OMRON

Electromagnetic Induction RFID System

V720 Series

Operation Manual

Read/Write Modules

PCB Read/Write Modules

V720-HMC73

V720-HMC73T

Notice

This user manual uses the symbols to indicate safety information and precautions to ensure safe use of the V720-HMC73 and the V720-HMC73T.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

Warning	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Explanation of Symbols

	Do not touch. Warns that, depending on specific conditions, touching specified parts of the device may result in injury.
	Do not disassemble. Warns that disassembling the device may result in injury due to electric shock.

Introduction

This user manual provides information on the functions, characteristics, and application methods required to use the V720-HMC73 and V720-HMC73T PCB Read/Write Modules. In this manual, the PCB Read/Write Modules are referred to as simply “R/W Modules.”

Be sure to observe the following precaution when using the V720 Series.

- You must read this manual and understand the information contained before attempting to set up or operate a V720-series Electromagnetic Inductive RFID System.
- Keep this manual close at hand for reference during operation.

Regulations and Standards

The V720-HMC73 and V720-HMC73T R/W Modules are combined with user devices and equipment depending on the user application. The user should check the conformity of devices with which the R/W Module has been combined with local laws and regulations.

OMRON’s R/W Modules are designed to conform to CISPR pub. 22 class A.

Application Precautions

Before using the product under conditions that are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

⚠ Caution	
Do not touch the PCB or any parts connected to the PCB while the power is being supplied. Doing so may result in electric shock.	
Do not attempt to take the product apart or insert or remove connectors while the power is being supplied. Doing so may result in injury.	

Precautions

Be sure to observe the following precautions to ensure safety in installing or operating the System.

1. Do not use the System in an environment subject to flammable, explosive, or corrosive gases.
2. Do not attempt to take any Units apart, to repair any Units, or to modify any Units in any way.
3. Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals.
4. Be sure that the power supply voltage is within the rated range (5 VDC ± 10%).
5. Observe all warnings, cautions, and safety precautions specified in the manual.

Correct Application

1. Do not install the R/W Module in the following locations:
   - Locations subject to direct sunlight.
   - Locations subject to condensation as the result of high humidity.
   - Locations subject to shock or vibration.

2. Check the operating environment before use.

   The R/W Module communicates with the tags using a frequency of 13.56 MHz. Noise that affects communications with the tags may occur in transceivers, motors, monitor units, or power supplies (power supply IC). If using the R/W Module close to these sources, check beforehand that the R/W Module is not affected. Also, observe the following precautions to minimize the effects of noise.
   - Connect any metal devices installed nearby to a ground of 100 Ω or less.
   - Do not install wiring near high-tension or high- current lines.

3. Handling

   The R/W Module is not equipped with a protective case to make it easier to use it with other devices. Consequently, observe the following precautions when handling.
   - Use a grounded conduction mat when removing the R/W Module.
   - Hold the tips of the PCB when handling the R/W Module.
   - Make sure the R/W Module is packaged during storage or carrying.
   - Do not remove the R/W Module other than when it is to be used. Never leave the R/W Module unpacked when not in use.
   - Do not touch the PCB parts (in particular the semiconductors) or the patterns.
   - Never place the R/W Module in a polyethylene or plastic bag.
   - Do not apply a voltage or current that exceeds specifications to the connector terminals.
   - Configure the Electromagnetic Inductive RFID System so that the surge is absorbed by inserting a filter on the power supply side if there is extensive external surge.
   - Insert or remove connectors only during installation. Do not use the R/W Module for applications in which the connectors are inserted or removed frequently. Also, wire the cables so that strong force is not applied to the connectors.

Revision History

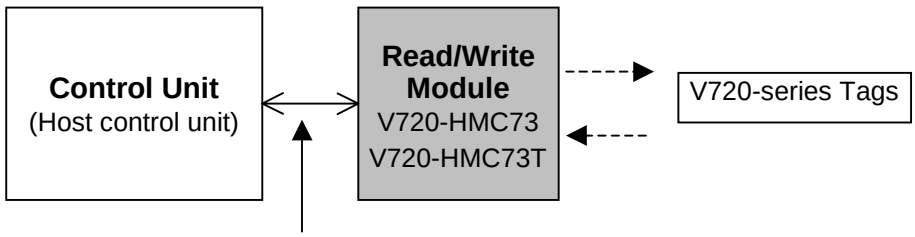
Revision code	Date of revision	Revision and page No.
-----	October 2000	First edition

Contents

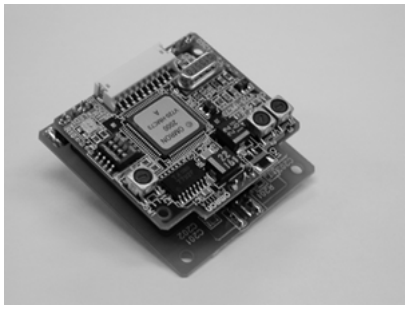
Section 1 Product Outline

The R/W Module is designed to be combined with other devices, and is configured from an antenna PCB and a control PCB equipped with send-receive functions and control functions for communicating with OMRON V720-series Tags, which use Phillips Semiconductor I-CODE chips.

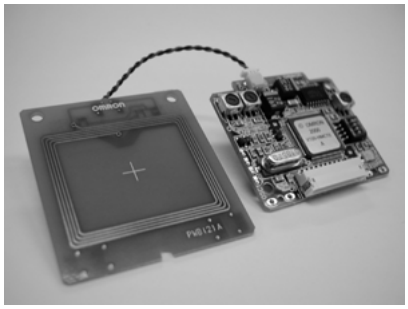
The V720-HMC73 combines the control PCB and the antenna PCB in a compact Unit. The V720-HMC73T provides the control PCB and the antenna PCB separately, and can be used in locations where mounting space is restricted. The V720-HMC73T control PCB and antenna PCB are connected via a connector.



Cable with housing
V700-A30 (manufactured by OMRON, sold separately)



V720-HMC73



V720-HMC73T

Features

Compact, Low Power Consumption

- 40 x 44 x t14 mm (V720-HMC73)
- Operating: 5 V 70 mA
- Stopped: Supports an energy-saving operating mode for 5 V, 13 mA (when STOP signal is input from the host control unit).

Slim (V720-HMC73T)

- Max. width: approx. 10 mm (V720-HMC73T control PCB)

Select Baud Rate and Communications Control Method from the Host Control Unit

- Select 9,600 bps or 38,400 bps baud rate.
- Select CR control or number-of-characters control for communications control method.

User-friendly Command Structure

- Easy-to-understand command structure
- Built-in repetitive data write command (enabled when writing identical data to tag memory areas)
- Specify data code (hexadecimal or ASCII) using read/write command (CR control only)

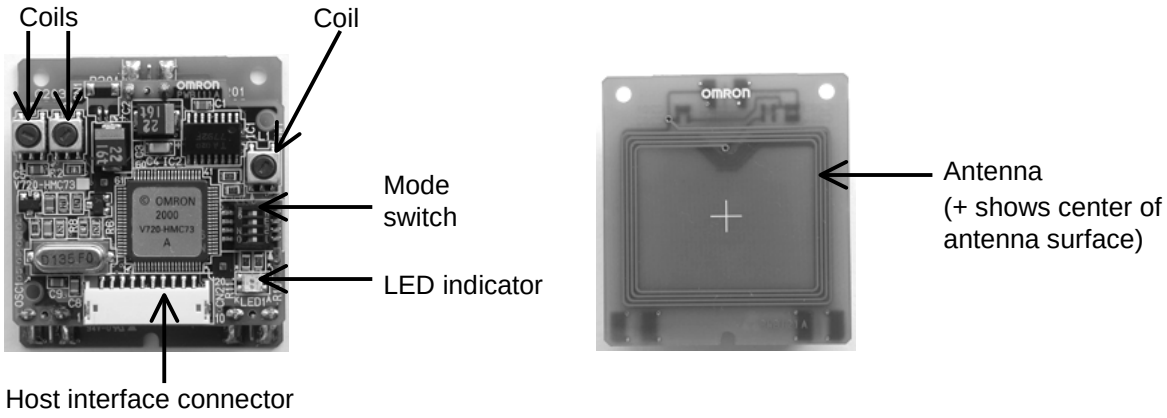
Many Operating Modes

- Supports two operating modes -- single access mode and FIFO access mode -- according to the status of the tags within the communications range.
- Supports four communications modes depending on the tag communications method. (Three communications modes when using single access mode.)

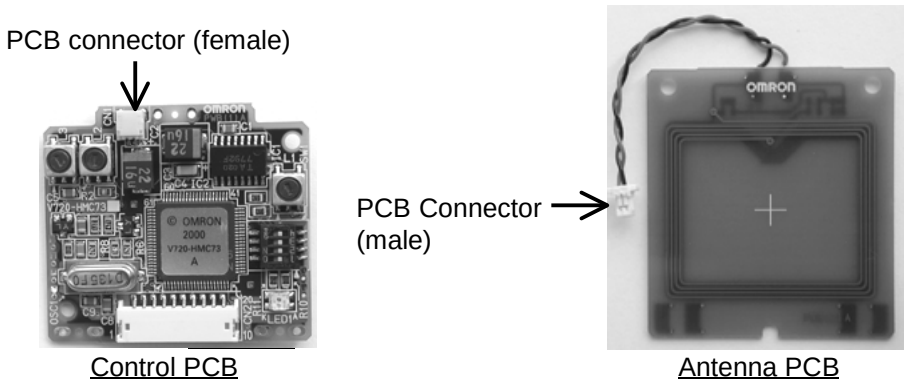
Section 2 Specifications and Performance

2-1 Nomenclature and Explanation

V720-HMC73



V720-HMC73T



Component Descriptions

LED Indicator

The LED indicator lights to show the R/W Module operating status.

Color	Details
Green	Lit during communications with the tags.
Red	Lit when communications cannot be completed normally.

Mode Switch

Set the R/W Module operating status using the DIP switch.

Pin No.	Name	Details	
1	Baud rate setting	OFF: 9,600 bps	ON: 38,400 bps
2	Communications control mode setting	OFF: CR control	ON: Number-of-characters control
3	Reserved for system use	Always OFF.	
4	Reserved for system use	Always OFF.	

Note: All pins are turned OFF at the factory. Change the settings to those required for the user application.

Host Interface Connector

Use this connector to connect to the host control unit.

Antenna

Move the tags close to the antenna when communicating with the tags.

PCB Connectors (V720-HMC73T)

Use these connectors to connect the control PCB to the antenna PCB.

Caution
The PCB and antenna connector is removed for the V720-HMC73T at the factory. Be sure to connect the control PCB and antenna PCB before turning ON the power supply.
Do not adjust the adjustment screws (straight slots) on the PCB coils; communications with the tags will be disabled.

2-2 Specifications

General Specifications

Item	V720-HMC73	V720-HMC73T
Dimensions	40 × 44 × 14 (thickness) mm	40 × 44 × 10 14 (thickness) mm (control PCB) 40 × 44 × 2 14 (thickness) mm (antenna PCB)
Mounting method	3 x M2.3 screws	2 x M2 screws (control PCB) 3 x M2.3 screws (antenna PCB)
Power supply voltage	5 VDC ± 10%	
Current consumption	Approx. 70 mA max. (oscillating) Approx. 30 mA max. (not oscillating) Approx. 13 mA max. (stopped)	
Vibration resistance	Destruction: 10 to 150 Hz, 0.1-mm half amplitude at 15 m/s² in X, Y, and Z directions 10 times each for 8 minutes	
Shock resistance	Destruction: 150 m/s² three times each in 6 directions	
Ambient operating temperature	-10 to 55℃	
Ambient storage temperature	-25 to 65℃	
Ambient operating humidity	25% to 85% max. (with no condensation)	
Communications frequency	13.56 MHz	
Maximum communications distance	Typical: 35 mm*1 (Tags used: V720-D52P30 or V720-D52P40)	
Weight	Approx. 12 g	

*1 Communications distance may be affected by the ambient noise environment and the presence of metallic objects.

Interface Specifications

Item	Details				
Connectors *2	S10B-ZR-SM3A-TF (JST Manufacturing Co., Ltd.)				
Communications method	2-wire half duplex serial (CMOS level)				
Synchronous method	Asynchronous mode or start-stop synchronous mode				
Communications control method *3	CR control/Number-of-characters control				
Baud rate *3	9, 600 bps / 38,400 bps				
Character format	Start bits	Data bits	Parity	Stop bits	Total bits
1) CR control	1	8	Even	1	11
2) Number-of-characters control	1	8	None	1	10
Error detection method	Parity (CR control) or BCC (number-of-characters control)				
Bit send order	Least significant bit (LSB) first				

*2 To connect the R/W Module, use an OMRON V700-A30 Connecting Cable (sold separately), or perform wiring using the following housing and contacts.

- Housing:
  ZHR-10 (JST Manufacturing Co., Ltd.)
- Contacts:
  SZH-002T-P0.5 (JST Manufacturing Co., Ltd.), applicable wire sizes: AWG28 to AWG26
  SZH-003T-P0.5 (JST Manufacturing Co., Ltd.), applicable wire sizes: AWG32 to AWG28

⚠ Caution

Use as short a connecting cable as possible (300 mm max.) to reduce noise.

[*3] Set using the DIP switch.

Electrical Specifications

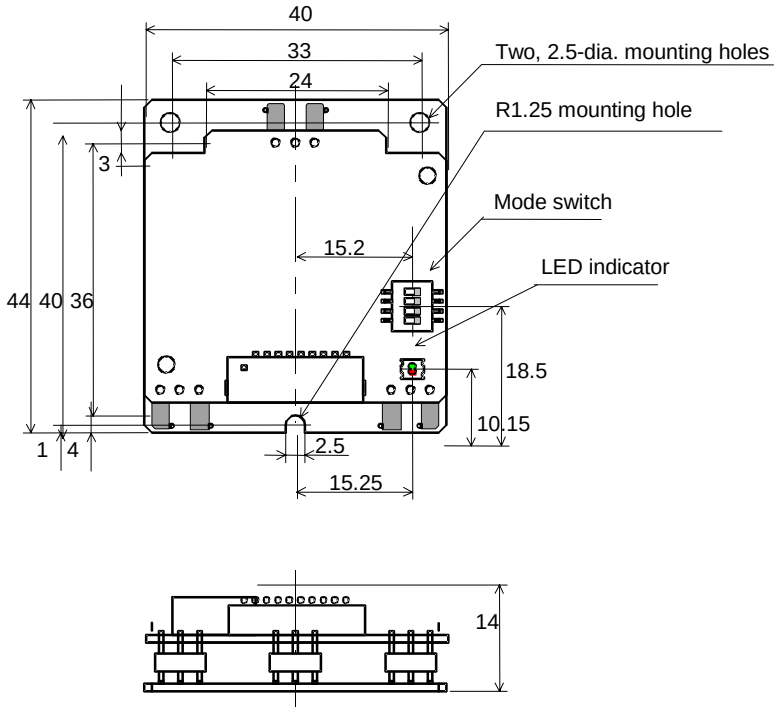
<table>
<tr><th>No.</th><th>Symbol</th><th>I/O</th><th>Function</th><th>Electrical characteristics</th></tr>
<tr><td>1</td><td>Vcc</td><td>—</td><td>5 V power supply</td><td>5 V ± 10%</td></tr>
<tr><td>2</td><td>GND</td><td>—</td><td>Ground</td><td>—</td></tr>
<tr><td>3</td><td>RxD</td><td>Input</td><td>Serial input</td><td>CMOS input with 47 kΩ pull-up, positive logic
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Specified value</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>High level input voltage</td><td>2.0 V</td><td>Vcc + 0.3 V</td></tr>
<tr><td>Low level input voltage</td><td>-0.3 V</td><td>0.8 V</td></tr>
</table></td></tr>
<tr><td>4</td><td>TxD</td><td>Output</td><td>Serial output</td><td>CMOS output, positive logic
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Specified value</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>High level output voltage</td><td>Vcc - 0.5 V (I_{OH} = -200 μA)</td><td>-----</td></tr>
<tr><td>Low level output voltage</td><td>-----</td><td>0.4 V (I_{OL} = 1.6 mA)</td></tr>
</table></td></tr>
<tr><td>5
6</td><td>GND</td><td>—</td><td>Ground</td><td>—</td></tr>
<tr><td>7</td><td>Reserved</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>8</td><td>STOP</td><td>Input</td><td>1) Cancels processing operation. After the STOP signal input is cancelled, enters sleep mode.
2) Operation is stopped using the STOP signal input, and Module enters energy-saving mode.</td><td>CMOS input with 47 kΩ, negative logic
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Specified value</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>High level input voltage</td><td>2.0 V</td><td>Vcc + 0.3 V</td></tr>
<tr><td>Low level input voltage</td><td>-0.3 V</td><td>0.8 V</td></tr>
</table></td></tr>
<tr><td>9</td><td>RUN</td><td>Output</td><td>1) Output when Module is operating normally.
2) OFF during STOP signal input.</td><td>CMOS output, positive logic
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Specified value</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>High level output voltage</td><td>Vcc - 0.5 V (I_{OH} = -200 μA)</td><td>-----</td></tr>
<tr><td>Low level output voltage</td><td>-----</td><td>1 V (I_{OL} = 10.0 mA)</td></tr>
</table></td></tr>
<tr><td>10</td><td>OSC</td><td>Output</td><td>Output during antenna oscillation.</td><td>CMOS output, positive logic
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Specified value</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>High level output voltage</td><td>Vcc - 0.5 V (I_{OH} = -200 μA)</td><td>-----</td></tr>
<tr><td>Low level output voltage</td><td>-----</td><td>1 V (I_{OL} = 10.0 mA)</td></tr>
</table></td></tr>
</table>

Correct Application

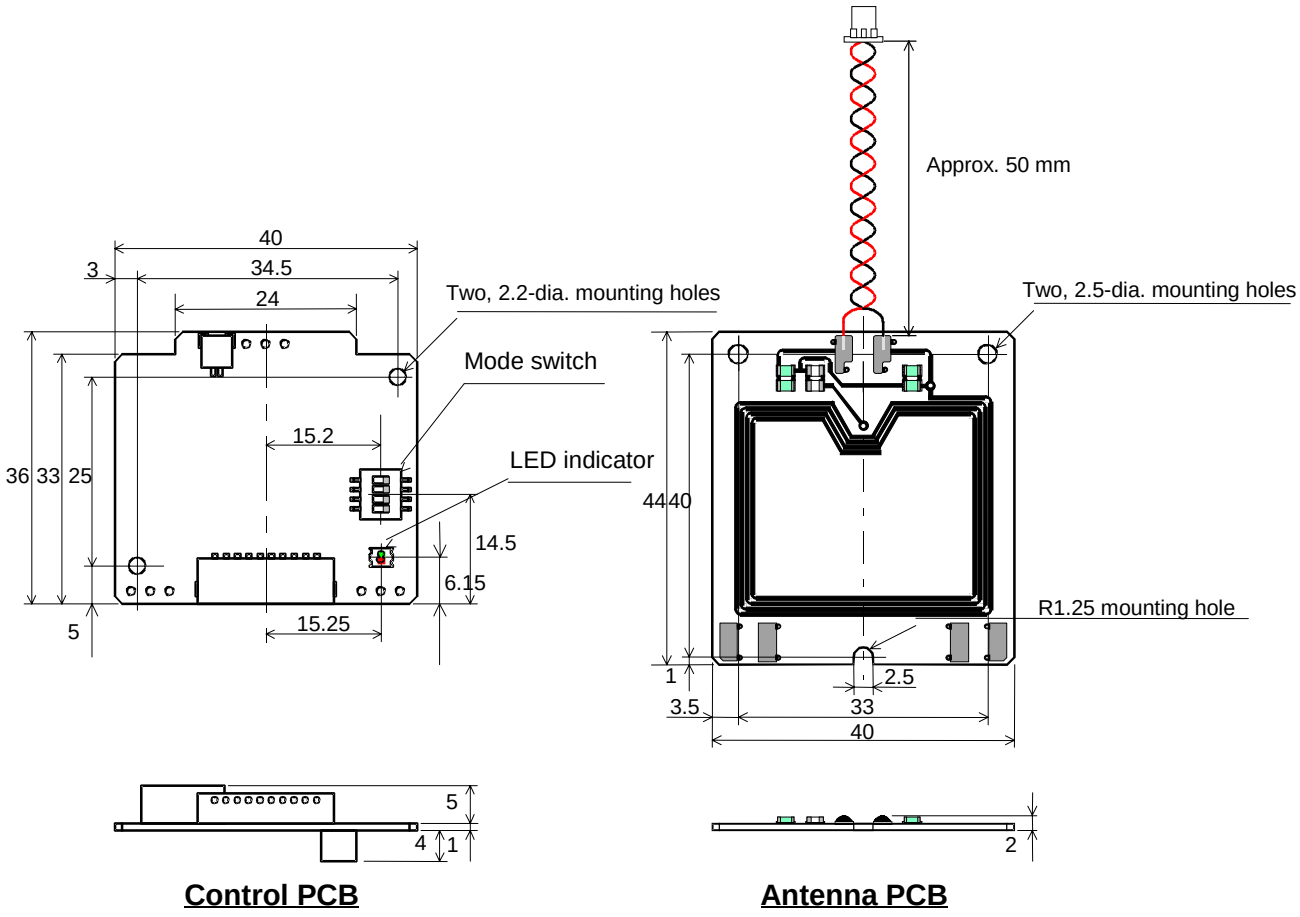
Do not connect unused signals.

2-3 Dimensions

V720-HMC73



V720-HMC73T



Control PCB **Antenna PCB**

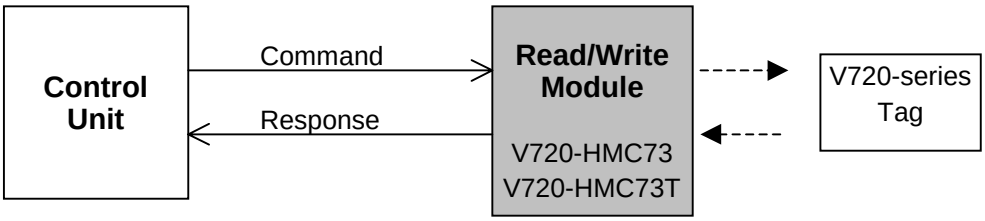
Caution

Use non-metal screws in the 2.2-diameter mounting holes on the V720-HMC73T.

Section 3 R/W Module Operations

3-1 Outline of Operations

The R/W Module reads or writes to the tags using commands sent from the host control unit, and returns the processing responses to the host control unit.

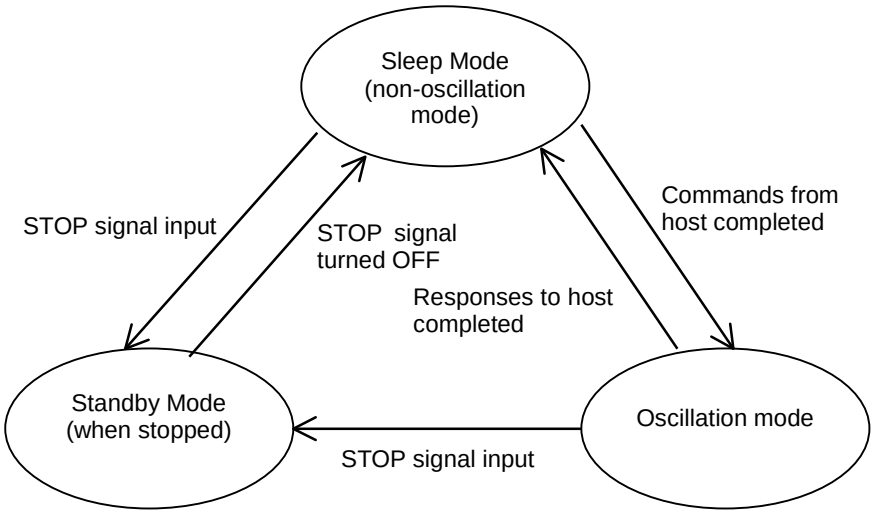


The R/W Module has three operating modes. The conditions for changing the mode are shown in the following diagram.

1) Oscillation Mode
   This mode performs communications with the tags.
   When using FIFO access mode, oscillation mode continues until a STOP command or STOP signal is input.

2) Sleep Mode (Non-oscillation Mode)
   This mode waits for commands from the host control unit.

3) Standby Mode (when Stopped)
   This is an energy-saving mode for low power consumption. Of the three modes, this mode consumes the least power. When the STOP signal is ON, the R/W Module enters this mode. When the STOP signal is turned OFF, the R/W Module enters Sleep Mode.



3-2 Tag Access Functions

3-2-1 Tag User Memory Map

The tag user memory consists of 11 pages and each page has four bytes, the smallest unit of access. In addition to the user memory area, tags also have the following: A serial number, family code, application ID, and lock setting (i.e., write-protect setting).

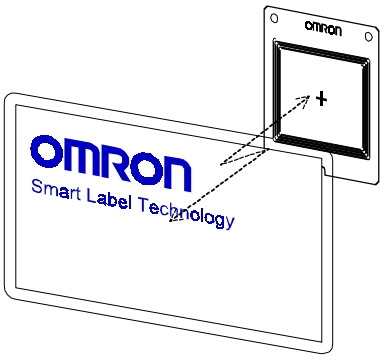
Specific commands are supported for the system area to enable easy access.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

3-2-2 Single Access and FIFO Access Functions

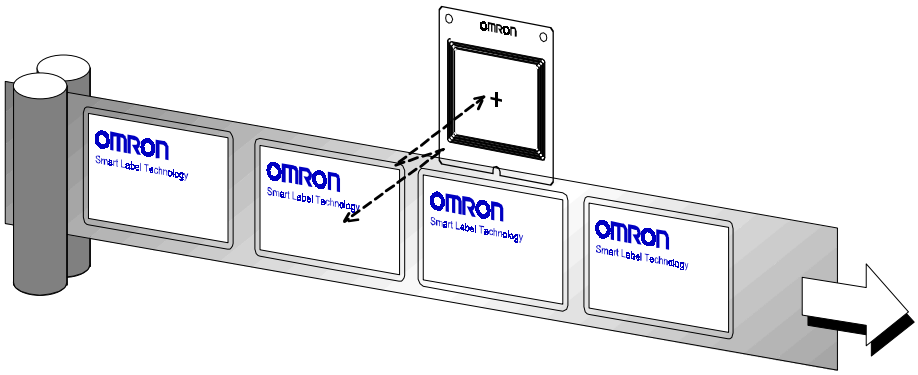
Single Access Mode

Use this mode to communicate with only one tag within the R/W Module communications area. The time required for communications with the tag is shorter compared with FIFO access mode.



FIFO Access Mode

FIFO (First In First Out) access mode enables reading tags in order as they enter the antenna communications range. Tags with which communications have been completed are prohibited from being accessed again, so even if tags with which communications have been completed are still within range of the antenna, communications will be possible with new tags as they enter the communications range. When two or more tags enter the antenna communications range at the same time, a communications error will occur. When a tag to which access has been prohibited moves out of the communications area, communications with it will be possible again if it reenters the antenna communications range.



The above diagram shows an example of a tag inspection line.

When the distance between tags is small, two tags may enter the R/W Module communications range at the same time. If this happens when in Single Access Mode, a communications error will occur, or even if read/write appears to have been performed, there is no way to know which of the two tags was read. In FIFO Access Mode, tags entering communications range can be read or written to in order, so this mode is suited to applications such as a tag inspection line, in which the order of access is important.

3-2-3 Lock Function

The lock function is a protection function provided to prevent the loss of data by unintentionally overwriting fixed data stored on the tags. This function can be set using the lock command.

There is a lock setting area in the tag system area, enabling user-defined areas to be write-protected one page at a time. If the write command is executed for a page that has been write-protected, a write processing error will occur.

Correct Application
The lock function used with the V720 Series cannot be canceled. Pages that have been write-protected cannot be written to again, so be careful when using this function.

3-2-4 Tag Identification Access Function

Only when the ID code stored on the tag and the ID code included in the command sent from the antenna match will the tag respond. This is called the tag identification access function.

Commands sent from the R/W Module respond without depending upon the ID code stored in the tags. To read and write tag ID codes, use the tag family codes and application ID read/write commands.

Reference Information

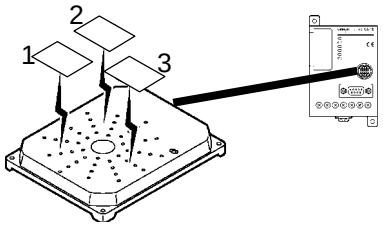
An example of using tag ID access using OMRON V720-H01 R/W Antenna and V720-CD1D is given below.

(1) The set values of the tag ID codes are given in the following table. These settings can be made using the R/W Module or the combined R/W Antenna and ID Controller.

	Tag No.1	**Tag No.2**	**Tag No.3**
Family Code	55 Hex	55 Hex	00 Hex
Application ID	AA Hex	11 Hex	00 Hex

(2) Tag ID Access Operation

- Not Using Tag ID Access

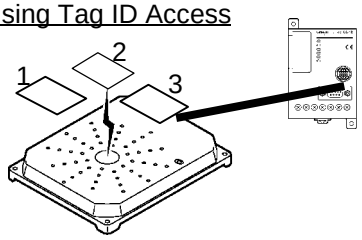


(1) Both the ID Controller family code and the application ID set value are taken to be 00 Hex. (Set at the factory.)

(2) Multiple tag access commands are executed.

(3) All tags within communications range respond. (The tag family codes and application IDs are not required.)

- Using Tag ID Access



(1) The set value of the ID Controller family code is 55 Hex, and the application ID is 11 Hex.

(2) Multiple tag access commands are executed.

(3) Only tags with the same ID code set in (1) and which are within communications range respond. In this example, only tag No. 2 responds.

3-3 Energy-saving Function

Standby mode, which is an energy-saving function, can be executed by turning ON the STOP signal (low ON) externally from the R/W Module.

Section 4 Controlling the R/W Module

Two methods of controlling the R/W Module from the host control unit are possible: CR control and number-of-characters control.

- **CR Control**

Data in the communications frame is handled as ASCII characters in 2-digit hexadecimal code (ASCII code). CR control simplifies operations with the host.

- **Number-of-characters Control**

Data in the communications frame is handled as hexadecimal code, thus minimizing communications time with the host.

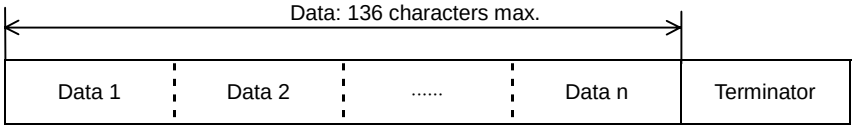
In this manual, the codes are displayed as follows:

ASCII characters: ‘ ×× ‘
Control code using ASCII characters: ‘<Control code>‘
Displayed as hexadecimal code: xx Hex

4-1 Communications Frames

(1) CR Control

The frame format consists of data in ASCII characters and a terminator. ‘<CR>‘ (ASCII: 0D Hex), the terminator, cannot be used in the data ASCII characters.



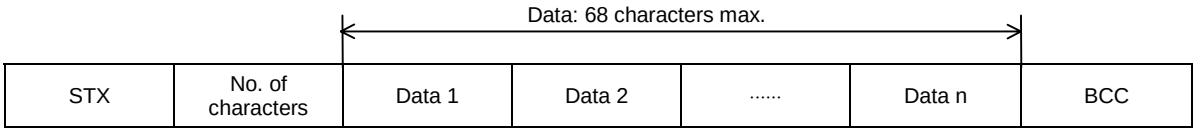
Data	No. of characters	Details
Data	1 to 136	Command parameters (ASCII characters)
Terminator	1	Code ‘<CR>‘ (0D Hex), which indicates end of communications frame

Communications Control Procedure

When a character is first received, reception starts, and when <CR> is received, the frame ends. If the interval between data is greater than 2 s, a communications error occurs. If a communications error occurs, a frame error end code (Error code: ‘18’) is sent as the response from the R/W Module to the host.

(2) Number-of-characters Control

The frame format is given below, with '<STX>' (ASCII code: 02 Hex) as the beginning of the frame.



Data	No. of characters	Details
STX	1	Code indicating start of communications frame (02 Hex).
No. of characters	1	Total number of data and BCC characters in hexadecimal.
Data	1 to 68	Command parameters (hexadecimal)
BCC	1	8-bit data taking the exclusive logical sum (ExOR) of the number of characters and the data characters (excluding STX). Example: Using STX 03 10 00 BCC BCC = (03 Hex) ExOR (10 Hex) ExOR (00 Hex) = 13 Hex

Communications Control Procedure

When character data has been received for the number of characters given at the beginning of the frame, the frame is assumed to have ended. If the interval between data is greater than 2 s, reception processing is stopped. If reception is stopped, responses are not returned from the R/W Module to the host.

4-2 Data Formats

The data in the communications frames used for commands and responses use the following formats.

■ **Commands**

The command data consists of the command, communications options, and parameters. The communications options are added only to commands 01 to 03.

Command	Communications option	Parameter 1	.....	Parameter n

■ **Responses**

The response data consists of an end code and parameters.

End code	Parameter 1	.....	Parameter n

4-2-1 Commands

Commands specify R/W Module processing. The commands are given in the following table.

Name	No.	Details
Read	01	Reads tag memory data by page.
Write	02	Writes tag memory data by page.
Write identical data	03	Writes identical data to tag memory by page.
Read serial numbers	05	Reads tag serial numbers.
Read family code and application ID	06	Reads tag family codes and application IDs.
Write family code and application ID	07	Writes tag family codes and application IDs.
Set EAS mode	08	Sets whether to permit or prohibit tag EAS responses.
Set lock	09	Sets locks by page.
Test	10	Sends the received data to the host control unit.
ACK	11	Sent when the host device can receive data normally.
NACK	12	Sent if the host device cannot receive data normally.
STOP	13	Ends the command currently being executed. Stops antenna oscillation.
EAS	24	Sends EAS commands to the tags.

4-2-2 Communications Options

The data code and communications mode can be specified as communications options. Data code specification is possible only when using CR control.

Bit	7	6	5	4	3	2	1	0
Setting details	Not used (Set these bits to 000.)			Data code	Communications mode			

(1) Specifying Data Code

Specify the data code to perform read/write communications between the R/W Module and the host control unit.

■ **Using CR Control**

Setting	Value	Details
Hex	0	Two-character data consisting of 0 to 9 and A to F is handled as 2-digit hexa-decimal data. Two characters occupy one byte of tag memory. Example: When 12345678 is written to page 0, tag memory is used as shown below. Page 0 Byte 0: 12 Byte 1: 34 Byte 2: 56 Byte 3: 78
ASCII	1	One character of data occupies one byte of tag memory as ASCII or JIS8 unit code. Example: When 'ABCD' is written to page 0, tag memory is used as shown below. Byte 0: 41 Byte 1: 42 Byte 2: 43 Byte 3: 44

■ **Using Number-of-characters Control**

Set the data code specification to 0.

(2) Specifying the Communications Mode

The following seven communications modes are supported for different processing procedures and execution timing.

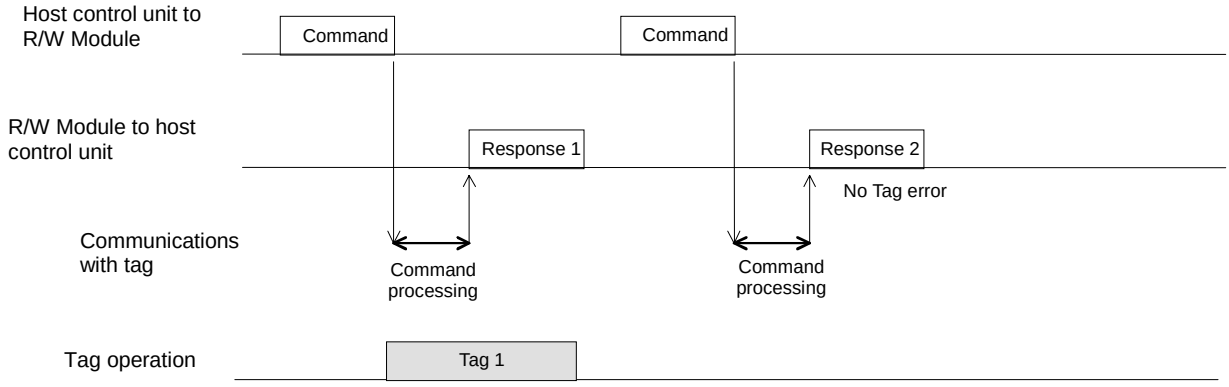
Communications mode	No.	Description
Single Trigger	0 Hex	After a command is received, communications with the tag is performed immediately and a response is sent. If there is no tag in communications range, a No Tag error is sent. After the response has been sent, the mode changes to sleep mode. Only one tag is permitted in communications range.
Single Auto	1 Hex	After a command is received, this mode waits for a tag to enter communications range, and then performs communications with the tag. After a response is sent, the mode changes to sleep mode. If a STOP command is received while waiting for a tag, the command is ended. Only one tag is permitted in communications range.
Single Repeat	2 Hex	After a command is received, this mode waits for a tag to enter communications range, and then performs communications with the tag. If this mode has been specified, the command is repeated continuously until a STOP command is received. This mode is enabled only for read commands. Only one tag is permitted in communications range.
FIFO Trigger	8 Hex	After a command is received, communications with the tag is performed immediately and a response is sent. If there is no tag in communications range, a No Tag error is sent. Access is prohibited to tags with which communications have been completed, and the R/W Module continues unmodulated oscillation. Tags with which communications have been completed do not respond to the next command. After the response has been sent, the mode changes to sleep mode. If a STOP command is received, oscillation stops.
FIFO Auto	9 Hex	After a command is received, this mode waits for a tag to enter communications range, and then performs communications with the tag. Access is prohibited to tags with which communications have been completed, and meanwhile, the R/W Module continues unmodulated oscillation. Tags with which communications have been completed do not respond to the next command. After the response has been sent, the mode changes to sleep mode. If a STOP command is received while waiting for a tag, the command is ended.
FIFO Continuous	A Hex	After a command is received, this mode waits for a tag to enter communications range, and then performs communications with the tag. Access is prohibited to tags with which communications have been completed, and the R/W Module continues unmodulated oscillation. Tags with which communications have been completed do not respond to the next command. After the response has been sent, when ACK is received, this mode again waits for a tag to enter communications range, and then performs communications with the tag. If a STOP command is received while waiting for a tag, the command is ended.
FIFO Repeat	B Hex	After a command is received, this mode waits for a tag to enter communications range, and then performs communications with the tag. Access is prohibited to tags with which communications have been completed. Tags with which communications have been completed do not respond to the next command. If this mode has been specified, the command is repeated continuously until a STOP command is received.

Note: The communications mode (except for Single Repeat Mode) can be specified only when using commands 01 to 03. Single Repeat Mode can be specified only when using command 01.

Communications Modes Diagrams

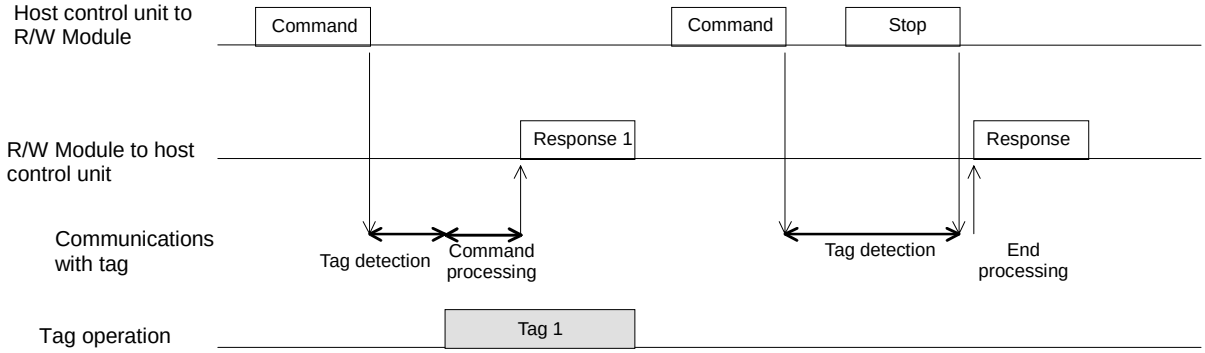
1) Single Trigger

■ Operation Sequence



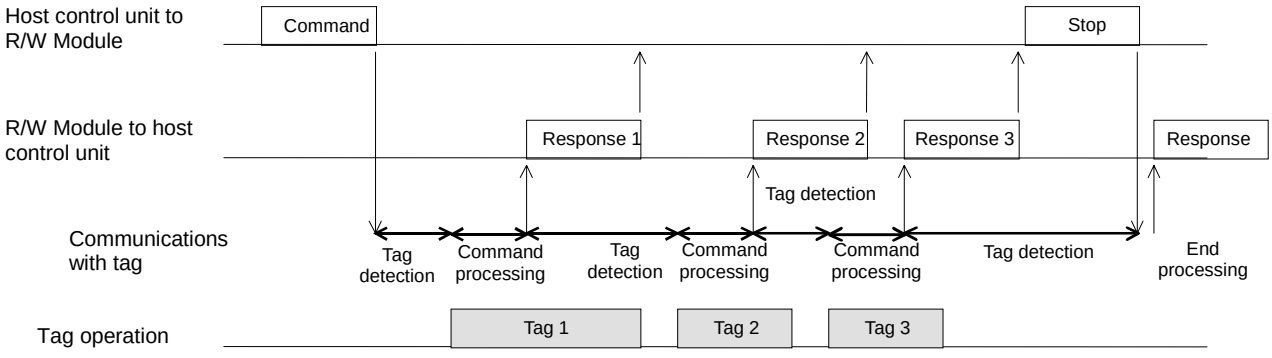
2) Single Auto

■ Operation Sequence



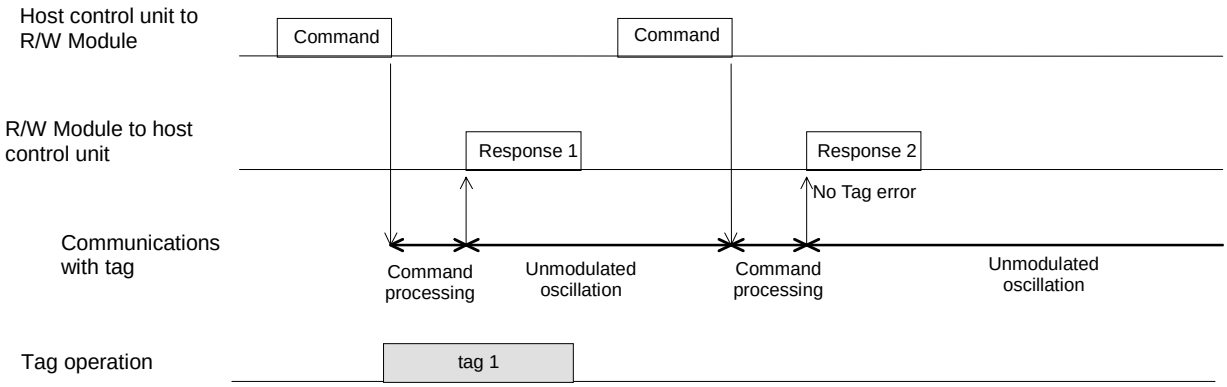
3) Single Repeat

■ Operation Sequence



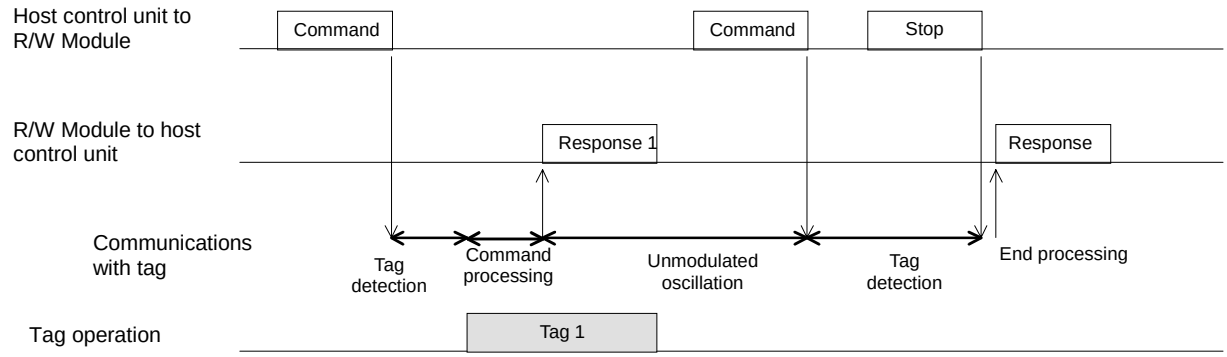
4) FIFO Trigger

■ **Operation Sequence**



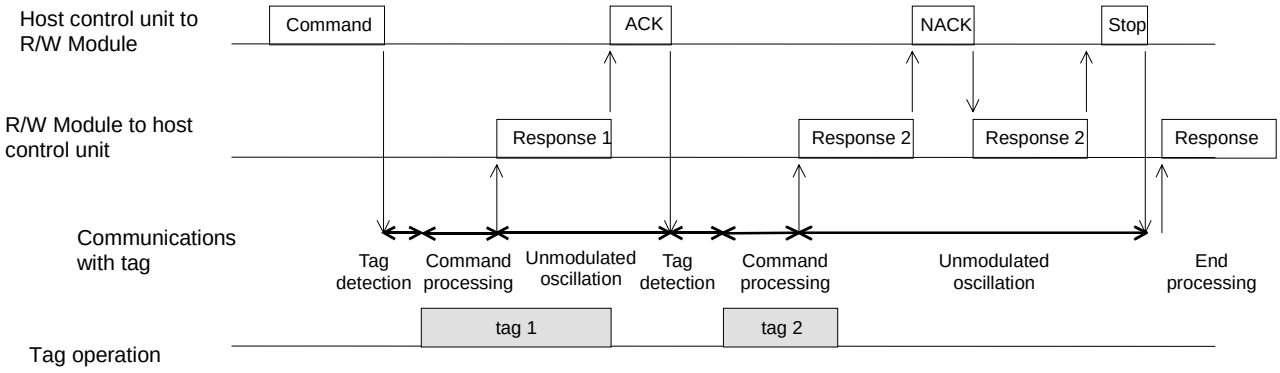
5) FIFO Auto

■ **Operation Sequence**



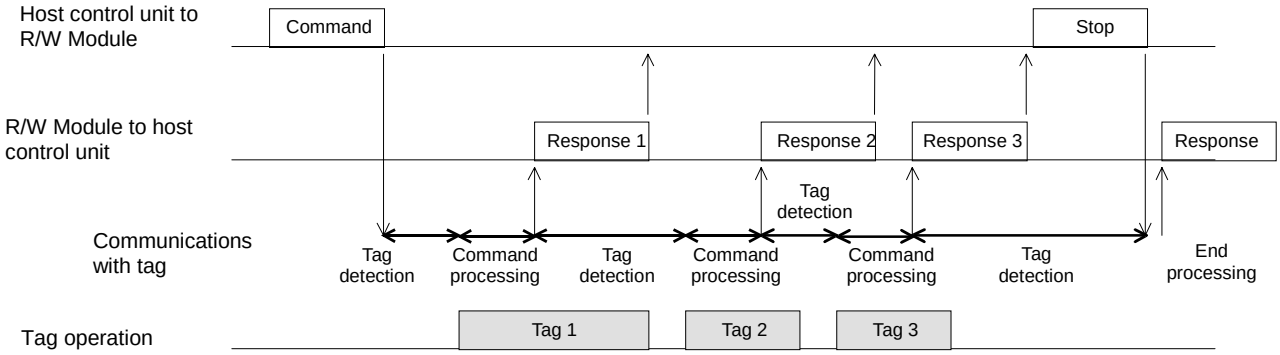
6) FIFO Continuous

■ **Operation Sequence**



7) FIFO Repeat

■ Operation Sequence



(4) End Codes

■ Communications between Host Device and R/W Module

End code	Name	Details
10	Parity Error	● There is a character with a parity error in the command received.
11	Framing Error	● There is a character with a frame error in the command received.
12	Overrun Error	● There is a character with an overrun error in the command received.
13	BCC Error	● The BCC for the frame received is invalid (number-of-characters control only).
14	Format Error	● Command format does not match specifications. Examples: Command is not defined, page/address specifications are invalid, etc.
18	Frame Error	● Characters are received more than 2 s apart (CR control only). ● Frame received exceeds 140 characters.

■ Communications between R/W Module and Tags

End code	Name	Details
70	Communications Error	● • Interference, such as noise, has occurred during communications with the tags, preventing normal completion.
71	Write Error	● Write command has been specified to a page that has been write-prohibited. ● There is a tag area to which reading is possible, but writing is not possible. ● Correct data cannot be written because the tag has exceeded its usable write life.
72	No Tag Error	● There was no tag in the communications area when the command was executed.

■ System Errors

End code	Name	Details
7C	Hardware Error	● •There is a hardware malfunction.

4-3 Command Types and Responses

4-3-1 Commands and Responses during CR Control

(1) Read

Use this command to read data from the tags. Data can be read from a user-specified page.

■ **Command**

This command specifies the pages to be read as command parameters. The page specification is as follows: The bits that correspond to the pages to be read are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. The pages are specified by the user.

Command		Communica-tions option	Page specification (4 characters)		
'0'	'1'				

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	'00' to '07' (Set bits 7 to 3 to 0.)								'00' to 'FF'							

■ **Response**

The response returns the read data and the end code (normal end: '00'). The read data is returned continuously in the order of the pages specified. If an error occurs, an error code is returned.

End code		Read data*1		
'0'	'0'	Data 1	.....	Data n

*1 Number of data n = Number of specified pages x 8 (hexadecimal)
Number of data n = Number of specified pages x 4 (ASCII)

Command Example

The following table gives the tag user memory details for the following example of commands and responses.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	54 Hex	55 Hex	56 Hex	57 Hex
9	58 Hex	59 Hex	5A Hex	61 Hex
10	62 Hex	63 Hex	64 Hex	65 Hex

(1) Reading the following four pages: 1, 3, 5, and 6, using Single Trigger Mode with hexadecimal is as follows:

Command ‘01 00 006A<CR>‘
Response ‘00 34353637 40414243 48494A4B 4C4D4E4F<CR>‘

(2) Reading the following four pages: 1, 3, 5, and 6, using Single Trigger Mode with ASCII is as follows:

Command ‘01 10 006A<CR>‘
Response ‘00 4567 @ABC HIJK LMNO<CR>‘

(2) Write

Use this command to write data to the tags by page. The data can be written to user-specified pages.

■ **Command**

This command sends the data to be written as parameters. The page specification is as follows: The bits that correspond to the pages to be written are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. Specify the write data in order from the specified page with the lowest number and in order from byte 0 within the page.

Command		Communications option		Page specification (4 characters)				Write data[*1]		
‘0’	‘2’							Data 1	.....	Data n

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	‘00’ to ‘07’ (Set bits 7 to 3 to 0)								‘00’ to ‘FF’							

[*1] Number of data n = Number of specified pages x 8 (hexadecimal)
Number of data n = Number of specified pages x 4 (ASCII)

■ **Response**

The response returns the end code (normal end:’00’).

End code	
‘0’	‘0’

Command Example

The following table gives the tag user memory details for the following example of commands and responses.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	52 Hex	46 Hex	49 Hex	44 Hex
9	58 Hex	59 Hex	5A Hex	61 Hex
10	56 Hex	37 Hex	32 Hex	30 Hex

(1) Writing 52464944 hexadecimal to page 8, and 56373230 hexadecimal to page 10 using FIFO Repeat Mode, with hexadecimal:

Command ‘02 0B 0500 52464944 56373230<CR>‘
Response ‘00<CR>

(2) Writing ‘RFID’ hexadecimal to page 8, and ‘V720’ hexadecimal to page 10 using FIFO Repeat Mode, with ASCII:

Command ‘02 1B 0500 RFID V720<CR>‘
Response ‘00<CR>‘

Data written to tag memory is the same for both (1) and (2).

(3) Write Identical Data

Use this command to write identical data to tags by the page. The data to be written to the pages is user-specified. This command is useful to write the same data to multiple pages.

■ **Command**

As parameters, the command sends specification of the pages to be written and the data to write to the specified pages one page at a time. The page specification is as follows: The bits that correspond to the pages to be written are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command.

Command		Communications option		Page specification (4 characters)				Write data[*1]		
‘0’	‘3’							Data 1	·····	Data n

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	‘00’ to ‘07’ (Set bits 7 to 3 to 0)								‘00’ to ‘FF’							

[*1] Number of data n = Number of specified pages x 8 (hexadecimal)
Number of data n = Number of specified pages x 4 (ASCII)

■ **Response**

The response returns the end code (normal end: ‘00’).

End code	
‘0’	‘0’

Command Example

The following table gives the tag user memory details for the following example of commands and responses.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	30 Hex	30 Hex	30 Hex	30 Hex
9	30 Hex	30 Hex	30 Hex	30 Hex
10	30 Hex	30 Hex	30 Hex	30 Hex

(1) Writing 30303030 hexadecimal to pages 8, 9, and 10 using FIFO Trigger Mode with hexadecimal:

Command ‘03 08 0700 30303030<CR>‘
Response ‘00<CR>

(2) Writing ‘0000’ to pages 8, 9, and 10 using FIFO Trigger Mode with ASCII:

Command ‘03 18 0700 0000<CR>‘
Response ‘00<CR>

Data written to tag memory is the same for both (1) and (2).

(4) Read Serial Number

Use this command to read the tag serial numbers.

■ **Command**

Command	
‘0’	‘5’

■ **Response**

The response returns the tag serial number read, and the end code (normal end: ‘00’).

End code		Tag serial number		
‘0’	‘0’	Data 1	·····	Data n

Tag serial numbers are 16-digit numbers written in hexadecimal.

(5) Read Family Code and Application ID

Use this command to read the tag family codes and application IDs.

■ **Command**

Command	
'0'	'6'

■ **Response**

The response returns the tag family code, application ID read, and end code (normal end: '00').

End code		Family code	Application ID
'0'	'0'	'00 ' to 'FF'	'00' to 'FF'

(6) Write Family Code and Application ID

Use this command to set the tag family code and application ID.

■ **Command**

Command		Family code	Application ID
'0'	'7'	'00' to 'FF'	'00' to 'FF'

■ **Response**

The response returns the end code (normal end: '00').

End code	
'0'	'0'

(7) Set EAS Mode

Use this command to set whether to permit or prohibit tag EAS responses.

■ **Command**

Command		Set value	
'0'	'8'		

Set value: '00' Permit
'01' Prohibit

■ **Response**

The response returns the end code (normal end: '00').

End code	
'0'	'0'

(8) Set Lock

Use this command to write-prohibit tags.

■ Command

This command sends the pages to be write-protected as command data. The page specification is as follows: The bits that correspond to the pages to be write-protected are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. To read the current write-prohibit settings, set the page specification to ‘0000’.

Command		Page specification (4 characters)			
‘0’	‘9’				

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	‘00’ to ‘07’ (Set bits 7 to 3 to 0)								‘00’ to ‘FF’							

■ Response

The response returns the setting status for write-protection and the end code (normal end: ‘00’). The page specification is as follows: The bits that correspond to the write-protect pages are set to 1, and all other bits are set to 0.

End code		Setting status			
‘0’	‘0’				

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	‘00’ to ‘07’ (Set bits 7 to 3 to 0)								‘00’ to ‘FF’							

Correct Application
The lock function used with the V720 Series cannot be canceled. Pages that have been write-protected cannot be written to again, so be careful when using this function.

(9) ACK

Use this command when the communications mode is FIFO Continuous Mode.
ACK is sent after the response has been received, and the next read operation is enabled.

■ **Command**

Command	
'1'	'1'

■ **Response**

There is no response to ACK.

(10) NACK

If the host control unit does not receive a response normally, NACK is sent as a request to resend the response. When the R/W Module receives the NACK command, it resends the immediately preceding response.

■ **Command**

Command	
'1'	'2'

■ **Response**

The immediately preceding response data is resent.

(11) STOP

Use this command to stop R/W Module processing. When this command is received, the R/W Module stops processing the current command, and enters sleep mode. If the antenna is oscillating, the oscillation also stops.

■ **Command**

Command	
'1'	'3'

■ **Response**

End code	
'0'	'0'

(12) Test

This command tests communications with the host. When this command is received, the R/W Module sends the same data to the host.

■ **Command**

Command		Test data		
'1'	'0'	Data 1	.....	Data n

■ **Response**

End code		Test data		
'0'	'0'	Data 1	.....	Data n

The test data returned is the same as the command.

(13) EAS

This command sends the EAS command to the tags. EAS data, which will also be the response from the tags, is fixed data as shown below.

■ **Command**

Command	
'2'	'4'

■ **Response**

EAS data
'2FB36270D5A7907FE8B18038D281497682DA9A866FAF8BB0F19CD112A57237EF'

4-3-2 Commands and Responses during Number-of-characters Control

(1) Read

Use this command to read data from the tags. Data can be read from a user-specified page.

■ **Command**

This command sends the pages to be read as command parameters. The page specification is as follows: The bits that correspond to the pages to be read are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. The pages are specified by the user.

Command	Communications options	Page specification (4 characters)	
01 Hex			

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	00 Hex to 07 Hex (Set bits 7 to 3 to 0)								00 Hex to FF Hex							

■ **Response**

The response returns the data read and the end code (normal end: 00 Hex). The read data is returned continuously in the order of the pages specified. If an error occurs, an error code is returned.

End code	Read data*1		
00 Hex	Data 1	·····	Data n

*1 Number of data n = Number of specified pages x 8

Command Example

The following table gives the tag user memory details for the following example of commands and responses.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	54 Hex	55 Hex	56 Hex	57 Hex
9	58 Hex	59 Hex	5A Hex	61 Hex
10	62 Hex	63 Hex	64 Hex	65 Hex

Reading the following four pages: 1, 3, 5, and 6, using Single Trigger Mode is as follows:

BCC

Command 02 05 01 00 006A(6E) Hex

Response 02 12 00 34353637 40414243 48494A4B 4C4D4E4F (12) Hex

STX BCC

(2) Write

Use this command to write tag data by page. Data can be written to user-specified pages.

■ **Command**

This command sends the data to be written as parameters. The page specification is as follows: The bits that correspond to the pages to be written are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. Specify the write data in order from the specified page in order from byte 0 within the page.

Command	Communica-tions option	Page specification		Write data*1		
02 Hex				Data 1	.....	Data n

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	00 Hex to 07 Hex (Set bits 7 to 3 to 0)								00 Hex to FF Hex							

*1 Number of data n = Number of specified pages x 8

■ **Response**

The response returns the end code (normal end: 00 Hex).

End code
00 Hex

Command Example

The following table gives details of tag user memory when executing the following command.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	52 Hex	46 Hex	49 Hex	44 Hex
9	58 Hex	59 Hex	5A Hex	61 Hex
10	56 Hex	37 Hex	32 Hex	30 Hex

Writing 52464944 Hex to page 8, and 56373230 Hex to page 10 using FIFO repeat mode:

BCC

Command 02 0D 02 0B 0500 52464944 56373230 7B Hex

Response 02 02 00 02 Hex

STX BCC

(3) Write Identical Data

Use this command to write identical data to multiple tags by page. Data is written to user-specified pages. This command is useful when writing the same data to multiple pages (specification is required only once).

■ **Command**

As parameters, the command sends specification of the pages to be written and the data to write to the specified pages one page at a time. The page specification is as follows: The bits that correspond to the pages to be written are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command.

Command	Communica-tions options	Page specification (2 characters)		Write data*1		
03 Hex				Data 1	·····	Data n

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	00 Hex to 07 Hex (Set bits 7 to 3 to 0.)								00 Hex to FF Hex							

*1 Number of data n = 8

■ **Response**

The response returns the end code (normal end: 00 Hex).

End code
00 Hex

Command Example

The following table gives details of tag user memory when executing the following command.

Page	Byte 0	Byte 1	Byte 2	Byte 3
0	30 Hex	31 Hex	32 Hex	33 Hex
1	34 Hex	35 Hex	36 Hex	37 Hex
2	38 Hex	39 Hex	30 Hex	30 Hex
3	40 Hex	41 Hex	42 Hex	43 Hex
4	44 Hex	45 Hex	46 Hex	47 Hex
5	48 Hex	49 Hex	4A Hex	4B Hex
6	4C Hex	4D Hex	4E Hex	4F Hex
7	50 Hex	51 Hex	52 Hex	53 Hex
8	30 Hex	30 Hex	30 Hex	30 Hex
9	30 Hex	30 Hex	30 Hex	30 Hex
10	30 Hex	30 Hex	30 Hex	30 Hex

Writing 30303030 Hex to pages 8, 9, and 10 using FIFO Trigger Mode:

BCC

Command 02 09 03 08 0700 30303030 05 Hex

Response 02 02 00 02 Hex

STX BCC

(4) Read Serial Number

Use this command to read tag serial numbers.

■ **Command**

Command
05 Hex

■ **Response**

The response returns the serial number of the tag and the end code (normal end: 00 Hex).

End code	Tag serial number		
00 Hex	Data 1	……	Data n

The tag serial number is 16 digits in hexadecimal code.

(5) Read Family Code and Application ID

Use this command to read tag family codes and application IDs.

■ **Command**

Command
06 Hex

■ **Response**

The response returns the family code, application ID, and end code (normal end: 00 Hex).

End code	Family code	Application ID
00 Hex	00 Hex to FF Hex	00 Hex to FF Hex

(6) Write Family Code and Application ID

Use this command to set the tag family code and application ID.

■ **Command**

Command	Family code	Application ID
07 Hex	00 Hex to FF Hex	00 Hex to FF Hex

■ **Response**

The response returns the end code (normal end: 00 Hex).

End code
00 Hex

(7) Set EAS Mode

Use this command to set whether to permit or prohibit tag EAS responses.

■ **Command**

Command	Set value
08 Hex	

Set value: 00 Hex Permit
01 Hex Prohibit

■ **Response**

The response returns the end code (normal end: 00 Hex).

End code
00 Hex

(8) Set Lock

Use this command to write-prohibit tags.

■ **Command**

This command sends the pages to be write-protected as command data. The page specification is as follows: The bits that correspond to the pages to be write-protected are set to 1, and all other bits are set to 0. This binary number is converted to hexadecimal and sent with the command. To read the current write-prohibit settings, set the page specification to 0000 Hex.

Command	Page specification (4 characters)	
09 Hex		

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	00 Hex to 07 Hex (Set bits 7 to 3n to 0.)								00 Hex to FF Hex							

■ **Response**

The response returns the setting status for write-protection and the end code (normal end: 00 Hex). The page specification is as follows: The bits that correspond to the write-protected pages are set to 1, and all other bits are set to 0.

End code	Setting status	
00 Hex		

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Page						10	9	8	7	6	5	4	3	2	1	0
Value	00 Hex to 07 Hex								00 Hex to FF Hex							

Correct Application
The lock function used with the V720 Series cannot be canceled. Pages that have been write-protected cannot be written to again, so be careful when using this function.

(9) ACK

Use this command when the communications mode is FIFO Continuous Mode.
ACK is sent after the response has been received, and the next read operation is permitted.

■ **Command**

Command
11 Hex

■ **Response**

There is no response to ACK.

(10) NACK

If the host control unit does not receive a response normally, NACK is sent as a request to resend the response. When the R/W Module receives the NACK command, it resends the immediately preceding response.

■ **Command**

Command
12 Hex

■ **Response**

The immediately preceding response data is resent.

(11) STOP

Use this command to stop the R/W Module processing. When this command is received, the R/W Module stops processing the current command and enters sleep mode. If the antenna is oscillating, the oscillation also stops.

■ **Command**

Command
13 Hex

■ **Response**

End code
00 Hex

(12) Test

This command tests communications with the host. When this command is received, the R/W Module sends the same data to the host.

■ **Command**

Command	Test data		
10 Hex	Data 1	.....	Data n

■ **Response**

End code	Test data		
00 Hex	Data 1	.....	Data n

The test data returned is the same as the command data.

(13) EAS

This command sends the EAS command to the tags. EAS data, which is the response from the tags, is fixed data, as shown below.

■ **Command**

Command
24 Hex

■ **Response**

EAS data
2FB36270D5A7907FE8B18038D281497682DA9A866FAF8BB0F19CD112A57237EF Hex

Section 5 Characteristics Data (Reference)

5-1 Communications Distance (Reference)

The communications distance is given in the following table. The communications distance changes, however, depending on the tag and R/W Module mounting conditions, so check the conditions of use beforehand.

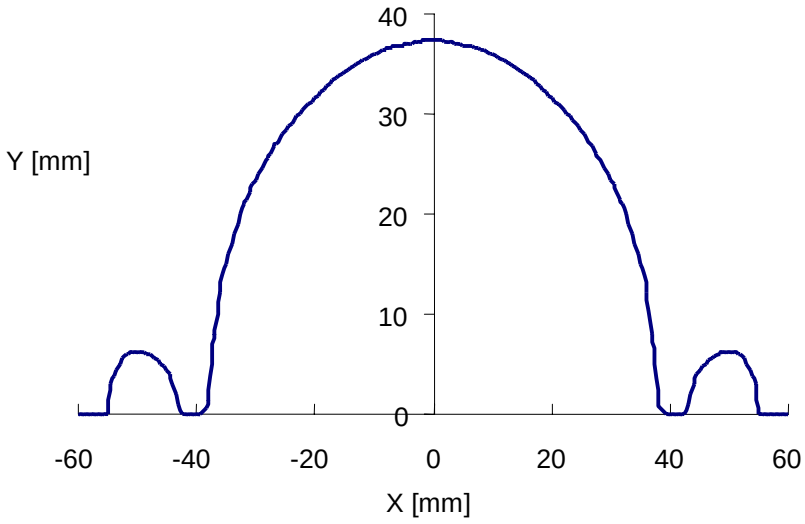
Tag	V720-HMC73	V720-HMC73T
V720-D52P30, manufactured by OMRON	0 to 35 mm	0 to 35 mm
V720-D52P40, manufactured by OMRON	0 to 35 mm	0 to 35 mm

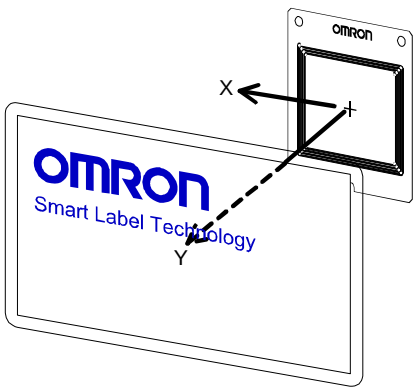
Note 1: The maximum communications distance (35 mm) given here is the typical value.

5-2 Diagram of Communications Range (Reference)

A diagram of the V720-HMC73 communications range is given below. The communications range differs, however, depending on the mounting conditions and the environmental conditions.

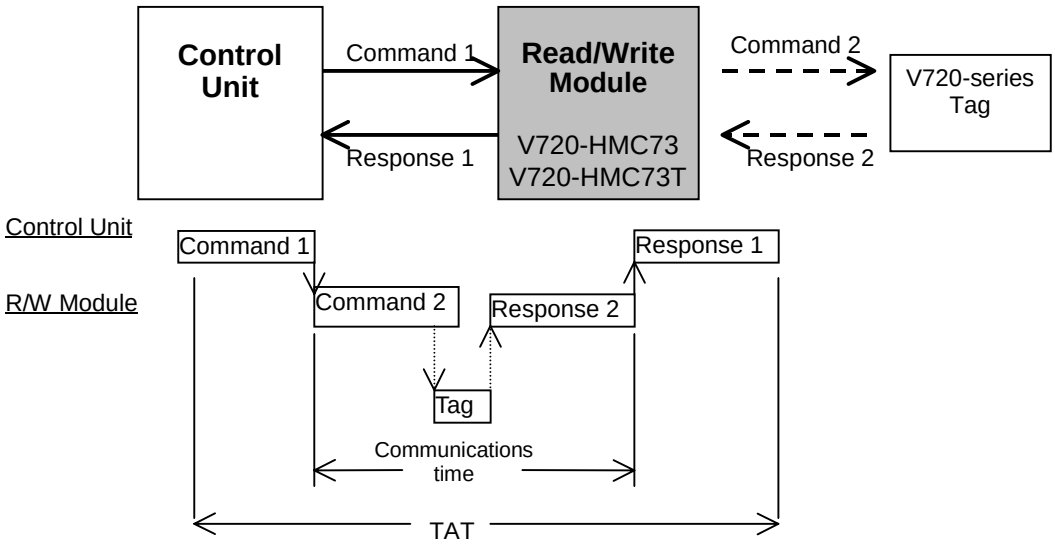
- R/W Module: V720-HMC73; Tags: V720-D52P30 (Manufactured by OMRON)
  The following diagram shows the communications area for a plane that goes through the center of the V720-HMC73 and is perpendicular to it.





5-3 Communications Time (Reference)

The communications time given below includes the communications time and TAT (Turn Around Time).



5-3-1 Communications Time

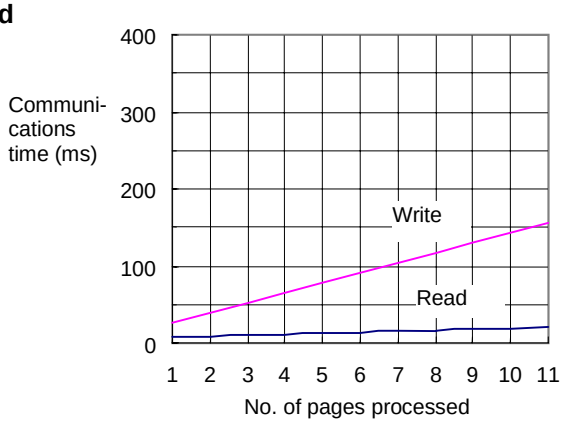
The communications time is the communications processing time between the R/W Module and the tags. The communications time differs depending on the number of pages being written or read.

- **Specifying Number of Pages to Be Written/Read Continuously**

Formulas

Command	Communications time (ms)
Read	T = 1.3N + 6.2
Write	T = 13N + 13.5

N: No. of pages processed



- **Not Specifying Number of Pages to Be Written/Read Continuously**

Formulas

Command	Communications time (ms)
Read	$T = 1.3N_R + 6.2$
Write	$T = 11.7N_W + 1.3N_R + 13.5$

N_R = (Maximum number of specified pages – minimum number of specified pages) + 1

N_W = No. of pages written

Example: Reading data from pages 1, 5, and 9

$T = 1.3 \times (9 - 1 + 1) + 6.2 = 17.9$ ms

Example: Writing data to pages 2, 4, 9, and 10

$T = 11.7 \times 4 + 1.3 \times (10 - 2 + 1) + 13.5 = 72$ ms

Communications time is calculated using the following conditions.

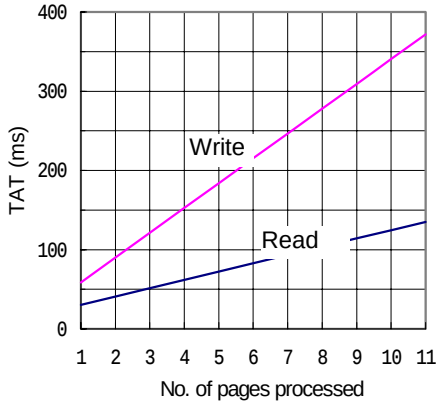
- Communications operation: Single Trigger Mode
- Communications errors must not occur.

5-3-2 TAT (Turn Around Time)

The TAT is the time taken from when the host control unit sends a command to the R/W Module, to when a response is received and completed. The time differs depending on the baud rate and the communications control method setting.

- **Example of TAT Calculation**

Example: Reading from page 0 to page 4



(1) Command send time
9 [char.] × 11 [bits] / 9600 [bps] × 1000 [ms/s] ≈ 10.32 ms

(2) Communications time
6.5 + 6.2 = 12.7ms

(3) Response receive time
43 [char.] × 11 [bits] / 9600 [bps] × 1000 ms/s] ≈ 49.27 ms

The TAT in to the above example is (1) + (2) + (3) = 72.29 ms.

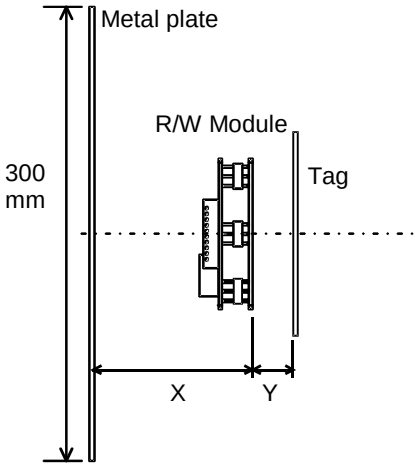
The calculations are performed according to the following conditions.

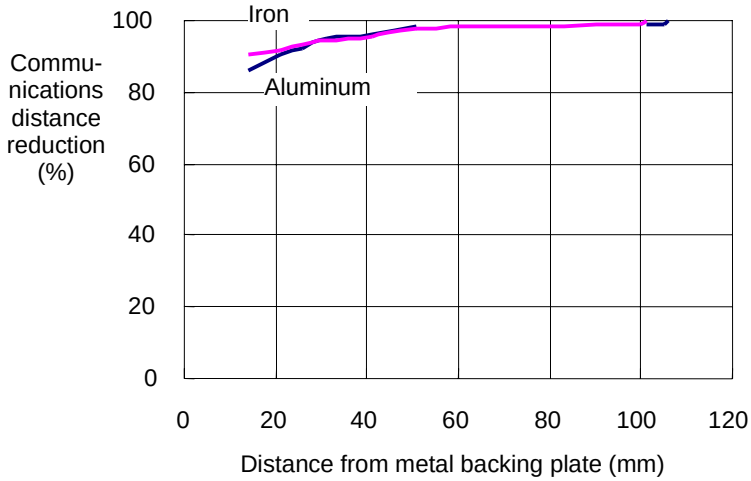
- Communications mode: Single Trigger Mode
- Communications control method: CR control
- Baud rate: 9,600 bps
- Data code specification: Hexadecimal
- Commands sent from the host control unit are sent continuously without spaces between the characters.
- Communications errors must not occur.

5-4 Effects of Metal Backing Plate (Reference)

When there is a metal backing plate to the R/W Module, communications distance with the tags is reduced. The data given below is for aluminum and iron.

(1) V720-HMC73

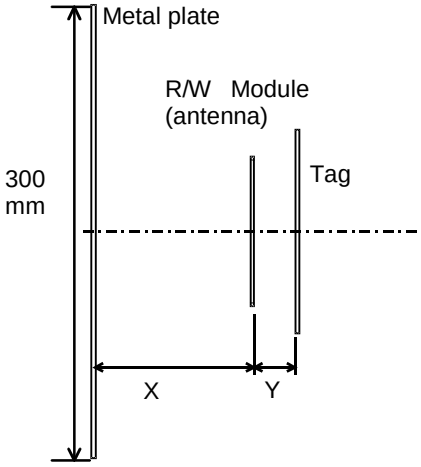


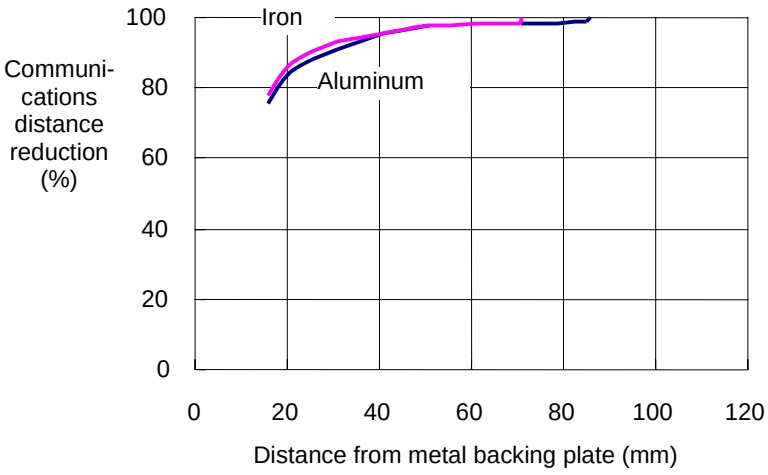


Measuring conditions
Aluminum: 300 × 300 × t1.5 mm
Iron: 300 × 300 × t1.0 mm

(2) V720-HMC73T

- **Effects of Metal Backing Plate**



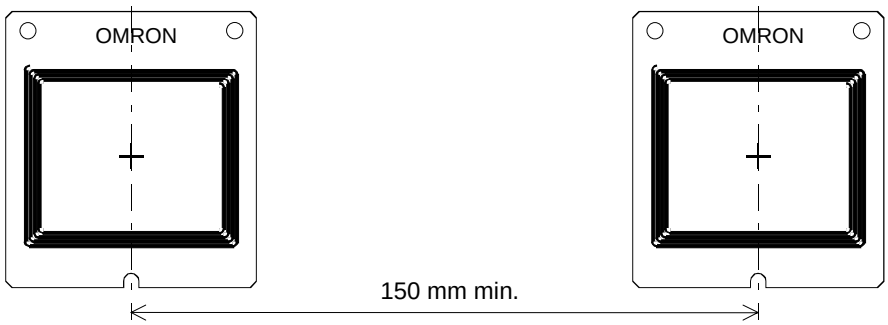


Measuring conditions
Aluminum: 300 × 300 × t1.5 mm
Iron: 300 × 300 × t1.0 mm

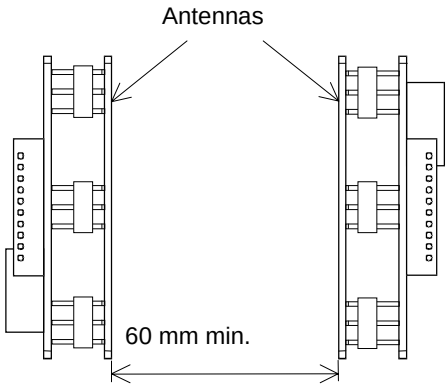
5-5 Mutual Interference (Reference)

If using multiple R/W Modules near to each other, space the Modules as shown below to prevent malfunction due to mutual interference. The following diagram shows the V720-HMC73, but the distance for the V720-HMC73T is the same.

- **Parallel Antennas**



- **Facing Antennas**

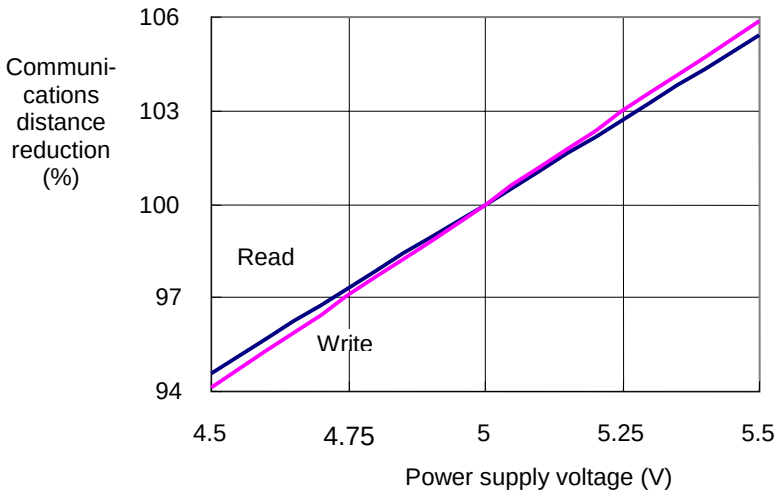


Correct Application
Mutual interference depends on the operating environment of the R/W Module and tags, so be sure to check the environment before application.

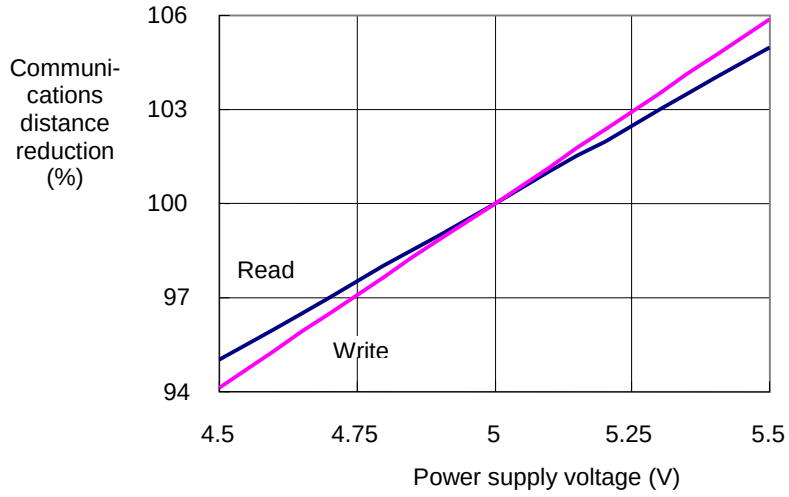
5-6 Voltage Effects (Reference)

The R/W Module read/write communications distances depend on the value of the power supply voltage. Refer to the following values when using the R/W Module. The rate of fluctuation in the communications range takes the distance of a 5-V power supply to be 100%.

- **V720-HMC73**



V720-HMC73T



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