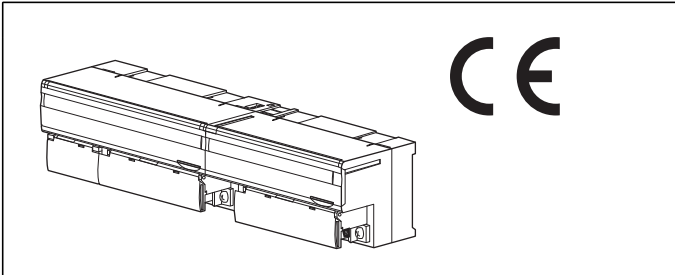


## Remote I/O R7 Series

### MECHATROLINK I/O MODULE

(MECHATROLINK-I/-II)



#### ORDERING INFORMATION

- Basic module: R7ML-[1]-R[2]  
Specify a code from below for each of [1] and [2].  
(e.g. R7ML-LC2-R/R20/F2K/Q)
- Specify the specification for option code /Q  
(e.g. /C01)
- Extension module: R7ML-[1][2]  
Specify a code from below for each of [1] and [2].  
(e.g. R7ML-EC16B/Q)
- Specify the specification for option code /Q  
(e.g. /C01)

#### BASIC MODULE: R7ML-[1]-R[2]

##### [1] I/O TYPE

- DA16:** Discrete input, 16 points
- DC16A:** NPN transistor output, 16 points
- DC16B:** PNP transistor output, 16 points
- DC16D:** PNP transistor output, 16 points, shortcircuit protection
- SV4:** DC voltage/current input (10 V/20 mA), 4 points
- TS4:** Thermocouple input, 4 points (CE not available)
- RS4:** RTD input, 4 points (CE not available)
- LC2:** Strain gauge input, 2 points (with monitor output)
- YV2:** DC voltage output, 2 points (CE not available)
- YS2:** DC current output, 2 points (CE not available)

##### POWER INPUT

DC power  
R: 24 V DC  
(Operational voltage range:  $\pm 10\%$ ; ripple 10 %p-p max.)

##### [2] OPTIONS (multiple selections only for LC2)

Input Range  
(Selectable only for LC2 (be sure to specify))  
/R20: -2 - +2 mV/V

/R10: -1 - +1 mV/V  
/R05: -0.5 - +0.5 mV/V  
CR Filter  
(Selectable only for LC2 (be sure to specify))  
/F2K: 2 kHz/2 Hz  
/F1: 1 Hz/2 Hz  
Other Options  
blank: none  
/Q: Option other than the above (specify the specification)

#### EXTENSION MODULE: R7ML-[1][2]

##### [1] I/O TYPE

- EA8:** Discrete input, 8 points (CE not available)
- EA16:** Discrete input, 16 points (CE not available)
- EC8A:** NPN transistor output, 8 points (CE not available)
- EC16A:** NPN transistor output, 16 points (CE not available)
- EC8B:** PNP transistor output, 8 points (CE not available)
- EC16B:** PNP transistor output, 16 points (CE not available)
- EC8D:** PNP transistor output, 8 points, shortcircuit protection
- EC16D:** PNP transistor output, 16 points, shortcircuit protection

##### [2] OPTIONS

blank: none  
/Q: Option other than the above (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

#### 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, zero/span adjustments, scaling and temperature unit, use the PC Configurator Software (model: R7CON)

#### RELATED PRODUCTS

- PC configurator software (model: R7CON)  
Downloadable at our web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

## GENERAL SPECIFICATIONS

### • Common Specifications

**Power input:** 24 V DC  $\pm 10\%$ ; ripple 10 %p-p max.

**Insulation resistance:**  $\geq 100\text{ M}\Omega$  with 500 V DC

**Dielectric strength:**

**Discrete I/O module**

1500 V AC @ 1 minute (I/O to power)

500 V AC @ 1 minute (MECHATROLINK or FG to I/O or power)

**Analog I/O module**

1500 V AC @ 1 minute (between each I/O, I/O to power)

500 V AC @ 1 minute (MECHATROLINK or FG to I/O or power)

**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 +149°F)

**Mounting:** DIN rail (35 mm wide)

**Connection**

**Communication:** MECHATROLINK connector

**Power & I/O:** M3 separable screw terminals (torque 0.5 N·m)

**Screw terminal material:** Nickel-plated steel

**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 mm<sup>2</sup> (AWG22 to 16)

**Housing material:** Flame-resistant resin (gray)

**Status indicator LED:** PWR (Refer to the instruction manual for details)

### ■ Current Consumption & Weight

R7ML-DA16: Approx. 70 mA; 220 g (7.7 oz)

R7ML-DC16A: Approx. 85 mA; 220 g (7.7 oz)

R7ML-DC16B: Approx. 85 mA; 220 g (7.7 oz)

R7ML-DC16D: Approx. 85 mA; 220 g (7.7 oz)

R7ML-SV4: Approx. 70 mA; 220 g (7.7 oz)

R7ML-TS4: Approx. 70 mA; 220 g (7.7 oz)

R7ML-RS4: Approx. 70 mA; 250 g (8.8 oz)

R7ML-LC2: Approx. 130 mA; 250 g (7.7 oz)

R7ML-YV2: Approx. 100 mA; 200 g (7.0 oz)

R7ML-YS2: Approx. 130 mA; 200 g (7.0 oz)

R7ML-EA8: Approx. 10 mA; 90 g (3.2 oz)

R7ML-EA16: Approx. 20 mA; 150 g (5.3 oz)

R7ML-EC8A: Approx. 10 mA; 90 g (3.2 oz)

R7ML-EC16A: Approx. 30 mA; 150 g (5.3 oz)

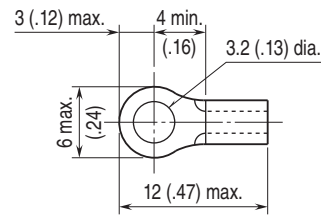
R7ML-EC8B: Approx. 10 mA; 90 g (3.2 oz)

R7ML-EC16B: Approx. 30 mA; 150 g (5.3 oz)

R7ML-EC8D: Approx. 10 mA; 90 g (3.2 oz)

R7ML-EC16D: Approx. 20 mA; 150 g (5.3 oz)

■ Recommended solderless terminal (unit: mm(inch))



## MECHATROLINK COMMUNICATION

### ■ MECHATROLINK:

**Mode:** MECHATROLINK-I or II (data length 17 byte) or II (32byte)

(Function selected with Rotary SW. Factory setting: MECHATROLINK-II (17byte) )

**Station address:** 60H - 7FH

(Function selected with Rotary SW. Factory setting: 60H)

### • 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 slaves:** 15

(The maximum number of slaves might change depending on the master unit. Refer to the manual of the master unit)

**Transmission cycle:** 2 msec. (fixed)

**Data length:** 17 byte

### • 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 slaves:** 30

(The maximum number of slaves might change depending on the master unit. Refer to the manual of the master 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)

## STANDARDS & APPROVALS

**EU conformity:**

EMC Directive

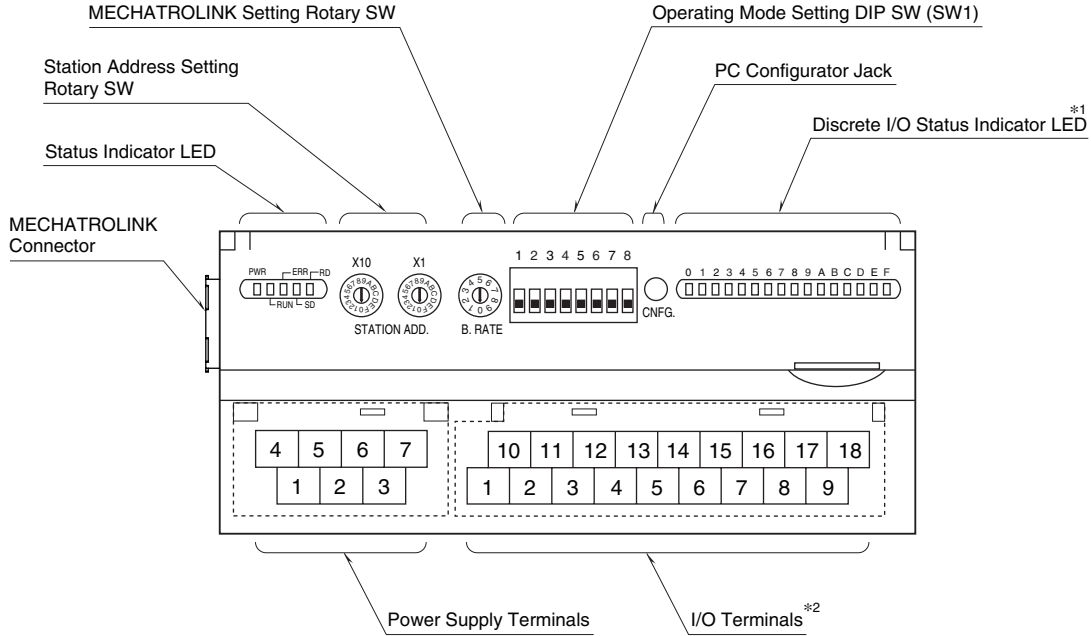
EMI EN 61000-6-4

EMS EN 61000-6-2  
RoHS Directive

## EXTERNAL VIEW

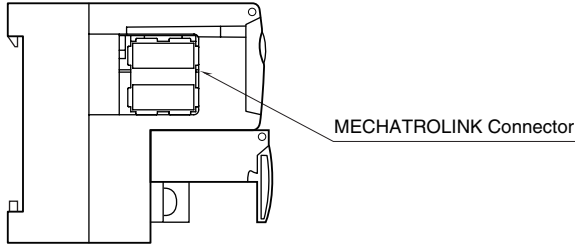
### ■ BASIC MODULE

#### ■ FRONT VIEW



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

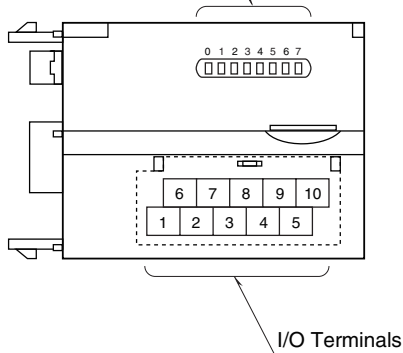
#### ■ LEFT SIDE VIEW



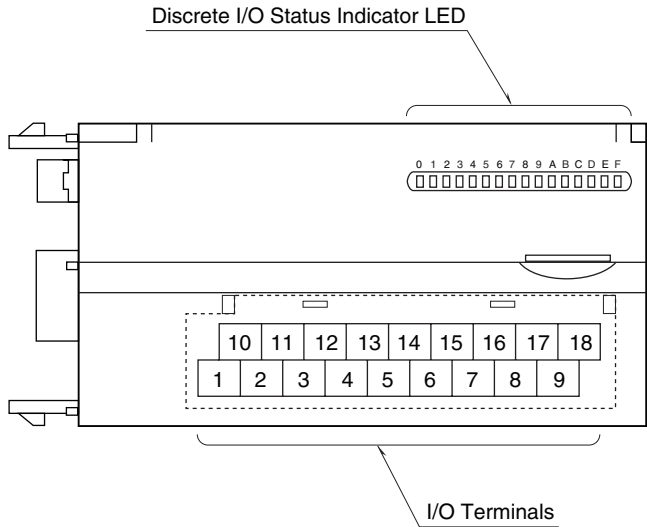
### ■ EXTENSION MODULE

#### • DISCRETE, 8 POINTS

Discrete I/O Status Indicator LED

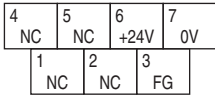


• DISCRETE, 16 POINTS



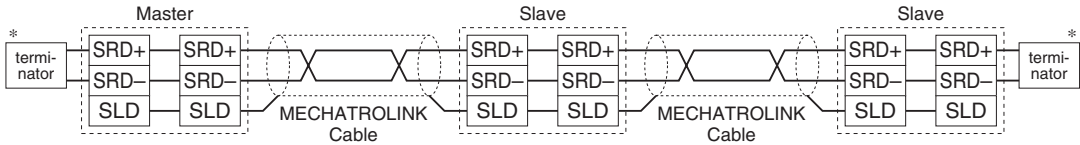
**CONNECTION DIAGRAMS**

■ POWER SUPPLY TERMINAL ASSIGNMENT



| 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.

**INDICATOR LED**

■ STATUS INDICATOR LED

| LED | COLOR | EXPLANATION   |
|-----|-------|---|
| PWR | Green | Turns on while internal power (5V) is normally supplied |
| RUN | Green | Turns on during normal communication                    |
| ERR | Red   | Turns on with setting failure or no communication       |
| SD  | Green | Turns on while sending data                             |
| RD  | Green | Turns on while receiving data                           |

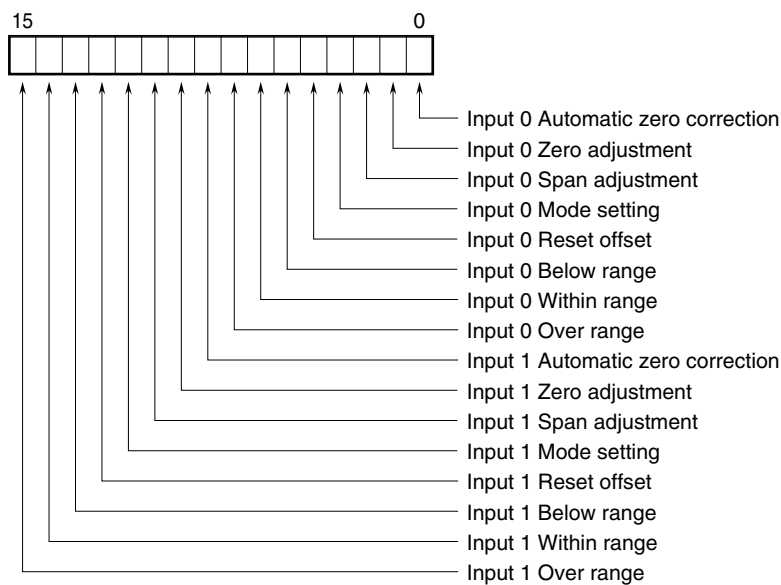
■ DISCRETE I/O STATUS INDICATOR LED

Discrete I/O module displays the status of each I/O by LED.

ON : Turns on

OFF : Turns off

■ LC2 STATUS



| ITEM                      | DESCRIPTION   |
|---------------------------|---|
| Automatic zero correction | Turns on after offset value setting is completed until Automatic zero correction bit is set to "0". |
| Zero adjustment           | Turns on after zero adjustment is completed until Zero adjustment bit is set to "0".                |
| Span adjustment           | Turns on after span adjustment is completed until Span adjustment bit is set to "0".                |
| Mode setting              | Turns on after monitor output mode setting is completed until measuring mode is set.                |
| Reset offset              | Turns on after offset value is reset to 0 until Reset offset bit is set to "0".                     |
| Below range               | Turns on while input is -1.0% or less.  |
| Within range              | Turns on while input is within the range from -1.0 to +101.0%.                                      |
| Over range                | Turns on while input is 101.0% or greater.  |

## 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 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 master |
|                           | DISCONNECT   | 0FH                   | Communication stop with master  |
|                           | 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 bytes 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<br>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 slave are sent to the master

| 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 slave is sent to the master 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 master

| 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<br>00 : Product model (data length : 32 bytes)<br>02 : Product version (data length : 32 bytes)<br>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 master

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

### • DISCONNECT (0FH) Command Data Format

Stops communication with the master .

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

• **DATA\_RWA (50H) Command Data Format**

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

• Discrete Input Unit

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

• Discrete Output Unit

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

• Analog 4-point Input Unit

| Byte    | COMMAND (hexadecimal)                               | RESPONSE (hexadecimal)   | REMARKS              |
|---------|---|--|----------------------|
| 5       | 00H   | Input 0 low 8 bit  |                      |
| 6       | 00H   | Input 0 high 8 bit   |                      |
| 7       | 00H   | Input 1 low 8 bit  |                      |
| 8       | 00H   | Input 1 high 8 bit   |                      |
| 9       | 00H   | Input 2 low 8 bit  |                      |
| 10      | 00H   | Input 2 high 8 bit   |                      |
| 11      | 00H   | Input 3 low 8 bit  |                      |
| 12      | 00H   | Input 3 high 8 bit   |                      |
| 13      | Discrete output data of extension module low 8 bit  | Discrete input data of extension module low 8 bit or echo back of set value at command area  |                      |
| 14      | Discrete output data of extension module high 8 bit | Discrete input data of extension module high 8 bit or echo back of set value at command area | "0" for EA8 and EC8x |
| 15      | 00H   | Status low 8 bit   | See I/O data status  |
| 16      | 00H   | Status high 8 bit  | See I/O data status  |
| 17 – 31 | 00H   | 00H  | Unused               |

• Analog 2-point Output Unit

| Byte    | COMMAND (hexadecimal)                               | RESPONSE (hexadecimal)   | REMARKS              |
|---------|---|--|----------------------|
| 5       | Output 0 low 8 bit                                  | Echo back of set value at command area   |                      |
| 6       | Output 0 high 8 bit                                 | Echo back of set value at command area   |                      |
| 7       | Output 1 low 8 bit                                  | Echo back of set value at command area   |                      |
| 8       | Output 1 high 8 bit                                 | Echo back of set value at command area   |                      |
| 9 – 12  | 00H   | 00H  | Unused               |
| 13      | Discrete output data of extension module low 8 bit  | Discrete input data of extension module low 8 bit or echo back of set value at command area  |                      |
| 14      | Discrete output data of extension module high 8 bit | Discrete input data of extension module high 8 bit or echo back of set value at command area | "0" for EA8 and EC8x |
| 15 – 31 | 00H   | 00H  | Unused               |



• LC2

| Byte    | COMMAND (hexadecimal)                               | RESPONSE (hexadecimal)   | REMARKS              |
|---------|---|--|----------------------|
| 5       | Input 0 set data low 8 bit                          | Input 0 low 8 bit or echo back of set value at command area                                  |                      |
| 6       | Input 0 set data high 8 bit                         | Input 0 high 8 bit or echo back of set value at command area                                 |                      |
| 7       | Input 1 set data low 8 bit                          | Input 1 low 8 bit or echo back of set value at command area                                  |                      |
| 8       | Input 1 set data high 8 bit                         | Input 1 high 8 bit or echo back of set value at command area                                 |                      |
| 9       | Command low 8 bit                                   | Command display low 8 bit or echo back of set value at command area                          |                      |
| 10      | Command high 8 bit                                  | Command display high 8 bit or echo back of set value at command area                         |                      |
| 11, 12  | 00H   | 00H  | Unused               |
| 13      | Discrete output data of extension module low 8 bit  | Discrete input data of extension module low 8 bit or echo back of set value at command area  |                      |
| 14      | Discrete output data of extension module high 8 bit | Discrete input data of extension module high 8 bit or echo back of set value at command area | "0" for EA8 and EC8x |
| 15      | 00H   | Status low 8 bit   | See I/O data status  |
| 16      | 00H   | Status high 8 bit  | See I/O data status  |
| 17 – 31 | 00H   | 00H  | Unused               |

## DATA CONVERSION

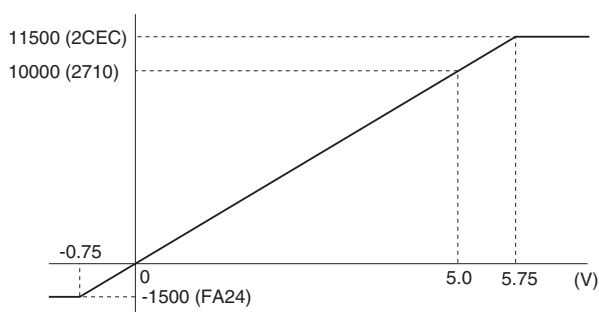
### ■ 0 – 100% DATA CONVERSION

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                |



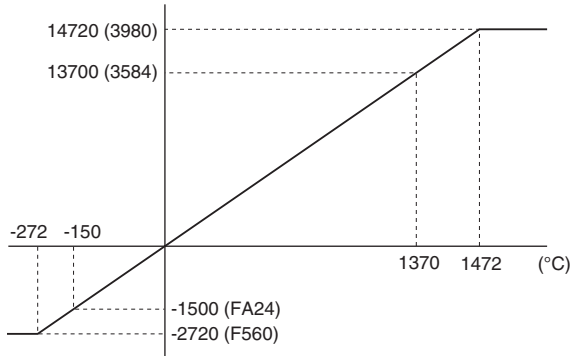
Analog output is converted in the reverse order of the input data. The output range 0 – 5V DC is expressed as 10000 at 5.0V (100%) and 0 at 0V (0%).

■ 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.

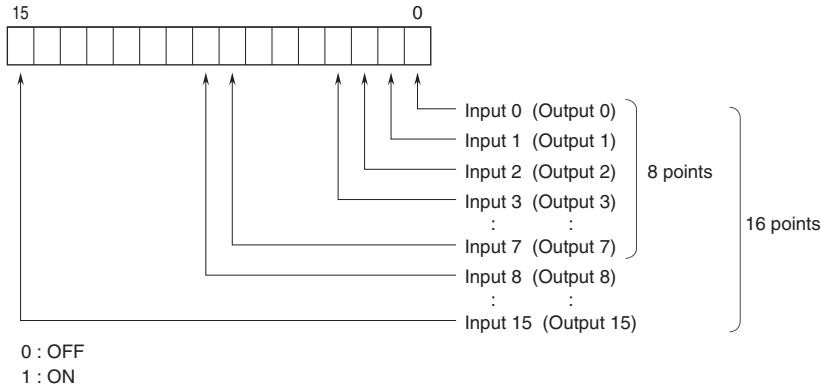
•Input Type K Thermocouple

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

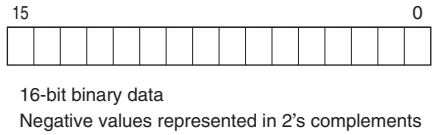


I/O DATA DESCRIPTIONS

■ DISCRETE I/O

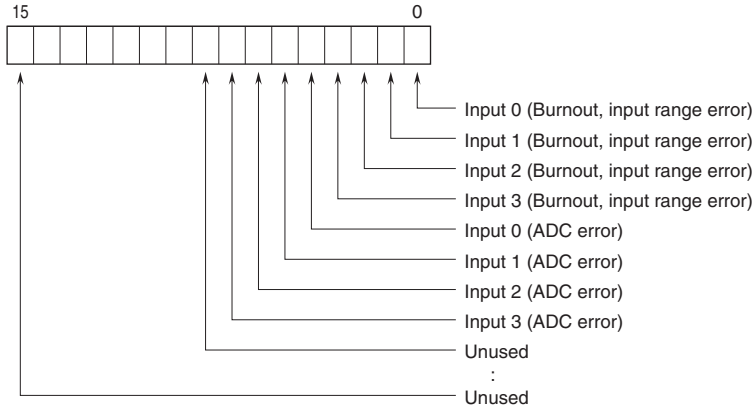


■ ANALOG I/O



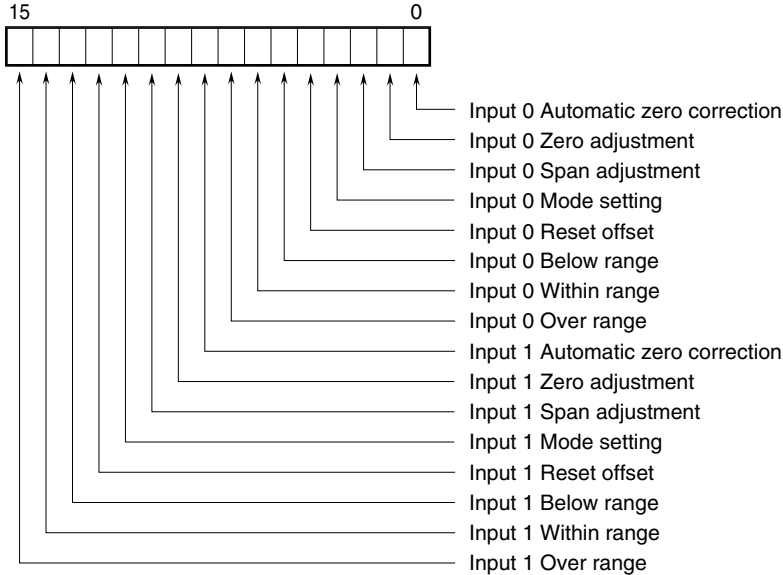
■ STATUS

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



Burnout, input range error ( $\leq -15\%$ ,  $\geq +115\%$ )  
 0 : Normal 1 : Error  
 ADC error (no response from ADC)  
 0 : Normal 1 : Error

■ LC2 COMMAND DETAILS



## ■ AUTOMATIC ZERO CORRECTION

Set the offset input value. Perform automatic zero correction setting after Zero/Span adjustments.

The procedures are as follows.

- 1) Apply desired offset input value to the sensor.
- 2) Set "1" to Automatic zero correction bit. When the offset is completed, LED0 for Input 0 or LED8 for Input 1 turns on.
- 3) After checking the LED, set "0" to Automatic zero correction bit.

## ■ ZERO ADJUSTMENT

Adjust input zero point. The procedures are as follows.

- 1) Apply 0% load to the sensor.
- 2) Set "1" to Zero adjustment bit. When the adjustment is completed, LED1 for Input 0 or LED9 for Input 1 turns on.
- 3) After checking the LED, set "0" to Zero adjustment bit.

## ■ SPAN ADJUSTMENT (with actual load)

Adjust input span point with the actual load. The procedures are as follows.

- 1) Apply actual 100% load to the sensor.
- 2) Set "1" to Span adjustment bit. When the adjustment is completed, LED2 for Input 0 or LED10 for Input 1 turns on.
- 3) After checking the LED, set "0" to Span adjustment bit.

## ■ LOAD COEFFICIENT

Adjust input Span point by setting load coefficient without applying 100% actual load. The followings are an example of adjustment with 20 % load.

- 1) Apply 20% load of the actual load to the sensor.
- 2) Set 2000 (decimal) to Input set data area.
- 3) Set "1" to Span adjustment bit. When the adjustment is completed, LED2 for Input 0 or LED10 for Input 1 turns on.
- 4) After checking the LED, set "0" to Span adjustment bit.

## ■ MODE SETTING

Select measuring mode or monitor output mode.

### • Measuring mode

Set "0" to Mode setting bit to enter measuring mode. In measuring mode, monitor output is linked with input data.

### • Monitor output mode

Set "1" to Mode setting bit to enter monitor output mode. In monitor output mode, values at set data area of each input are outputted. Set values at set data area are displayed in Input data area and inputs are disabled. The followings are setting procedures of 20% monitor output for Input 1.

- 1) Set 2000 (decimal) to Input 1 set data area.
- 2) Set "1" to Mode setting bit. When the setting is completed, LED7 turns on and 20% of Input 1 is outputted from monitor output terminal .
- 3) After checking the output, set "0" to Mode setting bit to return to measuring mode.

## ■ RESET OFFSET

Reset the offset value set by Automatic zero correction to zero. The procedures are as follows.

- 1) Set "1" to Reset offset bit. When the reset is completed, LED4 for Input 0 or LED12 for Input 1 turns on.
- 2) After checking the LED, set "0" to Reset offset bit.

## ■ INPUT BELOW RANGE (Input only)

"1" is to be set when input is -1.0% or less.

## ■ INPUT WITHIN RANGE (Input only)

"1" is to be set when input is within the range between -1.0% and 101.0%.

## ■ INPUT OVER RANGE (Input only)

"1" is to be set when input is 101.0% or more.

## EXTENSION MODULE

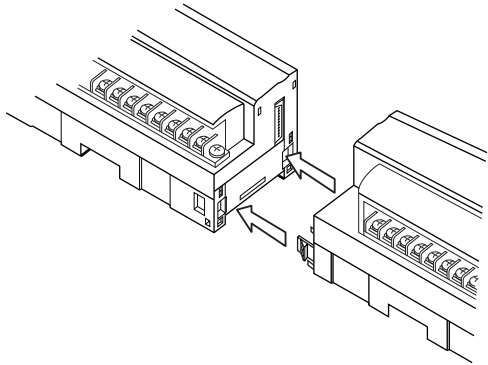
A 'basic' module can be attached with one 'extension' module. The extension module is powered from the basic module. By combining two modules, single station can handle mixed analog and discrete signals, 32-point discrete inputs, 32-point discrete outputs, 16-point discrete I/Os and other combinations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

### ■ OUTPUT AT THE LOSS OF COMMUNICATION

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

### ■ CONNECTING THE EXTENSION MODULE

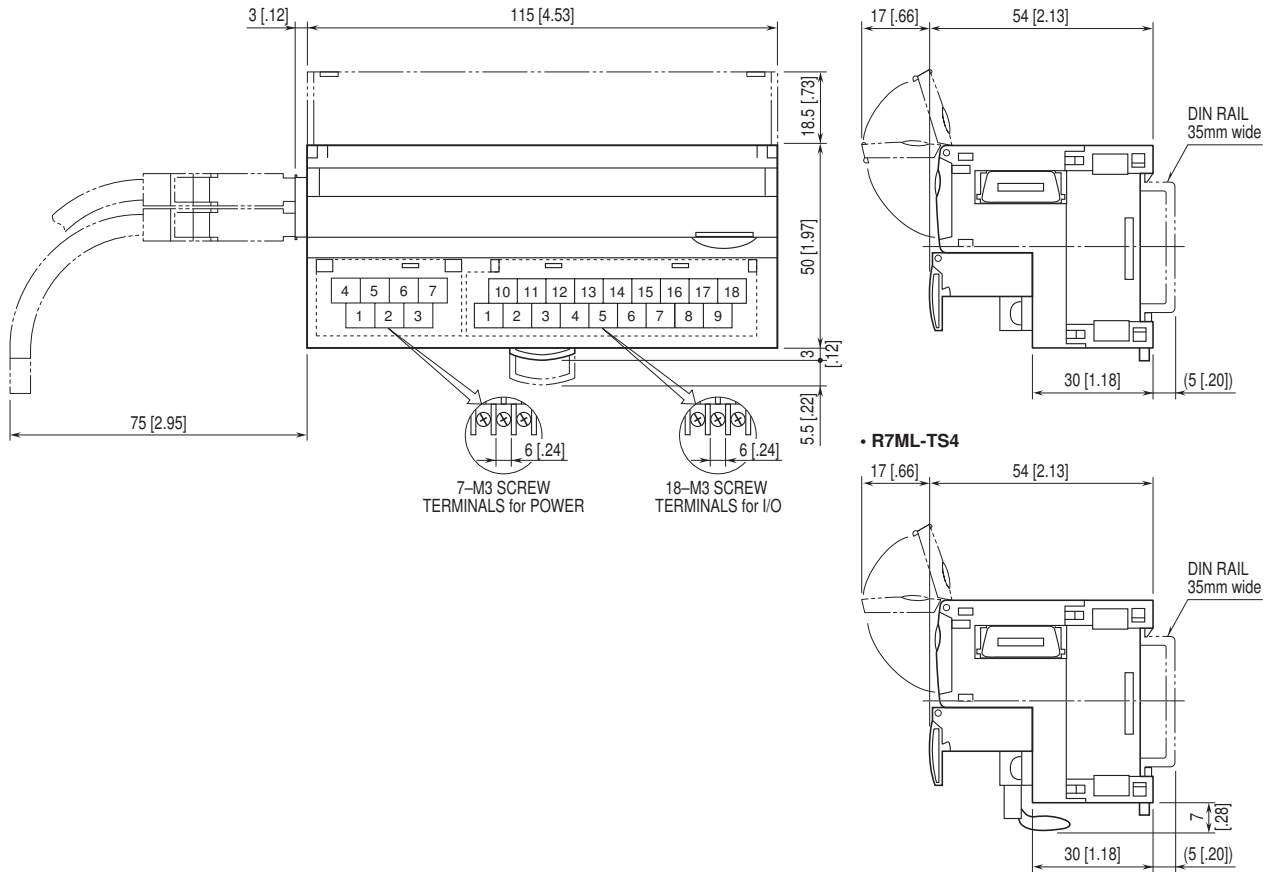
- 1) Remove the extension connector cover located at the side of the basic module.
- 2) Connect the extension module.



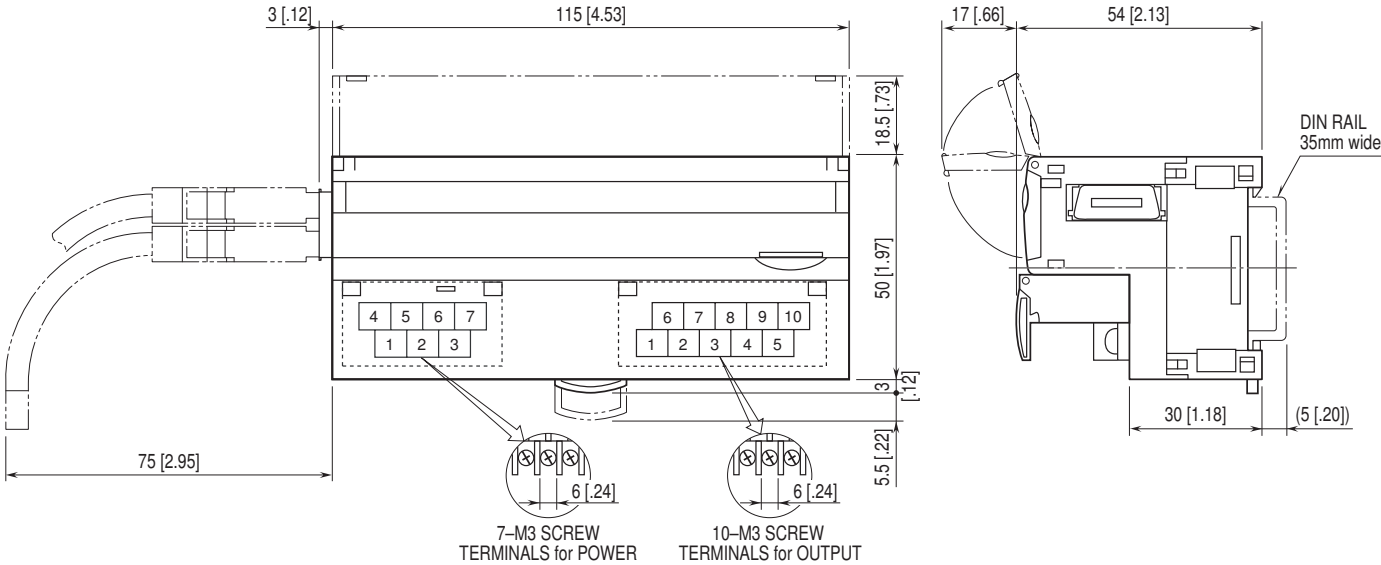
- 3) Mount the combined module on a DIN rail.

## DIMENSIONS unit: mm (inch)

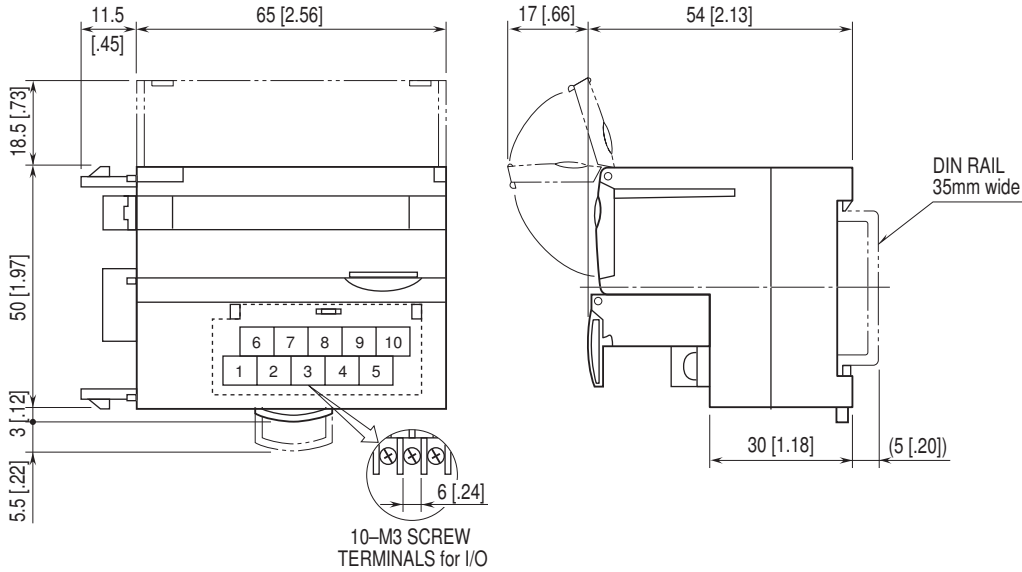
### ■ BASIC MODULE



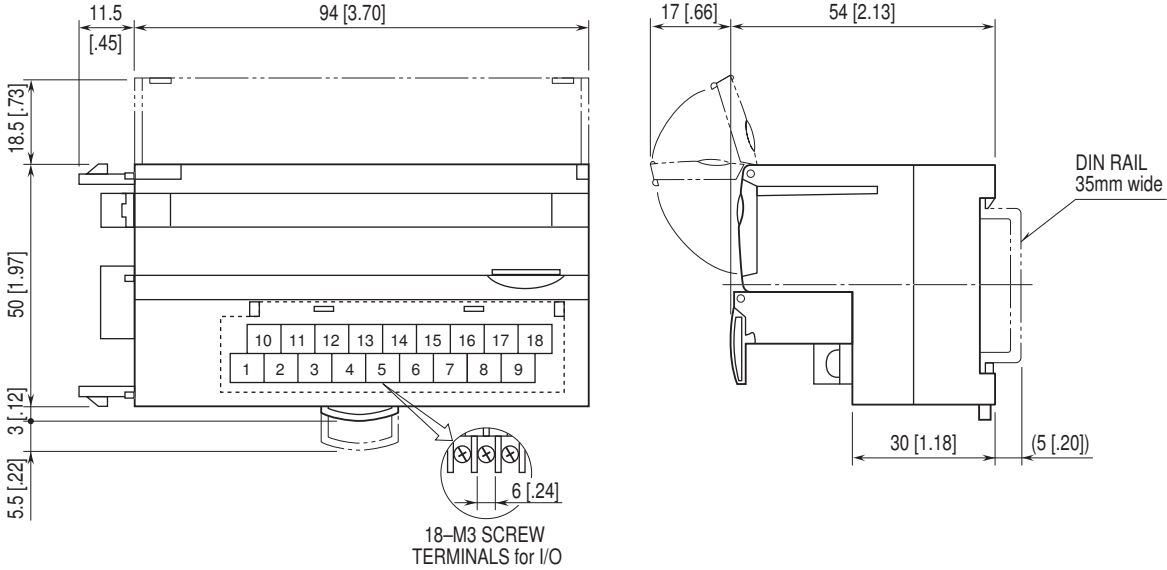
■ ANALOG OUTPUT



■ EXTENSION MODULE, 8 POINTS



■ EXTENSION MODULE, 16 POINTS



## 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

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

**Input status indicator:** LED turns ON with contact ON

**Isolation:** Input to MECHATROLINK or FG to power input

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

**ON voltage / current:**  $\geq 15$  V DC (input - COM) /  $\geq 3.5$  mA

**OFF voltage / current:**  $\leq 5$  V DC (input - COM) /  $\leq 1$  mA

**Input current:**  $\leq 5.5$  mA per point at 24 V DC

**Input resistance:** Approx. 4.4 k $\Omega$

**ON delay:**  $\leq 2.0$  msec.

**OFF delay:**  $\leq 2.0$  msec.

#### OPERATING MODE SETTING

(\*) Factory setting

Caution ! - SW1-3, 1-4, 1-5 are unused.

Be sure to turn off unused ones.

##### • 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   | $\leq 10$ msec. (*) |
| ON    | OFF   | OFF   | $\leq 1$ msec.      |
| OFF   | ON    | OFF   | $\leq 5$ msec.      |
| ON    | ON    | OFF   | $\leq 20$ msec.     |
| OFF   | OFF   | ON    | $\leq 50$ msec.     |
| ON    | OFF   | ON    | $\leq 70$ msec.     |
| OFF   | ON    | ON    | $\leq 100$ msec.    |
| ON    | ON    | ON    | $\leq 200$ msec.    |

#### TERMINAL ASSIGNMENTS

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

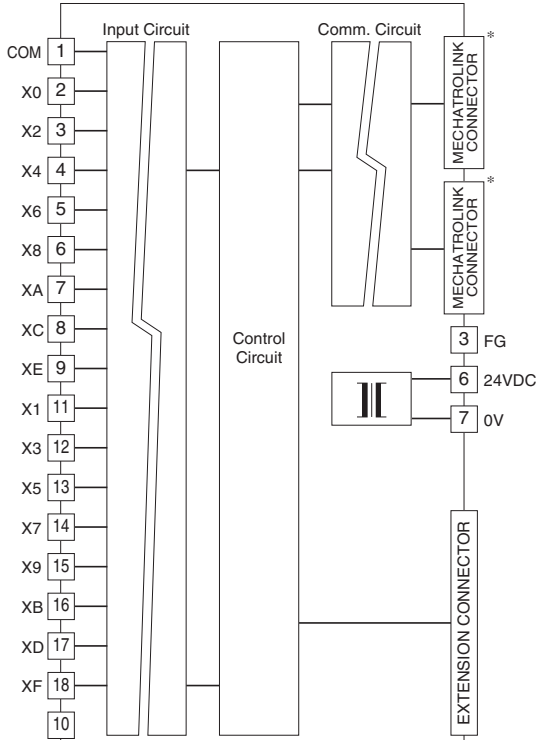
| NO. | ID  | FUNCTION | NO. | ID | FUNCTION      |
|-----|-----|----------|-----|----|---------------|
| 1   | COM | Common   | 10  | NC | No Connection |
| 2   | X0  | Input 0  | 11  | X1 | Input 1       |
| 3   | X2  | Input 2  | 12  | X3 | Input 3       |
| 4   | X4  | Input 4  | 13  | X5 | Input 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**

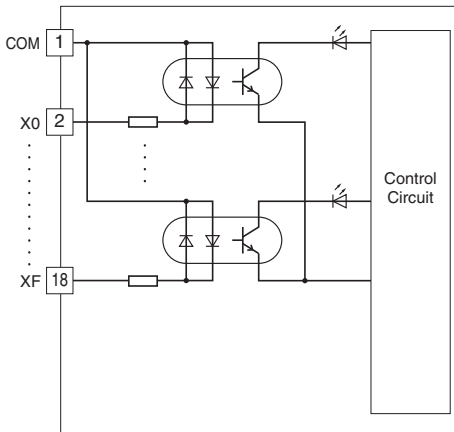
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.

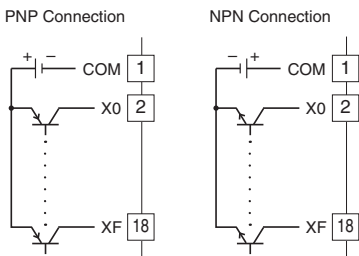


\*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

■ Input Circuit



■ Input Connection Examples



## NPN TRANSISTOR OUTPUT MODULE, 16 points

### MODEL: R7ML-DC16A

#### SPECIFICATIONS

**Common:** Negative common (NPN) per 16 points  
**Number of I/O:** Output, 16 points  
**Maximum outputs applicable at once:** No limit (at 24 V DC)  
**Output status indicator:** LED turns ON with contact ON  
**Isolation:** Output to MECHATROLINK or FG to power input  
**Rated load voltage:** 24 V DC  $\pm 10\%$   
**Rated output current:** 0.25 A per point, 2.0 A per common  
**Residual voltage:**  $\leq 1.2$  V  
**Leakage current:**  $\leq 0.1$  mA  
**ON delay:**  $\leq 0.5$  msec.  
**OFF delay:**  $\leq 1.5$  msec.  
 (When driving an inductive load, connect a diode in parallel with the load.)

#### OPERATING MODE SETTING

(\*) Factory setting  
 Caution ! - SW1-3, 1-5 through 1-8 are unused. Be sure to turn off unused ones.

##### • 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 (*)<br>(maintains the last data received normally) |

##### • 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 |

#### TERMINAL ASSIGNMENTS

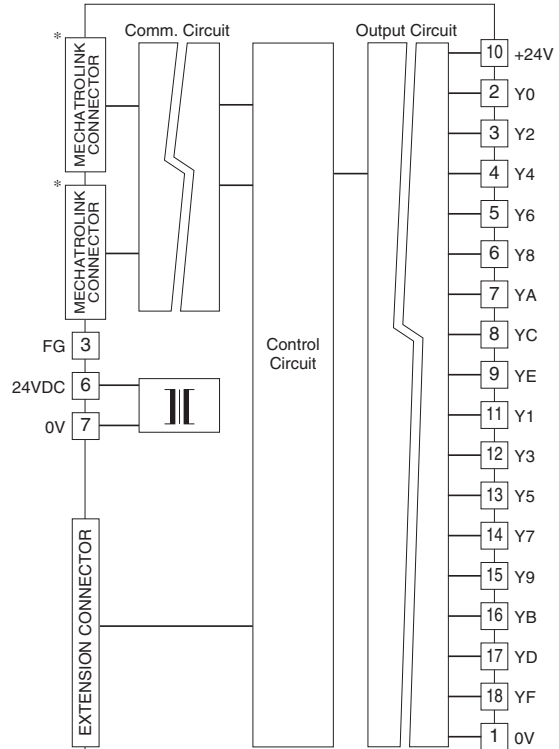
|      |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|
| 10   | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| +24V | Y1 | Y3 | Y5 | Y7 | Y9 | YB | YD | YF |
| 1    | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 0V   | Y0 | Y2 | Y4 | Y6 | Y8 | YA | YC | YE |

| NO. | ID  | FUNCTION     | NO. | ID    | FUNCTION  |
|-----|-----|--------------|-----|-------|-----------|
| 1   | 0 V | 0 V (common) | 10  | +24 V | 24 V 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

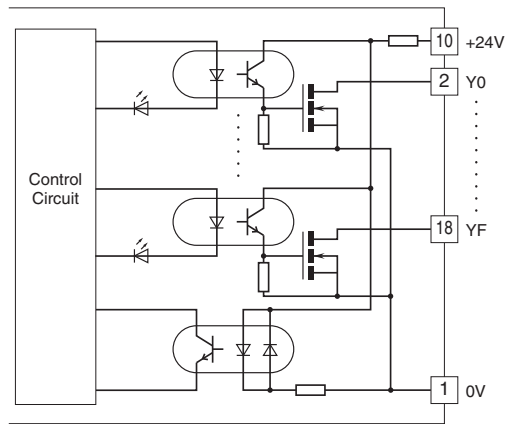
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.

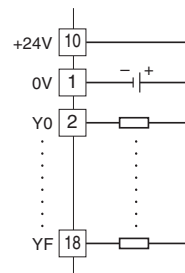


\*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

##### ■ 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  
**Maximum outputs applicable at once:** No limit (at 24 V DC)  
**Output status indicator:** LED turns ON with contact ON  
**Isolation:** Output to MECHATROLINK or FG to power input  
**Rated load voltage:** 24 V DC  $\pm 10\%$   
**Rated output current:** 0.25 A per point, 2.0 A per common  
**Residual voltage:**  $\leq 1.2$  V  
**Leakage current:**  $\leq 0.1$  mA  
**ON delay:**  $\leq 0.5$  msec.  
**OFF delay:**  $\leq 1.5$  msec.  
 (When driving an inductive load, connect a diode in parallel with the load.)

#### OPERATING MODE SETTING

(\*) Factory setting

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

##### • 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 (*)<br>(maintains the last data received normally) |

##### • 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 |

#### TERMINAL ASSIGNMENTS

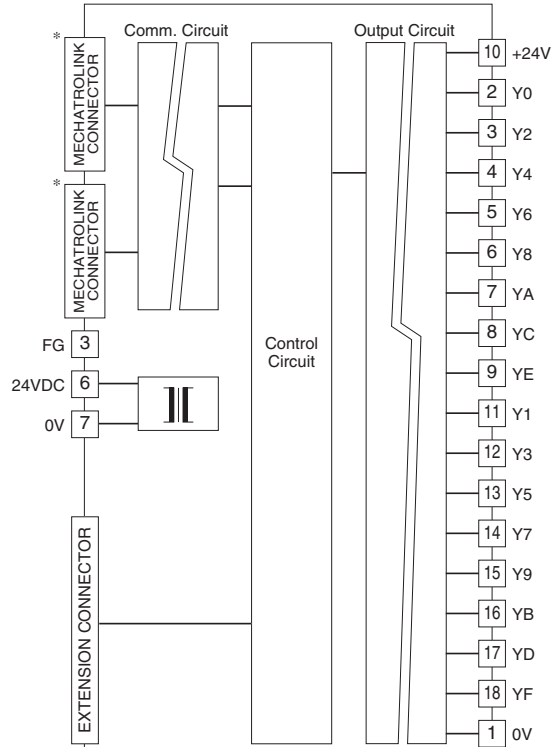
|      |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|
| 10   | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| +24V | Y1 | Y3 | Y5 | Y7 | Y9 | YB | YD | YF |
| 1    | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 0V   | Y0 | Y2 | Y4 | Y6 | Y8 | YA | YC | YE |

| NO. | ID  | FUNCTION  | NO. | ID    | FUNCTION         |
|-----|-----|-----------|-----|-------|------------------|
| 1   | 0 V | 0 V       | 10  | +24 V | 24 V 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

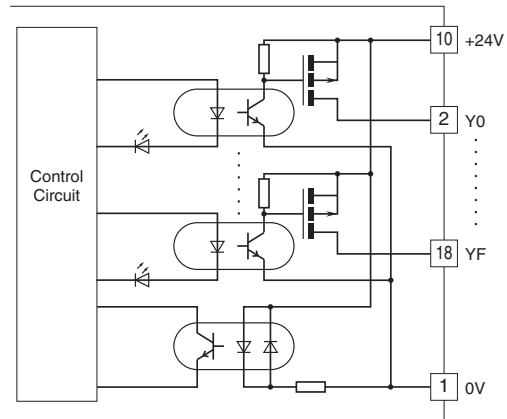
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.

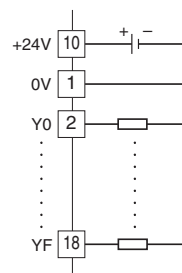


\*MECHATROLINK connectors are internally connected. The network cable can be connected to either one.

##### ■ Output Circuit



##### ■ Output Connection Example



## PNP TRANSISTOR OUTPUT MODULE, 16 points

(shortcircuit protection)

### MODEL: R7ML-DC16D

### SPECIFICATIONS

**Common:** Positive common (PNP) per 16 points

**Number of I/O:** Output, 16 points

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

**Output status indicator:** LED turns ON with contact ON

**Isolation:** Output to MECHATROLINK or FG to power input

**Rated load voltage**

**Nominal:** 19.2 to 30 V DC

**Absolute:** 15 to 45 V DC

**Rated output current:** 0.25 A per point, 2.0 A per common

**Residual voltage:**  $\leq 2.0$  V

**Leakage current:**  $\leq 0.3$  mA (24 V DC load, all points OFF)

**ON delay:**  $\leq 0.5$  msec.

**OFF delay:**  $\leq 1.5$  msec.

**Shortcircuit protection:** Works for 0.7 A or more;

automatically resets after recovery

(When driving an inductive load, connect a diode in parallel with the load.)

### OPERATING MODE SETTING

(\*) Factory setting

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

#### • 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 (*)<br>(maintains the last data received normally) |  |

#### • 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 |

### TERMINAL ASSIGNMENTS

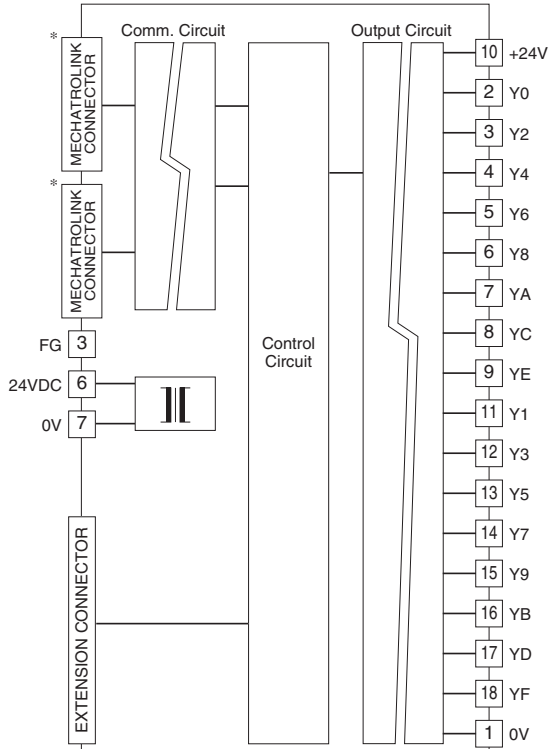
|      |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|
| 10   | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| +24V | Y1 | Y3 | Y5 | Y7 | Y9 | YB | YD | YF |
| 1    | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 0V   | Y0 | Y2 | Y4 | Y6 | Y8 | YA | YC | YE |

| NO. | ID  | FUNCTION  | NO. | ID    | FUNCTION         |
|-----|-----|-----------|-----|-------|------------------|
| 1   | 0 V | 0 V       | 10  | +24 V | 24 V 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**

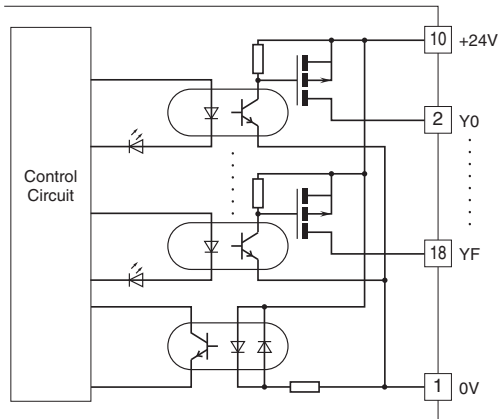
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.

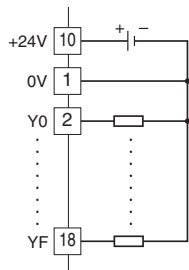


\*MECHATROLINK connectors are internally connected.  
The network cable can be connected to either one.

■ Output Circuit



■ Output Connection Example



## DC VOLTAGE/CURRENT INPUT MODULE, 4 points

### MODEL: R7ML-SV4

#### SPECIFICATIONS

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

**Converted data range:** 0 - 10000 of the input range

• **Input range**

**Wide span voltage:** -10 - +10 V DC, -5 - +5 V DC, 0 - 10 V DC, 0 - 5 V DC, 1 - 5 V DC

**Narrow span voltage:** -1 - +1 V DC, 0 - 1 V DC, -0.5 - +0.5 V DC

**Current range:** -20 - +20 mA DC, 0 - 20 mA DC, 4 - 20 mA DC

• **Input resistance**

**Wide span voltage:**  $\geq 1 \text{ M}\Omega$

**Narrow span voltage:**  $\geq 100 \text{ k}\Omega$

**Current range:**  $70 \Omega$

**Conversion rate / conversion accuracy:**

10 msec./ $\pm 0.8 \%$ , 20 msec./ $\pm 0.4 \%$ , 40 msec./ $\pm 0.2 \%$ , 80 msec./ $\pm 0.1 \%$

**Response time:** Conversion rate  $\times 2 + 50$  msec. (0 - 90 %)

**Temperature coefficient:**  $\pm 0.015 \%/^{\circ}\text{C}$  ( $\pm 0.008 \%/^{\circ}\text{F}$ )

#### OPERATING MODE SETTING

(\*) Factory setting

• **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 - +10 V DC (*)      |
| ON    | OFF   | OFF   | OFF   | -5 - +5 V DC            |
| OFF   | ON    | OFF   | OFF   | -1 - +1 V DC            |
| ON    | ON    | OFF   | OFF   | 0 - 10 V DC             |
| OFF   | OFF   | ON    | OFF   | 0 - 5 V DC              |
| ON    | OFF   | ON    | OFF   | 1 - 5 V DC              |
| OFF   | ON    | ON    | OFF   | 0 - 1V DC               |
| ON    | ON    | ON    | OFF   | -0.5 - +0.5 V DC        |
| ON    | OFF   | OFF   | ON    | -20 - +20 mA DC         |
| OFF   | ON    | OFF   | ON    | 4 - 20 mA DC            |
| ON    | ON    | OFF   | ON    | 0 - 20 mA DC            |
| ON    | ON    | ON    | ON    | PC Configurator setting |

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

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

• **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 |

#### TERMINAL ASSIGNMENTS

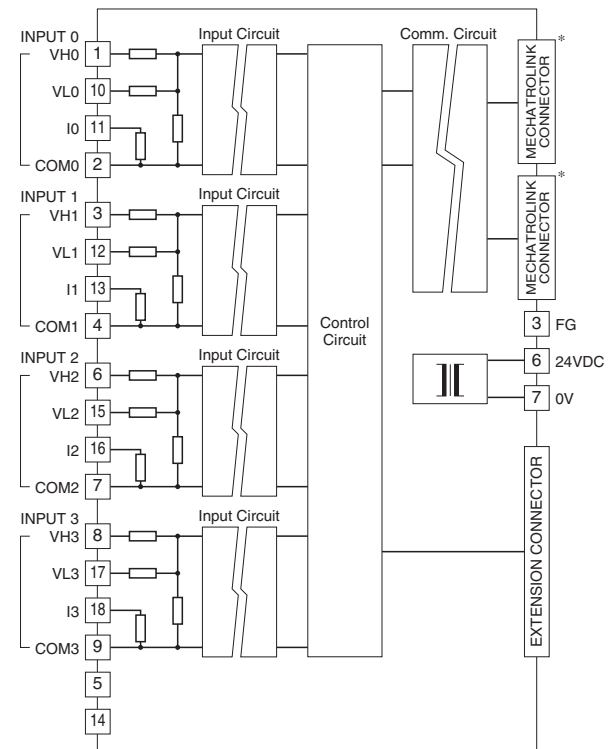
|     |      |     |      |    |     |      |     |      |
|-----|------|-----|------|----|-----|------|-----|------|
| 10  | 11   | 12  | 13   | 14 | 15  | 16   | 17  | 18   |
| VL0 | I0   | VL1 | I1   | NC | VL2 | I2   | VL3 | I3   |
| 1   | 2    | 3   | 4    | 5  | 6   | 7    | 8   | 9    |
| VH0 | COM0 | VH1 | COM1 | NC | VH2 | COM2 | VH3 | COM3 |

| 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

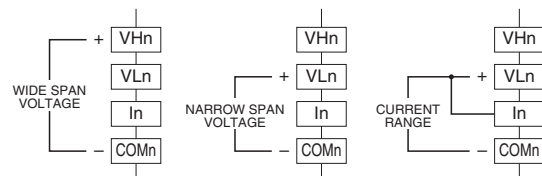
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.



\*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

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

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

**Thermocouple:** K, E, J, T, B, R, S, C, N, U, L, P, PR

**Input resistance:** ≥ 30 kΩ

**Burnout sensing:** ≤ 0.1 μA

**Conversion accuracy:** ±1°C (±1.8°F);

±2.0°C (±3.6°F) 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 (±0.008 %/°F) of max. span

**CJC error:** ±1.0°C at 25°C ±10°C

(±1.8°F at 77°F ±18°F)

±1.5°C (±2.7°F) for R, S, PR

| T/C             | BURNOUT INDICATION (°C) |         | CONFORMANCE RANGE (°C) |
|-----------------|-------------------------|---------|------------------------|
|                 | Downscale               | Upscale |                        |
| K (CA)          | -272                    | +1472   | -150 to +1370          |
| E (CRC)         | -272                    | +1120   | -170 to +1000          |
| J (IC)          | -260                    | +1300   | -180 to +1200          |
| T (CC)          | -272                    | + 500   | -170 to + 400          |
| B (RH)          | 24                      | 1920    | 1000 to 1760           |
| R               | -100                    | +1860   | 380 to 1760            |
| S               | -100                    | +1860   | 400 to 1760            |
| C (WRe 5-26)    | -52                     | +2416   | 100 to 2315            |
| N               | -272                    | +1400   | -130 to +1300          |
| U               | -252                    | + 700   | -200 to +600           |
| L               | -252                    | +1000   | -200 to +900           |
| P (Platinel II) | -52                     | +1496   | 0 to 1395              |
| (PR)            | -52                     | +1860   | 300 to 1760            |

| T/C             | BURNOUT INDICATION (°F) |         | CONFORMANCE RANGE (°F) |
|-----------------|-------------------------|---------|------------------------|
|                 | Downscale               | Upscale |                        |
| K (CA)          | -458                    | +2682   | -238 to +2498          |
| E (CRC)         | -458                    | +2048   | -274 to +1832          |
| J (IC)          | -436                    | +2372   | -292 to +2192          |
| T (CC)          | -458                    | +932    | -274 to +752           |
| B (RH)          | 75                      | 3488    | 1832 to 3200           |
| R               | -148                    | +3380   | 716 to 3200            |
| S               | -148                    | +3380   | 752 to 3200            |
| C (WRe 5-26)    | -62                     | +4381   | 212 to 4199            |
| N               | -458                    | +2552   | -202 to +2372          |
| U               | -422                    | +1292   | -328 to +1112          |
| L               | -422                    | +1832   | -328 to +1652          |
| P (Platinel II) | -62                     | +2725   | 32 to 2543             |
| (PR)            | -62                     | +3380   | 572 to 3200            |

#### OPERATING MODE SETTING

(\*) Factory setting

##### • 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 |

##### • Conversion Rate (SW1-3)

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

##### • Burnout (SW1-4)

| SW1-4 | Burnout     |
|-------|-------------|
| OFF   | Upscale (*) |
| ON    | Downscale   |

##### • Extension (SW1-1, 1-2)

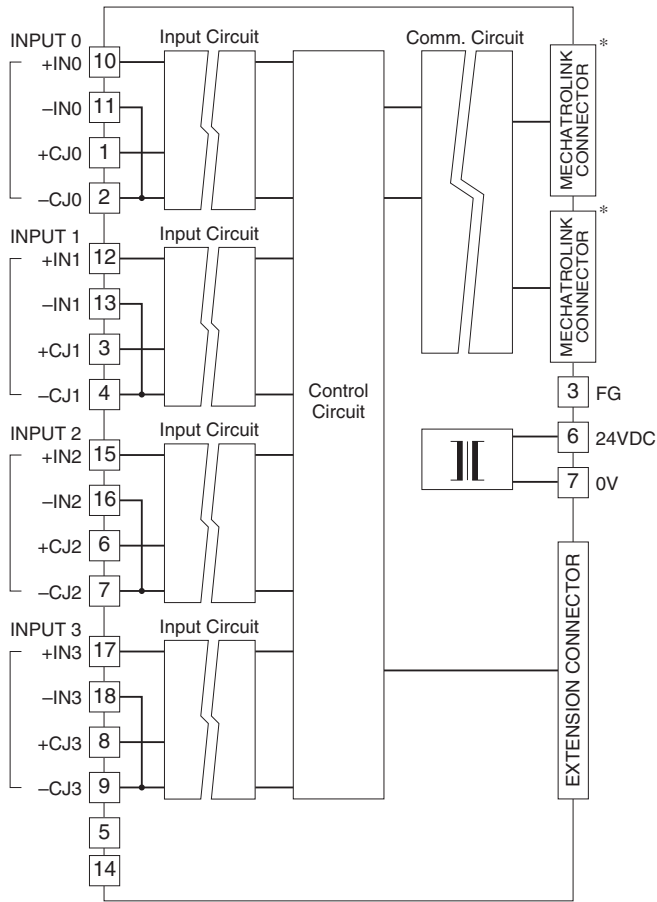
| SW1-1 | SW1-2 | Extension                       |
|-------|-------|---------------------------------|
| OFF   | OFF   | No extension (*)                |
| ON    | OFF   | Discrete input, 8 or 16 points  |
| OFF   | ON    | Discrete output, 8 or 16 points |

#### TERMINAL ASSIGNMENTS

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

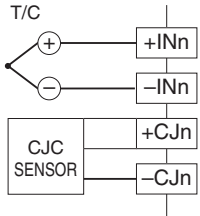
| NO. | ID   | FUNCTION      | NO. | ID   | FUNCTION      |
|-----|------|---------------|-----|------|---------------|
| 1   | +CJ0 | CJC + 0       | 10  | +IN0 | T/C + 0       |
| 2   | -CJ0 | CJC - 0       | 11  | -IN0 | T/C - 0       |
| 3   | +CJ1 | CJC + 1       | 12  | +IN1 | T/C + 1       |
| 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

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

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

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

**Sensing current:** ≤ 1 mA

**Input resistance:** ≥ 1 MΩ

**Maximum leadwire resistance:** 100 Ω per wire

**Conversion accuracy:** ±1°C (±1.8°F);

±3°C (±5.4°F) for Cu 10

**Conversion rate:** 250 msec. or 1 sec.

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

**Temperature coefficient:** ±0.015 %/°C (±0.008 %/°F) of max. span

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

| RTD                   | BURNOUT INDICATION (°F) |         | CONFORMANCE RANGE (°F) |
|-----------------------|-------------------------|---------|------------------------|
|                       | Downscale               | Upscale |                        |
| Pt 100 (JIS '97, IEC) | -400                    | +1652   | -328 to +1562          |
| Pt 100 (JIS '89)      | -400                    | +1652   | -328 to +1220          |
| JPt 100 (JIS '89)     | -393                    | +1040   | -328 to +950           |
| Pt 50 Ω (JIS '81)     | -393                    | +1292   | -328 to +1200          |
| Ni 100                | -148                    | +486    | -112 to +482           |
| Cu 10 @ 25°C          | -350                    | +594    | -58 to +482            |
| Cu 50                 | -148                    | +392    | -58 to +302            |

#### OPERATING MODE SETTING

(\*) 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 Ω (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   |

##### • Conversion Rate (SW1-3)

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

##### • Burnout (SW1-4)

| SW1-4 | Burnout     |
|-------|-------------|
| OFF   | Upscale (*) |
| ON    | Downscale   |

##### • Extension (SW1-1, 1-2)

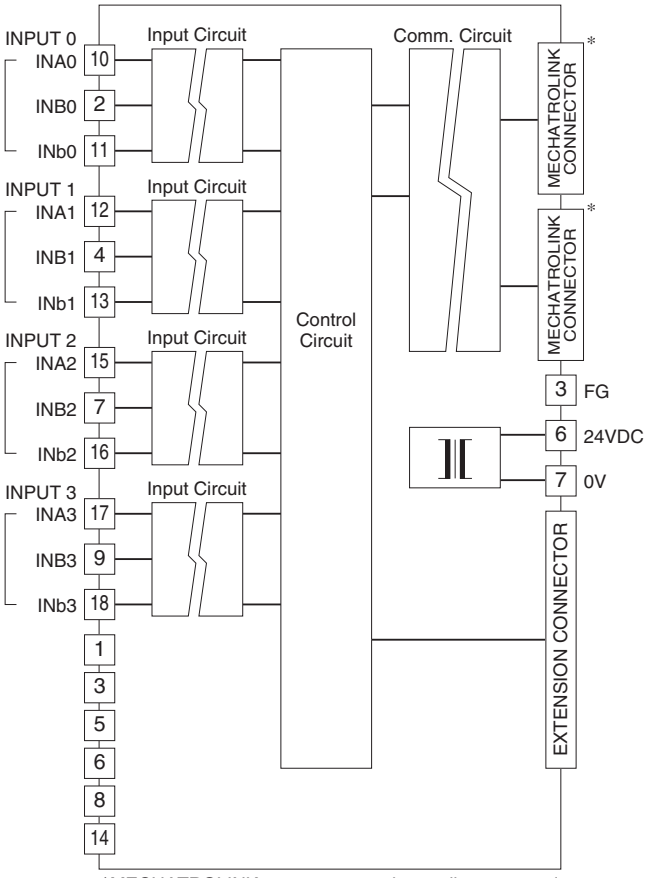
| SW1-1 | SW1-2 | Extension                       |
|-------|-------|---------------------------------|
| OFF   | OFF   | No extension (*)                |
| ON    | OFF   | Discrete input, 8 or 16 points  |
| OFF   | ON    | Discrete output, 8 or 16 points |

#### TERMINAL ASSIGNMENTS

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

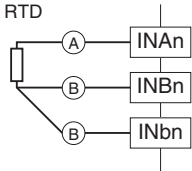
| NO. | ID   | FUNCTION      | NO. | ID   | FUNCTION      |
|-----|------|---------------|-----|------|---------------|
| 1   | NC   | No connection | 10  | INA0 | RTD 0-A       |
| 2   | INB0 | RTD 0-B       | 11  | INb0 | RTD 0-b       |
| 3   | NC   | No connection | 12  | INA1 | RTD 1-A       |
| 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



## STRAIN GAUGE INPUT MODULE

### MODEL: R7ML-LC2

#### SPECIFICATIONS

**Isolation:** Input 0 or monitor output 0 to input 1 or monitor output 1 to MECHATROLINK or FE to power input

##### ■ INPUT

**Excitation:** 5 V  $\pm 10\%$  or 2.5 V  $\pm 10\%$

(Input range doubled in the case of 2.5 V excitation)

Changeable with switch

**Maximum current:** max. 60 mA (Up to 4 strain gauges of 350  $\Omega$  can be connected in parallel-adding connection at 5 V excitation)

max. 100 mA (at 2.5 V excitation)

##### Input range:

Option code /R20

-2 - +2 mV/V (at 5 V excitation)

-4 - +4 mV/V (at 2.5 V excitation)

Option code /R10

-1 - +1 mV/V (at 5 V excitation)

-2 - +2 mV/V (at 2.5 V excitation)

Option code /R05

-0.5 - +0.5 mV/V (at 5 V excitation)

-1 - +1 mV/V (at 2.5 V excitation)

##### Max. Input range:

Option code /R20

-3 - +3 mV/V (at 5 V excitation)

-6 - +6 mV/V (at 2.5 V excitation)

Option code /R10

-1.5 - +1.5 mV/V (at 5 V excitation)

- 3 - +3 mV/V (at 2.5 V excitation)

Option code /R05

-0.75 - +0.75 mV/V (at 5 V excitation)

-1.5 - +1.5 mV/V (at 2.5 V excitation)

##### Zero adjustment:

Option code /R20

-1 - +1 mV/V (at 5 V excitation)

-2 - +2 mV/V (at 2.5 V excitation)

Option code /R10

-0.5 - +0.5 mV/V (at 5 V excitation)

-1 - +1 mV/V (at 2.5 V excitation)

Option code /R05

-0.25 - +0.25 mV/V (at 5 V excitation)

-0.5 - +0.5 mV/V (at 2.5 V excitation)

##### Accuracy:

Option code except /R05

$\pm 0.04\%$  (Averaging 128 samples or more)

$\pm 0.05\%$  (Averaging 64 samples)

$\pm 0.10\%$  (Averaging 8, 16, 32 samples)

$\pm 0.15\%$  (Averaging 4 samples)

$\pm 0.20\%$  (Averaging 2 samples)

Option code /R05

$\pm 0.05\%$  (Averaging 512 samples or more)

$\pm 0.10\%$  (Averaging 64, 128, 256 samples)

$\pm 0.20\%$  (Averaging 16, 32 samples)

$\pm 0.30\%$  (Averaging 2, 4, 8 samples)

##### Lowpass filter:

Approx. 2 kHz or approx. 2 Hz (option code /F2K)

Approx. 1 Hz or approx. 2 Hz (option code /F1)

##### Input delay time:

Lowpass filter 2 kHz max. 20 msec. (0 - 90%)

Lowpass filter 2 Hz max. 200 msec. (0 - 90%)

Lowpass filter 1 Hz max. 400 msec. (0 - 90%)

##### Conversion rate: min. 2000 samples/sec.

##### Resolution: 1/10000

##### Converted data range:

Input 0 / input 1: 0 - 10000 of the range from zero to span

Total input data: Sum of input 0 and input 1

##### Load coefficient: 10.00 - 100.00 (%)

##### Averaging: 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024 samples

##### Temperature coefficient: $\pm 0.015\%/^{\circ}\text{C}$ ( $\pm 0.008\%/^{\circ}\text{F}$ )

##### ■ OUTPUT

##### Output range: 0 - 10 V (for input 0 - 100 %)

##### Operational range: -115 - +115 %

##### Load resistance: $\geq 100\text{ k}\Omega$

##### Conversion accuracy: $\pm 0.1\%$

##### Output delay time: $\leq 250\text{ msec.}$ (0 - 90 %)

##### Temperature coefficient: $\pm 0.015\%/^{\circ}\text{C}$ ( $\pm 0.008\%/^{\circ}\text{F}$ )

#### PC CONFIGURATOR

The following parameters 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.

#### OPERATING MODE SETTING

(\*) Factory 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 |

##### • Lowpass Filter (SW1-3)

| SW1-3 | Lowpass filter                |
|-------|-------------------------------|
| OFF   | 2 kHz (/F2K) / 1 Hz (/F1) (*) |
| ON    | 2 Hz                          |

• **Averaging (SW1-4, 1-5, 1-6, 1-7)**

| SW1-4 | SW1-5 | SW1-6 | SW1-7 | Averaging     |
|-------|-------|-------|-------|---------------|
| OFF   | OFF   | OFF   | OFF   | 2 samples (*) |
| ON    | OFF   | OFF   | OFF   | 4 samples     |
| OFF   | ON    | OFF   | OFF   | 8 samples     |
| ON    | ON    | OFF   | OFF   | 16 samples    |
| OFF   | OFF   | ON    | OFF   | 32 samples    |
| ON    | OFF   | ON    | OFF   | 64 samples    |
| OFF   | ON    | ON    | OFF   | 128 samples   |
| ON    | ON    | ON    | OFF   | 256 samples   |
| OFF   | OFF   | OFF   | ON    | 512 samples   |
| ON    | OFF   | OFF   | ON    | 1024 samples  |

• **Excitation Voltage (SW1-8)**

| SW1-8 | Excitation Voltage |
|-------|--------------------|
| OFF   | 5V (*)             |
| ON    | 2.5V               |

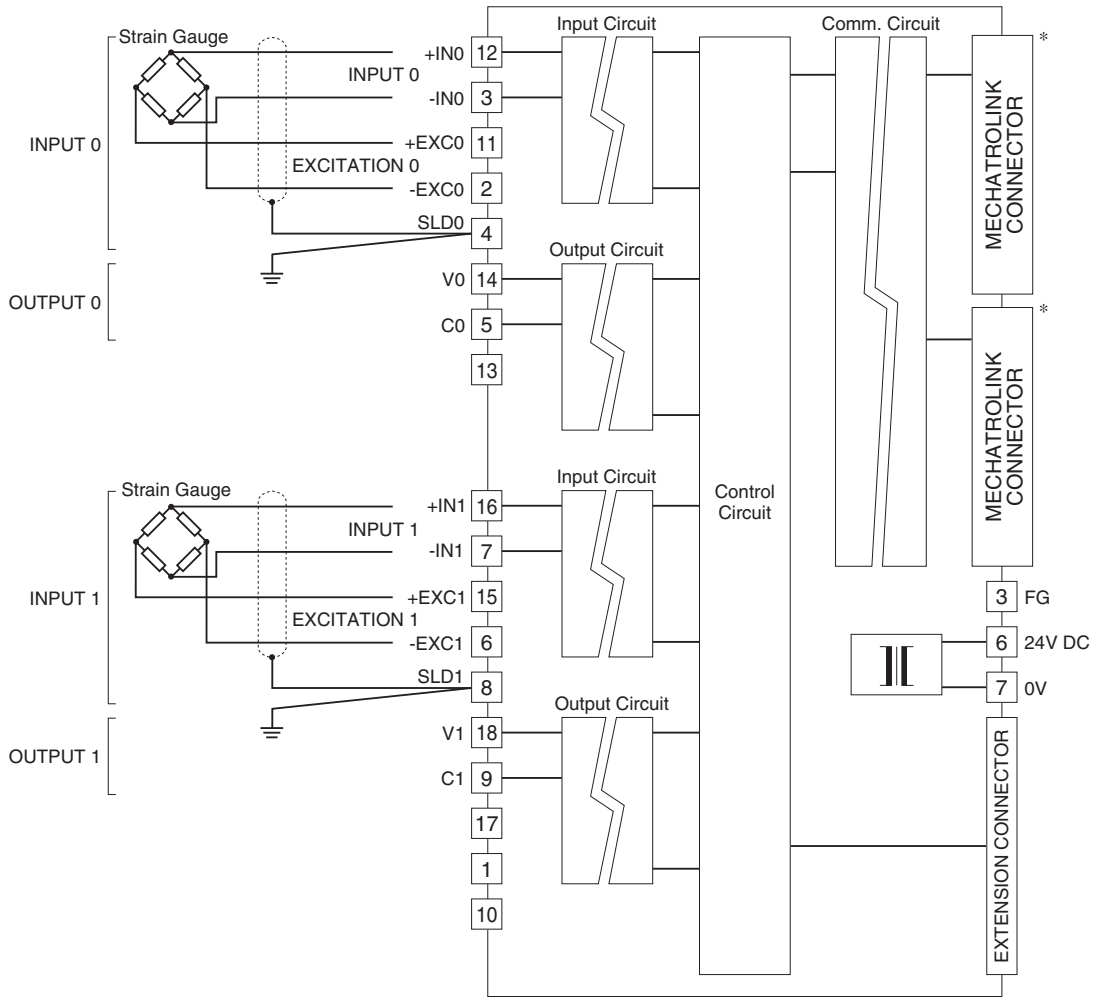
## TERMINAL ASSIGNMENTS

|          |             |            |           |          |             |            |           |          |
|----------|-------------|------------|-----------|----------|-------------|------------|-----------|----------|
| 10<br>NC | 11<br>+EXC0 | 12<br>+IN0 | 13<br>NC  | 14<br>V0 | 15<br>+EXC1 | 16<br>+IN1 | 17<br>NC  | 18<br>V1 |
| 1<br>NC  | 2<br>-EXC0  | 3<br>-IN0  | 4<br>SLD0 | 5<br>C0  | 6<br>-EXC1  | 7<br>-IN1  | 8<br>SLD1 | 9<br>C1  |

| NO. | ID    | FUNCTION          | NO. | ID    | FUNCTION          |
|-----|-------|-------------------|-----|-------|-------------------|
| 1   | NC    | No connection     | 10  | NC    | No connection     |
| 2   | -EXC0 | Excitation 0-     | 11  | +EXC0 | Excitation 0+     |
| 3   | -IN0  | Input 0-          | 12  | +IN0  | Input 0+          |
| 4   | SLD0  | Shield 0          | 13  | NC    | No connection     |
| 5   | C0    | Voltage output 0- | 14  | V0    | Voltage output 0+ |
| 6   | -EXC1 | Excitation 1-     | 15  | +EXC1 | Excitation 1+     |
| 7   | -IN1  | Input 1-          | 16  | +IN1  | Input 1+          |
| 8   | SLD1  | Shield 1          | 17  | NC    | No connection     |
| 9   | C1    | Voltage output 1- | 18  | V1    | Voltage output 1+ |

**SCHEMATIC CIRCUITRY**

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



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

## DC VOLTAGE OUTPUT MODULE, 2 points

### MODEL: R7ML-YV2

#### SPECIFICATIONS

**Isolation:** Output 0 to output 1 to MECHATROLINK or FG to power input

**Converted data range:** 0 - 10000 of the output range

**Output range**

**Wide span voltage:** -10 - +10 V DC, -5 - +5 V DC, 0 - 10 V DC, 0 - 5 V DC, 1 - 5 V DC

**Narrow span voltage:** -1 - +1 V DC, 0 - 1 V DC, -0.5 - +0.5 V DC

**Operational range:** -15 - +115 % of the output range (except -10 - +10 V DC);

approx. -11.5 - +11.5 V DC (-10 - +10 V DC)

**Load resistance:**  $\geq 100 \text{ k}\Omega$

**Conversion accuracy:**  $\pm 0.1 \%$

**Response time:** 250 msec. (0 - 90 %)

**Temperature coefficient:**  $\pm 0.015 \%/^{\circ}\text{C}$  ( $\pm 0.008 \%/^{\circ}\text{F}$ )

#### OPERATING MODE SETTING

(\*) Factory setting

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

##### • 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 - +10 V DC (*)      |
| ON    | OFF   | OFF   | OFF   | -5 - +5 V DC            |
| OFF   | ON    | OFF   | OFF   | -1 - +1 V DC            |
| ON    | ON    | OFF   | OFF   | 0 - 10 V DC             |
| OFF   | OFF   | ON    | OFF   | 0 - 5 V DC              |
| ON    | OFF   | ON    | OFF   | 1 - 5 V DC              |
| OFF   | ON    | ON    | OFF   | 0 - 1 V DC              |
| ON    | ON    | ON    | OFF   | -0.5 - +0.5 V DC        |
| ON    | ON    | ON    | ON    | PC Configurator setting |

##### • Output at the Loss of Communication (SW1-4)

| SW1-4 | Output at the loss of communication                                |
|-------|--|
| OFF   | Reset the output (to -15% or approx. -11.5V DC)                    |
| ON    | Hold the output (*)<br>(maintains the last data received normally) |

##### • Extension (SW1-1, 1-2)

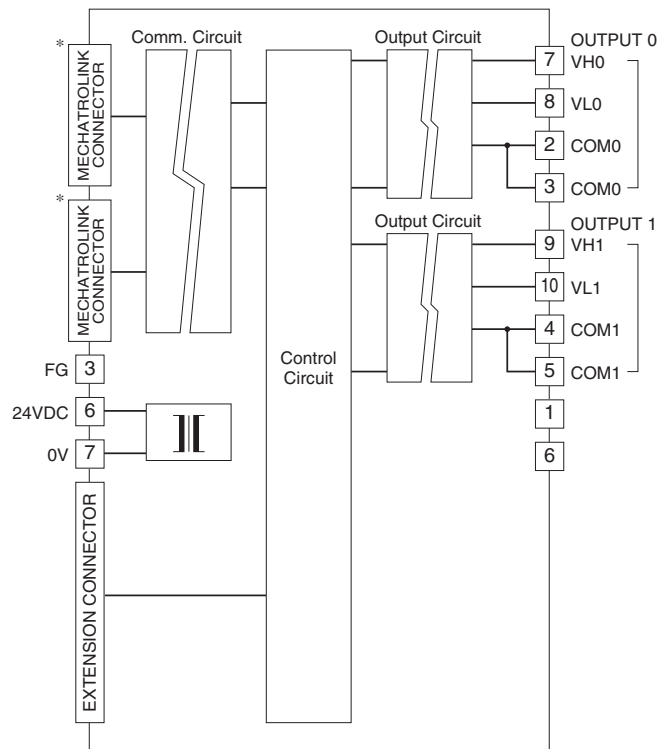
| SW1-1 | SW1-2 | Extension                       |
|-------|-------|---------------------------------|
| OFF   | OFF   | No extension (*)                |
| ON    | OFF   | Discrete input, 8 or 16 points  |
| OFF   | ON    | Discrete output, 8 or 16 points |

#### TERMINAL ASSIGNMENTS

|    |      |      |      |      |
|----|------|------|------|------|
| 6  | 7    | 8    | 9    | 10   |
| NC | VH0  | VL0  | VH1  | VL1  |
| 1  | 2    | 3    | 4    | 5    |
| NC | COM0 | COM0 | COM1 | 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

- Isolation:** Output 0 to output 1 to MECHATROLINK or FG to power input
- Converted data range:** 0 - 10000 of the output range
- Output range:** 4 - 20 mA DC
- Load resistance:** ≤ 600Ω
- Conversion accuracy:** ±0.1 %
- Response time:** 250 msec. (0 - 90 %)
- Temperature coefficient:** ±0.015 %/°C (±0.008 %/°F)

#### OPERATING MODE SETTING

(\*) Factory setting

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

##### • 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 (*)<br>(maintains the last data received normally) |

##### • Extension (SW1-1, 1-2)

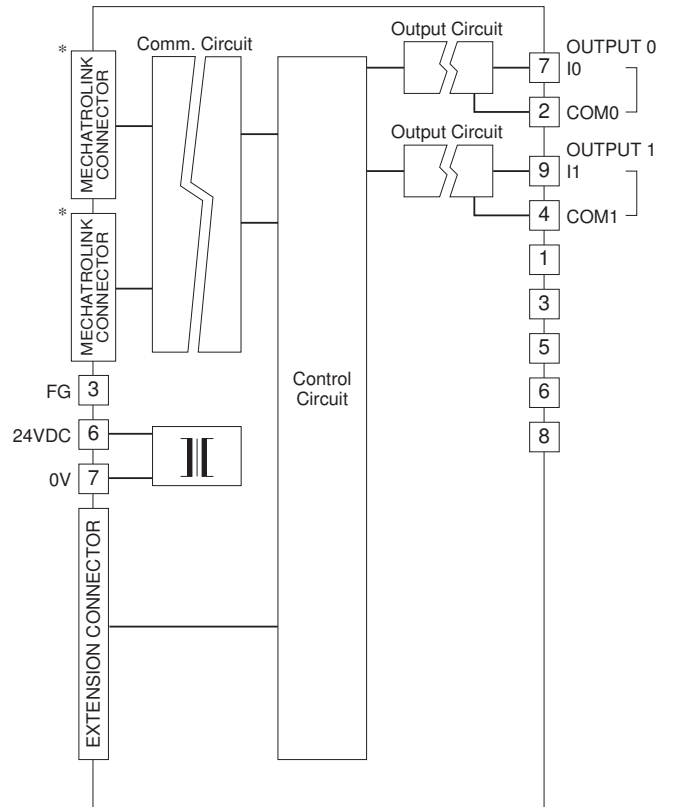
|       |       |                                 |
|-------|-------|---------------------------------|
| SW1-1 | SW1-2 | Extension                       |
| OFF   | OFF   | No extension (*)                |
| ON    | OFF   | Discrete input, 8 or 16 points  |
| OFF   | ON    | Discrete output, 8 or 16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

#### TERMINAL ASSIGNMENTS

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

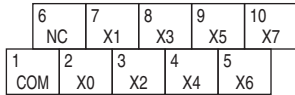
## CIRCUIT DIAGRAM

### MODEL: R7ML-EA8

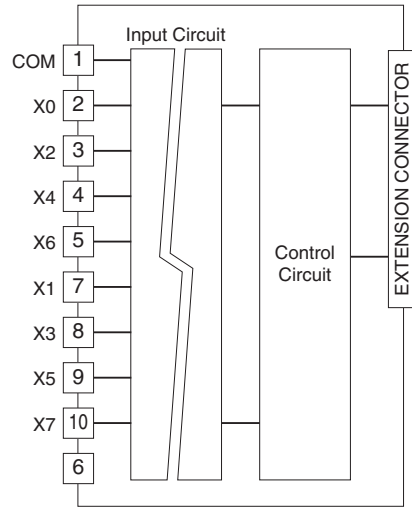
### SPECIFICATIONS

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

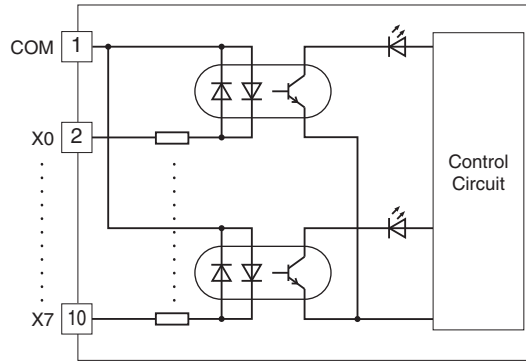
### TERMINAL ASSIGNMENTS



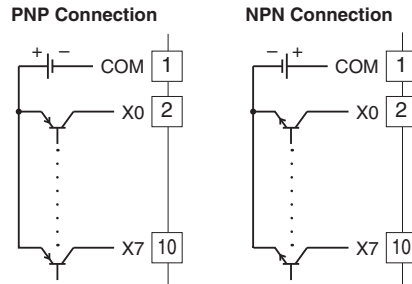
| NO. | ID  | FUNCTION | NO. | ID | FUNCTION      |
|-----|-----|----------|-----|----|---------------|
| 1   | COM | Common   | 6   | NC | No Connection |
| 2   | X0  | Input 0  | 7   | X1 | Input 1       |
| 3   | X2  | Input 2  | 8   | X3 | Input 3       |
| 4   | X4  | Input 4  | 9   | X5 | Input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



#### Input Circuit



#### Input Connection Examples





## DISCRETE INPUT EXTENSION MODULE, 16 points

## CIRCUIT DIAGRAM

### MODEL: R7ML-EA16

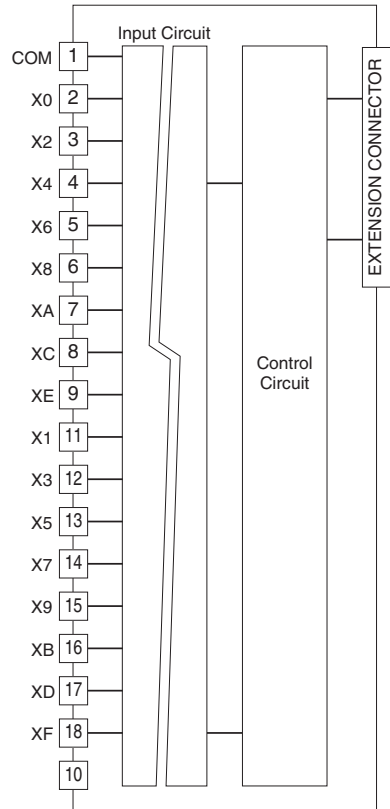
### SPECIFICATIONS

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

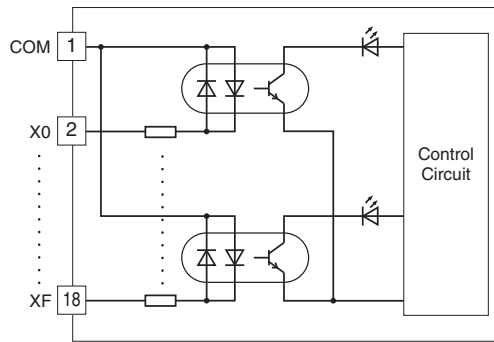
### TERMINAL ASSIGNMENTS

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

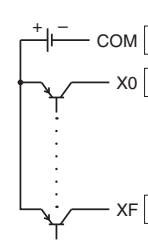


#### Input Circuit

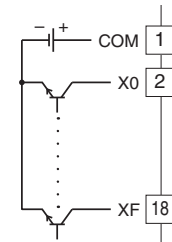


#### Input Connection Examples

##### PNP Connection



##### NPN Connection



**NPN TRANSISTOR OUTPUT EXTENSION MODULE, 8 points**

**CIRCUIT DIAGRAM**

**MODEL: R7ML-EC8A**

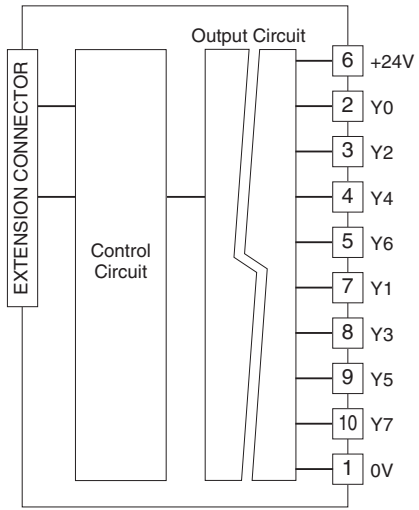
**SPECIFICATIONS**

- Common:** Negative common (NPN) per 8 points
  - Number of I/O:** Output, 8 points
  - Maximum outputs applicable at once:** No limit (at 24 V DC)
  - Output status indicator:** LED turns ON with contact ON
  - Isolation:** Output to internal circuits
  - Rated load voltage:** 24 V DC  $\pm 10\%$
  - Rated output current:** 0.25 A per point, 2.0 A per common
  - Residual voltage:**  $\leq 1.2$  V
  - Leakage current:**  $\leq 0.1$  mA
  - ON delay:**  $\leq 0.5$  msec.
  - OFF delay:**  $\leq 1.5$  msec.
- (When driving an inductive load, connect a diode in parallel with the load.)

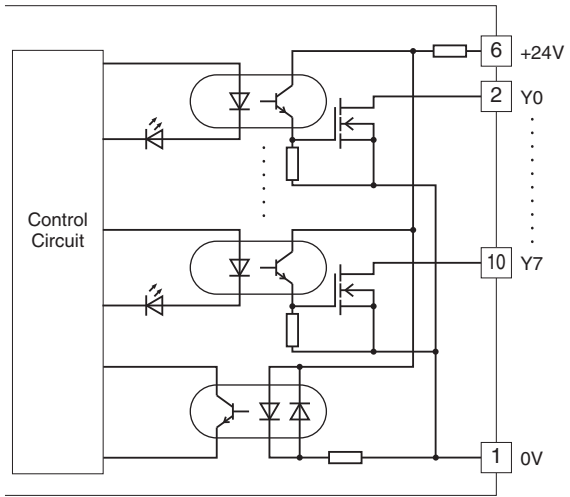
**TERMINAL ASSIGNMENTS**



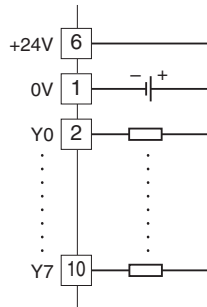
| NO. | ID  | FUNCTION     | NO. | ID    | FUNCTION |
|-----|-----|--------------|-----|-------|----------|
| 1   | 0 V | 0 V (common) | 6   | +24 V | 24 V DC  |
| 2   | Y0  | Output 0     | 7   | Y1    | Output 1 |
| 3   | Y2  | Output 2     | 8   | Y3    | Output 3 |
| 4   | Y4  | Output 4     | 9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



■ Output Circuit



■ Output Connection Example



**NPN TRANSISTOR OUTPUT EXTENSION MODULE, 16 points**

**CIRCUIT DIAGRAM**

**MODEL: R7ML-EC16A**

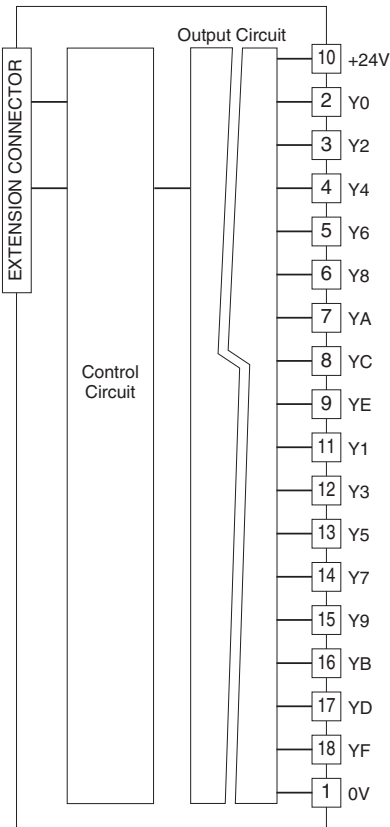
**SPECIFICATIONS**

- Common:** Negative common (NPN) per 16 points
- Number of I/O:** Output, 16 points
- Maximum outputs applicable at once:** No limit (at 24 V DC)
- Output status indicator:** LED turns ON with contact ON
- Isolation:** Output to internal circuits
- Rated load voltage:** 24 V DC  $\pm 10\%$
- Rated output current:** 0.25 A per point, 2.0 A per common
- Residual voltage:**  $\leq 1.2$  V
- Leakage current:**  $\leq 0.1$  mA
- ON delay:**  $\leq 0.5$  msec.
- OFF delay:**  $\leq 1.5$  msec.
- (When driving an inductive load, connect a diode in parallel with the load.)

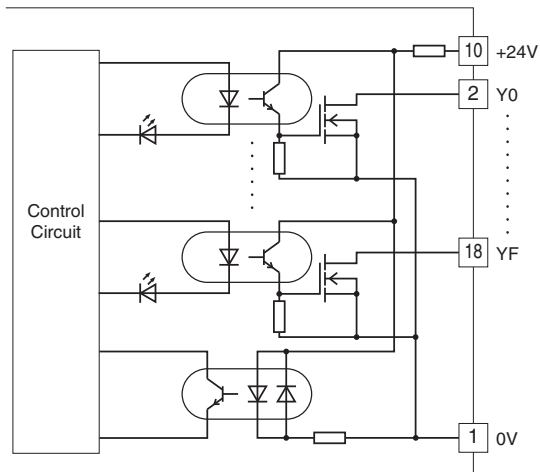
**TERMINAL ASSIGNMENTS**

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

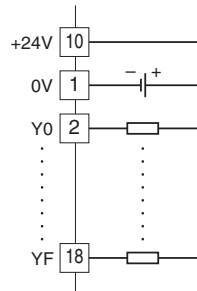
| NO. | ID  | FUNCTION     | NO. | ID    | FUNCTION  |
|-----|-----|--------------|-----|-------|-----------|
| 1   | 0 V | 0 V (common) | 10  | +24 V | 24 V DC   |
| 2   | Y0  | Output 0     | 11  | Y1    | Output 1  |
| 3   | Y2  | Output 2     | 12  | Y3    | Output 3  |
| 4   | Y4  | Output 4     | 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 |



■ Output Circuit



■ Output Connection Example



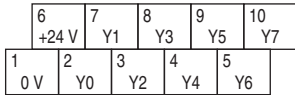
**PNP TRANSISTOR OUTPUT EXTENSION MODULE, 8 points**

**MODEL: R7ML-EC8B**

**SPECIFICATIONS**

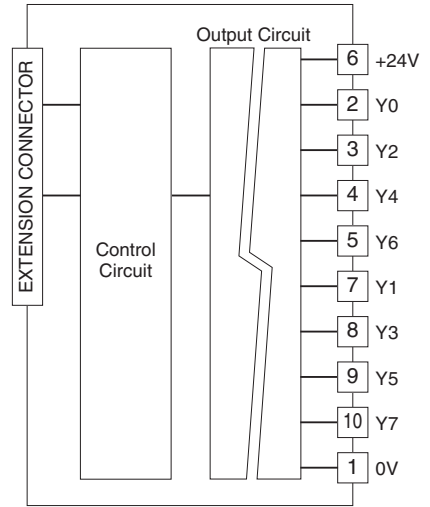
- Common:** Positive common (PNP) per 8 points
  - Number of I/O:** Output, 8 points
  - Maximum outputs applicable at once:** No limit (at 24 V DC)
  - Output status indicator:** LED turns ON with contact ON
  - Isolation:** Output to internal circuits
  - Rated load voltage:** 24 V DC  $\pm 10\%$
  - Rated output current:** 0.25 A per point, 2.0 A per common
  - Residual voltage:**  $\leq 1.2$  V
  - Leakage current:**  $\leq 0.1$  mA
  - ON delay:**  $\leq 0.5$  msec.
  - OFF delay:**  $\leq 1.5$  msec.
- (When driving an inductive load, connect a diode in parallel with the load.)

**TERMINAL ASSIGNMENTS**

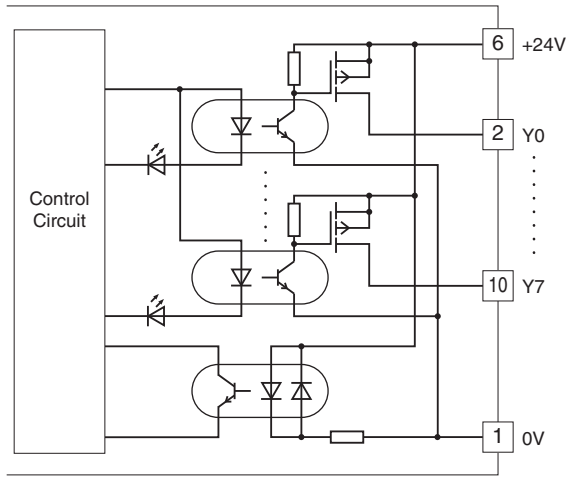


| NO. | ID  | FUNCTION | NO. | ID    | FUNCTION         |
|-----|-----|----------|-----|-------|------------------|
| 1   | 0 V | 0 V      | 6   | +24 V | 24 V DC (common) |
| 2   | Y0  | Output 0 | 7   | Y1    | Output 1         |
| 3   | Y2  | Output 2 | 8   | Y3    | Output 3         |
| 4   | Y4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

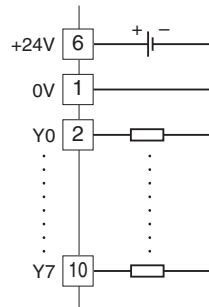
**CIRCUIT DIAGRAM**



■ Output Circuit



■ Output Connection Example



**PNP TRANSISTOR OUTPUT EXTENSION MODULE, 16 points**

**CIRCUIT DIAGRAM**

**MODEL: R7ML-EC16B**

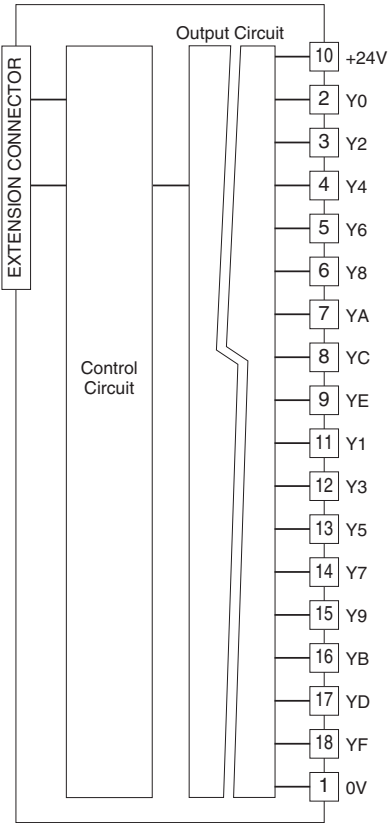
**SPECIFICATIONS**

- Common:** Positive common (PNP) per 16 points
- Number of I/O:** Output, 16 points
- Maximum outputs applicable at once:** No limit (at 24 V DC)
- Output status indicator:** LED turns ON with contact ON
- Isolation:** Output to internal circuits
- Rated load voltage:** 24 V DC  $\pm 10\%$
- Rated output current:** 0.25 A per point, 2.0 A per common
- Residual voltage:**  $\leq 1.2$  V
- Leakage current:**  $\leq 0.1$  mA
- ON delay:**  $\leq 0.5$  msec.
- OFF delay:**  $\leq 1.5$  msec.
- (When driving an inductive load, connect a diode in parallel with the load.)

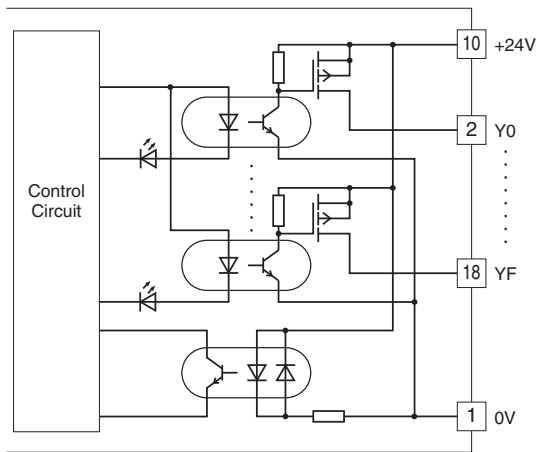
**TERMINAL ASSIGNMENTS**

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

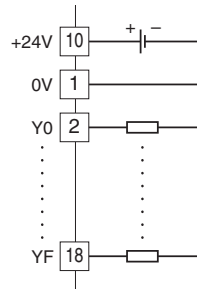
| NO. | ID  | FUNCTION  | NO. | ID    | FUNCTION         |
|-----|-----|-----------|-----|-------|------------------|
| 1   | 0 V | 0 V       | 10  | +24 V | 24 V DC (common) |
| 2   | Y0  | Output 0  | 11  | Y1    | Output 1         |
| 3   | Y2  | Output 2  | 12  | Y3    | Output 3         |
| 4   | 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        |



■ Output Circuit



■ Output Connection Example



**PNP TRANSISTOR OUTPUT EXTENSION MODULE, 8 points**  
(shortcircuit protection)

## MODEL: R7ML-EC8D

### SPECIFICATIONS

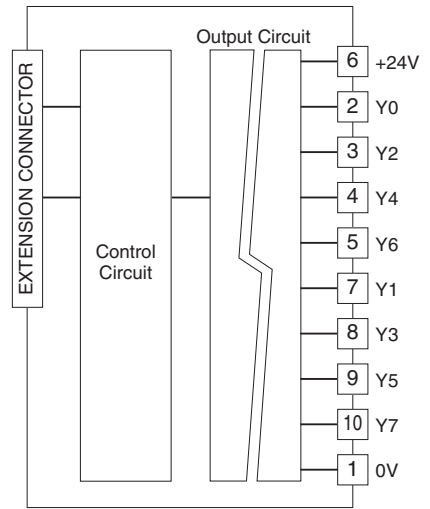
- Common:** Positive common (PNP) per 8 points
- Number of I/O:** Output, 8 points
- Maximum outputs applicable at once:** No limit (at 24 V DC)
- Output status indicator:** LED turns ON with contact ON
- Isolation:** Output to internal circuits
- Rated load voltage**
  - Nominal:** 19.2 to 30 V DC
  - Absolute:** 15 to 45 V DC
- Rated output current:** 0.25 A per point, 2.0 A per common
- Residual voltage:**  $\leq 2.0$  V
- Leakage current:**  $\leq 0.3$  mA (24 V DC load, all points OFF)
- ON delay:**  $\leq 0.5$  msec.
- OFF delay:**  $\leq 1.5$  msec.
- Shortcircuit protection:** Works for 0.7 A or more; automatically resets after recovery (When driving an inductive load, connect a diode in parallel with the load.)

### TERMINAL ASSIGNMENTS

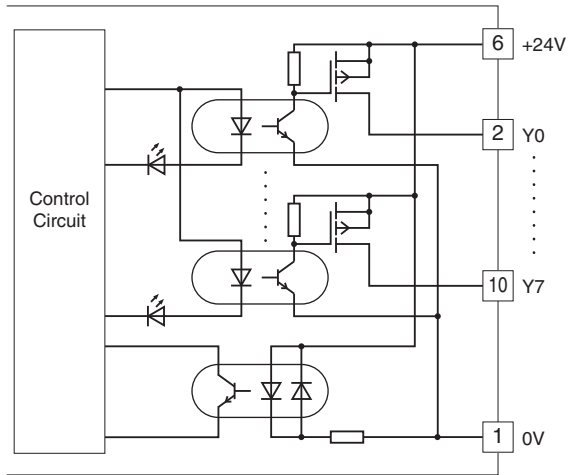


| NO. | ID  | FUNCTION | NO. | ID    | FUNCTION         |
|-----|-----|----------|-----|-------|------------------|
| 1   | 0 V | 0 V      | 6   | +24 V | 24 V DC (common) |
| 2   | Y0  | Output 0 | 7   | Y1    | Output 1         |
| 3   | Y2  | Output 2 | 8   | Y3    | Output 3         |
| 4   | Y4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

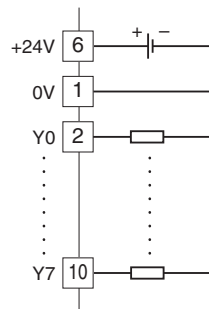
### CIRCUIT DIAGRAM



#### Output Circuit



#### Output Connection Example



**PNP TRANSISTOR OUTPUT EXTENSION MODULE, 16 points**  
(shortcircuit protection)

**CIRCUIT DIAGRAM**

**MODEL: R7ML-EC16D**

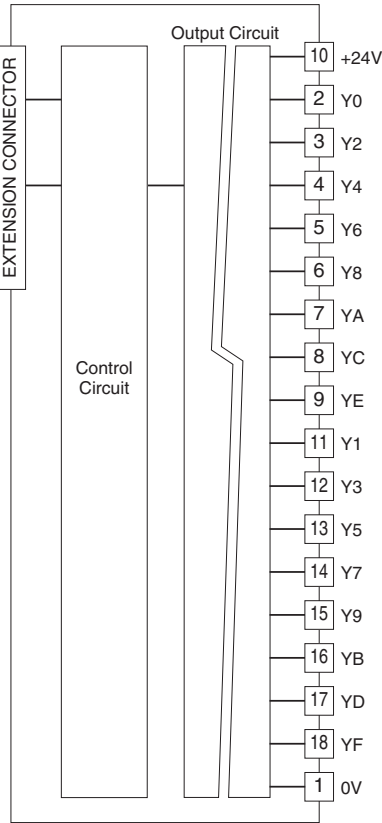
**SPECIFICATIONS**

- Common:** Positive common (PNP) per 16 points
- Number of I/O:** Output, 16 points
- Maximum outputs applicable at once:** No limit (at 24 V DC)
- Output status indicator:** LED turns ON with contact ON
- Isolation:** Output to internal circuits
- Rated load voltage**
  - Nominal:** 19.2 to 30 V DC
  - Absolute:** 15 to 45 V DC
- Rated output current:** 0.25 A per point, 2.0 A per common
- Residual voltage:** ≤ 2.0 V
- Leakage current:** ≤ 0.3 mA (24 V DC load, all points OFF)
- ON delay:** ≤ 0.5 msec.
- OFF delay:** ≤ 1.5 msec.
- Shortcircuit protection:** Works for 0.7 A or more; automatically resets after recovery  
(When driving an inductive load, connect a diode in parallel with the load.)

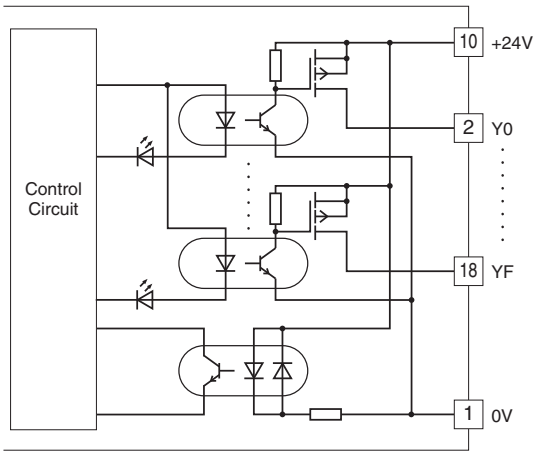
**TERMINAL ASSIGNMENTS**

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

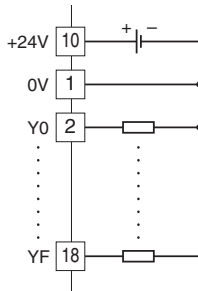
| NO. | ID  | FUNCTION  | NO. | ID    | FUNCTION         |
|-----|-----|-----------|-----|-------|------------------|
| 1   | 0 V | 0 V       | 10  | +24 V | 24 V DC (common) |
| 2   | Y0  | Output 0  | 11  | Y1    | Output 1         |
| 3   | Y2  | Output 2  | 12  | Y3    | Output 3         |
| 4   | 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        |



■ Output Circuit



■ Output Connection Example





Specifications are subject to change without notice.