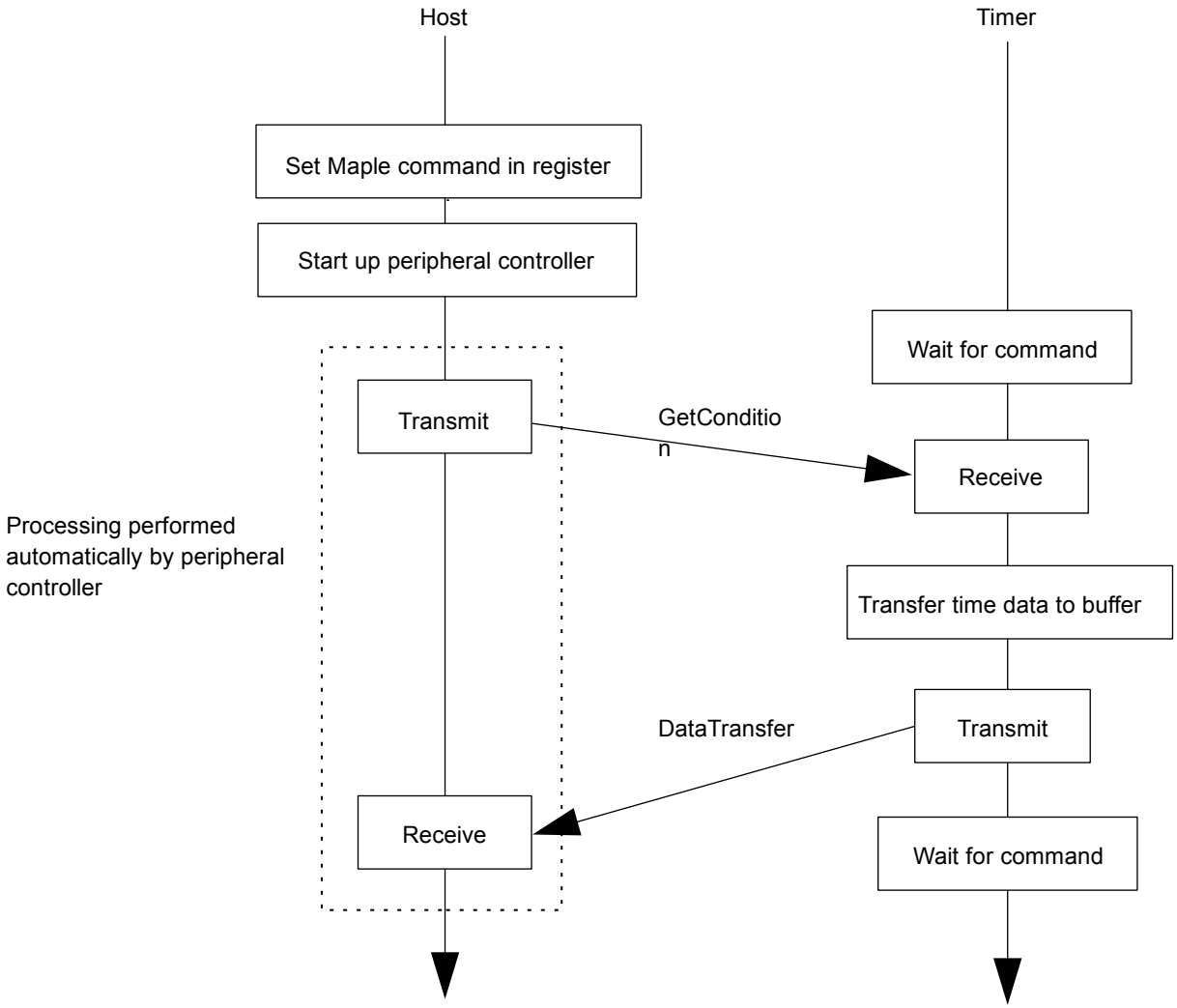

Fig. 5.5□Overview of Button Data Read Processing Flow

6 Postscript

The contents of these specifications are subject to change in whole or in part until the official version (Rev. 1.0) is distributed.