

# Operation Manual

Issued: July 7, 2000

**Product Name:**  
**R/W Module Board Type (L) V700-HMC71**  
**R/W Module Board Type (S) V700-HMC73**

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**OMRON Corporation**  
 Industrial Automation Company  
 Advanced Sensors Development Department  
 Sensing Devices & Components Division H.Q.

Revision history	Revised date	Revised item
-	'98/ 7/ 17	New issue
	'00/ 7/ 07	"Applicable Standards" is added on the page 2

## Applicable Standards

FCC (USA) Part 15 subpart B and C

This device complies with part 15 of the FCC Rules. Operation is subjected to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC ID : E4E6CYAID7000100

### FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

### FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Properly shielded and grounded cables and connectors must be used for connection to host computer and / or peripherals in order to meet FCC emission limits.

AC adapter with ferrite core must be used for RF interference suppression.

## Precautions of Use

This device uses a frequency of 125 kHz to communicate with a tag. Some transceivers, motors, monitor units, and power supply (power IC) emit noise that adversely affects this communication with the tag. If this product is to be used in an environment close to such devices, please check the effects from these devices prior to use.

To minimise the effect of noise, please ground any metal object surrounding this device.

This manual specifies the specifications and transmission format of the R/W Module.

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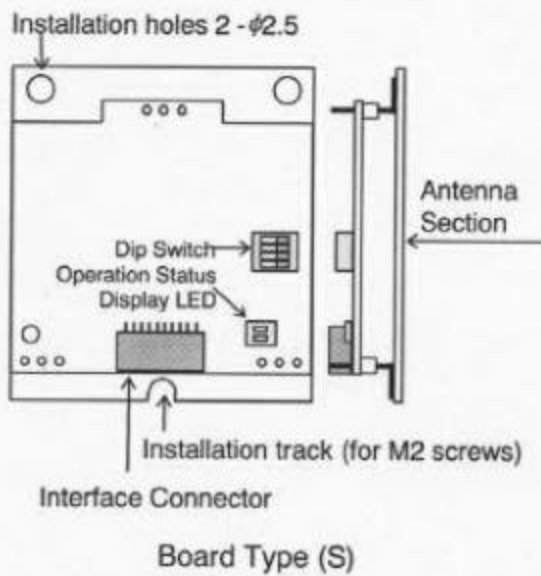
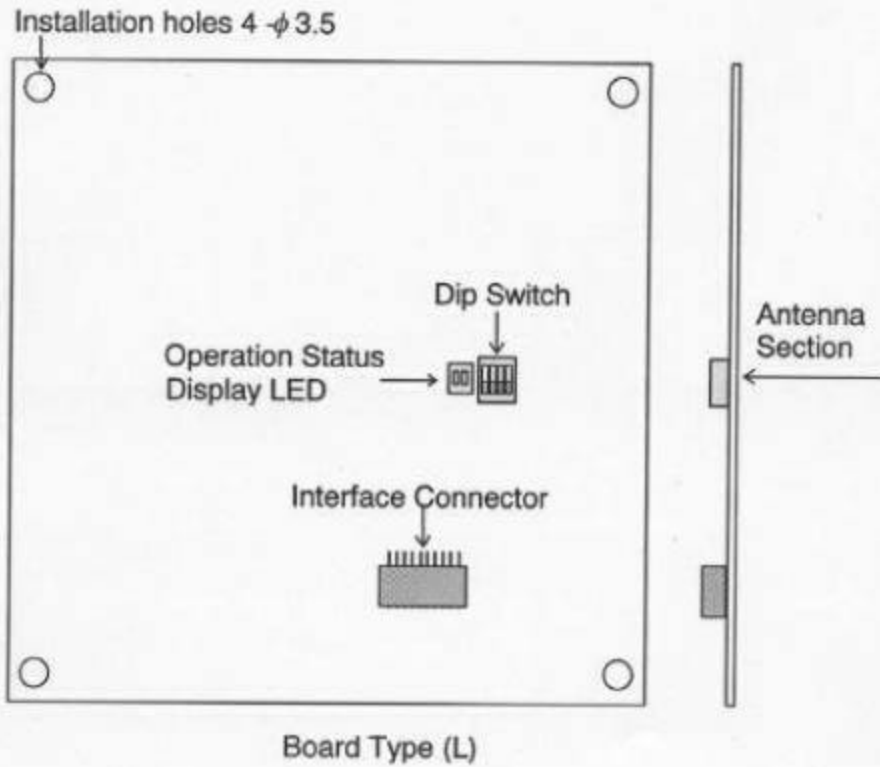
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## 1. Product Outline

The R/W Module is an integrated unit of the transmission/receiving circuit and control function to communicate with the V700 Series Tag.

## 2. Specifications and Performance

### (1) Shape



- Dip Switch  
Will not be used. Turn every dip switch OFF.
- Operating conditon displaying LED

LED Display	Detail
Green lights on	Lights on when communicating with the Tag
Red lights on	Lights on when communication process does not complete successfully.

- Interface Connector  
This connector connects the R/W module to a User Board.
- Antenna Section  
When communicating with the Tag, please bring the Tag close to the antenna section.

## (2) General Specifications

Item	Board Type (L)	Board Type (S)
External measurement	80 × 80 × 5 mm	40 × 44 × 10 mm
Installation	4 points Secured by M3 screws	Secured at 3 points, M2 or M2.3 screws
Electric current	5V ±10%	
Dissipation current	180 mA or less (during oscillation) 20 mA or less (no oscillation)	
Vibration resistance	Destruction: 20m/s <sup>2</sup> 10 to 150Hz, 0.15mm double amplitude, with 4 sweeps of 8min each in 3 directions	
Shock resistance	Destruction: 200m/s <sup>2</sup> , 3 times each in 6 directions	
Ambient temperature during use	-10 ~ +55°C	
Ambient temperature during storage	-25 ~ +65°C	
Ambient humidity during use	25 ~ 85% RH or less (with no condensation)	
Radio frequency	125 kHz	
Transmission distance (Tag: V700 - D13P31) Distance at center of coil - Tag axis	5 ~ 65 mm	10 ~ 40 mm

### (3) Signal Interface Specifications

Item	Specifications				
Connector specifications	S10B-ZR-SM3A-TF (manufactured by J.S.T. MFG CO.,LTD.) (applicable wires: AWG#32 ~ #26)				
Transmission format	2 wire system semi-double serial (CMOS level)				
Synchronization format	Asynchronous mode; start-stop system				
Transmission control format	Cr control				
Transmission speed	9600 bps (fixed)				
Character format (fixed)	Start bit	Data bit	Parity bit	Stop bit	Total
	1	8	Even	1	11
Error detection format	Even number parity				
Bit transmission order	Low order fist (from LSB)				

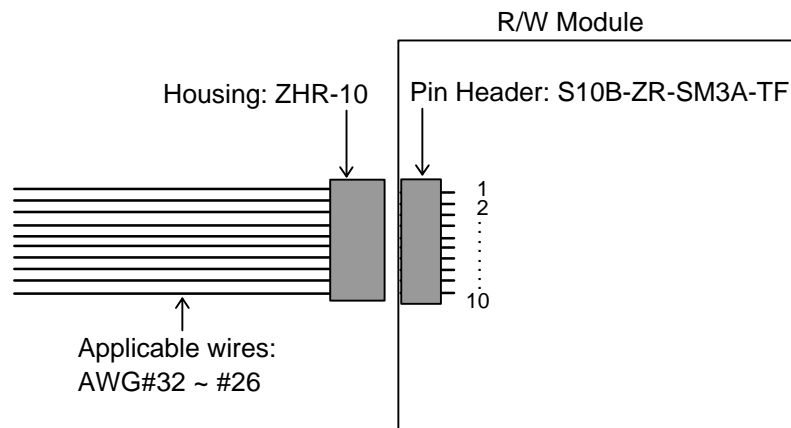
#### ■ Pin Layout and Connection with User board

For housing of cable connecting the R/W Module with the User board, please use the following:

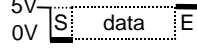
Manufactured by J.S.T. MFG CO.,LTD.

Socket housing: ZHR-10

Socket contact: SZH-002T-P0.5 or SZH-003T-P0.5

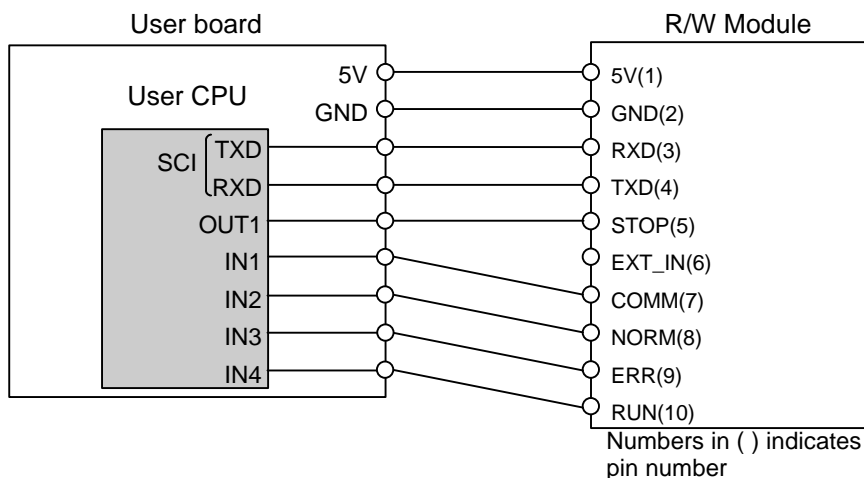


■ Names of Signals and Functions

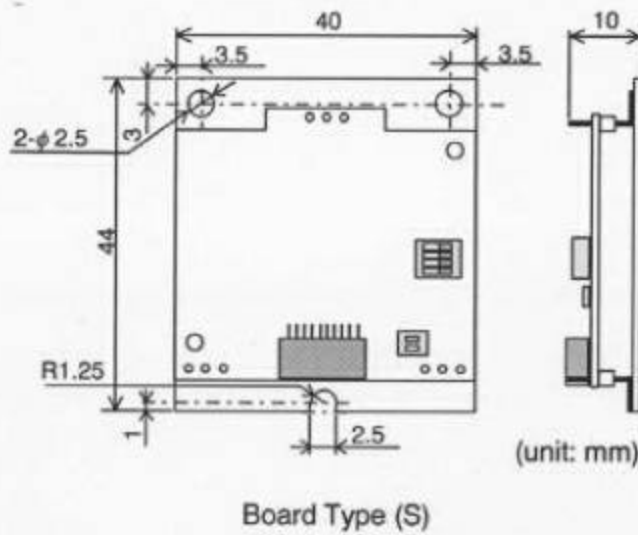
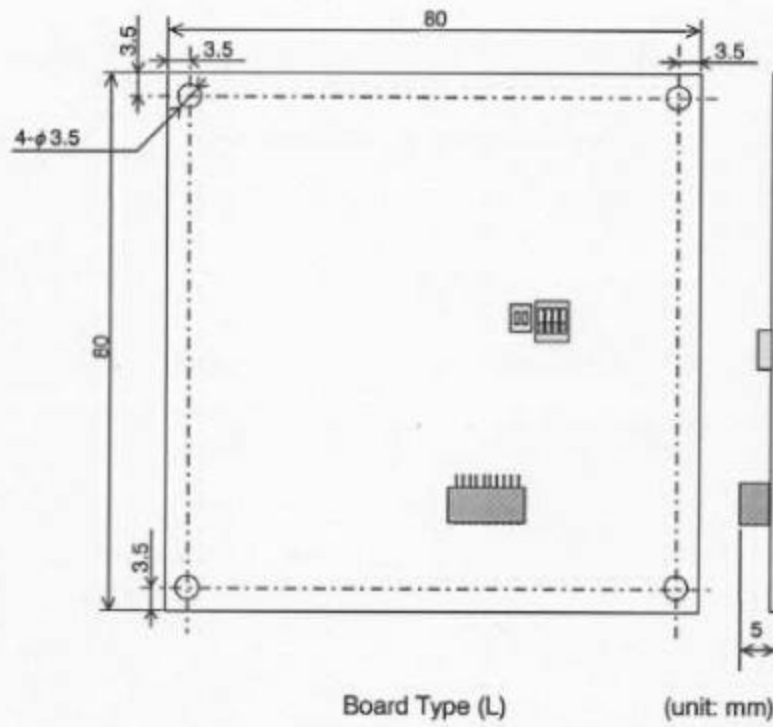
No.	Codes	I/O	Function	Performance	Signal Logic
1	5V	-	Power	5V ±10%	-
2	GND	-	Ground	-	-
3	RXD	Input	Serial input CMOS	CMOS input 47 kΩ pull up	0:0V, 1:5V (positive logic)
4	TXD	Output	Serial output	CMOS output I <sub>OL</sub> =2mA, I <sub>OH</sub> =2mA	5V 0V 
5	STOP	Input	Receive process of command being executed / command execution will be aborted and after STOP is input, will be on stand by for command	CMOS input 47 kΩ pull up	↓ active
6	EXT_IN	Input	(unused)	CMOS input 47 kΩ pull up	-
7	COMM	Output	Will be output while communication is occurring between tag	CMOS output I <sub>OL</sub> =10mA, I <sub>OH</sub> =2mA	H active
8	NORM	Output	Will be output after transmission with tag is successfully completed	CMOS output I <sub>OL</sub> =10mA, I <sub>OH</sub> =2mA	H active
9	ERR	Output	Will be output when transmission with tag was unsuccessful	CMOS output I <sub>OL</sub> =10mA, I <sub>OH</sub> =2mA	H active
10	RUN	Output	Will be output when Module is operating normally	CMOS output I <sub>OL</sub> =10mA, I <sub>OH</sub> =2mA	H active

■ Example of Connection with User board

Please refer to the below-indicated connection for connecting the Module to the User board. Any signals that will be unused should not be connected.



(4) External Measurements

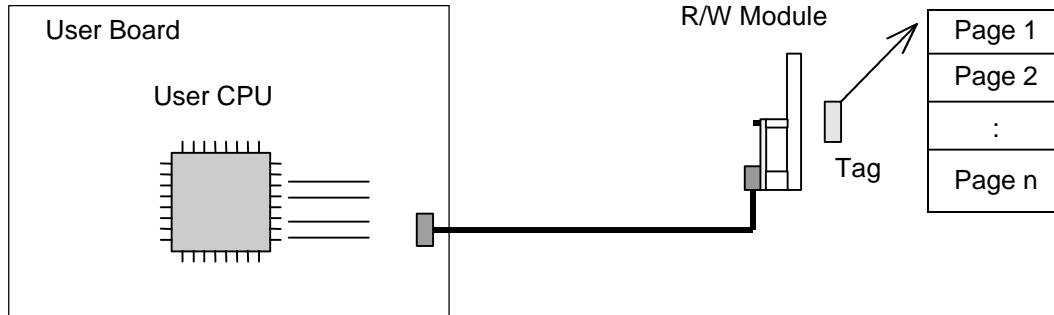




### 3. Operations of the R/W Module

#### 3.1 Outline of operations

The R/W Module receives commands from the User board, executes read / write processes on the Tag, and returns a response of the results of the process to the User board. The status of the R/W Module operations will be reflected on the Output / LED.



#### ■ Operations Timing Chart

Status	Initial process	Waiting for command	Receiving command	Processing command	Transmitting response	Waiting command
TXD			Command			
RXD					Response	
Tag communications				←→		
Output / LED	COMM	↓				
	NORM	↓				↓
	ERR	↓				↓
	RUN	↓				

#### 3.2 Oscillation Control

The R/W Module supplies power to the Tag by oscillating the antenna, and thus conducts communication with the Tag. The Module may be set on either the "Oscillate Mode" "Stop Mode" depending on whether the Module should oscillate while not in communication with the Tag. The "Stop Mode" conserves dissipation power, and enables the R/W Module antenna to be installed close to the Tag to conduct communications on a time sharing basis. The "Oscillate Mode" allows the Module to constantly supply power to the Tag for FIFO processing.

Oscillation Status	Operation	Mode Switching Conditions
Stop Mode (conserves dissipation power)	The antenna stops oscillating while not processing commands	<ul style="list-style-type: none"> <li>• Mode switching conditions at start-up</li> <li>• When oscillation OFF command is active</li> </ul>
Oscillation Mode (enables high-speed processing)	The antenna is constantly oscillating	<ul style="list-style-type: none"> <li>• When oscillation ON command is active</li> <li>• When option is active in FIFO Trigger / FIFO Auto Command</li> </ul>

### 3.3 Input STOP

When a STOP signal is input to the R/W Module, receiving and processing of commands and command processing will stop and then, after the STOP signal is deactivated, the Module will be on stand by for new commands. When the STOP signal is input, oscillation will stop regardless of the setting of the oscillation control mode.

If a STOP signal is input more than 50 msec prior to shut down, writing of unstable data to the Tag may be prevented. However, if writing of the command in process requires more than one page, not all pages may be completely rewritten.

### 3.4 Memory Management on Tag

The Tags used to conduct communication with the R/W Module may be one of the following two types depending on memory capacity: 128 bytes (user area 112 bytes) or 256 bytes (user area 240 bytes). The memory area recognizes every 8 bytes as one page, distinguished by such addresses as 00h ~ 07h, 08h ~ 0Fh, and so on.

■ Memory Map (00h ~ EFh indicates to address)

Page	8 bytes / page									
1	00h	01h	02h	03h	04h	05h	06h	07h	112 bytes	
2	08h	09h	0Ah	0Bh	0Ch	0Dh	0Eh	0Fh		
3	10h	11h	12h		...	...		17h		
4	18h	19h	1Ah		...	...		1Fh		
5	20h							27h		
6	28h							2Fh		
7	30h							37h		
8										
9										
10	:							:		
11	:							:		
12										
13										
14	68h				...	...		6Fh		240 bytes
15	70h				...	...		77h		
16	78h				...	...		7Fh		
:	:							:		
:	:							:		
29	E0h	E1h			...	...		E7h		
30	E8h	E9h			...	...		EFh		

### 3.5 Processing Tag Memory

#### (1) Process Contents

The following three processes may be executed on the Tag Memory

1) Read

Reading data from Tag Memory. The area to execute the Read command may be selected at random up to 16 pages.

2) Write

Writing data onto Tag Memory. The area to execute the Write command may be selected at random up to 16 pages. When writing the same data onto all pages (multiple write), there is no limitation on the number of pages. Certain data within a page may be selected in units of bytes to be written onto the Tag Memory (byte write).

3) Write Protection Set/OFF

Write protection may be set on the selected pages of Tag Memory. When write protection is set, the data may be read, but not re-written. Write protection may be set on any of the pages. Write protection may be set or turned off by commands.

#### (2) Communication Operations

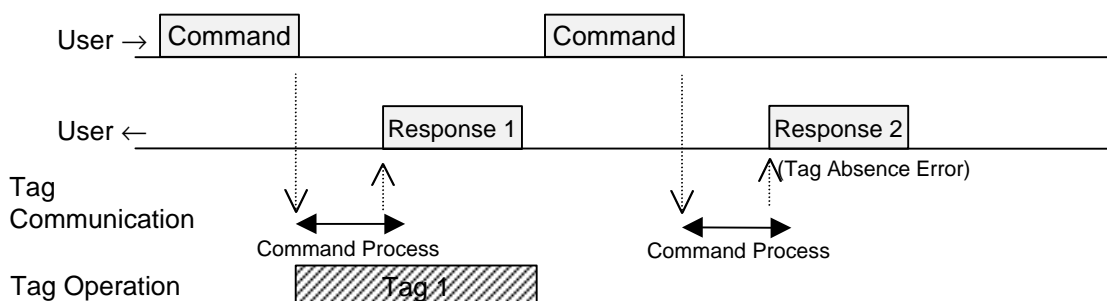
The following 6 communications operation may be executed by changing the process procedure and execution timing. Communication operations may be specified by commands during command transmission.

1) Single Trigger

Communication with Tag will be executed immediately after receiving command and a response will be transmitted. After response is transmitted, the Module will be on stand by for new commands. During communication with the Tag, there may only be one Tag within the communication area.

◆ Operation Sequence

Processing will be executed once only after receiving command. If there is no Tag, a Tag absent error message will be transmitted.

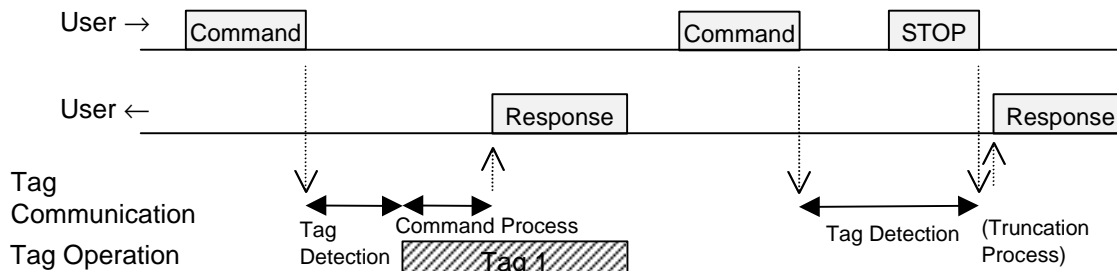


### 2) Single Auto

After receiving command, the Module waits for the Tag to approach, communicates with the Tag, and then transmits a response. Once the response is transmitted, Module will be on stand by for new commands. During communication with the Tag, there must be one Tag within the communication area.

#### ◆ Operation Sequence

After receiving command, the Module waits for the Tag to approach, then executes process once only after Tag is detected. When Module receives a STOP command, the command will be completed.

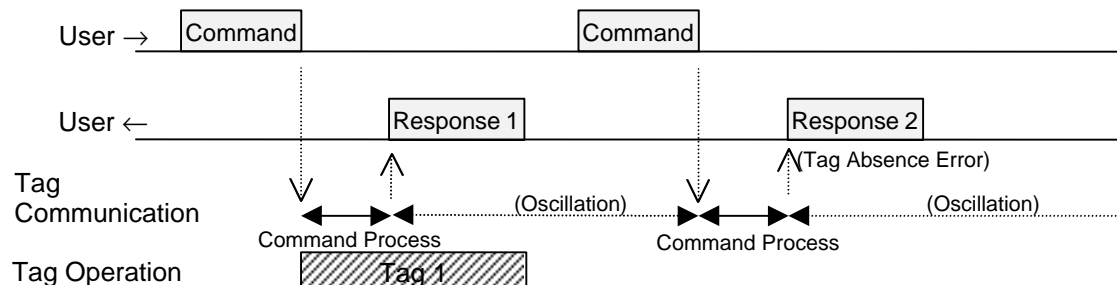


### 3) FIFO Trigger

Module will communicate with Tag immediately after receiving command and transmit response. After communication is completed, Module will prohibit Tag from operating. Module will be on stand by for commands after response is transmitted. During communication with Tag, there MUST BE AN OPERATIONAL TAG (A TAG THAT IS NOT PROHIBITED FROM OPERATION) within the communication area. When this command is executed, Module automatically activates "Oscillation Mode"

#### ◆ Operation Sequence

Upon receiving command, Module will execute process once only. If there is no Tag, a Tag absence error will be transmitted. During processing of the command, Tag will become inoperative, and thus will not respond to the next command. Oscillation will continue after command is processed.

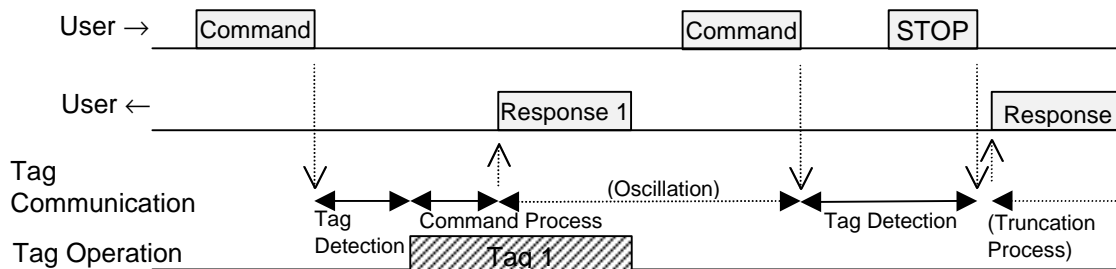


#### 4) FIFO Auto

Module will await Tag to approach after receiving command, then communicate with Tag and transmit response. After communication is completed, Module will prohibit Tag from operating. Module will be on stand by after response transmission is completed. During communication with the Tag, there MUST BE AN OPERATIONAL TAG (A TAG THAT IS NOT PROHIBITED FROM OPERATION) within the communication area. When this command is executed, Module automatically activates "Oscillation Mode."

##### ◆ Operation Sequence

After receiving command, the Module waits for the Tag to approach, then executes process once only after Tag is detected. During processing of the command, Tag will become inoperative, and thus will not respond to the next command. Oscillation will continue after command is processed. When Module receives a STOP command, the command will be completed.

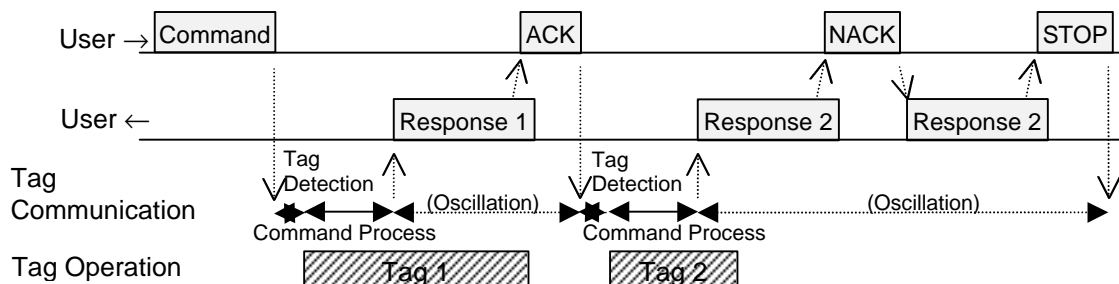


#### 5) FIFO Continue

After receiving command, the Module waits for the Tag to approach, then communicates with the Tag and transmits a response. After communication is completed, Tag will become inoperative. After transmitting a response, Module will await Tag to approach again if it receives [ACK], and CONTINUE UNTIL MODULE RECEIVES A STOP COMMAND. When communicating with the Tag, THERE MUST ONLY BE ONE ACTIVE TAG within the communication area.

##### ◆ Operation Sequence

Upon receiving the command, Module awaits Tag to approach. When Tag is detected, Module executes command and transmits a response. Afterwards, when [ACK] is received, Module repeats the same operation. Once process is executed on a Tag, the Tag becomes inoperative, and thus a Tag will only be processed once. When Module receives a STOP command, processing will stop.

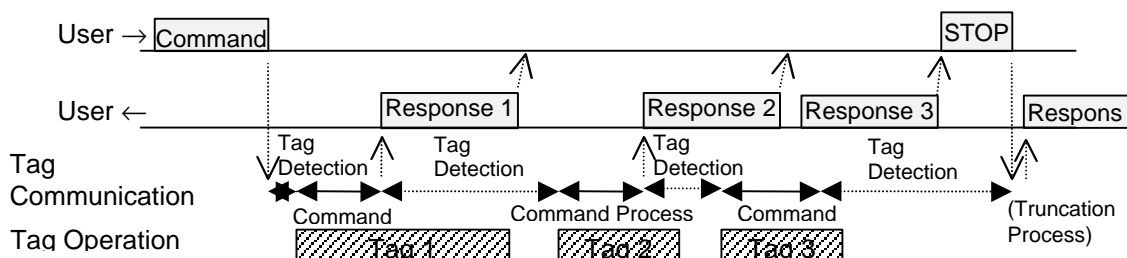


6) FIFO Repeat

After receiving command, the Module waits for the Tag to approach, then communicates with the Tag and transmits a response. After communication is completed, Tag will become inoperative. MODULE WILL CONTINUE PROCESS UNTIL IT RECEIVES A STOP COMMAND. When communicating with the Tag, THERE MUST ONLY BE ONE ACTIVE TAG (A TAG THAT IS NOT PROHIBITED FROM OPERATION) within the communication area.

◆ Operation Sequence

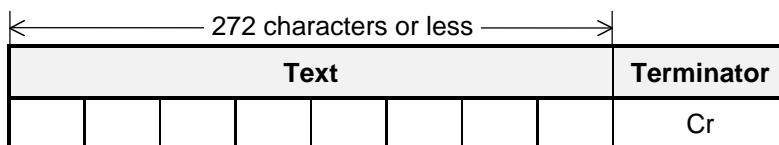
Upon receiving the command, Module awaits Tag to approach. When Tag is detected, Module executes command and transmits a response. Afterwards, Module repeats the same operation. Once process is executed on a Tag, the Tag becomes inoperative, and thus a Tag will only be processed once. When Module receives a STOP command, processing will stop.



## 4. Controlling the Module from User board

### 4.1 Transmission Control Format

The frame format consists of 16 types of text in even number units from through "0"~ "F" (Band the terminator [Cr] (ASCII code : 0Dh).



Data	Number of characters	Details
Text	1 ~ 272	Parameters of each command ("0" ~ "F")
Terminator	1	Code (0Dh) indicating the completion of transmission frame

**(Transmission Control Procedure)**

Receipt commences when a character is received first, and when [Cr] is received, the frame is recognized as finished. If the interval between data exceeds 2 seconds, a transmission error will be recognized.

## 4.2 Command/Response Format

### ■ Command

The frame consists of an operation option, parameters, and terminator.  
Communication options can be attached to commands No. 01 through 08 only.

Command	Option	Parameter 1	~	Parameter n	Terminator
					Cr

### ■ Response

The frame consists of a completion code, parameters, and terminator.

Completion code	Parameter 1	~	Parameter n	Terminator
				Cr

### (1) Types of Commands

Specifies the process of the R/W Module

Command Name	Number	Details
Read	01	Reads Tag Memory data in units of pages
Write	02	Writes data onto Tag Memory in units of pages
Multiple Write	03	Writes the same data onto Tag Memory in units of pages
Byte Write	04	Writes data onto Tag Memory in units of bytes
Write Protection	08	Specifies setting or to undo write protection per page
ACK	11	Is sent when User board successfully receives data
NACK	12	Is sent when User board does not receive data successfully
STOP	13	Stops processing of command being executed
Oscillation ON	14	Activates Oscillation Mode on Module Antenna
Oscillation OFF	15	Stops Oscillation Mode on Module Antenna
Test	10	Transmits data received directly back to User board

**(2) Options**

Specifies communication operations when command is one of 01 through 08.

Option	Number	Details
Single Trigger	00	Conducts communication with Tag on Single Trigger Mode
Single Auto	01	Conducts communication with Tag on Single Auto Mode
FIFO Trigger	08	Conducts communication with Tag on FIFO Trigger Mode
FIFO Auto	09	Conducts communication with Tag on FIFO Auto Mode
FIFO Continue	0A	Conducts communication with Tag on FIFO Continue Mode
FIFO Repeat	0B	Conducts communication with Tag on FIFO Repeat Mode

**(3) Completion Code**

When command process is completed successfully, completion code becomes "00".

If process was not completed successfully, an error code will be transmitted.

**4.3 Types of Commands and Responses**

**(1) Read**

Read is used when data is to be read from the Tag. Data for any specified page may be read. The maximum number of pages that may be read at one time is 16.

**■ Command**

The pages to be read will be transmitted as parameters. Page specifications shall be made by specifying the bit indicating the page as 1 and the other bits as 0. Pages can be specified at random.

Command		Option		Page specification (8 characters)								Terminator	
"0"	"1"												Cr

Bit	7	6	5	4		1	0	7	6		1	0	7	6		1	0	7	6		2	1	0
Page	3	2	2	2	~	2	2	2	2	~	1	1	1	1	~	8	7	6	5	~	1	*	*
Value	"00" ~ "FF"					"00" ~ "FF"					"00" ~ "FF"					"00" ~ "FC"							

\*0,1 bits should be specified as 0. When 1 is specified, it will register as an error (error code 14).



■ **Response**

The completion code ("00" when successful) and read data will be transmitted. The read data will be transmitted continuously according to the order of page specification.

Completion code		Read data*				Terminator
"0"	"0"	(Data 1)	·	·	(Data n)	Cr

\*Data number n = specified page × 8

(2) **Write**

The Write command is used when data is to be written onto the Tag Memory in units of pages. Data can be written on any specified page. The maximum number of pages onto which data may be written at one time is 16.

■ **Command**

The pages to be written on and the data to be written onto each page will be transmitted as parameters. Page specifications shall be made by specifying the bit indicating the page as 1 and the other bits as 0. Data to be written should be specified in the order of specification of the designated pages.

Command	Option	Page specification (8 characters)								Data to be written*				
"0"	"2"									(Data 1)	·	·	(Data n)	Cr

Bit	7	6	5	4		1	0	7	6		1	0	7	6		1	0	7	6		2	1	0
Page	3	2	2	2	~	2	2	2	2	~	1	1	1	1	~	8	7	6	5	~	1	**	**
Value	"00" ~ "FF"					"00" ~ "FF"					"00" ~ "FF"					"00" ~ "FC"							

\* Data number n = specified page x 8

\*\* 0,1 bits should be specified as 0. When 1 is specified, it will register as an error (error code 14).

■ **Response**

The completion code ("00" when successful) will be transmitted.

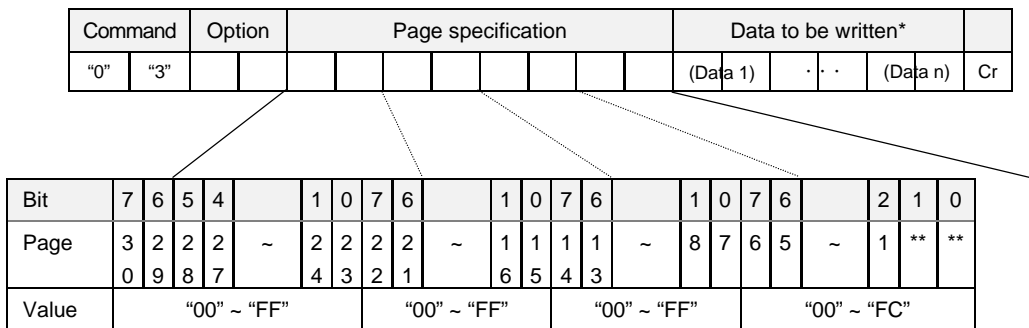
Completion code		Terminator
"0"	"0"	Cr

### (3) Multiple Write

The Multiple Write command is used when the same data is written in units of pages. Pages may be specified at random. There is no limit on the number of pages that may be written at one time.

#### ■ Command

The designated pages to be written and the data to be written onto each page is transmitted as parameters. Page specifications shall be made by specifying the bit indicating the page as 1 and the other bits as 0. Data to be written should be specified in the order of specification of the designated pages.



\* Data number n = 8  
\*\* 0,1 bits should be specified as 0. When 1 is specified, it will register as an error (error code 14).

#### ■ Response

The completion code ("00" when successful) will be transmitted.

Completion code		Terminator
"0"	"0"	Cr

### (4) Byte Write

The Byte Write command is used when data is to be written onto the Tag Memory in Units of Bytes. Data can only be written on the same specified page. Data cannot be written on more than one page.

#### ■ Command

The pages to be written on and the data to be written onto each page will be transmitted as parameters. Address specifications are done by specifying the first address where the data is to be written (specification range: 00h ~ EFh). Data will be written in accordingly from the specified address. (The maximum volume of data is 8 bytes)

Command		Option	Designated Address	Data to be written*								Terminator
"0"	"4"					(Data 1)			...		(Data n)	Cr

\* Data number n = number of bytes to be written (maximum 8)

#### ■ Response

The completion code ("00" when successful) will be transmitted.

Completion code		Terminator
"0"	"0"	Cr

### (5) Write Protection

The Write Protection command is used to set or turn off write protection on Tag.

#### ■ Command

The pages to set or turn off write protection on will be transmitted as parameters. Page specifications shall be made by specifying the bit indicating the page as 1 and the other bits as 0. If set and turn off were specified for the same page, the set command will have priority.

Command		Option		Setting specification (8 characters)								Turn off specification (8 characters)								
"0"	"8"			(Data 1)	(Data 2)	(Data 3)	(Data 4)	(Data 1)	(Data 2)	(Data 3)	(Data 4)	(Data 1)	(Data 2)	(Data 3)	(Data 4)	Cr				

Bit	7	6	5	4		1	0	7	6		1	0	7	6		1	0	7	6		2	1	0
Page	3	2	2	2	~	2	2	2	2	~	1	1	1	1	~	8	7	6	5	~	1	*	*
Value	"00" ~ "FF"				"00" ~ "FF"				"00" ~ "FF"				"00" ~ "FC"										

\* 0,1 bits should be specified as 0. When 1 is specified, it will register as an error (error code 14).

Command code		Setting specification (8 characters)								
"0"	"0"	(Data 1)	(Data 2)	(Data 3)	(Data 4)	(Data 1)	(Data 2)	(Data 3)	(Data 4)	Cr

Bit	7	6	5	4		1	0	7	6		1	0	7	6		1	0	7	6		2	1	0
Page	3	2	2	2	~	2	2	2	2	~	1	1	1	1	~	8	7	6	5	~	1	*	*
Value	"00" ~ "FF"				"00" ~ "FF"				"00" ~ "FF"				"00" ~ "FC"										

\* 0, 1 bits are indicated as 0.

#### ■ Response

The completion code ("00" when successful) and write protection status information will be transmitted.

### (6) ACK

ACK is transmitted after FIFO Continue is operated and the response is received to allow reading of the following:

#### ■ Command

Command		Terminator
"1"	"1"	Cr

#### ■ Response

There is no response.

**(7) NACK**

When the User board was not able to receive a response correctly, NACK is transmitted to demand that the response to be transmitted again. When the R/w Module receives this command, the most recent response will be transmitted again.

**■ Command**

Command		Terminator
"1"	"2"	Cr

**■ Response**

The most recent response will be transmitted again.

**(8) STOP**

The STOP command is used to stop the R/W Module from executing a command. When the R/W Module receives this command, it immediately stops the execution of the current command and sets on stand by mode for a new command.

**■ Command**

Command		Terminator
"1"	"3"	Cr

**■ Response**

Completion Code	Terminator	
"0"	"0"	Cr

**(9) Oscillation ON / OFF**

The Oscillation ON / OFF command specifies the oscillation of the antenna.

**■ Command**

Oscillation ON

Command		Terminator
"1"	"4"	Cr

Oscillation OFF

Command		Terminator
"1"	"5"	Cr

**■ Response**

Completion Code	Terminator	
"0"	"0"	Cr

**(10) Test**

The Test command is to conduct transmission tests on the transmission to the User board. When the R/W Module receives this command, it transmits the same command to the User board.

**■ Command**

Command		Test Data				Terminator
"1"	"0"	(Data 1)	...		(Data n)	Cr

**■ Response**

Completion code		Test Data (Same data as the command)				Terminator
"0"	"0"	(Data 1)	...		(Data n)	Cr

## 5. Error Code List

### (1) Transmission Between User board and R/W Module

Completion Code	Name	Details
10	Parity error	<ul style="list-style-type: none"> <li>There is a parity error in one of the characters among the command received.</li> </ul>
11	Framing error	<ul style="list-style-type: none"> <li>There is a framing error in one of the characters among the command received.</li> </ul>
12	Overrun error	<ul style="list-style-type: none"> <li>There is an overrun error in one of the characters among the command received.</li> </ul>
14	Format error	<ul style="list-style-type: none"> <li>The command format is not suitable for the specification Ex) Command section is not specified; page specification is incorrect, etc.</li> </ul>
18	Frame length error	<ul style="list-style-type: none"> <li>When the receiving frame exceeds 260 characters.</li> <li>When the intervals between the characters being received exceeded 2 sec.</li> </ul>

### (2) Transmission Between R/W Module and Tag

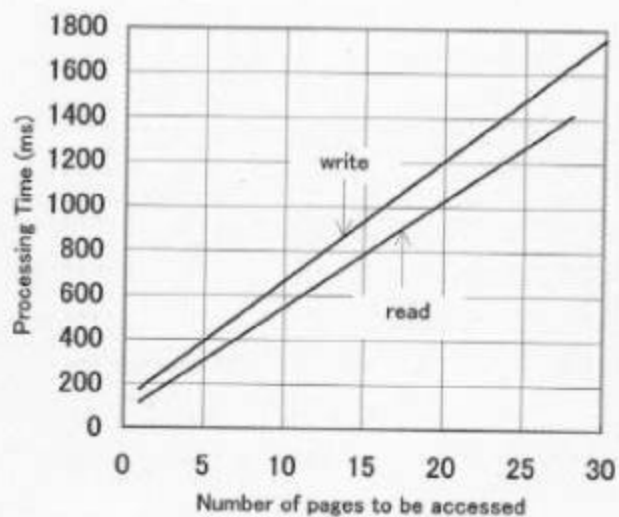
Completion Code	Name	Details
70	Transmission error	<ul style="list-style-type: none"> <li>Noise or other disruption occurred during communication with Tag and command cannot be executed properly.</li> </ul>
71	Verification error	<ul style="list-style-type: none"> <li>Tag is dated or incapable of being written correctly for physical reasons.</li> </ul>
72	Tag absence error	<ul style="list-style-type: none"> <li>Tag is not present near antenna at time of command execution.</li> </ul>
7A	Address specification error	<ul style="list-style-type: none"> <li>Page specification is incorrect.</li> </ul>
7B	Outside of write area error	<ul style="list-style-type: none"> <li>There is a Tag in the area where reading is possible but writing is not.</li> </ul>
7D	Write protection error	<ul style="list-style-type: none"> <li>Write command was executed on a page specified with write protection.</li> </ul>
7F	ID system error	<ul style="list-style-type: none"> <li>The Tag used is not to specification of system.</li> </ul>

### (3) Hardware problem

Completion Code	Name	Details
7C	Antenna hardware error	<ul style="list-style-type: none"> <li>There is a hardware problem on the antenna.</li> </ul>

## 6. Processing Time (Indicative Data)

The time required for communication between the Tag and R/W Module is as indicated below. The following values were obtained in an environment free of noise or any other communication hindering influences.



Numerical expression of Processing Time

	Processing Time T(msec)
read	$T=48N+66$
write	$T=55N+120$

N : Number of pages