Remote I/O *R7 Series*

MECHATROLINK I/O MODULE
(MECHATROLINK-I / -II)

MODEL **R7ML**

MODEL & SUFFIX CODE SELECTION

■ **BASIC MODULE**

R7ML–☐–R

MODEL

I/O TYPE
DA16 : Discrete input, 16 points
DC16A: NPN transistor output, 16 points
DC16B: PNP transistor output, 16 points
SV4 : DC voltage/current input (10V/20mA), 4 points
TS4 : Thermocouple input, 4 points
RS4: RTD input, 4 points
YV2: DC voltage output, 2 points
YS2: DC current output, 2 points

POWER INPUT
R : 24V DC

■ **EXTENSION MODULE**

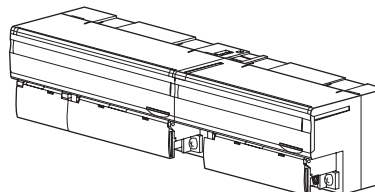**R7ML–☐**

MODEL

I/O TYPE
EA8 : Discrete input, 8 points
EA16 : Discrete input, 16 points
EC8A : NPN transistor output, 8 points
EC16A: NPN transistor output, 16 points
EC8B : PNP transistor output, 8 points
EC16B: PNP transistor output, 16 points

FUNCTIONS & FEATURES

The R7ML, complying with MECHATROLINK-I and -II Intelligent I/O specifications, interfaces analog and discrete I/O signals with a PLC or PC via MECHATROLINK.

A 'basic' module can be attached with an 'extension' module. By combining two modules, single station can handle mixed analog and discrete signals, 32-point discrete inputs, 32-point discrete outputs, 16-point discrete I/Os and other combinations of signals.

Input sensor type (thermocouple, RTD) and range can be selected with the front DIP switches for all channels. In order to set different selections for individual channels, the PC Configurator Software (model: R7CON) is used.

ORDERING INFORMATION

Specify code number. (e.g. R7ML-DC16A-R)

RELATED PRODUCTS

• PC configurator software (model: R7CON)
Downloadable at M-System's web site:
http://www.m-system.co.jp

GENERAL SPECIFICATIONS

■ **COMMON SPECIFICATIONS**
Power input: 24V DC ±10%
Dielectric strength: 1500V AC @1 minute (I/O to power)
500V AC @1 minute
(MECHATROLINK to I/O or power)
Insulation resistance: ≥100MΩ with 500V DC
Operating temperature: 0 to 55°C (32 to 131°F)
Operating humidity: 30 to 90% RH (non-condensing)
Atmosphere: No corrosive gas or heavy dust
Storage temperature: -20 to +65°C (-4 to +148°F)
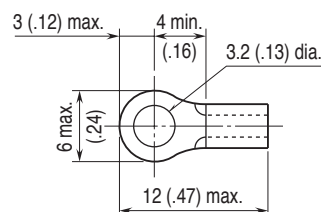**Mounting**: DIN rail (35 mm wide)
Connection
Communication: MECHATROLINK connectors
Power & I/O: M3 screw terminals
Screw terminal material: Nickel-plated steel (torque 0.5 N·m)
Recommended solderless terminal: Refer to the drawing below (unit: mm (inch)). Applicable wire size 0.3 to 0.75 mm^2

3 (.12) max. 4 min.
(.16)
3.2 (.13) dia.
6 max. (.24)
12 (.47) max.

■ **CURRENT CONSUMPTION & WEIGHT**

MODEL	CURRENT CONSUMPTION (at 24V DC)	WEIGHT
R7ML-DA16	70mA	220 g (7.7 oz)
R7ML-DC16A	85mA	220 g (7.7 oz)
R7ML-DC16B	85mA	220 g (7.7 oz)
R7ML-SV4	70mA	220 g (7.7 oz)
R7ML-TS4	70mA	220 g (7.7 oz)
R7ML-RS4	70mA	250 g (8.8 oz)
R7ML-YV2	100mA	200 g (7.0 oz)
R7ML-YS2	130mA	200 g (7.0 oz)
R7ML-EA8	10mA	90 g (3.2 oz)
R7ML-EA16	20mA	150 g (5.3 oz)
R7ML-EC8A	10mA	90 g (3.2 oz)
R7ML-EC16A	30mA	150 g (5.3 oz)
R7ML-EC8B	10mA	90 g (3.2 oz)
R7ML-EC16B	30mA	150 g (5.3 oz)

■ **MECHATROLINK**

	MECHATROLINK-II	MECHATROLINK-I
Baud rate	10 Mbps	4 Mbps
Max. transmission distance	50 meters	50 meters
Min. distance between stations	50 centimeters	30 centimeters
Communication cable	MECHATROLINK cable Model JEPMC-W6002-x-E, Yaskawa Controls Co., Ltd.	
Max. number of slave stations	30 [1]	15 [1]
Transmission cycle	1 msec., 2 msec., 4 msec.	2 msec. fixed
Data size	17 bytes / 32 bytes selectable (Must choose identical data size for all stations on one network)	17 bytes

[1]. Max. number may be limited depending on the master unit types. Refer to the instruction manual of the Master.
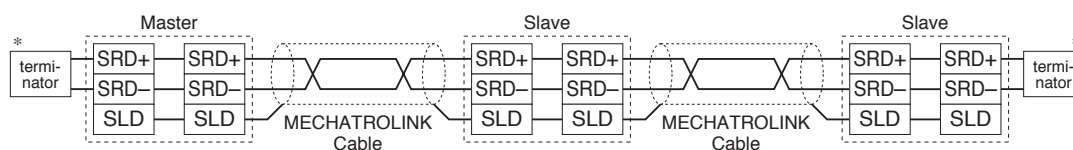
CONNECTION DIAGRAMS

■ **POWER SUPPLY TERMINAL ASSIGNMENT**

4 NC	5 NC	6 +24V	7 0V

1 NC	2 NC	3 FG

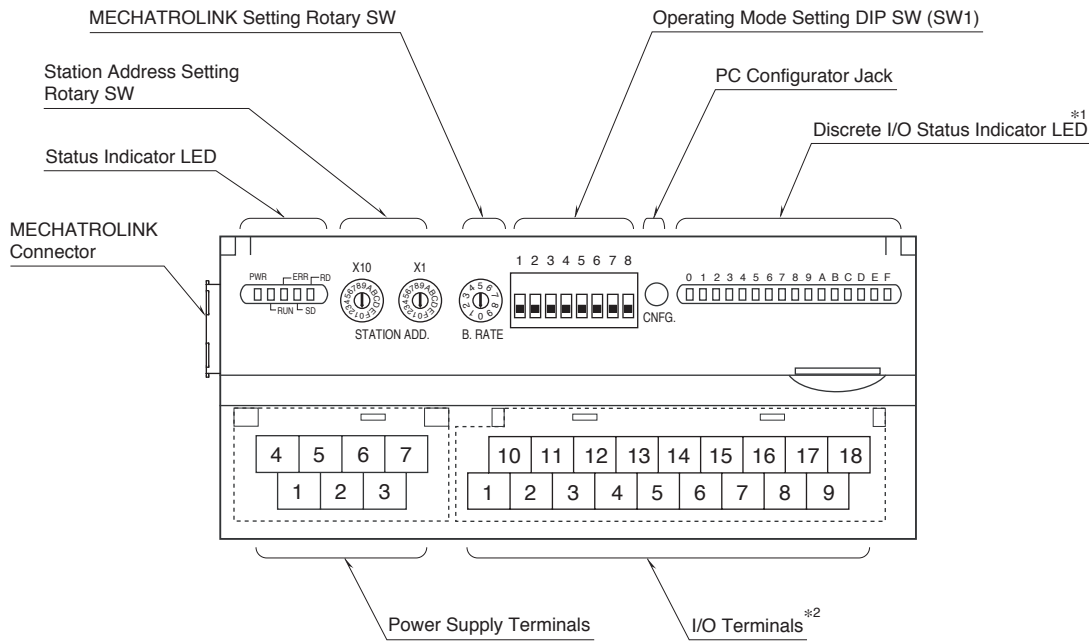| NO.	ID	FUNCTION, NOTES
1	NC	----
2	NC	----
3	FG	FG
4	NC	----
5	NC	----
6	+24V	Power input (24V DC)
7	0V	Power input (0V)

■ **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 Master units may have incorporated terminating resistors. Consult the instruction manual for the Master.

FRONT VIEW

■ **FRONT VIEW**

MECHATROLINK Setting Rotary SW

Station Address Setting
Rotary SW

Status Indicator LED

MECHATROLINK
Connector

Operating Mode Setting DIP SW (SW1)

PC Configurator Jack

Discrete I/O Status Indicator LED[*1]

Power Supply Terminals

I/O Terminals[*2]

*1. Not available with analog I/O modules.
*2. 10 screw terminals for analog output modules.

■ **LEFT SIDE VIEW**

MECHATROLINK Connector
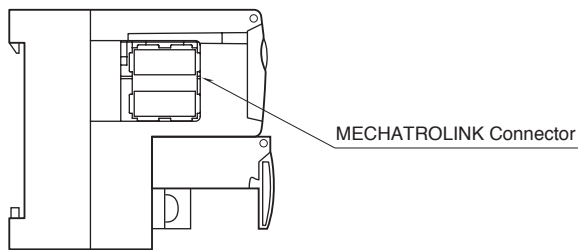
■ **STATUS INDICATOR LED**

ID	COLOR	FUNCTION
PWR	Green	Turns on when the internal 5V is supplied normally.
RUN	Green	Turns on in normal communications conditions.
ERR	Red	Turns on in no communication or setting error.
SD	Green	Turns on when the module is transmitting.
RD	Green	Turns on when the module is receiving.

■ **STATION ADDRESS**

Station Address is selected between 60H and 7FH (Intelligent I/O) in hexadecimal. (Certain numbers may not be selectable depending on the master types. Refer to the instruction manual of the master unit.)
The left switch determines the MSD, while the right switch does the LSD of the address.
(Factory setting: 60H)

Station Address Setting (LSD)

Station Address Setting (MSD)
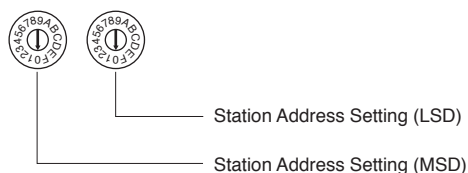
■ **MECHATROLINK MODE**

Choose MECHATROLINK-I or -II, and the data size. Positions 2, 4 through 9 are unused.
(Factory setting: 1)

0 : MECHATROLINK-II (32-byte mode)
1 : MECHATROLINK-II (17-byte mode)
3 : MECHATROLINK-I (17-byte mode)

MECHATROLINK Setting
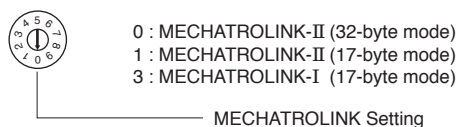
■ **OPERATING MODE**

Operating mode setting depends upon I/O type and ranges. Refer to the respective I/O sections.

■ **PC CONFIGURATOR JACK**

The PC Configurator is used to set the following parameters for each channel.
• Zero and span adjustments
• Scaling
• Sensor type and range

Before starting programming analog I/O modules, turn on the front SW1-5 through 1-8. For more information about the programming using the R7CON, please refer to the R7CON Users Manual.

■ **DISCRETE I/O STATUS INDICATOR LED**

Discrete I/O modules including those for extensions have LED indicators showing I/O signal status.
        Contact ON   : LED ON
        Contact OFF   : LED OFF
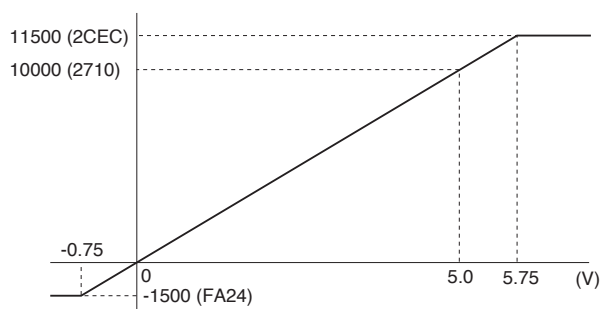
DATA CONVERSION

■ 0 – 100% DATA CONVERSION

Analog input data is converted into digital representations of 0 – 100% proportional to each scaled range. The converted % values are multiplied by 100 and expressed in 16 bits.

Overrange input is possible from -15 to +115% of the nominal range. When the signal exceeds the limit, the data is fixed at -15% or +115% respectively.

• Input Range 0 – 5V DC

Input Value	Input %	Converted Data, Decimal	Converted Data, Hex
≤ -0.75V	-15%	-1500	FA24
0V	0%	0	0
5V	100%	10000	2710
≥ 5.75V	115%	11500	2CEC

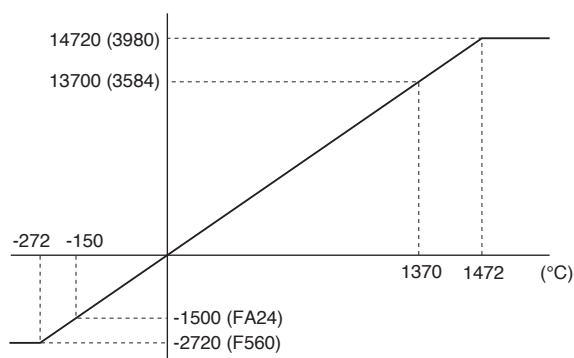
Analog output is converted in the reverse order of the input data. The output range 0 – 5V DC is expressed as 10000 at 5.0V (100%) and 0 at 0V (0%).

■ TEMPERATURE DATA CONVERSION

Temperature data (thermocouple and RTD) are represented in engineering unit value, °C or K, multiplied by 10 and expressed in 16 bits. °F data is represented in engineering unit value, without multiplication.
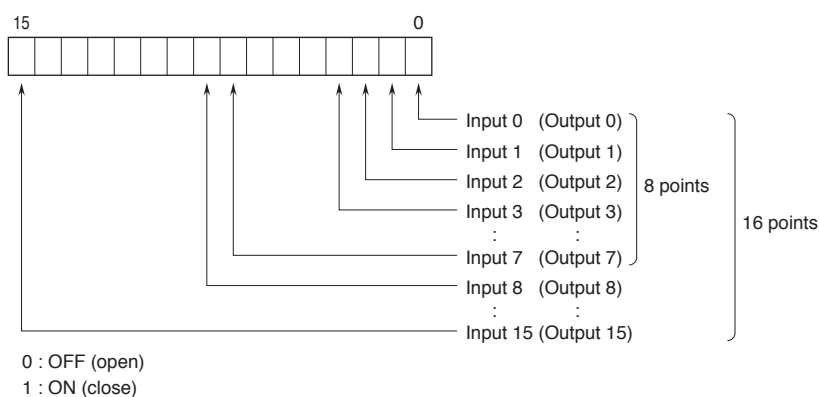
• Input Type K Thermocouple

Input Value	Converted Data, Decimal	Converted Data, Hex
≤ -272°C	-2720	F560
-150°C	-1500	FA24
1370°C	13700	3584
≥ 1472°C	14720	3980

M·SYSTEM CO.,LTD.

I/O DATA DESCRIPTIONS

■ DISCRETE I/O

```
15                                          0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

Input 0 (Output 0) ⎫
Input 1 (Output 1) ⎪
Input 2 (Output 2) ⎬ 8 points ⎫
Input 3 (Output 3) ⎪   ⎪
    :   :   ⎪   ⎬ 16 points
Input 7 (Output 7) ⎭   ⎪
Input 8 (Output 8)   ⎪
    :   :   ⎪
Input 15 (Output 15)   ⎭

0 : OFF (open)
1 : ON (close)

■ ANALOG I/O

```
15                                          0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

16-bit binary data
Negative values represented in 2's complements
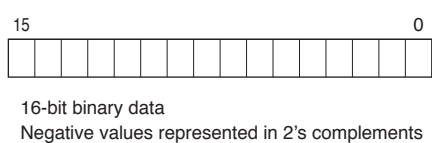
■ STATUS

Analog input modules (models: R7ML-SV4, R7ML-TS4, R7ML-RS4) can show input status of each channel.

```
15                                          0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

Input 0 (Burnout, input range error)
Input 1 (Burnout, input range error)
Input 2 (Burnout, input range error)
Input 3 (Burnout, input range error)
Input 0 (ADC error)
Input 1 (ADC error)
Input 2 (ADC error)
Input 3 (ADC error)
Unused
    :
Unused

Burnout, input range error (≤-15%, ≥+115%)
    0 : Normal   1 : Error
ADC error (no response from ADC)
    0 : Normal   1 : Error
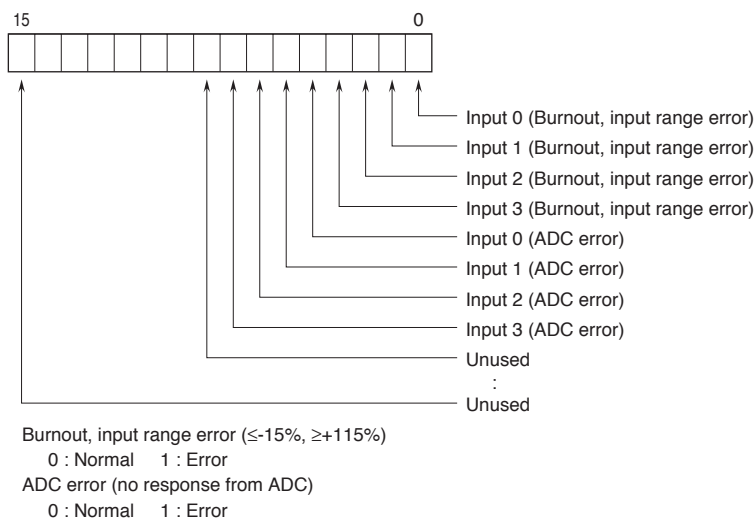
MECHATROLINK DATA LINK LAYER COMMAND DESCRIPTIONS

The R7ML, Intelligent I/O, performs the connection-type communications according to MECHATROLINK protocol.
The following tables explain Data Link Layer Commands supported by the R7ML.

■ MDS COMMAND (04H) DATA FORMAT

BYTE	COMMAND	RESPONSE	REMARKS
0	MDS (04H)	S(0) (90H)	Message Data Search (MDS) Command: Read the ID from the slave station S(0): Response to MDS
1	0	ID1 (00H)	
2	0	ID2 (80H)	Intelligent I/O specified
3	0	0	
4	0	0	
5	0	0	
6	0	0	
7	0	0	
8	0	0	
9	0	0	
10	0	0	
11	0	0	
12	0	0	
13	0	0	
14	0	0	
15	0	0	
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

■ CDRW COMMAND (03H) DATA FORMAT

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	CMD	RCMD	CMD: Application Layer Command RCMD: Response to Application Layer Command
2 : 16			Byte 2 through 16 depend upon the Application Layer Command type.
17 : 31			Byte 17 through 31 depend upon the Application Layer Command type. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

MECHATROLINK APPLICATION LAYER COMMAND DESCRIPTIONS

The following tables explain Application Layer Commands supported by the R7ML.

■ NOP COMMAND (00H) DATA FORMAT

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	NOP (00H)	NOP (00H)	No Operation (NOP) Command: Nothing is performed.
2	0	ALARM	Error code: See "MECHATROLINK DATA DESCRIPTIONS"
3	0	STATUS1	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
4	0	STATUS2	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
5	0	0	
6	0	0	
7	0	0	
8	0	0	
9	0	0	
10	0	0	
11	0	0	
12	0	0	
13	0	0	
14	0	0	
15	0	0	
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

■ ID_RD COMMAND (03H) DATA FORMAT

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	ID_RD (03H)	ID_RD (03H)	Read ID (ID_RD) Command: Read out the device ID
2	0	ALARM	Error code: See "MECHATROLINK DATA DESCRIPTIONS"
3	0	STATUS1	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
4	0	STATUS2	Status code: See "MECHATROLINK DATA DESCRIPTIONS"

5	DEVICE_CODE	DEVICE_CODE	Specifies the device code
			    00H: Product's model number
			    0FH: Vendor code

6	OFFSET	OFFSET	Indicates where to start reading in the specified device ID
7	SIZE	SIZE	Number of byte counts to read
8	0	ID1	ASCII or binary data
9	0	ID2	ASCII or binary data
10	0	ID3	ASCII or binary data
11	0	ID4	ASCII or binary data
12	0	ID5	ASCII or binary data
13	0	ID6	ASCII or binary data
14	0	ID7	ASCII or binary data
15	0	ID8	ASCII or binary data
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

■ **CONNECT COMMAND (0EH) DATA FORMAT**

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	CONNECT (0EH)	CONNECT (0EH)	Establish Connection (CONNECT) Command: Requests to establish connection to MECHATROLINK
2	0	ALARM	Error code: See "MECHATROLINK DATA DESCRIPTIONS"
3	0	STATUS1	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
4	0	STATUS2	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
5	VER	VER	Application Layer version number 　　10H: MECHATROLINK-I 　　21H: MECHATROLINK-II
6	COM_MODE	COM_MODE	Communication mode 　　00H: 17-byte mode 　　80H: 32-byte mode
7	COM_TIME	COM_TIME	Communication cycle (milliseconds) MECHATROLINK-I: Multiples of two (2) MECHATROLINK-II: Integral multiples of the transmission cycle
8	0	0	
9	0	0	
10	0	0	
11	0	0	
12	0	0	
13	0	0	
14	0	0	
15	0	0	
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

■ **DISCONNECT COMMAND (0FH) DATA FORMAT**

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	DISCONNECT (0FH)	DISCONNECT (0FH)	Release Connection (DISCONNECT) Command: Requests to release connection to MECHATROLINK
2	0	ALARM	Error code: See "MECHATROLINK DATA DESCRIPTIONS"
3	0	STATUS1	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
4	0	STATUS2	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
5	0	0	
6	0	0	
7	0	0	
8	0	0	
9	0	0	
10	0	0	
11	0	0	
12	0	0	
13	0	0	
14	0	0	
15	0	0	
16	0	0	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

■ **DATA_RWA COMMAND (50H) DATA FORMAT**

BYTE	COMMAND	RESPONSE	REMARKS
0	CDRW (03H)	ACK (01H)	Cyclic Data Read/Write (CDRW) Command: Link transmission Acknowledge (ACK): Positive response to CDRW
1	DATA_RWA (50H)	DATA_RWA (50H)	Data Read/Write_A (DATA_RWA) Command: Refreshes I/O data
2	0	ALARM	Error code: See "MECHATROLINK DATA DESCRIPTIONS"
3	0	STATUS1	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
4	0	STATUS2	Status code: See "MECHATROLINK DATA DESCRIPTIONS"
5	CH1 OUT LO	CH1 IN LO	CHx OUT: Output data: See "MECHATROLINK DATA DESCRIPTIONS"
6	CH1 OUT HI	CH1 IN HI	CHx IN: Input data: See "MECHATROLINK DATA DESCRIPTIONS"
7	CH2 OUT LO	CH2 IN LO	
8	CH2 OUT HI	CH2 IN HI	
9	CH3 OUT LO	CH3 IN LO	
10	CH3 OUT HI	CH3 IN HI	
11	CH4 OUT LO	CH4 IN LO	
12	CH4 OUT HI	CH4 IN HI	
13	EXT OUT LO	EXT IN LO	EXT OUT: Extension output data: See "MECHATROLINK DATA DESCRIPTIONS"
14	EXT OUT HI	EXT IN HI	EXT IN: Extension input data: See "MECHATROLINK DATA DESCRIPTIONS"
15	0	STATUS LO	R7ML status: See "MECHATROLINK DATA DESCRIPTIONS"
16	0	STATUS HI	
17 : 31	0 : 0	0 : 0	Byte 17 through 31 are always 0 in the 32-byte mode. These bytes are unavailable for MECHATROLINK-I, or MECHATROLINK-II in the 17-byte mode.

MECHATROLINK APPLICATION LAYER DATA DESCRIPTIONS

■ ALARM ERROR CODES

Errors detected at the slave are set at ALARM in the response and sent to the master.

ERROR CODE	DESCRIPTION	CLASSIFICATION
00H	Normal status	----
01H	Invalid Command: Command is not supported.	Warning
02H	Command Not Allowed: Command execution conditions are not met.	Warning
03H	Invalid Data: Data in the command is not correct.	Warning
04H	Synchronization Error	Alarm

■ STATUS1 BIT ALLOCATIONS

Alarm/Warning classification and status information are set at STATUS1 in the response and sent to the master.

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

■ STATUS2

Reserved for future use

■ INPUT DATA

Input data to be sent from the slave to the master are set in the response. With an output module, output data in the command are repeated and sent back to the master.

ID	DESCRIPTION	REMARKS
CH1 IN LO	CH1 data, low 8 bits	R7ML-DA16: Bit 0 through 7 data are set. R7ML-DC16x, R7ML-YS2, R7ML-YV2: Output data are repeated.
CH1 IN HI	CH1 data, high 8 bits	R7ML-DA16: Bit 8 through 15 data are set. R7ML-DC16x, R7ML-YS2, R7ML-YV2: Output data are repeated.
CH2 IN LO	CH2 data, low 8 bits	R7ML-DA16, R7ML-DC16x: Unused R7ML-YS2, R7ML-YV2: Output data are repeated.
CH2 IN HI	CH2 data, high 8 bits	R7ML-DA16, R7ML-DC16x: Unused R7ML-YS2, R7ML-YV2: Output data are repeated.
CH3 IN LO	CH3 data, low 8 bits	R7ML-DA16, R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH3 IN HI	CH3 data, high 8 bits	R7ML-DA16, R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH4 IN LO	CH4 data, low 8 bits	R7ML-DA16, R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH4 IN HI	CH4 data, high 8 bits	R7ML-DA16, R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused

■ OUTPUT DATA

Output data to be sent from the master to the slave are set in the command. Unused with all input modules.

ID	DESCRIPTION	REMARKS
CH1 OUT LO	CH1 data, low 8 bits	R7ML-DC16x: Bit 0 through 7 data are set.
CH1 OUT HI	CH1 data, high 8 bits	R7ML-DC16x: Bit 8 through 15 data are set.
CH2 OUT LO	CH2 data, low 8 bits	R7ML-DC16x: Unused
CH2 OUT HI	CH2 data, high 8 bits	R7ML-DC16x: Unused
CH3 OUT LO	CH3 data, low 8 bits	R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH3 OUT HI	CH3 data, high 8 bits	R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH4 OUT LO	CH4 data, low 8 bits	R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused
CH4 OUT HI	CH4 data, high 8 bits	R7ML-DC16x, R7ML-YS2, R7ML-YV2 : Unused

■ EXTENSION INPUT DATA

Input data of the extension module to be sent from the slave to the master are set in the response. With an output extension module, output data in the command are repeated and sent back to the master.

ID	DESCRIPTION	REMARKS
EXT IN LO	Extension data, low 8 bits	R7ML-EA16, R7ML-EA8: Bit 0 through 7 data are set. R7ML-EC16x, R7ML-EC8x: Output data are repeated.
EXT IN HI	Extension data, high 8 bits	R7ML-EA16: Bit 8 through 15 data are set. R7ML-EC16x: Output data are repeated. R7ML-EA8, R7ML-EC8x: Unused

■ EXTENSION OUTPUT DATA

Output data to be sent from the master to the slave are set in the command. Unused with all input modules.

| ID	DESCRIPTION	REMARKS
EXT·OUT LO	Extension data, low 8 bits	R7ML-EC16x: Bit 0 through 7 data are set.
EXT·OUT HI	Extension data, high 8 bits	R7ML-EC16x: Bit 8 through 15 data are set. R7ML-EC8x: Unused

■ R7ML STATUS DATA

Status data to be sent from the slave to the master are set in the response. Refer to "I/O DATA DESCRIPTIONS."

EXTENSION MODULE

A 'basic' module can be attached with one 'extension' module. The extension module is powered from the basic module.
By combining two modules, single station can handle mixed analog and discrete signals, 32-point discrete inputs, 32-point discrete outputs, 16-point discrete I/Os and other combinations of signals.

■ CONNECTING THE EXTENSION MODULE

1) Remove the extension connector cover located at the side of the basic module.
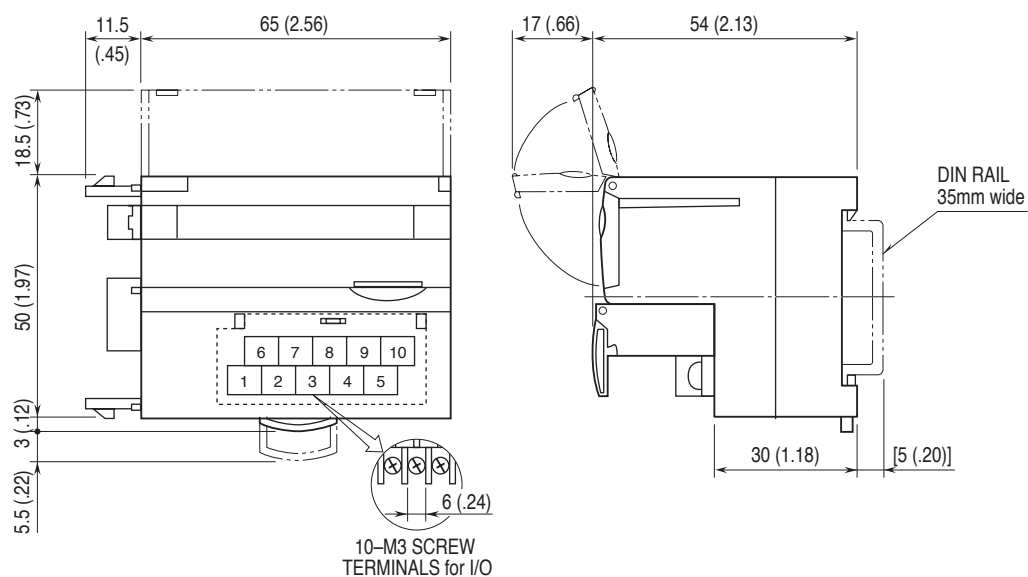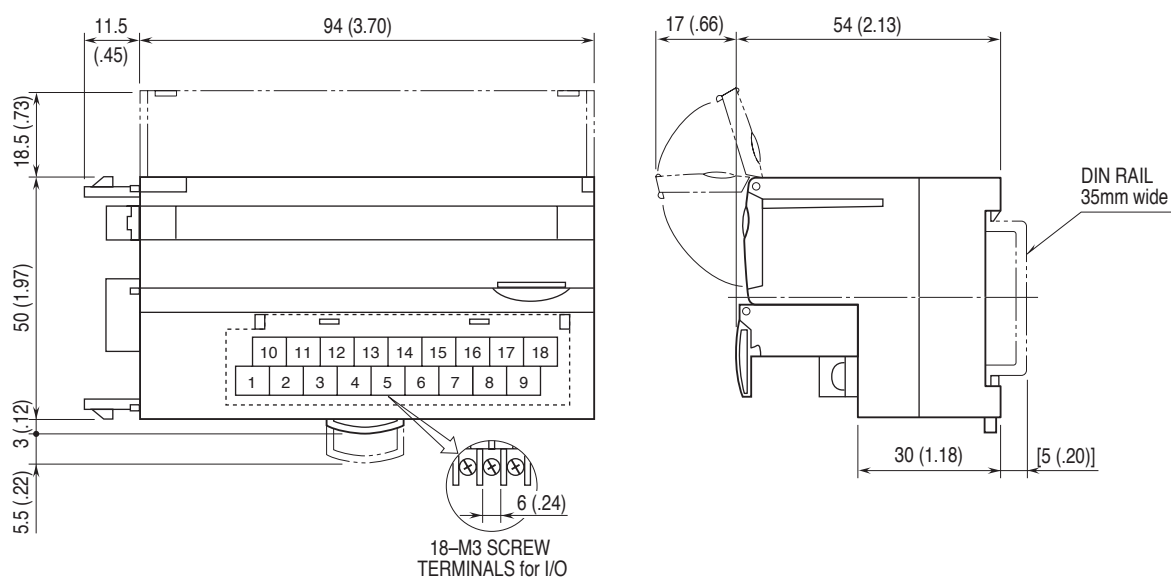2) Connect the extension module.
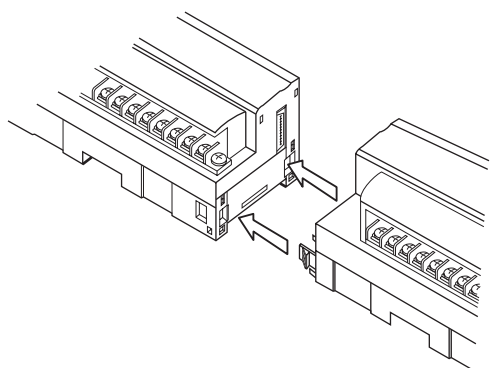
3) Mount the combined module on a DIN rail.

■ OUTPUT AT THE LOSS OF COMMUNICATION

The extension module is set to 'Hold Output' by factory default setting. The PC Configurator is used to change the setting to 'Reset Output.'

EXTERNAL DIMENSIONS unit: mm (inch)

■ **BASIC MODULE**

3 (.12) 115 (4.53) 18.5 (.73) 50 (1.97) 3 (.12) 5.5 (.22)

17 (.66) 54 (2.13)

DIN RAIL 35mm wide

30 (1.18) [5 (.20)]

| 4 | 5 | 6 | 7 |
| 1 | 2 | 3 |

| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

75 (2.95)

6 (.24) 6 (.24)

7–M3 SCREW TERMINALS for POWER

18–M3 SCREW TERMINALS for I/O

• **R7ML-TS4**

17 (.66) 54 (2.13)

DIN RAIL 35mm wide

30 (1.18) [5 (.20)] 7 (.28)
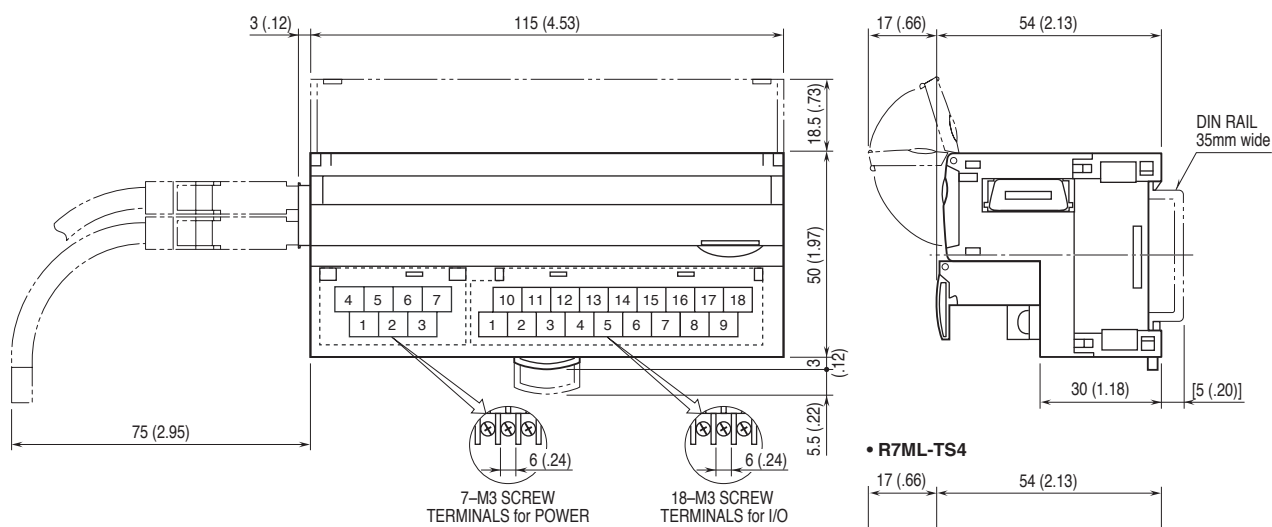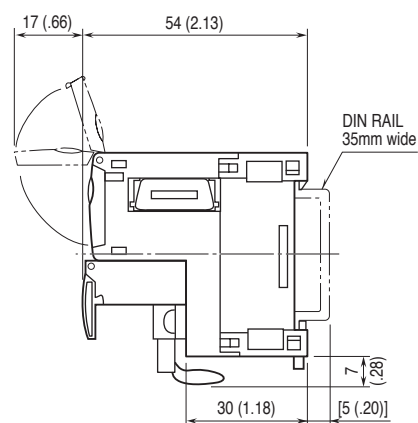
■ **BASIC MODULE, ANALOG OUTPUT**

3 (.12) 115 (4.53) 18.5 (.73) 50 (1.97) 3 (.12) 5.5 (.22)

17 (.66) 54 (2.13)

DIN RAIL 35mm wide

30 (1.18) [5 (.20)]

| 4 | 5 | 6 | 7 |
| 1 | 2 | 3 |

| 6 | 7 | 8 | 9 | 10 |
| 1 | 2 | 3 | 4 | 5 |

75 (2.95)

6 (.24) 6 (.24)

7–M3 SCREW TERMINALS for POWER

10–M3 SCREW TERMINALS for OUTPUT

M·SYSTEM CO.,LTD.
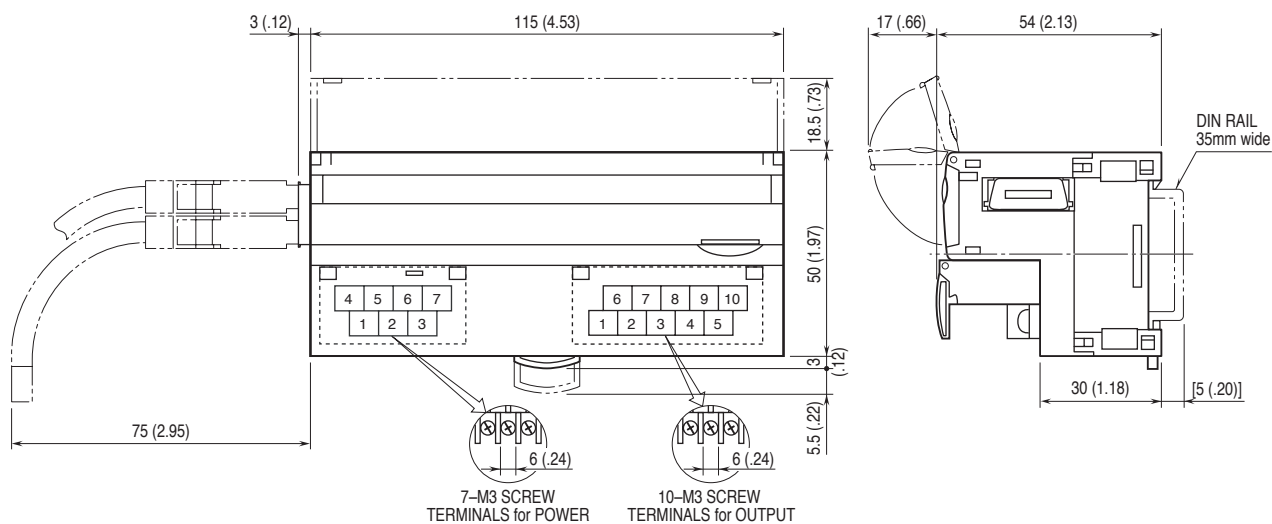
EXTERNAL DIMENSIONS unit: mm (inch)

■ **EXTENSION MODULE, 8 POINTS**

11.5 (.45)   65 (2.56)   17 (.66)   54 (2.13)

18.5 (.73)   50 (1.97)   3 (.12)   5.5 (.22)

6	7	8	9	10
1	2	3	4	5

6 (.24)

10–M3 SCREW
TERMINALS for I/O

DIN RAIL
35mm wide

30 (1.18)   [5 (.20)]

■ **EXTENSION MODULE, 16 POINTS**

11.5 (.45)   94 (3.70)   17 (.66)   54 (2.13)

18.5 (.73)   50 (1.97)   3 (.12)   5.5 (.22)

10	11	12	13	14	15	16	17	18
1	2	3	4	5	6	7	8	9

6 (.24)

18–M3 SCREW
TERMINALS for I/O

DIN RAIL
35mm wide

30 (1.18)   [5 (.20)]

DISCRETE INPUT MODULE, 16 points | MODEL **R7ML-DA16**

SPECIFICATIONS

Common: Positive or negative common (NPN/PNP) per 16 points
Number of I/O: Input, 16 points
Rated input voltage: 24V DC ±10%; ripple 5% p-p max.
ON voltage/current: ≥15V DC (input-COM) / ≥3.5mA
OFF voltage/current: ≤5V DC (input-COM) / ≤1mA
Input current: ≤5.5mA per point at 24V DC
Input resistance: Approx. 4.4kΩ
ON delay: ≤2.0 msec.
OFF delay: ≤2.0 msec.
I/O status indicator: LED turns on with closed contact.
Maximum inputs applicable at once: No limit (at 24V DC)
Isolation: Input to MECHATROLINK or FG to power input

OPERATING MODE SETTING

• Extension (SW1-1, 1-2)

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• Read rate (SW1-6, 1-7, 1-8)

SW1-6	SW1-7	SW1-8	Read rate
OFF	OFF	OFF	≤10 msec. (*)
ON	OFF	OFF	≤1 msec.
OFF	ON	OFF	≤5 msec.
ON	ON	OFF	≤20 msec.
OFF	OFF	ON	≤50 msec.
ON	OFF	ON	≤70 msec.
OFF	ON	ON	≤100 msec.
ON	ON	ON	≤200 msec.

(*) Factory setting
Caution ! - SW1-3, 1-4, 1-5 are unused.
Be sure to turn off unused ones.

TERMINAL ASSIGNMENTS

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

CIRCUIT DIAGRAM

*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

■ **Input Circuit**

■ **Input Connection Examples**

PNP Connection
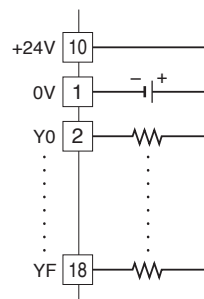
NPN Connection

NPN TRANSISTOR OUTPUT MODULE, 16 points | MODEL **R7ML-DC16A**

SPECIFICATIONS

Common: Negative common (NPN) per 16 points
Number of I/O: Output, 16 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
Isolation: Output to MECHATROLINK or FG to power input

OPERATING MODE SETTING

• **Extension (SW1-1, 1-2)**

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• **Output at the loss of communication (SW1-4)**

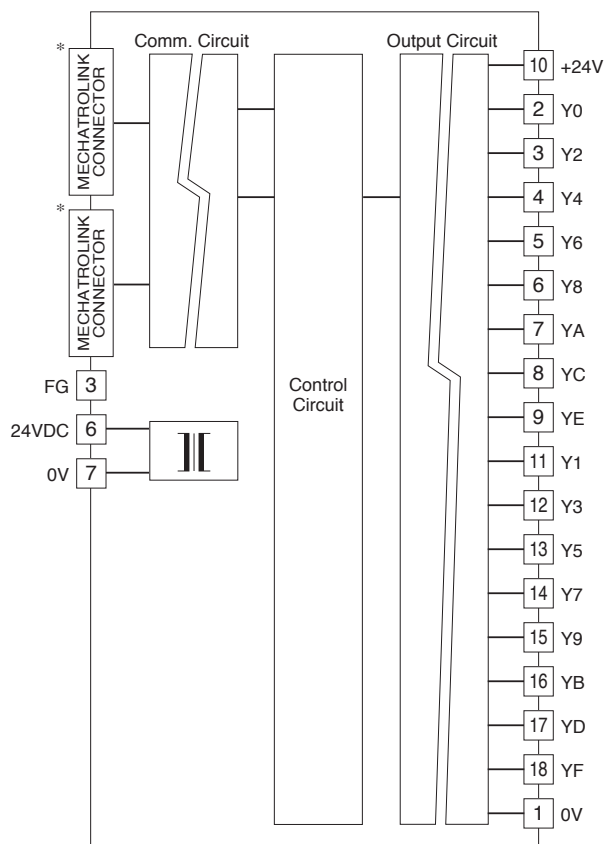| SW1-4	Output at the loss of communication
OFF	Reset the output (turned off)
ON	Hold the output (*) (maintains the last data received normally)

(*) Factory setting

Caution ! - SW1-3, 1-5, 1-6, 1-7, 1-8 are unused.
Be sure to turn off unused ones.

TERMINAL ASSIGNMENTS

10 +24V	11 Y1	12 Y3	13 Y5	14 Y7	15 Y9	16 YB	17 YD	18 YF
1 0V	2 Y0	3 Y2	4 Y4	5 Y6	6 Y8	7 YA	8 YC	9 YE

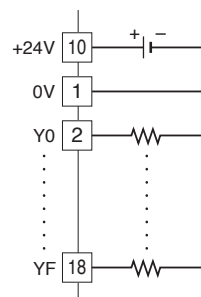| NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V (common)	10	+24V	24V DC
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output 15

CIRCUIT DIAGRAM

*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **Output Circuit**

■ **Output Connection Example**

PNP TRANSISTOR OUTPUT MODULE, 16 points | MODEL **R7ML-DC16B**

SPECIFICATIONS

Common: Positive common (PNP) per 16 points
Number of I/O: Output, 16 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
Isolation: Output to MECHATROLINK or FG to power input

OPERATING MODE SETTING

• **Extension (SW1-1, 1-2)**

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• **Output at the loss of communication (SW1-4)**

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

(*) Factory setting

Caution ! - SW1-3, 1-5, 1-6, 1-7, 1-8 are unused.
Be sure to turn off unused ones.

TERMINAL ASSIGNMENTS

10 +24V	11 Y1	12 Y3	13 Y5	14 Y7	15 Y9	16 YB	17 YD	18 YF
1 0V	2 Y0	3 Y2	4 Y4	5 Y6	6 Y8	7 YA	8 YC	9 YE

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V	10	+24V	24V DC (common)
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output 15

CIRCUIT DIAGRAM

*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **Output Circuit**

■ **Output Connection Example**

M·SYSTEM CO., LTD.

DC VOLTAGE/CURRENT INPUT MODULE, 4 points | MODEL **R7ML-SV4**

SPECIFICATIONS

Input range & resistance
Wide span voltage: -10 – +10V DC, -5 – +5V DC,
0 – 10V DC, 0 – 5V DC, 1 – 5V DC;
input resistance 1MΩ minimum
Narrow span voltage: -1 – +1V DC, 0 – 1V DC,
-0.5 – +0.5V DC;
input resistance 100kΩ minimum
Current range: -20 – +20mA DC, 0 – 20mA DC,
4 – 20mA DC; input resistance 70Ω
Conversion rate/conversion accuracy:
10 msec./±0.8%, 20 msec./±0.4%,
40 msec./±0.2%, 80 msec./±0.1%
Response time: Conversion rate × 2 + 50 msec. (0 – 90%)
Temperature coefficient: ±0.015%/°C
Converted data range: 0 – 10000 of the input range
Isolation: Input 0 to input 1 to input 2 to input 3 to
MECHATROLINK or FG to power input

OPERATING MODE SETTING

• Extension (SW1-1, 1-2)

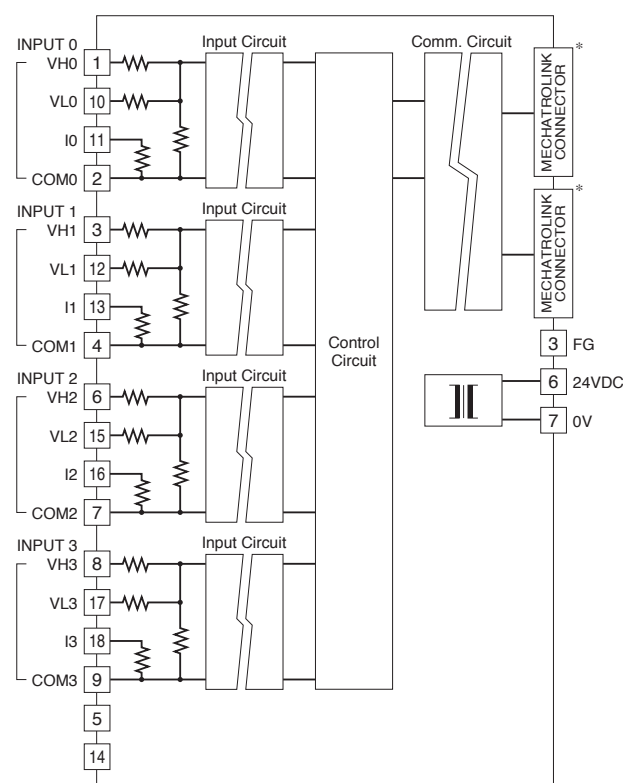| SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• Conversion rate / Accuracy (SW1-3, 1-4)

SW1-3	SW1-4	Conversion rate / Accuracy
OFF	OFF	80 msec. / ±0.1% (*)
ON	OFF	40 msec. / ±0.2%
OFF	ON	20 msec. / ±0.4%
ON	ON	10 msec. / ±0.8%

• Input range (SW1-5, 1-6, 1-7, 1-8)

SW1-5	SW1-6	SW1-7	SW1-8	Input range
OFF	OFF	OFF	OFF	-10 – +10V DC (*)
ON	OFF	OFF	OFF	-5 – +5V DC
OFF	ON	OFF	OFF	-1 – +1V DC
ON	ON	OFF	OFF	0 – 10V DC
OFF	OFF	ON	OFF	0 – 5V DC
ON	OFF	ON	OFF	1 – 5V DC
OFF	ON	ON	OFF	0 – 1V DC
ON	ON	ON	OFF	-0.5 – +0.5V DC
ON	OFF	OFF	ON	-20 – +20mA DC
OFF	ON	OFF	ON	4 – 20mA DC
ON	ON	OFF	ON	0 – 20mA DC
ON	ON	ON	ON	PC Configurator setting

(*) Factory setting

TERMINAL ASSIGNMENTS

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	VH0	Wide span volt. 0	10	VL0	Narrow span volt. 0
2	COM0	Common 0	11	I0	Current range 0
3	VH1	Wide span volt. 1	12	VL1	Narrow span volt. 1
4	COM1	Common 1	13	I1	Current range 1
5	NC	No connection	14	NC	No connection
6	VH2	Wide span volt. 2	15	VL2	Narrow span volt. 2
7	COM2	Common 2	16	I2	Current range 2
8	VH3	Wide span volt. 3	17	VL3	Narrow span volt. 3
9	COM3	Common 3	18	I3	Current range 3

CIRCUIT DIAGRAM

*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **Input Connection Examples**
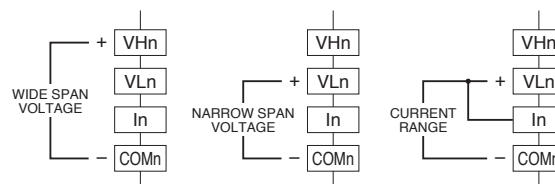
Be sure to close across VLn and In terminals for a current input.

THERMOCOUPLE INPUT MODULE, 4 points | MODEL **R7ML-TS4**

SPECIFICATIONS

Thermocouple: K, E, J, T, B, R, S, C, N, U, L, P, PR
Input resistance: 30kΩ minimum
Burnout sensing: ≤0.1μA
Burnout indication: Maximum value (upscale burnout) or minimum value (downscale burnout) of the usable range
Conversion accuracy: ±1°C (±2.0°C for B, R, S, C, PR)
Conversion rate: 250 msec. or 1 sec.
Response time: Conversion rate × 2 + 50 msec. (0 – 90%)
Temperature coefficient: ±0.015%/°C
CJC error: ±1.0°C maximum at 25°C ±10°C
±1.5°C maximum for R, S, PR
Converted data range: Engineering unit value (°C, K) × 10 (integer); No multiplication for °F
Isolation: Input 0 to input 1 to input 2 to input 3 to MECHATROLINK or FG to power input

T/C	USABLE RANGE (°C)	CONFORMANCE RANGE (°C)
K (CA)	-272 to +1472	-150 to +1370
E (CRC)	-272 to +1120	-170 to +1000
J (IC)	-260 to +1300	-180 to +1200
T (CC)	-272 to + 500	-170 to + 400
B (RH)	24 to 1920	400 to 1760
R	-100 to +1860	200 to 1760
S	-100 to +1860	0 to 1760
C (WRe 5-26)	-52 to +2416	0 to 2315
N	-272 to +1400	-130 to +1300
U	-252 to + 700	-200 to +600
L	-252 to +1000	-200 to +900
P (Platinel II)	-52 to +1496	0 to 1395
(PR)	-52 to +1860	0 to 1760

Max. (upscale) or min. (downscale) value of the usable range when a burnout is detected. Overrange input (out of the usable range) is also handled as burnout.

OPERATING MODE SETTING

• Extension (SW1-1, 1-2)

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• Thermocouple type (SW1-5, 1-6, 1-7, 1-8)

SW1-5	SW1-6	SW1-7	SW1-8	Thermocouple type
OFF	OFF	OFF	OFF	K (CA) (*)
ON	OFF	OFF	OFF	E (CRC)
OFF	ON	OFF	OFF	J (IC)
ON	ON	OFF	OFF	T (CC)
OFF	OFF	ON	OFF	B (RH)
ON	OFF	ON	OFF	R
OFF	ON	ON	OFF	S
ON	ON	ON	OFF	C (WRe 5-26)
OFF	OFF	OFF	ON	N
ON	OFF	OFF	ON	U
OFF	ON	OFF	ON	L
ON	ON	OFF	ON	P (Platinel II)
OFF	OFF	ON	ON	(PR)
ON	ON	ON	ON	PC Configurator setting

(*) Factory setting

• Conversion rate (SW1-3)

SW1-3	Conversion rate
OFF	250 msec. (*)
ON	1 sec.

• Burnout (SW1-4)

SW1-4	Burnout
OFF	Upscale (*)
ON	Downscale

(*) Factory setting

TERMINAL ASSIGNMENTS

10 +IN0	11 –IN0	12 +IN1	13 –IN1	14 NC	15 +IN2	16 –IN2	17 +IN3	18 –IN3
1 +CJ0	2 –CJ0	3 +CJ1	4 –CJ1	5 NC	6 +CJ2	7 –CJ2	8 +CJ3	9 –CJ3

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	+CJ0	CJC 0	10	+IN0	T/C + 0
2	–CJ0	CJC 0	11	–IN0	T/C – 0
3	+CJ1	CJC 1	12	+IN1	T/C + 1
4	–CJ1	CJC 1	13	–IN1	T/C – 1
5	NC	No connection	14	NC	No connection
6	+CJ2	CJC 2	15	+IN2	T/C + 2
7	–CJ2	CJC 2	16	–IN2	T/C – 2
8	+CJ3	CJC 3	17	+IN3	T/C + 3
9	–CJ3	CJC 3	18	–IN3	T/C – 3

CIRCUIT DIAGRAM
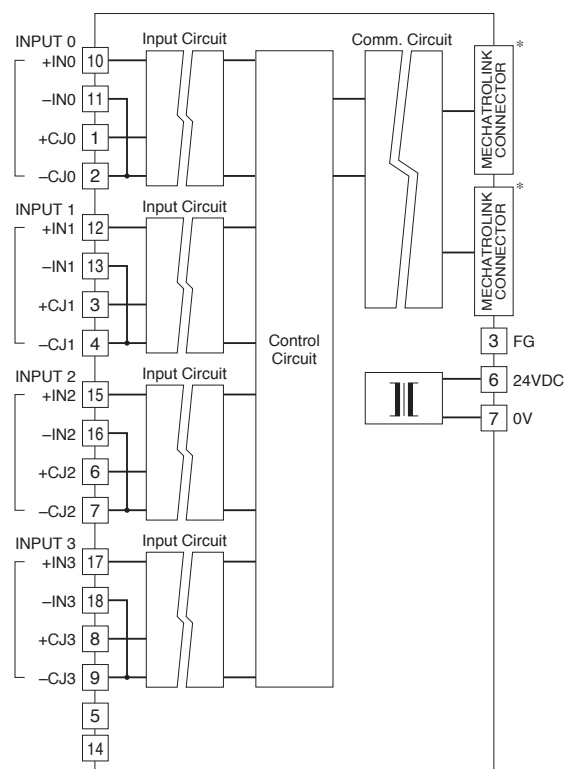
*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

■ Input Connection Example
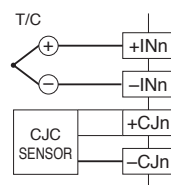
RTD INPUT MODULE, 4 points   MODEL **R7ML-RS4**

SPECIFICATIONS

RTD: Pt 100 (JIS '97/IEC), Pt 100 (JIS '89), JPt 100 (JIS '89), Pt 50 (JIS '81), Ni 100, Cu 10, Cu 50

Input resistance: 1MΩ minimum

Maximum leadwire resistance: 100Ω per wire

Burnout indication: Maximum value (upscale burnout) or minimum value (downscale burnout) of the usable range

Sensing current: ≤1mA

Conversion accuracy: ±1°C (±3°C for Cu 10)

Conversion rate: 250 msec. or 1 sec.

Response time: Conversion rate × 2 + 50 msec. (0 – 90%)

Temperature coefficient: ±0.015%/°C

Converted data range: Engineering unit value (°C, K) × 10 (integer); No multiplication for °F

Isolation: Input 0 to input 1 to input 2 to input 3 to MECHATROLINK or FG to power input

RTD	USABLE RANGE (°C)	CONFORMANCE RANGE (°C)
Pt 100 (JIS '97/IEC)	-240 to +900	-200 to +850
Pt 100 (JIS '89)	-240 to +900	-200 to +660
JPt 100 (JIS '89)	-236 to +560	-200 to +510
Pt 50Ω (JIS '81)	-236 to +700	-200 to +649
Ni 100	-100 to +252	-80 to +250
Cu 10 (25°C)	-212 to +312	-50 to +250
Cu 50	-100 to +200	-50 to +150

Max. (upscale) or min. (downscale) value of the usable range when a burnout is detected. Overrange input (out of the usable range) is also handled as burnout.

OPERATING MODE SETTING

• Extension (SW1-1, 1-2)

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• Conversion rate (SW1-3)

SW1-3	Conversion rate
OFF	250 msec. (*)
ON	1 sec.

• Burnout (SW1-4)

SW1-4	Burnout
OFF	Upscale (*)
ON	Downscale

(*) Factory setting

• RTD type (SW1-5, 1-6, 1-7, 1-8)

SW1-5	SW1-6	SW1-7	SW1-8	RTD type
OFF	OFF	OFF	OFF	Pt 100 (JIS '97/IEC) (*)
ON	OFF	OFF	OFF	Pt 100 (JIS '89)
OFF	ON	OFF	OFF	JPt 100 (JIS '89)
ON	ON	OFF	OFF	Pt 50 (JIS '81)
OFF	OFF	ON	OFF	Ni 100
ON	OFF	ON	OFF	Cu 10 (25°C)
OFF	OFF	OFF	ON	Cu 50
ON	ON	ON	ON	PC Configurator setting

(*) Factory setting

TERMINAL ASSIGNMENTS

10 INA0	11 INb0	12 INA1	13 INb1	14 NC	15 INA2	16 INb2	17 INA3	18 INb3
1 NC	2 INB0	3 NC	4 INB1	5 NC	6 NC	7 INB2	8 NC	9 INB3

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	10	INA0	RTD 0-A
2	INB0	RTD 0-B	11	INb0	RTD 0-b
3	NC	No connection	12	INA1	RTD 1-A
4	INB1	RTD 1-B	13	INb1	RTD 1-b
5	NC	No connection	14	NC	No connection
6	NC	No connection	15	INA2	RTD 2-A
7	INB2	RTD 2-B	16	INb2	RTD 2-b
8	NC	No connection	17	INA3	RTD 3-A
9	INB3	RTD 3-B	18	INb3	RTD 3-b

CIRCUIT DIAGRAM
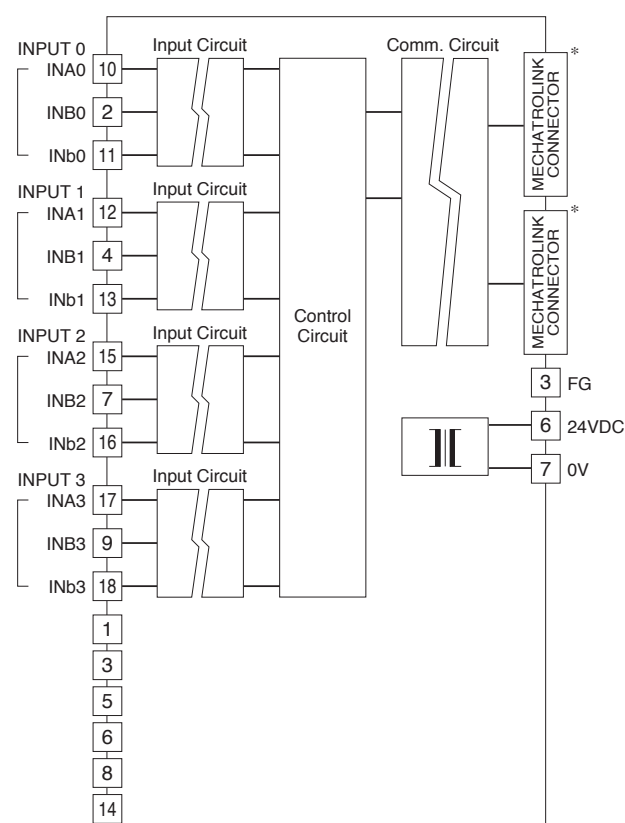
*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

■ Input Connection Example
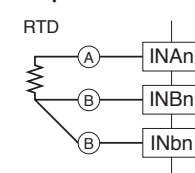
DC VOLTAGE OUTPUT MODULE, 2 points | MODEL **R7ML-YV2**

SPECIFICATIONS

Output range
  Wide span voltage: -10 – +10V DC, -5 – +5V DC,
          0 – 10V DC, 0 – 5V DC, 1 – 5V DC
  Narrow span voltage: -1 – +1V DC, 0 – 1V DC,
          -0.5 – +0.5V DC
Operational range: -11.5 – +11.5V DC or -15 – +115%
Load resistance: 100kΩ minimum
Conversion accuracy: ±0.1%
Response time: 250 msec. (0 – 90%)
Temperature coefficient: ±0.015%/°C
Converted data range: 0 – 10000 of the output range
Isolation: Output 0 to output 1 to MECHATROLINK
          or FG to power input

OPERATING MODE SETTING

• Extension (SW1-1, 1-2)

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• Output at the loss of communication (SW1-4)

SW1-4	Output at the loss of communication
OFF	Reset the output (to -15%)
ON	Hold the output (*) (maintains the last data received normally)

• Output range (SW1-5, 1-6, 1-7, 1-8)

SW1-5	SW1-6	SW1-7	SW1-8	Output range
OFF	OFF	OFF	OFF	-10 – +10V DC (*)
ON	OFF	OFF	OFF	-5 – +5V DC
OFF	ON	OFF	OFF	-1 – +1V DC
ON	ON	OFF	OFF	0 – 10V DC
OFF	OFF	ON	OFF	0 – 5V DC
ON	OFF	ON	OFF	1 – 5V DC
OFF	ON	ON	OFF	0 – 1V DC
ON	ON	ON	OFF	-0.5 – +0.5V DC
ON	ON	ON	ON	PC Configurator setting

(*) Factory setting

Caution ! - SW1-3 is unused. Be sure to turn off unused one.

TERMINAL ASSIGNMENTS

6 NC	7 VH0	8 VL0	9 VH1	10 VL1

1 NC	2 COM0	3 COM0	4 COM1	5 COM1

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	6	NC	No connection
2	COM0	Common 0	7	VH0	Wide span volt. 0
3	COM0	Common 0	8	VL0	Narrow span volt. 0
4	COM1	Common 1	9	VH1	Wide span volt. 1
5	COM1	Common 1	10	VL1	Narrow span volt. 1

CIRCUIT DIAGRAM

*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.
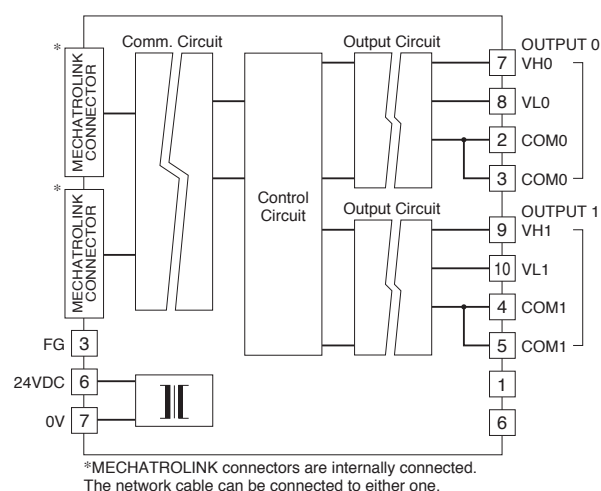
■ **Output Connection Examples**
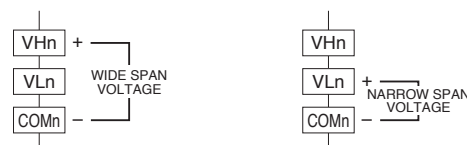
DC CURRENT OUTPUT MODULE, 2 points | MODEL **R7ML-YS2**

SPECIFICATIONS

Output range: 4 – 20mA DC
Load resistance: 600Ω maximum
Conversion accuracy: ±0.1%
Response time: 250 msec. (0 – 90%)
Temperature coefficient: ±0.015%/°C
Converted data range: 0 – 10000 of the output range
Isolation: Output 0 to output 1 to MECHATROLINK or FG to power input

OPERATING MODE SETTING

• **Extension (SW1-1, 1-2)**

SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

• **Output at the loss of communication (SW1-4)**

SW1-4	Output at the loss of communication
OFF	Reset the output (to -15%)
ON	Hold the output (*) (maintains the last data received normally)

(*) Factory setting

Caution ! - SW1-3, 1-5 through 1-8 are unused. Be sure to turn off unused ones.

TERMINAL ASSIGNMENTS

6 NC	7 I0	8 NC	9 I1	10 NC
1 NC	**2** COM0	**3** NC	**4** COM1	**5** NC

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	6	NC	No connection
2	COM0	Common 0	7	I0	Current 0
3	NC	No connection	8	NC	No connection
4	COM1	Common 1	9	I1	Current 1
5	NC	No connection	10	NC	No connection

CIRCUIT DIAGRAM
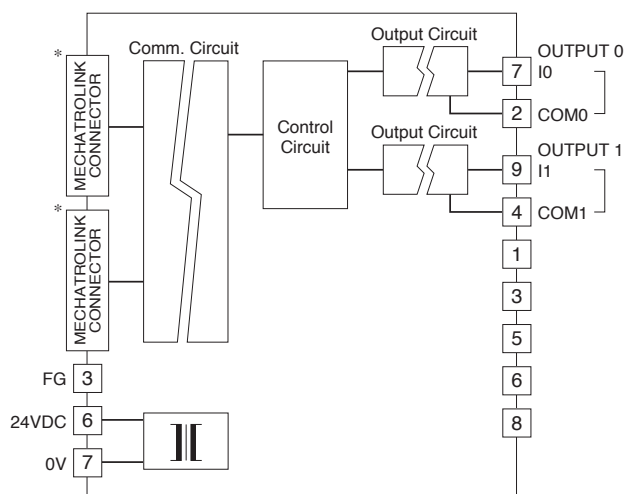
*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

DISCRETE INPUT EXTENSION MODULE, 8 points | MODEL **R7ML-EA8**

SPECIFICATIONS

Common: Positive or negative common (NPN/PNP) per 8 points
Number of I/O: Input, 8 points
Rated input voltage: 24V DC ±10%; ripple 5% p-p max.
ON voltage/current: ≥15V DC (input-COM) / ≥3.5mA
OFF voltage/current: ≤5V DC (input-COM) / ≤1mA
Input current: ≤5.5mA per point at 24V DC
Input resistance: Approx. 4.4kΩ
ON delay: ≤2.0 msec.
OFF delay: ≤2.0 msec.
I/O status indicator: LED turns on with closed contact.
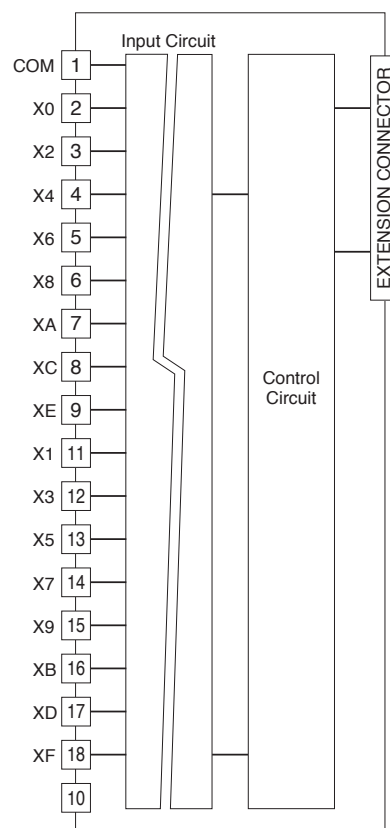**Maximum inputs applicable at once**: No limit (at 24V DC)
Isolation: Input to internal circuits
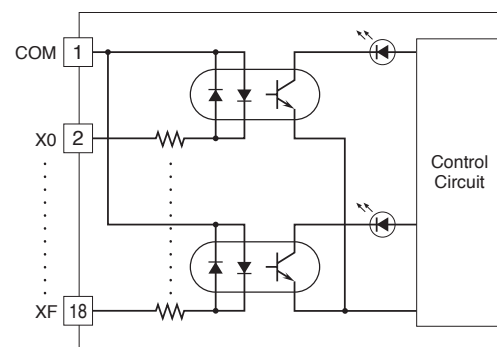
TERMINAL ASSIGNMENTS

6 NC	7 X1	8 X3	9 X5	10 X7
1 COM	2 X0	3 X2	4 X4	5 X6

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	COM	Common	6	NC	No Connection
2	X0	Input 0	7	X1	Input 1
3	X2	Input 2	8	X3	Input 3
4	X4	Input 4	9	X5	Input 5
5	X6	Input 6	10	X7	Input 7

CIRCUIT DIAGRAM
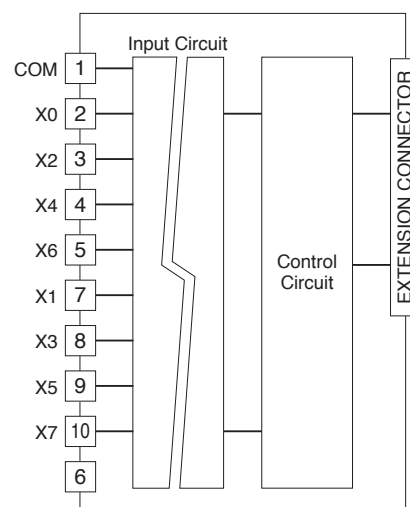
■ **Input Circuit**
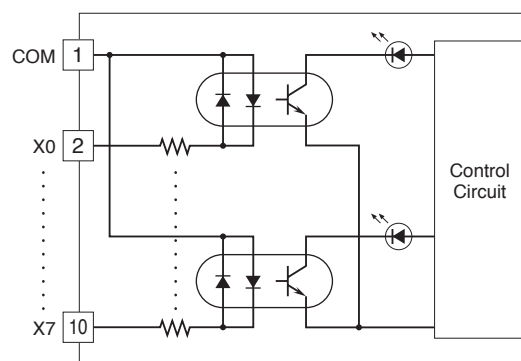
■ **Input Connection Examples**
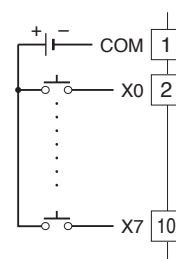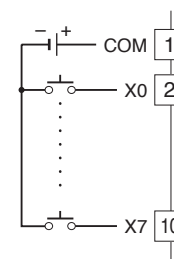
DISCRETE INPUT EXTENSION MODULE, 16 points | MODEL **R7ML-EA16**

SPECIFICATIONS

Common: Positive or negative common (NPN/PNP) per 16 points
Number of I/O: Input, 16 points
Rated input voltage: 24V DC ±10%; ripple 5% p-p max.
ON voltage/current: ≥15V DC (input-COM) / ≥3.5mA
OFF voltage/current: ≤5V DC (input-COM) / ≤1mA
Input current: ≤5.5mA per point at 24V DC
Input resistance: Approx. 4.4kΩ
ON delay: ≤2.0 msec.
OFF delay: ≤2.0 msec.
I/O status indicator: LED turns on with closed contact.
Maximum inputs applicable at once: No limit (at 24V DC)
Isolation: Input to internal circuits

TERMINAL ASSIGNMENTS

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

CIRCUIT DIAGRAM

■ **Input Circuit**

■ **Input Connection Examples**

PNP Connection   NPN Connection

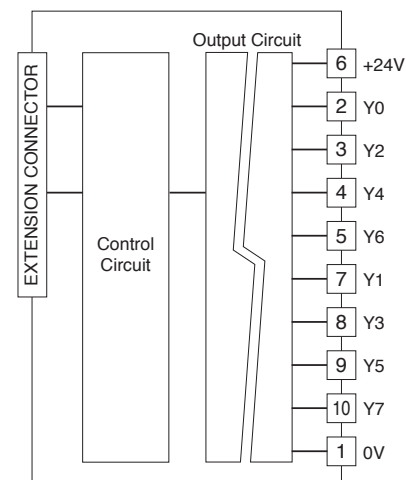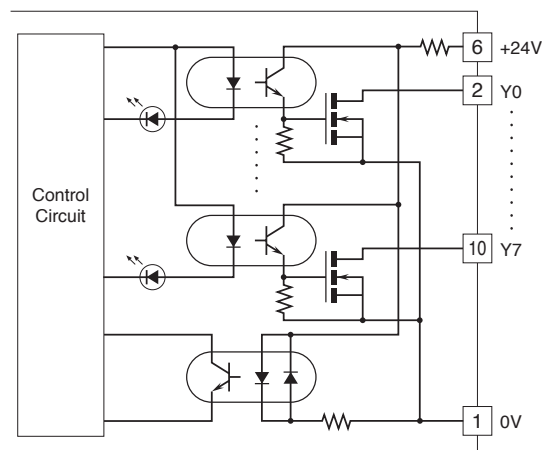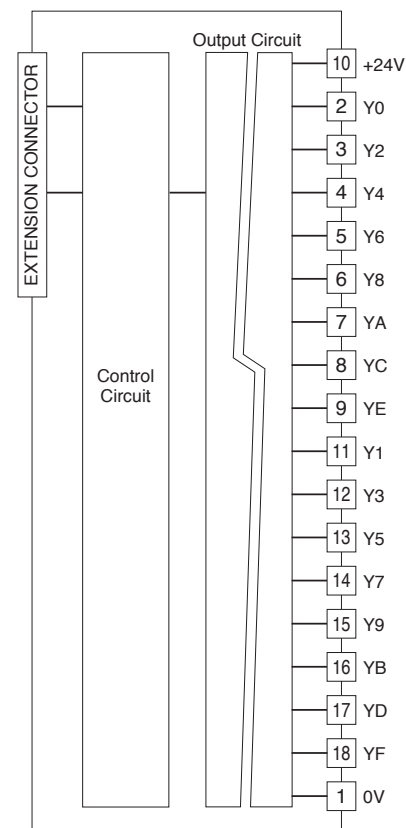# NPN TRANSISTOR OUTPUT EXTENSION MODULE, 8 points | MODEL **R7ML-EC8A**

SPECIFICATIONS

Common: Negative common (NPN) per 8 points
Number of I/O: Output, 8 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
Isolation: Output to internal circuits

TERMINAL ASSIGNMENTS

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V (common)	6	+24V	24V DC
2	Y0	Output 0	7	Y1	Output 1
3	Y2	Output 2	8	Y3	Output 3
4	Y4	Output 4	9	Y5	Output 5
5	Y6	Output 6	10	Y7	Output 7

CIRCUIT DIAGRAM

■ **Output Circuit**

■ **Output Connection Example**
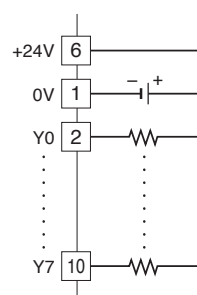
NPN TRANSISTOR OUTPUT EXTENSION MODULE, 16 points | MODEL **R7ML-EC16A**

SPECIFICATIONS

Common: Negative common (NPN) per 16 points
Number of I/O: Output, 16 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
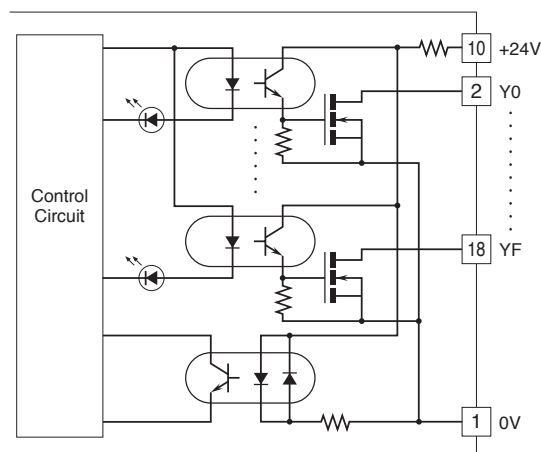**Isolation**:   Output to internal circuits

TERMINAL ASSIGNMENTS

10 +24V	11 Y1	12 Y3	13 Y5	14 Y7	15 Y9	16 YB	17 YD	18 YF
1 0V	2 Y0	3 Y2	4 Y4	5 Y6	6 Y8	7 YA	8 YC	9 YE

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V (common)	10	+24V	24V DC
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output 15

CIRCUIT DIAGRAM

■ **Output Circuit**

■ **Output Connection Example**

M·SYSTEM CO.,LTD.

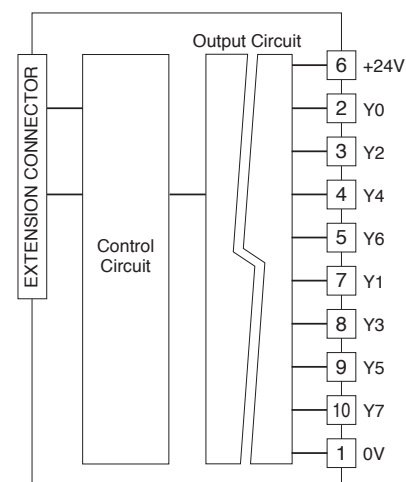| **PNP TRANSISTOR OUTPUT EXTENSION MODULE, 8 points** | MODEL **R7ML-EC8B** |

SPECIFICATIONS

Common: Positive common (PNP) per 8 points
Number of I/O: Output, 8 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
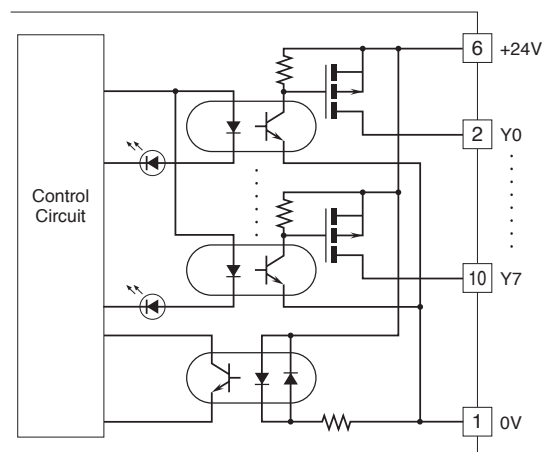**Isolation**:   Output to internal circuits

TERMINAL ASSIGNMENTS

6 +24V	7 Y1	8 Y3	9 Y5	10 Y7
1 0V	2 Y0	3 Y2	4 Y4	5 Y6

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V	6	+24V	24V DC (common)
2	Y0	Output 0	7	Y1	Output 1
3	Y2	Output 2	8	Y3	Output 3
4	Y4	Output 4	9	Y5	Output 5
5	Y6	Output 6	10	Y7	Output 7

CIRCUIT DIAGRAM

■ **Output Circuit**

■ **Output Connection Example**
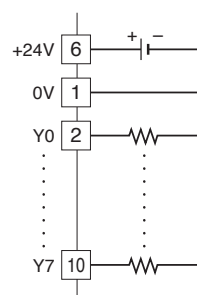
PNP TRANSISTOR OUTPUT EXTENSION MODULE, 16 points | MODEL **R7ML-EC16B**
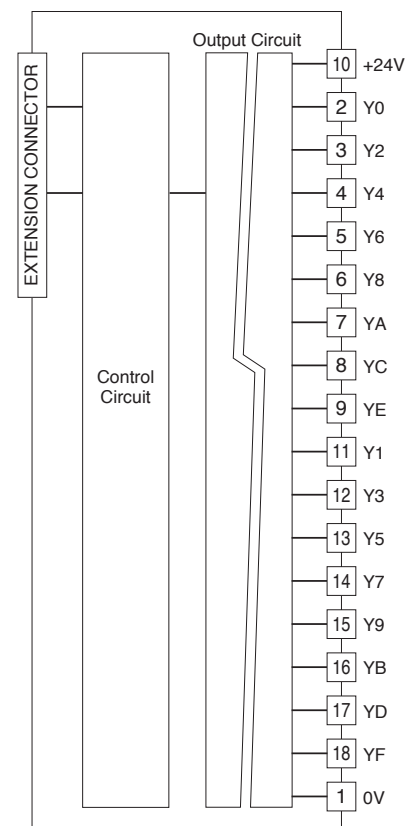
SPECIFICATIONS

Common: Positive common (PNP) per 16 points
Number of I/O: Output, 16 points
Rated load voltage: 24V DC ±10%
Rate output current: 0.25A per point, 2.0A per common
Residual voltage: ≤1.2V
Leakage current: ≤0.1mA
ON delay: ≤0.5 msec.
OFF delay: ≤1.5 msec.
I/O status indicator: LED turns on with closed contact.
Maximum outputs provided at once: No limit (at 24V DC)
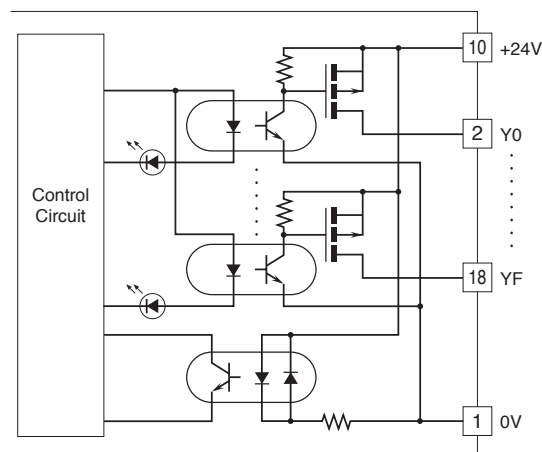**Isolation**: Output to internal circuits

TERMINAL ASSIGNMENTS

10 +24V	11 Y1	12 Y3	13 Y5	14 Y7	15 Y9	16 YB	17 YD	18 YF
1 0V	2 Y0	3 Y2	4 Y4	5 Y6	6 Y8	7 YA	8 YC	9 YE

NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0V	0V	10	+24V	24V DC (common)
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output 15

CIRCUIT DIAGRAM

■ **Output Circuit**

■ **Output Connection Example**