

**MECHATROLINK I/O MODULE**

(self-synch input & DC voltage/current output, 1 point each, isolated, screw terminal block, message transmission command, MECHATROLINK-III use)

**MODEL R7G4HML3-6-STYVS1****BEFORE USE ....**

Thank you for choosing us. Before use, please check contents of the package you received as outlined below. If you have any problems or questions with the product, please contact our sales office or representatives.

**■ PACKAGE INCLUDES:**

Self-synch input, DC voltage/current output module.....(1)  
DIN rail mouser slider.....(2)

**■ MODEL NO.**

Confirm Model No. marking on the product to be exactly what you ordered.

**■ INSTRUCTION MANUAL**

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

**POINTS OF CAUTION****■ CONFORMITY WITH EU DIRECTIVES**

- This equipment is suitable for Pollution Degree 2 and Measurement Category II (input, transient voltage 1500 V). Basic insulation (signal input to output: 300V) \*1 is maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements. \*1. For use in Measurement Category I, applicable as reinforced insulation (300V).
- The equipment must be mounted inside the instrument panel of a metal enclosure.
- Altitude up to 2000 meters
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.

**■ POWER INPUT RATING & OPERATIONAL RANGE**

- Locate the power input rating marked on the product and confirm its operational range as indicated below:  
24V DC rating: 24V  $\pm$ 10%, approx. 100mA

**■ GENERAL PRECAUTIONS**

- Before you remove the unit or mount it, turn off the power supply, input signal and output signal for safety.
- Before you remove the terminal block or mount it, make sure to turn off the power supply and input signal for safety.

**■ ENVIRONMENT**

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

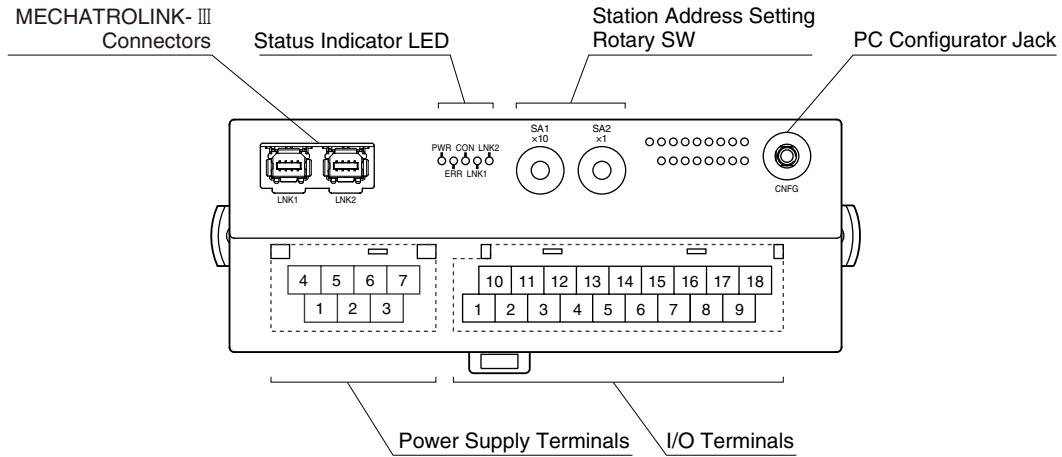
**■ WIRING**

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.
- Be sure to close the terminal cover for safety.

**■ AND ....**

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

## COMPONENT IDENTIFICATION



### ■ STATUS INDICATOR LED

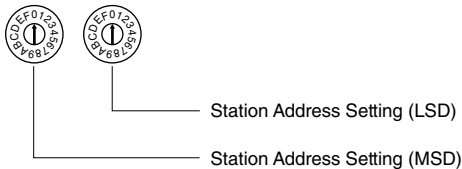
ID	COLOR	FUNCTION
PWR	Green	Turns on when the internal power is supplied normally.
ERR	Red	Turns on at MECHATROLINK-III communication error
CON	Green	Turns on at MECHATROLINK-III connection is established
LNK1	Green	Turns on at MECHATROLINK-III LNK1 is established
LNK2	Green	Turns on at MECHATROLINK-III LNK2 is established

### ■ STATION ADDRESS

Station Address is selected between 03H and EFH in hexadecimal.

The SA1 switch determines the MSD, while the SA2 switch does the LSD of the address.

(Factory setting: 03H)



### ■ POWER SUPPLY TERMINAL ASSIGNMENT

4	5	6	7
NC	NC	+24V	0V
1	2	3	
NC	NC	FE	

- 1. NC -
- 2. NC -
- 3. FE Functional earth
- 4. NC -
- 5. NC -
- 6. +24V Power supply (24V DC)
- 7. 0V Power supply (0V)

### ■ I/O TERMINAL ASSIGNMENT

10	11	12	13	14	15	16	17	18
NC	NC	IO	ICOM	R1	NC	NC	NC	NC
1	2	3	4	5	6	7	8	9
NC	VO	VCOM	NC	R2	NC	S1	S2	S3

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	10	NC	No connection
2	VO	Voltage out.	11	NC	No connection
3	VCOM	Voltage out. common	12	IO	Current out.
4	NC	No connection	13	ICOM	Current out. common
5	R2	Sync signal input 2	14	R1	Sync signal input 1
6	NC	No connection	15	NC	No connection
7	S1	Self-synch input 1	16	NC	No connection
8	S2	Self-synch input 2	17	NC	No connection
9	S3	Self-synch input 3	18	NC	No connection

## PC CONFIGURATOR

The following parameter items can be set with using PC Configurator Software (model: R7CFG). Refer to the users manual for the R7CFG for detailed operation of the software program.

### ■ CHANNEL INDIVIDUAL SETTING

	PARAMETER	SETTING RANGE	DEFAULT SETTING
INPUT	Angle offset	0.00 to 360.00 (deg.)	0.00 (deg.)
	Angle span	60.00 to 360.00 (deg.)	270.00 (deg.)
	Rotating direction	CW CCW	CW
	Bias	-320.00 to +320.00 (%)	0.00 (%)
	Gain	-3.2000 to +3.2000	1.0000
	Zero scale	-32 000 to +32 000	0
	Full scale	-32 000 to +32 000	10 000
	Averaging number	1, 2, 4, 8, 16, 32, 64, 128, 256	1
	Linearization point	Disable, 3 to 32	0
	Linearization (depends on number of point)	-15% (-1500) to +115% (+11500)	0
OUTPUT	Output	Valid Invalid	Valid
	Output range	-10 to +10V DC -5 to +5V DC 0 to 10V DC 0 to 5V DC 1 to 5V DC 4 to 20mA DC	-10 to +10V DC
	Bias	-320.00 to +320.00 (%)	0.00 (%)
	Gain	-3.2000 to +3.2000	1.0000
	Zero scale	-32 000 to +32 000	0
	Full scale	-32 000 to +32 000	10 000
	Output clear value	-15.00 to +115.00 (%)	-15.00 (%)
	Output at the loss of communication	Hold Clear	Hold

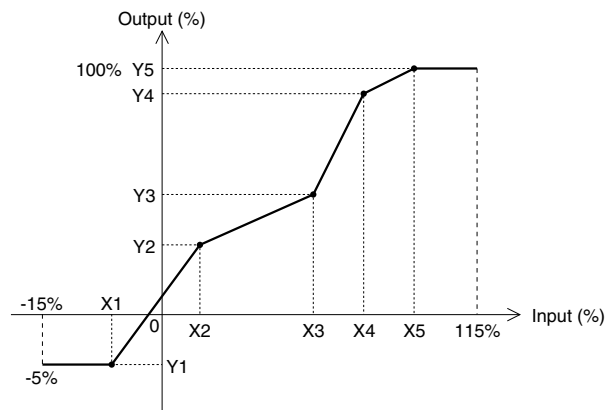
## LINEARIZATION

It is available to approximate the relation between self-synch input and the read value of the unit by max. 32 points of line plot. The linearization consists of pair of X-axis and Y-axis. Set with integer of hundredfold % value (-1500 – +11500). For X-axis, set so that No.1 < No.2 < No.3 ....

It is available to set with PC Configurator Software (model: R7CFG) or Message Transmission of MECHATROLINK-III. Refer to the R7CFG operation manual or 'Message Transmission' of this manual for detailed setting information.

### • Example

No.	X (%)	Y (%)
1	-500	-500
2	1000	3000
3	6000	5000
4	8000	9000
5	10000	10000



## INPUT RANGE

For self-synch input, be sure to perform angle offset as following procedure with your self-synch connected.

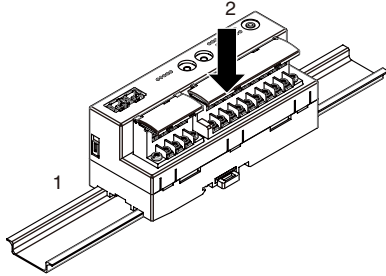
- 1) Connect the unit and your self-synch as in the connection diagram. Turn the power on.
- 2) Fix the position of the self-synch at where you want set to 0°.
- 3) Perform angle offset with PC Configurator software (model: R7CFG) or with MECHATROLINK-III message transmission. By this step, present input value is set as offset angle and input data for 0° is obtained.
- 4) Scaling is performed within the preset angle span range with offset angle set at above step. Input data is transferred to host device.

## MOUNTING INSTRUCTIONS

### ■ DIN RAIL MOUNTING (PARALLEL)

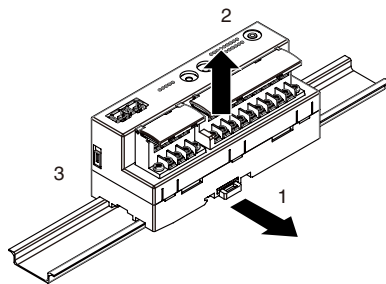
#### • Mounting

- 1) Set the upper hook at the rear side of the unit on the DIN rail.
- 2) Push in the lower.



#### • Dismounting

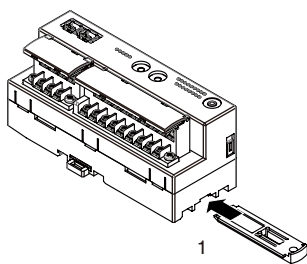
- 1) Push down the DIN rail mounter slider with tip of a minus screwdriver.
- 2) Pull the lower of the unit.
- 3) Remove the upper hook of the unit from the DIN rail.



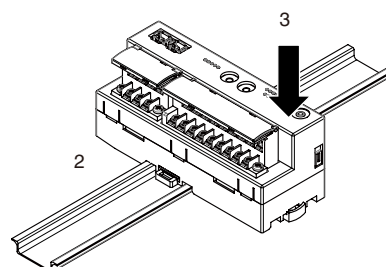
### ■ DIN RAIL MOUNTING (RIGHT ANGLE)

#### • Mounting

- 1) Insert the longer DIN rail mounter slider until it clicks twice, as shown below.

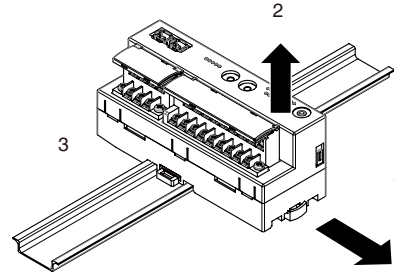


- 2) Set the upper hook at the rear side of the unit on the DIN rail.
- 3) Push in the lower.



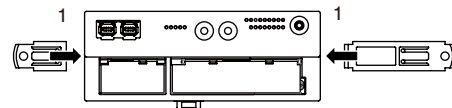
#### • Dismounting

- 1) Push down the DIN rail mounter slider with tip of a minus screwdriver.
- 2) Pull the lower of the unit.
- 3) Remove the upper hook of the unit from the DIN rail.

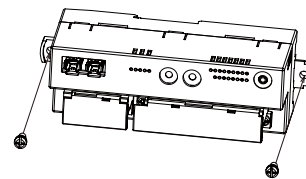


### ■ SURFACE MOUNTING

- 1) Insert the two DIN rail mounter sliders until it clicks once, as shown below.



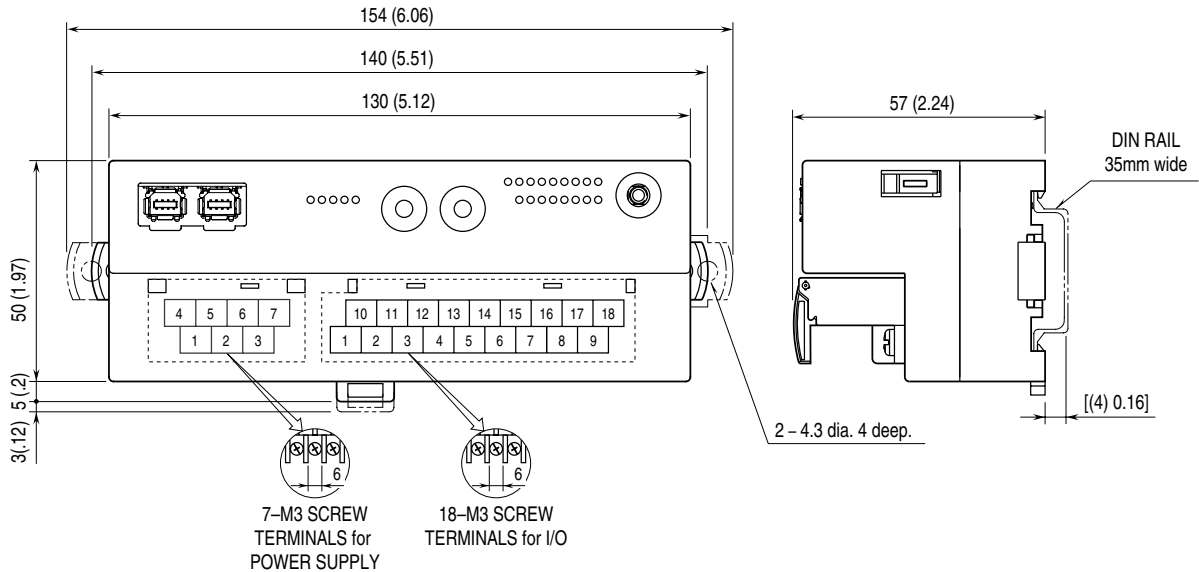
- 2) Mount the unit with M4 screws referring the External Dimensions. (Torque: 1.4 N·m)



## TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

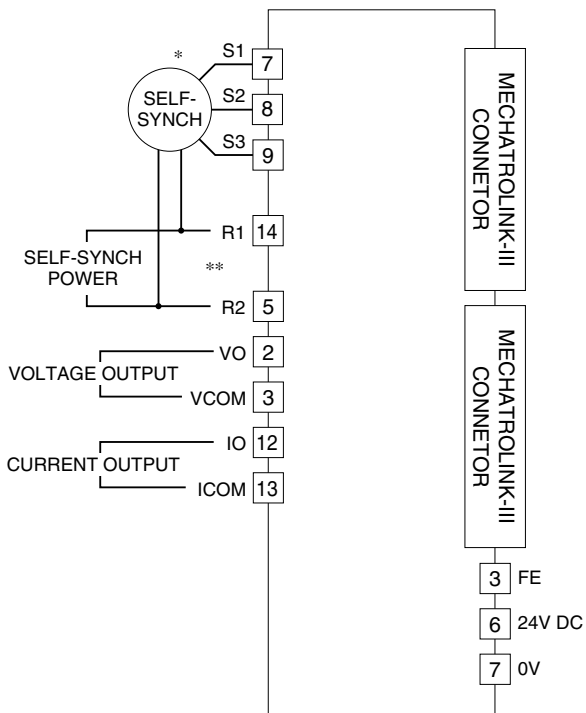
### EXTERNAL DIMENSIONS unit: mm (inch)



### CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FE terminal to ground.

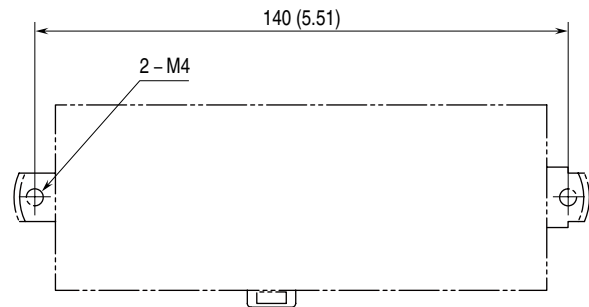
Caution: FE terminal is NOT a protective conductor terminal.



\* The output increases when the self-synch rotates clockwise. For changing the operation to counterclockwise, replace the connection of the S2 and S3.

\*\*Be sure that the polarity of the self-synch power input to the module matches to the self-synch input polarity. When the connection is reversed, the module input data will be shifted by 180°.

### MOUNTING REQUIREMENTS unit: mm (inch)



### WIRING INSTRUCTIONS

#### TORQUE

Wiring screw for separable terminal: 0.5 N·m

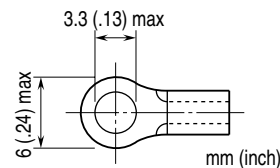
Fixing screw for separable terminal: 0.5 N·m

#### SOLDERLESS TERMINAL

Refer to the drawing below for recommended ring tongue terminal size. Spade tongue type is also applicable.

Applicable wire size: 0.25 to 1.65 mm<sup>2</sup> (AWG 22 to 16)

Recommended manufacturer: Japan Solderless Terminal MFG. Co., Ltd, Nichifu Co., Ltd



#### HOW TO UNMOUNT THE SEPARABLE TERMINAL

The separable terminal of the unit is 2 piece constructions. It is possible to remove the terminal by loosening two screws of terminal alternately.

## MECHATROLINK-III COMMUNICATION

**Transmission cycle:** 125  $\mu$ sec., 250  $\mu$ sec., 500  $\mu$ sec., 1 – 64 msec. (with 1 msec. increments)

**Communication cycle:** 125  $\mu$ sec. through 64 msec.

**Applicable profile:** Standard I/O profile (cyclic communication)

Event-driven communication acquiring ID profile (event-driven communication)

**Transmission bytes:** 16 bytes

**Station address:** 03H through EFH (set with rotary switches)

**Supported communication mode:** Cyclic, Message and Event-driven communication

**Message transmission command:** 01H, 7FH (Relay level: 3 levels)

**Slave monitoring:** None

## MECHATROLINK-III RELATED COMMANDS

Commands available with this unit are the following.

PROFILE	COMMAND	CODE	FUNCTION
Common command	NOP	00H	No operation command
	ID_RD	03H	Read ID command
	CONFIG	04H	Setup device command
	ALM_RD	05H	Read alarm or warning command
	ALM_CLR	06H	Clear alarm or warning command
	CONNECT	0EH	Establish connection command
	DISCONNECT	0FH	Release connection command
Standard I/O profile	DATA_RWA	20H	Transmit I/O data

### • NOP (00H)

Does nothing except sending back current status

BYTE	COMMAND	RESPONSE	REMARKS
0	NOP (00H)	NOP (00H)	No operation command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
$\geq 4$	00H	00H	Reserve

### • ID\_RD (03H)

Reads the product ID.

BYTE	COMMAND	RESPONSE	REMARKS
0	ID_RD (03H)	ID_RD (03H)	Read ID command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	ID_CODE	ID_CODE	Refer to ID_CODE
5	OFFSET	OFFSET	OFFSET: designates the place to read data
6	SIZE	SIZE	SIZE: specify the size of data to read
7			
$\geq 8$	00H	ID	Product's ID

### • CONFIG (04H)

No parameter to set for this unit. Immediately response with completion.

BYTE	COMMAND	RESPONSE	REMARKS
0	CONFIG (04H)	CONFIG (04H)	Setup device command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	00H	00H	Recalculation of parameters and set up. Other than 00H is not supported.
$\geq 5$	00H	00H	Reserve

• **ALM\_RD (05H)**

Reads alarm or warning

BYTE	COMMAND	RESPONSE	REMARKS
0	ALM_RD (05H)	ALM_RD (05H)	Read alarm or warning command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	0000H	0000H	Read current alarm or warning. 12 points max. (2 bytes in 8th to 31st byte) Other than 0000H is not available.
5			
6	0000H	0000H	0
7			
≥ 8	00H	00H	0

• **ALM\_CLR (06H)**

Clears alarm or warning

BYTE	COMMAND	RESPONSE	REMARKS
0	ALM_CLR (06H)	ALM_CLR (06H)	Clear alarm or warning command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	0000H	0000H	Clear current alarm or warning. Other than 0000H is not available.
5			
≥ 6	00H	00H	Reserve

• **CONNECT (0EH)**

Starts communication with master station.

BYTE	COMMAND	RESPONSE	REMARKS
0	CONNECT (0EH)	CONNECT (0EH)	Establish connection command
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	30H	30H	MECHATROLINK application layer: 30H
5	00H	00H	Communication mode: Asynchronous, single transmission, subcommand disabled
6	COM_TIME	COM_TIME	Communication cycle: Multiple of transmission cycle. E.g. Transmission cycle: 0.5 msec., communication cycle: 2 msec. Set 4 (=2/0.5)
7	30H or 01H	30H or 01H	Profile type 30H: Standard I/O profile 01H: Event-driven communication acquiring ID profile
≥ 8	00H	00H	Reserve

• **DISCONNECT (0FH)**

Stops communication with master station.

BYTE	COMMAND	RESPONSE	REMARKS
0	DISCONNECT (0FH)	DISCONNECT (0FH)	Release connection command
≥ 1	00H	00H	Reserve

• **DATA\_RWA (20H)**

Transmits I/O data to master station. Data allocation is following.  
Data size is 16 bytes.

BYTE	COMMAND	RESPONSE	REMARKS
0	DATA_RWA (20H)	DATA_RWA (20H)	Transmit I/O data
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	00H	CH0 IN LO	Lower byte of CH0 input data
5	00H	CH0 IN HI	Upper byte of CH0 input data
6	CH0 OUT LO	CH0 OUT LO (READ BACK)	Lower byte of CH0 output data
7	CH0 OUT HI	CH0 OUT HI (READ BACK)	Upper byte of CH0 output data
8	00H	00H	Not used
9	00H	00H	Not used
10	00H	00H	Not used
11	00H	00H	Not used
12	00H	STATUS LO	Lower byte of R7G4HML3 status
13	00H	STATUS HI	Upper byte of R7G4HML3 status
14	00H	00H	Not used
15	00H	00H	Not used

Note: The response at detection of breaking wire returns -15% of scaling.

(E.g. When breaking wire is detected with scaling 0 to 10000, the response returns -1500.)



## MESSAGE TRANSMISSION

Available message transmission command is as follows.

FUNCTION CODE	SUB FUNCTION CODE	DESCRIPTION	REMARKS
42H	01H	Reading memory	Reading virtual memory space
	7FH	Vendor-specific command	M-system's own command

### ■ READ MEMORY (01H) MESSAGE FORMAT

Command to read data in the virtual memory space.

BYTE	COMMAND	RESPONSE	
		NORMAL	ERROR
0	Slave address	Slave address	Slave address
1	Function code: 42H	Function code: 42H	Function code: C2H
2	00H (Not used)	Extended address	Extended address
3	00H (Not used)	Response status	Response status
4	Sub function code: 01H	Sub function code: 01H	Sub function code: 01H
5	Mode/Data type*1 : 13H	Mode/Data type*1 : 13H	Error code (See error code table)
6	Number of data*2	Number of data*2	Reserve (00H)
7			
8	Initial address	Data	
9		:	
10		:	
11		:	
:		:	
:		:	

\*1. Mode: Only 01H (volatile memory) is supported. Data type: 03H (long, 4 Bytes) is supported.

\*2. For number of data, specify number of data type.

Max. number of data is as follows. Relay Level 1: 24, Relay Level 2: 22, Relay Level 3: 20.

The virtual memory is defined by three address spaces as shown below.

1. 0000H to 0083H, 2. 00C0H to 011FH 3. 0180H to 019FH

To read out the memory, set address so that initial address and end address are within one of above mentioned address space.

The command, which read address not defined, causes error.

(End address = initial address + (number of data × 4) -1)

Address for readable virtual memory space is as follows.

ADDRESS	DESCRIPTION
0000 0000	Reserve (00000000H)
0000 0004	Vendor ID code
0000 0008	Device code
0000 000C	Device version
0000 0010	Device definition file version
0000 0014	Extended address setting
0000 0018	Serial number (ASCII code)
:	
0000 0037	
0000 0038	Reserve (00000000H)
0000 003C	Reserve (00000000H)
0000 0040	Profile type 1
0000 0044	Profile version 1
0000 0048	Profile type 2
0000 004C	Profile version 2
0000 0050	Profile type 3
0000 0054	Profile version 3
0000 0058	Min. transmission cycle
0000 005C	Max. transmission cycle
0000 0060	Increments of transmission cycle
0000 0064	Min. communication cycle
0000 0068	Max. communication cycle
0000 006C	Transmission bytes
0000 0070	Transmission bytes (current setting)
0000 0074	Profile type (current selection)
0000 0078	Reserve (00000000H)
0000 007C	Reserve (00000000H)
0000 0080	Supported communication mode

ADDRESS	DESCRIPTION
0000 00C0	List of supported main commands
:	
0000 00DF	
0000 00E0	List of supported sub commands
:	
0000 00FF	
0000 0100	List of supported common parameters
:	
0000 011F	
0000 0180	List of supported MECHATROLINK message communication sub function
:	
0000 019F	

## ■ VENDOR-SPECIFIC COMMAND (7FH) MESSAGE FORMAT

Vendor-specific commands are our independently defined command.

BYTE	COMMAND		RESPONSE			
			NORMAL		ERROR	
0	Slave address		Slave address		Slave address	
1	Function code: 42H		Function code: 42H		Function code + 80H C2H	
2	00H (Not used)		Extended address		Extended address	
3	00H (Not used)		Response status		Response status	
4	Sub function code: 7FH		Sub function code: 7FH		Sub function code: 7FH	
5	00H (Reserve)		00H (Reserve)		Error code (See error code table)	
6	Protocol ID	00H	Protocol ID	00H	Protocol ID* <sup>1</sup>	00H
7		21H		21H		21H
8	Data length (Byte)		Data length (Byte)		Data length (Byte)	
9						
10						
11						
12	00H		00H (Status flag: normal)		Vendor - specific error code (See vendor-specific error code table)* <sup>2</sup>	
13	Model code (See following table)		Model code		Model code* <sup>2</sup>	
14	Channel designation (See following table)		Channel		Channel* <sup>2</sup>	
15	Command code (See following table)		Command code		Command code* <sup>2</sup>	
16	Set data 1 upper byte		Set data 1 upper byte			
17	Set data 1 lower byte		Set data 1 lower byte			
18	Set data 2 upper byte		Set data 2 upper byte			
19	Set data 2 lower byte		Set data 2 lower byte			
:	:		:			
80	Set data 33 upper byte		Set data 33 upper byte			
81	Set data 33 lower byte		Set data 33 lower byte			

\*1. Error code: 0000H when 01H (Function code error).

\*2. Error code: Only 83H (vendor-specific area error) is valid.

### • MODEL CODE

MODEL CODE	MODEL
02H	R7G4HML3-6-STYVS1

### • CHANNEL CODE

CHANNEL CODE	CHANNEL
01H	CHANNEL 0

### • COMMAND CODE

COMMAND CODE	COMMAND	DESCRIPTION
01H	Set angle offset	Reset the current input to 0.
02H	Set angle span	Set angle span.
03H	Set number of point	Set number of point for linearization.
04H	Read number of point	Read number of point for linearization.
05H	Set linearization	Set X axis and Y axis for linearization.
06H	Read linearization	Read setting of linearization.
07H	Set output bias	Set analog output bias.
08H	Read output bias	Read setting of analog output bias.
09H	Set output gain	Set analog output gain.
0AH	Read output gain	Read setting of analog output gain.
0BH	Read angle offset	Read angle offset.
0CH	Read angle span	Read angle span.

### • COMMAND DETAILS

#### SET ANGLE OFFSET (01H)

Reset the current input to 0 and returns a response when the offset is completed.

Data length of command and response is '4'.

The following is an example of angle offset command of input 0.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	04H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	01H	01H	Command code: Set angle offset

#### SET ANGLE SPAN (02H)

Set the span point of angle and returns a response when the adjustment is completed.

Set angle (°) × 100 for the data. The data length of command and response is '6'.

The following is an example of command when the span point of angle for input 0 is set to 270.00° (27000: 6978H).

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	06H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	02H	02H	Command code: Set angle span
16	69H	69H	Angle span point data upper byte
17	78H	78H	Angle span point data lower byte

#### SET NUMBER OF POINT FOR LINEARIZATION (03H)

Set the number of point and returns a response when the setting is completed.

If '0' is set, linearization is invalid. The data length of command and response is '6'.

The following is an example of command when the number of point for input 0 is set to '8'.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	06H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	03H	03H	Command code: Set number of point
16	00H	00H	Linearization data upper byte
17	08H	08H	Linearization data lower byte

#### READ NUMBER OF POINT FOR LINEARIZATION (04H)

Read the number of point. The data length of command is '4', the data length of response is '6'.

The following is an example of command when the number of point for input 0 is read.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	04H	04H	Command code: Read number of point
16	Not used	00H	Linearization data upper byte
17	Not used	08H	Linearization data lower byte

**SET LINEARIZATION (05H)**

Set linearization and returns a response when the setting is completed. Be sure to specify the number of point to be set. For data, set percent value (%) × 100. The data length of command and response is (6 + number of data × 4).

The following is an example of command when input 0, number of data: 4 is set.

Data length: 6 + 4 × 4 = 22 (16H)

Data 1, X axis: 10.00% (1000: 03E8H), Y axis: 5.00% (500: 01F4H)

Data 2, X axis: 20.00% (2000: 07D0H), Y axis: 10.00% (1000: 03E8H)

Data 3, X axis: 50.00% (5000: 1388H), Y axis: 20.00% (2000: 07D0H)

Data 4, X axis: 80.00% (8000: 1F40H), Y axis: 50.00% (5000: 1388H)

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	16H	16H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	05H	05H	Command code: Set linearization
16	00H	00H	Linearization data upper byte
17	04H	04H	Linearization data lower byte
18	03H	03H	Data 1, X axis data upper byte
19	E8H	E8H	Data 1, X axis data lower byte
20	01H	01H	Data 1, Y axis data upper byte
21	F4H	F4H	Data 1, Y axis data lower byte
22	07H	07H	Data 2, X axis data upper byte
23	D0H	D0H	Data 2, X axis data lower byte
24	03H	03H	Data 2, Y axis data upper byte
25	E8H	E8H	Data 2, Y axis data lower byte
26	13H	13H	Data 3 X axis data upper byte
27	88H	88H	Data 3, X axis data lower byte
28	07H	07H	Data 3, Y axis data upper byte
29	D0H	D0H	Data 3, Y axis data lower byte
30	1FH	1FH	Data 4, X axis data upper byte
31	40H	40H	Data 4, X axis data lower byte
32	13H	13H	Data 4, Y axis data upper byte
33	88H	88H	Data 4, Y axis data lower byte

**READ LINEARIZATION (06H)**

Read linearization data. Be sure to specify the number of point to read. The data length of command is '6', the data length of response is (6 + number of data × 4).

The following is an example of command when input 0, number of data: 4 is set.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	06H	16H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	06H	06H	Command code: Read Linearization
16	00H	00H	Linearization data upper byte
17	04H	04H	Linearization data lower byte
18	Not used	03H	Data 1, X axis data upper byte
19	Not used	E8H	Data 1, X axis data lower byte
20	Not used	01H	Data 1, Y axis data upper byte
21	Not used	F4H	Data 1, Y axis data lower byte
22	Not used	07H	Data 2, X axis data upper byte
23	Not used	D0H	Data 2, X axis data lower byte
24	Not used	03H	Data 2, Y axis data upper byte
25	Not used	E8H	Data 2, Y axis data lower byte
26	Not used	13H	Data 3 X axis data upper byte
27	Not used	88H	Data 3, X axis data lower byte
28	Not used	07H	Data 3, Y axis data upper byte
29	Not used	D0H	Data 3, Y axis data lower byte
30	Not used	1FH	Data 4, X axis data upper byte
31	Not used	40H	Data 4, X axis data lower byte
32	Not used	13H	Data 4, Y axis data upper byte
33	Not used	88H	Data 4, Y axis data lower byte

**SET OUTPUT BIAS (07H)**

Set bias for analog output, and returns a response when the adjustment is completed.

For data, set percent value (%) × 100. The data length of command and response is '6'.

The following is an example of command when bias for output 0 is set to 1.00% (100: 0064H).

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	06H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Output 0
15	07H	07H	Command code: Set output bias
16	00H	00H	Output bias upper data
17	64H	64H	Output bias lower data

**READ OUTPUT BIAS (08H)**

Read bias setting for analog output. The data length of command is '4', the data length of response is '6'.

The following is an example of command when bias for output 0 is read.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Output 0
15	08H	08H	Command code: Read output bias
16	Not used	00H	Output bias upper data
17	Not used	64H	Output bias lower data

**SET OUTPUT GAIN (09H)**

Set analog output gain, and returns a response when the adjustment is completed.

For data, set gain × 10000. The data length of command and response is '6'.

The following is an example of command when gain for output 0 is set to 1.0100 (10100: 2774H).

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	06H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Output 0
15	09H	09H	Command code: Set output gain
16	27H	27H	Output gain upper data
17	74H	74H	Output gain lower data

**READ OUTPUT GAIN (0AH)**

Read gain setting for analog output. The data length of command is '4', the data length of response is '6'.

The following is an example of command when gain for output 0 is read.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Output 0
15	0AH	0AH	Command code: Read output gain
16	Not used	27H	Output gain upper data
17	Not used	74H	Output gain lower data

**READ ANGLE OFFSET (0BH)**

Read angle offset setting. Set angle (°) × 10 for the data. The data length of command is '4', the data length of response is '6'. The following is an example of command when angle offset 30.0° (300: 012CH) for input 0 is read.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	0BH	0BH	Command code: Read angle offset
16	Not used	01H	Angle offset upper data
17	Not used	2CH	Angle offset lower data

**READ ANGLE SPAN (0CH)**

Read angle span setting. The data length of command is '4', the data length of response is '6'.

The following is an example of command when angle span 270.00° (2700: 6978H) for input 0 is read.

BYTE	COMMAND	RESPONSE	DESCRIPTION
8	00H	00H	Data length
9	00H	00H	
10	00H	00H	
11	04H	06H	
12	00H	00H	Status flag: normal
13	02H	02H	Model code: R7G4HML3-6-STYVS1
14	01H	01H	Channel: Input 0
15	0CH	0CH	Command code: Read angle span
16	Not used	69H	Angle span upper data
17	Not used	78H	Angle span lower data

**• ERROR CODE**

ERROR CODE	DESCRIPTION	DETAIL
01H	Function code error	Non supported function code or sub function code.
03H	Wrong number	Differ from data length of command.
04H	Data type error	Not supported to specified mode or data type.
09H	Process conflict error	Cannot process due to during processing.
81H	Protocol ID setting error	Protocol ID does not match connected device during vendor-specific command is executed.
82H	Data length setting error	Setting of data length for vendor-specific area does not match connected device during vendor-specific command is executed.
83H	Vendor-specified area error	Vendor-specific error (refer to table below) occurred in the vendor-specific area during vendor-specific command is executed.

**• VENDOR - SPECIFIC ERROR CODE**

ERROR CODE	DESCRIPTION	DETAIL
01H	Device code error	Specified device code differs from connected device.
02H	Specified channel error	Specified channel is not supported by connected device.
03H	Specified command error	Specified command is not supported by connected device.
04H	Specified command data error	Data error of specified command.

**CMD\_CTRL**

CMD\_CTRL command area is following.

BIT	FUNCTION	REMARKS
0 – 2	Reserve	Not used
3	ALM_CLR	0: Clear alarm/warning disabled 1: Clear alarm/warning triggered
4 – 5	Reserve	Not used
6 – 7	CMD_ID	Not used in the standard I/O command profile
8 – 15	Reserve	Not used

**CMD\_STAT**

CMD\_STAT response area is following.

BIT	FUNCTION	REMARKS	
0	D_ALM	Not used	
1	D_WAR	Not used	
2	CMDRDY	1: Command reception enabled 0: Other	
3	ALM_CLR_CMP	1: Completion of execution of ALM_CLR 0: Other ALM_CLR_CMP can be canceled by setting '0' for ALM_CLR in CMD_CTRL command area.	
4 – 5	Reserve	Not used	
6 – 7	RCMD_ID	Not used in the standard I/O command profile	
8 – 11	CMD_ALM	Warning	0: Normal, 1: Invalid data
		Alarm	8: Unsupported command received, 9: Invalid data, A: Command execution condition error, B: Subcommand combination error, C: Phase error
12 – 15	COMM_ALM	Warning	0: Normal, 1: FCS error, 2: Command data not received, 3: Synchronous frame not received
		Alarm	8: FCS error, 9: Command data not received, A: Synchronous frame not received, B: Synchronization time interval error, C: WDT error

**ID\_CODE**

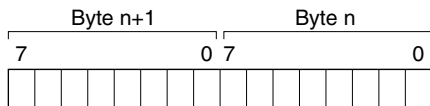
ID\_CODE is following.

ID_CODE	NAME	SIZE (BYTES)	SUPPORT	VALUE (HEXADECIMAL)	REMARKS
01H	Vendor ID Code	4	Yes	0x00000021	M-SYSTEM CO., LTD.
02H	Device Code	4	Yes	0x0000020F	R7G4HML3-6-STYVS1
03H	Device Version	4	Yes	Firmware version	E.g. 1.00 -> 0x0064
04H	Device Definition File version	4	Yes	0x00001000	
05H	Extended Address Setting	4	Yes	0x00000001	
06H	Serial No.	32	Yes	Unit serial number	E.g. AB123456 -> 0x32314241 0x36353433 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
10H	Profile Type 1	4	Yes	0x00000030	Standard I/O profile
11H	Profile Version 1	4	Yes	0x00000100	
12H	Profile Type 2	4	Yes	0x000000FF	Indicates the unit does not support
13H	Profile Version 2	4	Yes	0x00000000	
14H	Profile Type 3	4	Yes	0x000000FF	Indicates the unit does not support
15H	Profile Version 3	4	Yes	0x00000000	
16H	Min. Transmission Cycle	4	Yes	0x000030D4	125 $\mu$ sec.
17H	Max. Transmission Cycle	4	Yes	0x0061A800	64 msec.
18H	Increments of Transmission Cycle	4	Yes	0x00000001	Available to 31.25, 62.5, 125, 250, 500 [ $\mu$ sec.] & 1 – 64 [msec.] (1 msec. increments)
19H	Min. Communication Cycle	4	Yes	0x000030D4	125 $\mu$ sec.
1AH	Max. Communication Cycle	4	Yes	0x0061A800	64 msec.
1BH	Transmission Bytes	4	Yes	0x00000002	16 Bytes
1CH	Transmission Bytes (Current Setting)	4	Yes	0x00000002	16 Bytes
1DH	Profile Type (Current Selection)	4	Yes	0x00000001 / 0x00000030	Event-driven communication / Cyclic communication
20H	Supported Communication Mode	4	Yes	0x00000003	Event-driven communication / Cyclic communication
21H	MAC Address	4	No	----	
30H	List of Supported Main Commands	32	Yes	0x0000C079 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000	ALM_CLR, ALM_RD, CONFIG, ID_RD, NOP, DISCONNECT, CONNECT, DATA_RWA
38H	List of Supported Sub Commands	32	No	----	
40H	List of Common Parameters	32	No	----	
80H	Main Device Name	32	Yes	0x34473752 0x334C4D48 0x4C2D362D 0x53565954 0x00000000 0x00000000 0x00000000 0x00000000	“R7G4HML3-6-STYVS1”
90H	Sub Device 1 Name	4	No	----	
98H	Sub Device 1 Version	32	No	----	
A0H	Sub Device 2 Name	4	No	----	
A8H	Sub Device 2 Version	32	No	----	
B0H	Sub Device 3 Name	4	No	----	
B8H	Sub Device 3 Version	32	No	----	



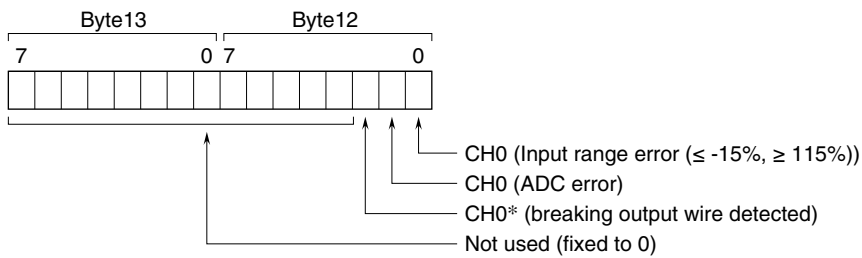
## I/O DATA DESCRIPTION

### ■ ANALOG I/O MODULE



Data is represented in 16-bit binary. Negative value is represented in 2's complements.

### ■ STATUS



Input range error

0: Normal 1: Error

ADC error

0: Normal 1: Error

Detected breaking output wire

0: Normal 1: Error

\* When '4 to 20mA' is chosen for output range. It is fixed to 0 for except '4 to 20mA' range.