INSTRUCTION MANUAL

NPN/PNP DISCRETE HIGH SPEED INPUT & NPN TRANSISTOR OUTPUT MODULE
(32 points each, tension clamp terminal block, MECHATROLINK-III use)

MODEL **R7K4JML3-E-DAFC64A**

BEFORE USE ....

Thank you for choosing M-System. 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 M-System's Sales Office or representatives.

■ PACKAGE INCLUDES:

Discrete I/O module..(1)
DIN rail mounter slider...(2)

■ MODEL NO.

Confirm that the model number described on the product is 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

The actual installation environments such as panel configurations, connected devices and 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 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 ±10%, approx. 115mA

■ 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, turn off the power supply, input signal and output 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.

FRONT VIEW
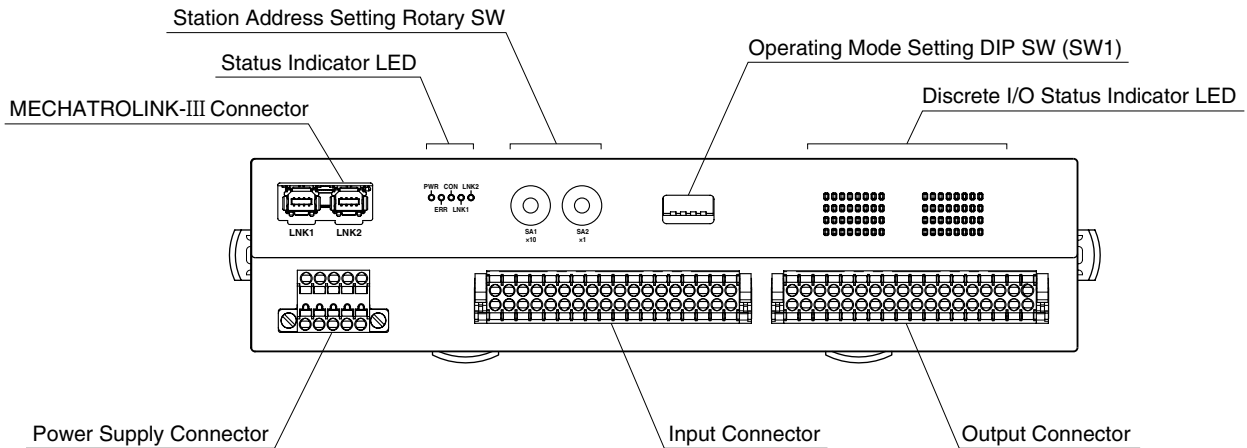
■ STATUS INDICATOR LED

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)

Station Address Setting (LSD)

Station Address Setting (MSD)
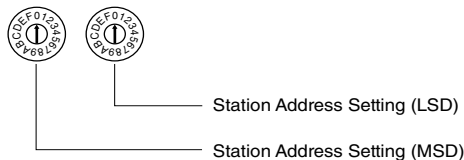
■ OPERATING MODE

• Acquire Cycle (SW-1, 2, 3)

SW1-1	SW1-2	SW1-3	ACQUIRE CYCLE
OFF	OFF	OFF	≤ 100 µsec. (*)
ON	OFF	OFF	≤ 200 µsec.
OFF	ON	OFF	≤ 400 µsec.
ON	ON	OFF	≤ 800 µsec.
OFF	OFF	ON	≤ 4 msec.
ON	OFF	ON	≤ 8 msec.
OFF	ON	ON	≤ 16 msec.
ON	ON	ON	≤ 40 msec.

• Output at loss of communication (SW1-4)

SW1-4	Output at loss of communication
OFF	Reset the output (turned off)
ON	Hold the output (*) (maintains the last data received normally)

(*) Factory setting

■ DISCRETE I/O STATUS INDICATOR LED

LED green indicators shows the signal status.
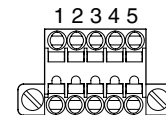 ON : LED ON
  OFF : LED OFF

■ POWER SUPPLY TERMINAL ASSIGNMENT

Applicable connector: TFMC1,5 / 5–STF–3,5 (Phoenix Contact) (included in the package)
Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm
Recommended solderless terminal
• AI0,25–10YE 0.25 mm² (Phoenix Contact)
• AI0,34–10TQ 0.34 mm² (Phoenix Contact)
• AI0,5–10WH 0.5 mm² (Phoenix Contact)
• AI0,75–10GY 0.75 mm² (Phoenix Contact)
• A1–10 1.0 mm² (Phoenix Contact)
• A1,5–10 1.5 mm² (Phoenix Contact)

1. FE   Functional Earth
2. NC   —
3. NC   —
4. +24V   Power Input (24V DC)
5. 0V   Power Input (0V)

■ **I/O TERMINAL ASSIGNMENT**

Applicable connector: DFMC1,5/18-ST-3,5-LR (Phoenix Contact) (included in the package)

Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm

Recommended solderless terminal:
• AI0,25–10YE 0.25 mm² (Phoenix Contact)
• AI0,34–10TQ 0.34 mm² (Phoenix Contact)
• AI0,5–10WH 0.5 mm² (Phoenix Contact)
• AI0,75–10GY 0.75 mm² (Phoenix Contact)
• A1–10 1.0 mm² (Phoenix Contact)
• A1,5–10 1.5 mm² (Phoenix Contact)

CONNECTING CONNECTORS
• Connectors with lock & release lever
• To connect, push the connector until the lock is latched.
• To disconnect, pull the lever toward to release the lock. Remove the connector.
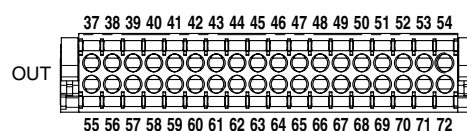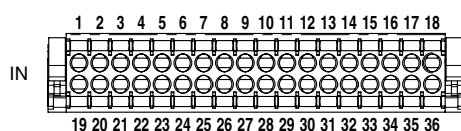
NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	COM	In. Common	19	COM	In. Common
2	COM	In. Common	20	COM	In. Common
3	X0	Input 0	21	X16	Input 16
4	X1	Input 1	22	X17	Input 17
5	X2	Input 2	23	X18	Input 18
6	X3	Input 3	24	X19	Input 19
7	X4	Input 4	25	X20	Input 20
8	X5	Input 5	26	X21	Input 21
9	X6	Input 6	27	X22	Input 22
10	X7	Input 7	28	X23	Input 23
11	X8	Input 8	29	X24	Input 24
12	X9	Input 9	30	X25	Input 25
13	X10	Input 10	31	X26	Input 26
14	X11	Input 11	32	X27	Input 27
15	X12	Input 12	33	X28	Input 28
16	X13	Input 13	34	X29	Input 29
17	X14	Input 14	35	X30	Input 30
18	X15	Input 15	36	X31	Input 31

NO.	ID	FUNCTION	NO.	ID	FUNCTION
37	V+	External excitation	55	V+	External excitation
38	V–	Out. Common	56	V–	Out. Common
39	Y0	Output 0	57	Y16	Output 16
40	Y1	Output 1	58	Y17	Output 17
41	Y2	Output 2	59	Y18	Output 18
42	Y3	Output 3	60	Y19	Output 19
43	Y4	Output 4	61	Y20	Output 20
44	Y5	Output 5	62	Y21	Output 21
45	Y6	Output 6	63	Y22	Output 22
46	Y7	Output 7	64	Y23	Output 23
47	Y8	Output 8	65	Y24	Output 24
48	Y9	Output 9	66	Y25	Output 25
49	Y10	Output 10	67	Y26	Output 26
50	Y11	Output 11	68	Y27	Output 27
51	Y12	Output 12	69	Y28	Output 28
52	Y13	Output 13	70	Y29	Output 29
53	Y14	Output 14	71	Y30	Output 30
54	Y15	Output 15	72	Y31	Output 31

MOUNTING INSTRUCTIONS

■ DIN RAIL MOUNTING

• Mounting

1) Set the upper hook at the rear side of the unit on the DIN rail.

2) Push in the lower.
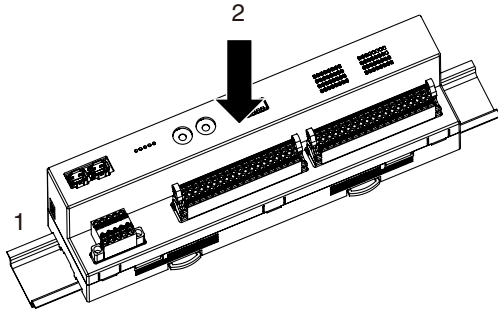
• Dismounting

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.
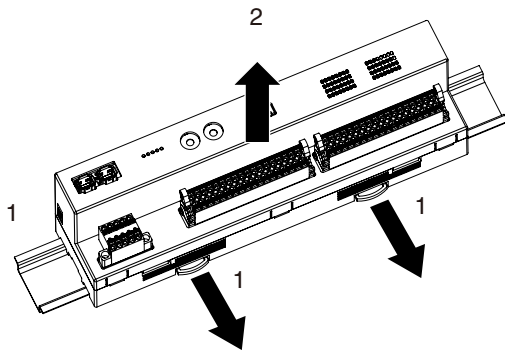
■ SURFACE MOUNTING

1) Insert the two DIN rail mounter sliders until it clicks once, as shown below.
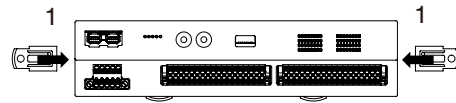
2) Mount the unit with M4 screws referring the Mounting Requirements.   (Torque: 1.4 N·m)

EXTERNAL DIMENSIONS unit: mm (inch)

235 (9.25)

220 (8.66)

210 (8.27)

65 (2.56)

50 (1.97)

3.5 (0.14)

5 (0.20)

DIN RAIL 35mm wide

[4 (.16)]

2 - 4.3 dia. 4 deep
(2 - 1.17 dia. 0.16 deep)

CONNECTION DIAGRAM

Connect the unit as in the diagram below.

COM	1
COM	2
X0	3
X1	4
X2	5
X3	6
X4	7
X5	8
X6	9
X7	10
X8	11
X9	12
X10	13
X11	14
X12	15
X13	16
X14	17
X15	18
COM	19
COM	20
X16	21
X17	22
X18	23
X19	24
X20	25
X21	26
X22	27
X23	28
X24	29
X25	30
X26	31
X27	32
X28	33
X29	34
X30	35
X31	36

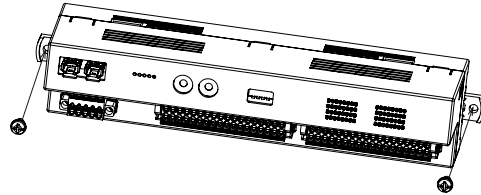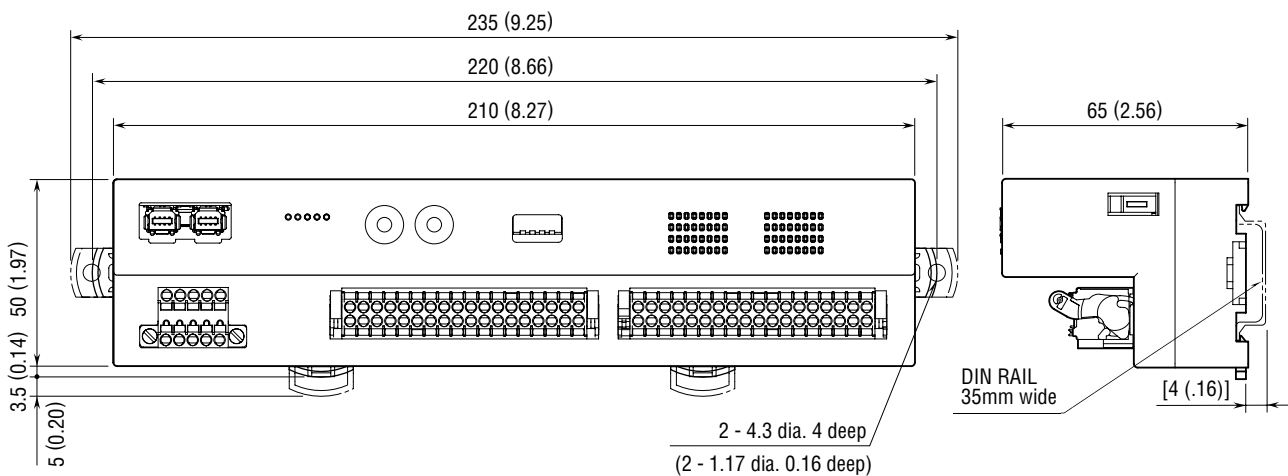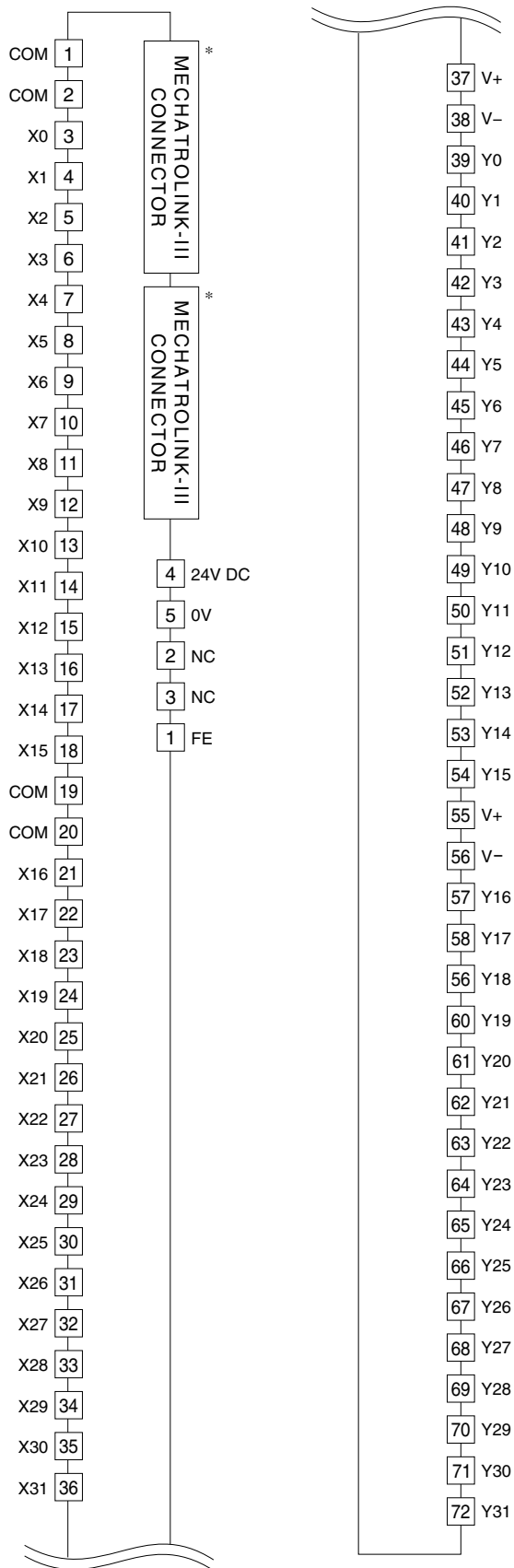MECHATROLINK-III CONNECTOR *

MECHATROLINK-III CONNECTOR *

4	24V DC
5	0V
2	NC
3	NC
1	FE

37	V+
38	V−
39	Y0
40	Y1
41	Y2
42	Y3
43	Y4
44	Y5
45	Y6
46	Y7
47	Y8
48	Y9
49	Y10
50	Y11
51	Y12
52	Y13
53	Y14
54	Y15
55	V+
56	V−
57	Y16
58	Y17
56	Y18
60	Y19
61	Y20
62	Y21
63	Y22
64	Y23
65	Y24
66	Y25
67	Y26
68	Y27
69	Y28
70	Y29
71	Y30
72	Y31

■INPUT CONNECTION EXAMPLES

PNP Connection

COM	1
COM	2
COM	19
COM	20
X0	3
X31	36

NPN Connection

COM	1
COM	2
COM	19
COM	20
X0	3
X31	36

■OUTPUT CONNECTION EXAMPLES

V+	37
V+	55
V−	38
V−	56
Y0	39
Y31	72

* The network cable can be connected to either one.
Note: In order to improve EMC performance, bond the FE terminal to ground.
Caution: FE terminal is NOT a protective conductior terminal.

MOUNTING REQUIREMENTS unit: mm (inch)

MECHATROLINK-III COMMUNICATION

Transmission cycle:125 µsec., 250 µsec., 500 µsec., 1 – 64 msec. (with 1 msec. increments)
Communication cycle: 125 µsec. through 64 msec.
Applicable profile: Standard I/O profile (cyclic communication) Event-driven communication acquiring ID profile (event-driven communication)
Transmission bytes: 16 bytes
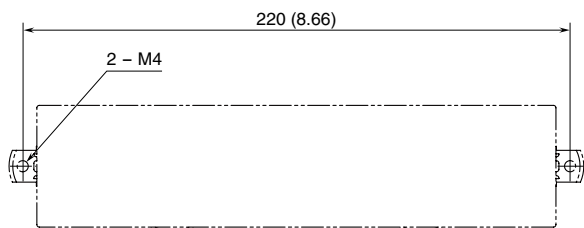**Station address**: 03H through EFH (set with rotary switches)
Cyclic communication: Available
Event-driven communication: Available
Slave monitoring: None

MECHATROLINK-III COMMAND

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			
≥ 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			
≥ 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.
≥ 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.
5			12 points max. (2 bytes in 8th to 31st byte) Other than 0000H is not available.
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 01H: Event-driven
≥ 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 data
1	00H	00H	Not used
2	CMD_CTRL	CMD_STAT	Refer to CMD_CTRL/CMD_STAT.
3			
4	CH0 OUT LO	CH0 IN LO	CHx OUT: Output data: See 'Output Data' of 'I/O DATA'
5	CH0 OUT HI	CH0 IN HI	CHx IN: Input data: See 'Input Data' of 'I/O DATA'
6	CH1 OUT LO	CH1 IN LO	
7	CH1 OUT HI	CH1 IN HI	
8	CH2 OUT LO	CH2 IN LO	
9	CH2 OUT HI	CH2 IN HI	
10	CH3 OUT LO	CH3 IN LO	
11	CH3 OUT HI	CH3 IN HI	
12	00H	00H	Not used
13	00H	00H	Not used
14	00H	00H	Not used
15	00H	00H	Not used

[I/O DATA]

• Input data

Input data to be sent from the slave to the master are set in the response.

CH0 IN LO	CH0 data low 8 bits	Bit 0 through 7 of the input data are set
CH0 IN HI	CH0 data high 8 bits	Bit 8 through 15 of the input data are set
CH1 IN LO	CH1 data low 8 bits	Bit 16 through 23 of the input data are set
CH1 IN HI	CH1 data high 8 bits	Bit 24 through 31 of the input data are set
CH2 IN LO	CH2 data low 8 bits	Bit 0 through 7 of the data, which reads back the input data, are set
CH2 IN HI	CH2 data high 8 bits	Bit 8 through 15 of the data, which reads back the input data, are set
CH3 IN LO	CH3 data low 8 bits	Bit 16 through 23 of the data, which reads back the input data, are set
CH3 IN HI	CH3 data high 8 bits	Bit 24 through 31 of the data, which reads back the input data, are set

• Output Data

Output data to be sent from the master to the slave are set in the command.   Not used for input module.

CH0 OUT LO	CH0 data low 8 bits	Not used
CH0 OUT HI	CH0 data high 8 bits	Not used
CH1 OUT LO	CH1 data low 8 bits	Not used
CH1 OUT HI	CH1 data high 8 bits	Not used
CH2 OUT LO	CH2 data low 8 bits	Bit 0 through 7 of the output data are set
CH2 OUT HI	CH2 data high 8 bits	Bit 8 through 15 of the output data are set
CH3 OUT LO	CH3 data low 8 bits	Bit 16 through 23 of the output data are set
CH3 OUT HI	CH3 data high 8 bits	Bit 24 through 31 of the output data are set

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 Cancellation of ALM_CLR_CMP causes ALM_CLR of CMD_CTRL to '0'.	
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
01 H	Vendor ID Code	4	Yes	0x00000021	M-SYSTEM CO., LTD.
02 H	Device Code	4	Yes	0x00000603	R7K4JML3–E–DAFC64A
03 H	Device Version	4	Yes	Firmware version	E.g. 1.00 -> 0x0064
04 H	Device Definition File version	4	Yes	0x00001000	
05 H	Extended Address Setting	4	Yes	0x00000001	
06 H	Serial No.	32	Yes	Unit serial number	E.g. AB123456-> 0x32314241 0x36353433 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
10 H	Profile Type 1	4	Yes	0x00000030	Standard I/O profile
11 H	Profile Version 1	4	Yes	0x00000100	
12 H	Profile Type 2	4	Yes	0x000000FF	Indicates the unit does not support
13 H	Profile Version 2	4	Yes	0x00000000	
14 H	Profile Type 3	4	Yes	0x000000FF	Indicates the unit does not support
15 H	Profile Version 3	4	Yes	0x00000000	
16 H	Min.Transmission Cycle	4	Yes	0x000030D4	125 µsec.
17 H	Max.Transmission Cycle	4	Yes	0x0061A800	64 msec.
18 H	Increments of Transmission Cycle	4	Yes	0x00000001	Available to 31.25, 62.5, 125, 250, 500 [µsec.] & 1 – 64 [msec.] (1 msec. increments)
19 H	Min. Communication Cycle	4	Yes	0x000030D4	125 µsec.
1A H	Max. Communication Cycle	4	Yes	0x0061A800	64 msec.
1B H	Transmission Bytes	4	Yes	0x00000002	16 Bytes
1C H	Transmission Bytes (Current Setting)	4	Yes	0x00000002	16 Bytes
1D H	Profile Type (Current Selection)	4	Yes	0x00000001 / 0x00000030	Event-driven communication / Cyclic communication
20 H	Supported Communication Mode	4	Yes	0x00000003	Event-driven communication / Cyclic communication
21 H	MAC Address	4	No	–	
30 H	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
38 H	List of Supported Sub Commands	32	No	–	
40 H	List of Common Parameters	32	No	–	
80 H	Main Device Name	32	Yes	0x344B3752 0x334C4D4A 0x442D452D 0x36434641 0x00004134 0x00000000 0x00000000 0x00000000	"R7K4JML3–E–DAFC64A"
90 H	Sub Device 1 Name	4	No	–	
98 H	Sub Device 1 Version	32	No	–	
A0 H	Sub Device 2 Name	4	No	–	
A8 H	Sub Device 2 Version	32	No	–	
B0 H	Sub Device 3 Name	4	No	–	
B8 H	Sub Device 3 Version	32	No	–	

I/O DATA DESCRIPTION

■**DISCRETE I/O**

15															0

	Input 0	Input 16	Output 0	Output 16
	Input 1	Input 17	Output 1	Output 17
	Input 2	Input 18	Output 2	Output 18
	Input 3	Input 19	Output 3	Output 19
	:	:	:	:
	Input 7	Input 23	Output 7	Output 23
	Input 8	Input 24	Output 8	Output 24
	:	:	:	:
	Input 15	Input 31	Output 15	Output 31

0 : OFF   1 : ON