

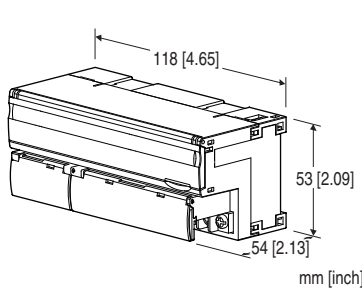
Remote I/O R7 Series

MECHATROLINK I/O MODULE

(discrete input, 16 points, MECHATROLINK-I / -II use)

Functions & Features

- 16 points discrete input module for MECHATROLINK -I/ -II
- Extension module can be connected



MODEL: R7ML-DA16-R[1]

ORDERING INFORMATION

- Code number: R7ML-DA16-R[1]
- Specify a code from below for [1].
(e.g. R7ML-DA16-R/Q)
- Specify the specification for option code /Q
(e.g. /C01)

I/O TYPE

DA16: Discrete input, 16 points

POWER INPUT

DC Power

R: 24 V DC

(Operational voltage range 24 V $\pm$ 10 %, ripple 10 %p-p max.)

[1] OPTIONS

blank: none

/Q: With options (specify the specification)

SPECIFICATIONS OF OPTION: Q

COATING (For the detail, refer to our web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

RELATED PRODUCTS

- PC Configurator cable (model: MCN-CON or COP-US)
- PC configurator software (model: R7CON)

Downloadable at our web site.

- Discrete input extension module (model: R7ML-EAx)
- Discrete output extension module (model: R7ML-ECx)

GENERAL SPECIFICATIONS

Connection

MECHATROLINK: MECHATROLINK-I/-II connector

Power input, input: M3 separable screw terminal (torque 0.5 N·m)

Solderless terminal: Refer to the drawing at the end of the section.

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

Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (gray)

Isolation: Input to MECHATROLINK or FG to power

Extension: No extension (*), Discrete input 8 or 16 points, Discrete output 8 or 16 points

Selectable with the front DIP SW

(*) Factory default setting

Status indicator LEDs: PWR, RUN, ERR, SD, RD

(Refer to the instruction manual)

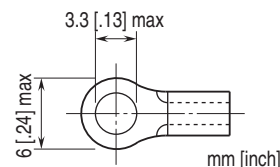
Discrete input status indicator LED: LED turns on with input ON

Configurator connection: 2.5 dia. miniature jack

Read rate: 1 / 5 / 10(*) / 20 / 50 / 70 / 100 / 200 msec.
selectable with front DIP SW

(*) Factory default setting

■ Recommended solderless terminal



MECHATROLINK COMMUNICATION

MECHATROLINK mode: Set with DIP switches

(MECHATROLINK-I or -II, data length; Factory default setting:

MECHATROLINK-II; data length (17 bytes)

(Refer to the instruction manual)

Station address: 60H - 7FH

(Function selected with Rotary SW. Factory default setting: 60H) (Refer to the instruction manual)

■ MECHATROLINK-I

Baud rate: 4 Mbps

Transmission distance: 50 m max.

Distance between stations: 30 cm min.

Transmission media: MECHATROLINK cable (Model JEPMC-W6003-x-E, Yaskawa Controls Co., Ltd.)

Max. number of Subordinate Devices: 15

(The maximum number of Subordinate Devices might change depending on the Main Device unit. Refer to the manual of the Main Device unit)

Transmission cycle: 2 msec. (fixed)

Data length: 17 bytes

STANDARDS & APPROVALS**EU conformity:**

EMC Directive

EMI EN 61000-6-4

EMS EN 61000-6-2

RoHS Directive

■ MECHATROLINK-II

Baud rate: 10 Mbps

Transmission distance: 50 m max.

Distance between stations: 50 cm min.

Transmission media: MECHATROLINK cable (Model JEPMC-W6003-x-E, Yaskawa Controls Co., Ltd.)

Max. number of Subordinate Devices: 30

(The maximum number of Subordinate Devices might change depending on the Main Device unit. Refer to the manual of the Main Device unit)

Transmission cycle: 0.5 msec., 1 msec., 1.5 msec., 2 msec., 4 msec., 8 msec.

Data length: 17 bytes / 32 bytes selectable (Must choose identical data size for all stations on one network)

INPUT SPECIFICATIONS

Common: Positive or negative common (NPN/PNP) per 16 points

Maximum inputs applicable at once: No limit (at 24 V DC)

Rated input voltage: 24 V DC $\pm 10\%$; ripple 5 %p-p max.

ON voltage / current: ≥ 15 V DC (input - COM) / ≥ 3.5 mA

OFF voltage / current: ≤ 5 V DC (input - COM) / ≤ 1 mA

Input current: ≤ 5.5 mA per point at 24 V DC

Input resistance: Approx. 4.4 k Ω

ON delay: ≤ 2.0 msec.

OFF delay: ≤ 2.0 msec.

INSTALLATION**Current consumption**

•DC: Approx. 70 mA

Operating temperature: 0 to 55°C (32 to 131°F)

Storage temperature: -20 to +65°C (-4 to +149°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Atmosphere: No corrosive gas or heavy dust

Mounting: DIN rail (35 mm rail)

Weight: 220 g (0.49 lb)

PERFORMANCE

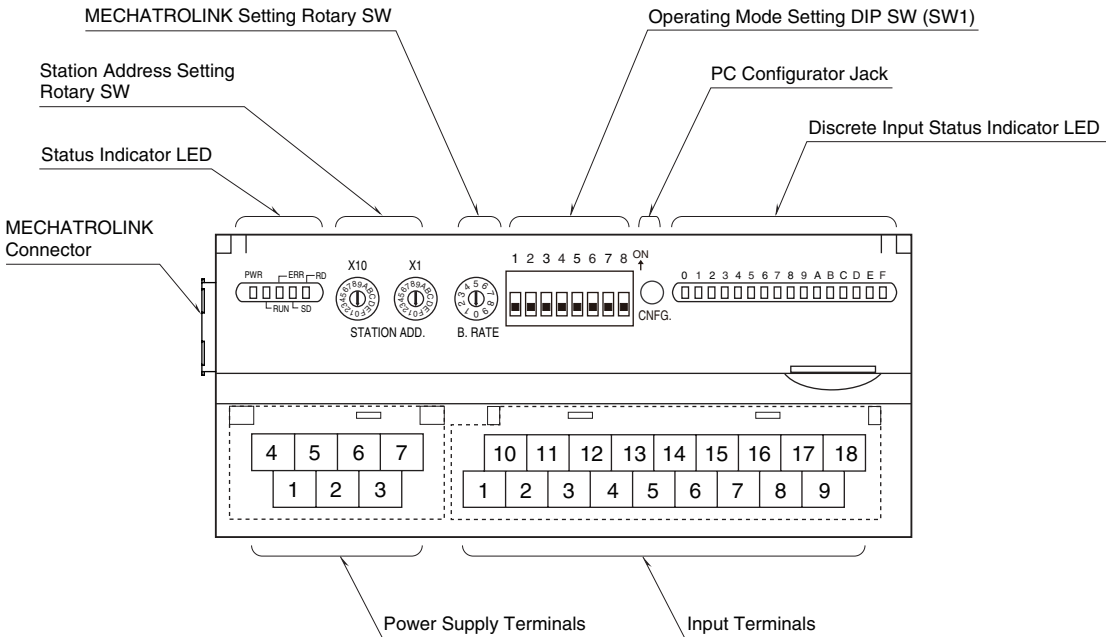
Insulation resistance: ≥ 100 M Ω with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute (input to power)

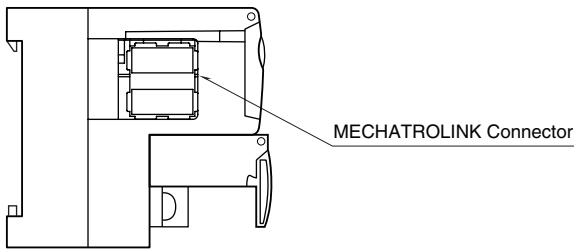
500 V AC @ 1 minute (MECHATROLINK or FG to input or power)

EXTERNAL VIEW

FRONT VIEW

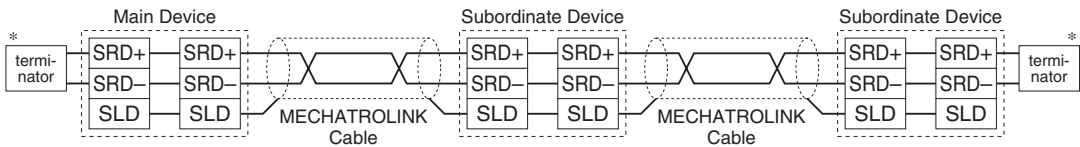


SIDE VIEW



COMMUNICATION CABLE CONNECTIONS

MECHATROLINK CONNECTION



*Terminator
Be sure to connect the terminating resistors to the unit at both ends of transmission line.
Use the terminating resistor dedicated for MECHATROLINK: Model JEPMC-W6022, Yaskawa Controls Co., Ltd.
Certain types of Main Device units may have incorporated terminating resistors. Consult the instruction manual for the Main Device.

TERMINAL ASSIGNMENTS**■ INPUT TERMINAL ASSIGNMENT**

10 NC	11 X1	12 X3	13 X5	14 X7	15 X9	16 XB	17 XD	18 XF
1 COM	2 X0	3 X2	4 X4	5 X6	6 X8	7 XA	8 XC	9 XE

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	COM	Common	10	NC	No Connection
2	X0	Input 0	11	X1	Input 1
3	X2	Input 2	12	X3	Input 3
4	X4	Input 4	13	X5	Input 5
5	X6	Input 6	14	X7	Input 7
6	X8	Input 8	15	X9	Input 9
7	XA	Input 10	16	XB	Input 11
8	XC	Input 12	17	XD	Input 13
9	XE	Input 14	18	XF	Input 15

■ POWER SUPPLY TERMINAL ASSIGNMENT

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

NO.	ID	FUNCTION, NOTES
1	NC	----
2	NC	----
3	FG	FG
4	NC	----
5	NC	----
6	+24V	Power input (24V DC)
7	0 V	Power input (0V)

MECHATROLINK RELATED COMMANDS

Related commands are as follows.

Command of MECHATROLINK has a two-layer structure, which is composed of Data Link Layer (upper layer) and Application Layer (lower layer). All the Application Layer Commands are located in lower layer of Data Link Layer (CDRW).

COMMAND	COMMAND NAME	COMMAND (hexadecimal)	DESCRIPTION
Data Link Layer Command	MDS	04H	Product type reading
	CDRW	03H	Data transmission
Application Layer Command	NOP	00H	Invalid
	ID_RD	03H	Product information reading
	CONNECT	0EH	Communication start with Main Device
	DISCONNECT	0FH	Communication stop with Main Device
	DATA_RWA	50H	I/O data update

■ DATA LINK LAYER COMMAND

• MDS (04H) Command Data Format

Reads product type.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
0	04H	90H	Product type reading
1	00H	00H	Reserved
2	00H	80H	Intelligent I/O
3 – 31	00H	00H	3 – 17 bytes at 17-byte mode

• CDRW (03H) Command Data Format

Data transmission command is located in upper layer of Application Layer Command.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
0	03H	90H	Data transmission
1	CMD	RCMD	CMD : Application Layer command RCMD : Response (Same value as Application Layer Command)
2	00H	ALARM	Error code (Refer to the following table)
3	00H	STATUS1	Transmission status (Refer to the following table)
4	00H	STATUS2	Reserved
5 – 31	XX	YY	Depend upon the Application Layer Command

• ALARM

Communication error codes at the Subordinate Device are sent to the Main Device.

ERROR CODE (hexadecimal)	DESCRIPTION	CLASSIFICATION
00H	MECHATROLINK communication is in normal status	----
01H	Unsupported command is received.	Warning
02H	Command execution conditions are not met.	Warning
03H	Data in the command is not correct.	Warning
04H	Synchronization Error	Error

• STATUS1

The status of the Subordinate Device is sent to the Main Device in accordance with the classification of the error codes at ALARM.

Bit	DEFINITION	DESCRIPTION
0	Error Bit	1 : Error, 0 : Normal
1	Warning Bit	1 : Warning, 0 : Normal
2	Command Ready Bit	1 : Command can be accepted (ready), 0 : Command cannot be accepted (busy)
3 – 7	Unused	----

■ APPLICATION LAYER COMMAND

Application Layer Command is located in lower layer of Data Link Layer Command (CDRW). Following tables are details on bytes 5 through 31 dependent upon Application Layer Command.

Note : At 17 bytes mode, bytes dependant upon Application Layer Command are to be 5 through 17.

• NOP (00H) Command Data Format

0, which indicates invalid command, is sent to the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5 – 31	00H	00H	Invalid

• ID_RD (03) Command Data Format

Reads product information. (max. 8 bytes at a time) Repeat reading multiple times in order to read out all the data.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	DEVICE_CODE	DEVICE_CODE	DEVICE_CODE : Selection of product information 00 : Product model (data length : 32 bytes) 02 : Product version (data length : 32 bytes) 0F : Vendor code (data length : 48 bytes)
6	OFFSET	OFFSET	OFFSET : Specify read position
7	SIZE	SIZE	SIZE : Specify length of read data (max. 8 bytes)
8 – 15	00H	ID	Product information data
16 – 31	00H	00H	Unused

• CONNECT (0EH) Command Data Format

Starts communication with the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	VER	VER	MODE : Selection of MECHATROLINK version 10 : MECHATROLINK - I 21 : MECHATROLINK - II
6	COM_MODE	COM_MODE	COM_MODE : Selection of data length 00 : 17-byte mode 80 : 32-byte mode
7	COM_TIME	COM_TIME	COM_TIME : Communication cycle (milliseconds) MECHATROLINK-I: Multiples of two (2) MECHATROLINK-II: Integral multiples of the transmission cycle
8 – 31	00H	00H	Unused

• DISCONNECT (0FH) Command Data Format

Stops communication with the Main Device.

Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5 – 31	00H	00H	Unused

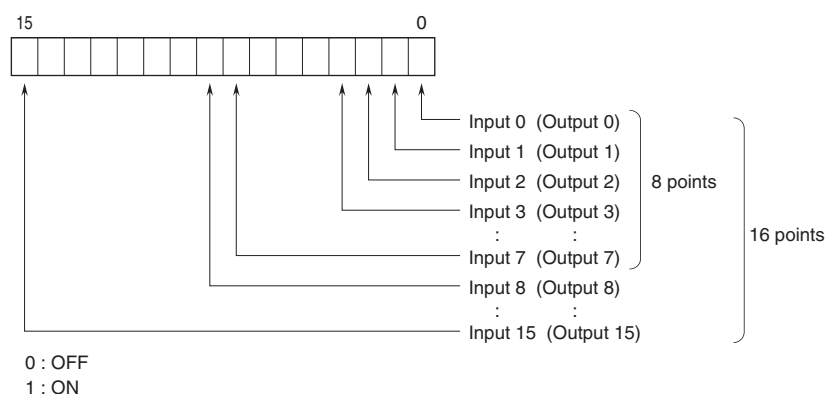
• DATA_RWA (50H) Command Data Format

Transmits I/O data from/to the Main Device. Data allocation is as follows.

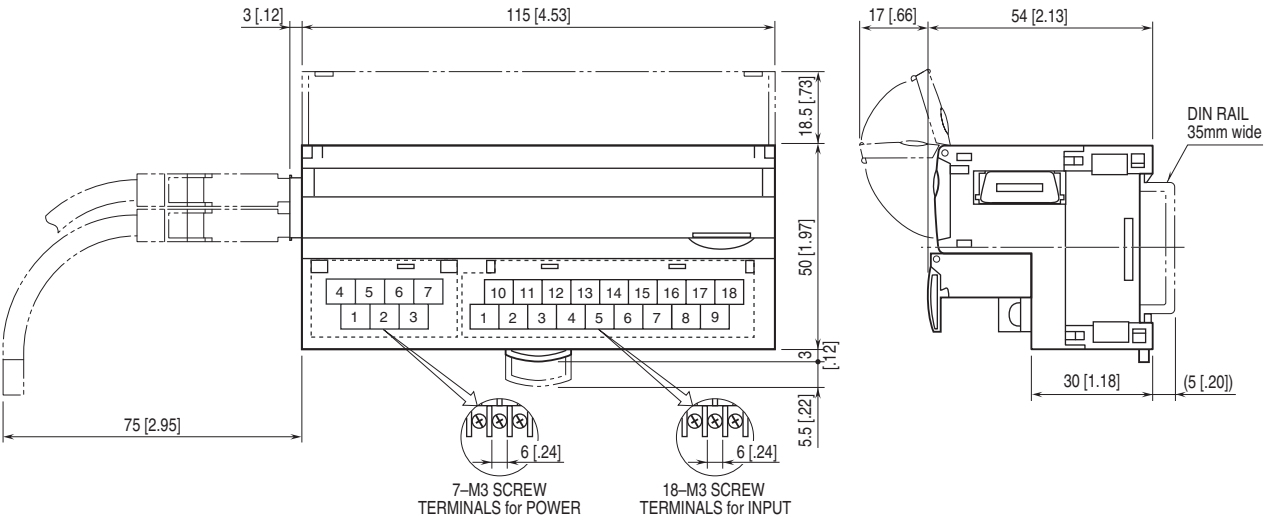
Byte	COMMAND (hexadecimal)	RESPONSE (hexadecimal)	REMARKS
5	00H	Discrete input data low 8 bits	
6	00H	Discrete input data high 8 bits	
7 – 12	00H	00H	Unused
13	Discrete output data of extension module low 8 bits	Discrete input data of extension module low 8 bits or echo back of set value at command area	
14	Discrete output data of extension module high 8 bits	Discrete input data of extension module high 8 bits or echo back of set value at command area	“0” for R7ML-EA8 and R7ML-EC8x
15 – 31	00H	00H	Unused

I/O DATA DESCRIPTIONS

■ DISCRETE I/O

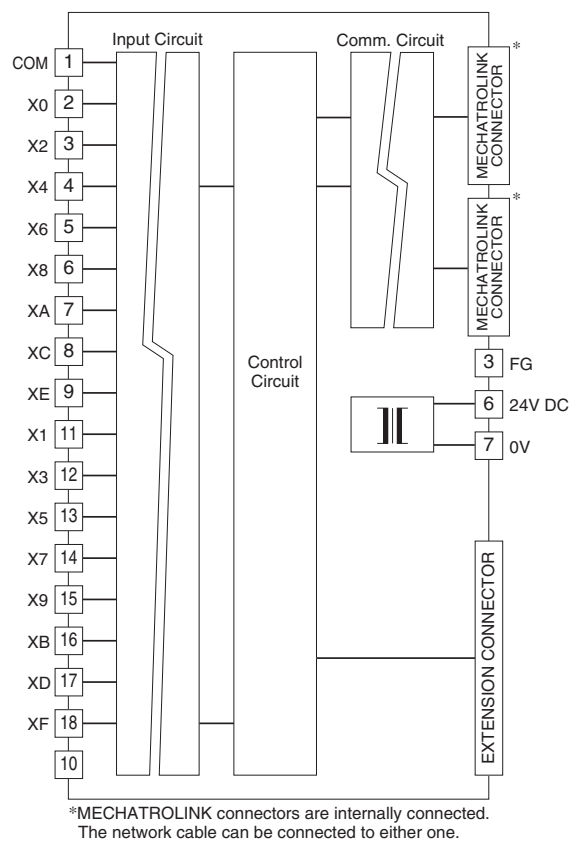


EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]

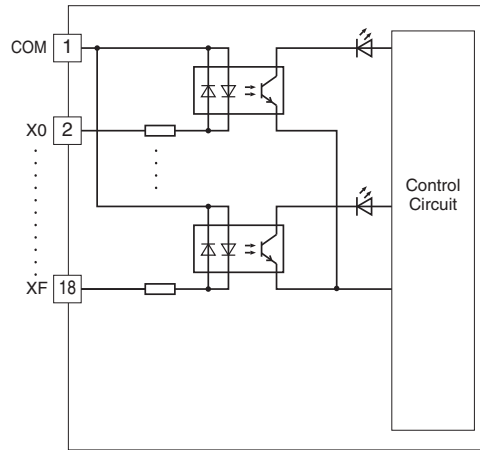


SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FG terminal to ground.
Caution: FG terminal is NOT a protective conductor terminal.

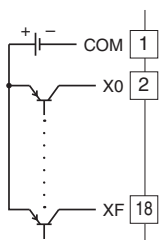


■ Input Circuit

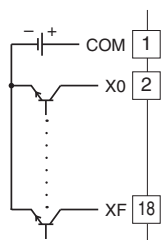


■ Input Connection Examples

PNP Connection



NPN Connection





Specifications are subject to change without notice.