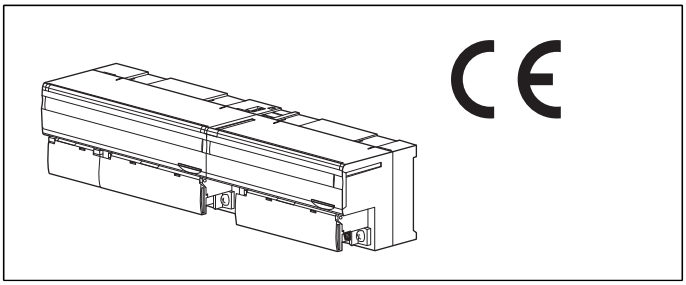
Remote I/O R7 Series

MECHATROLINK I/O MODULE

(MECHATROLINK-I/-II)



ORDERING INFORMATION

• Basic module: R7ML-[1]-R[2]
Specify a code from below for each [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 [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: ±10 %; ripple 10 %p-p max.)

[2] OPTIONS (multiple selections only for LC2)

Input Range
(Selectable only for LC2 (be sure to specfy))
/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 specfy))
/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 M-System's 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 M-System's 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

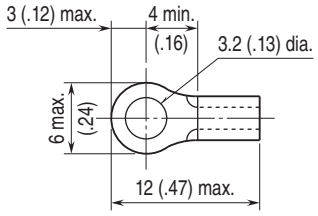
• Common Specifications

Power input: 24 V DC ±10 %; ripple 10 %p-p max.
Insulation resistance: ≥ 100 MΩ 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^2 (AWG 22 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 bype) 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

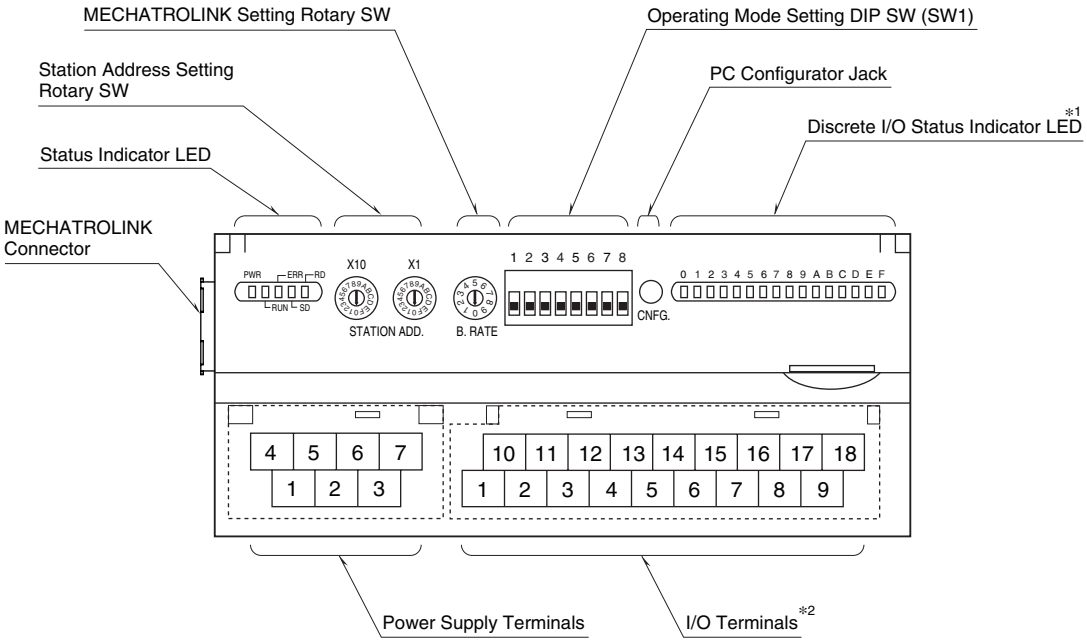
EU conformity:
EMC Directive
EMI EN 61000-6-4

EMS EN 61000-6-2
RoHS Directive
EN 50581

EXTERNAL VIEW

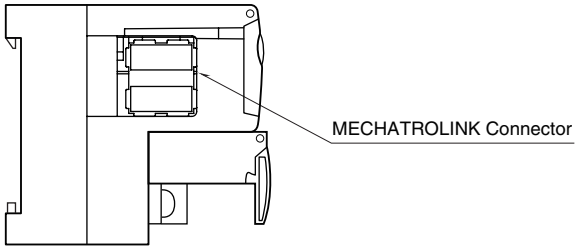
■ BASIC MODULE

■ FRONT VIEW



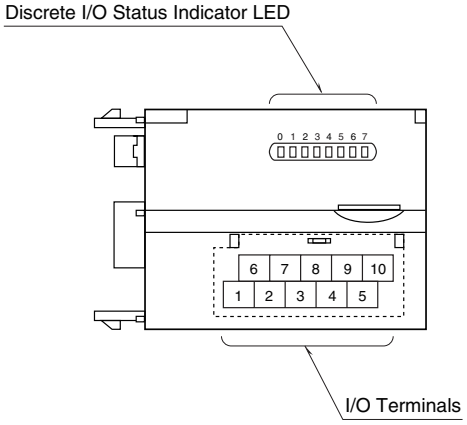
*1. Not available with analog I/O modules.
*2. 10 screw terminals for analog output modules.

■ LEFT SIDE VIEW

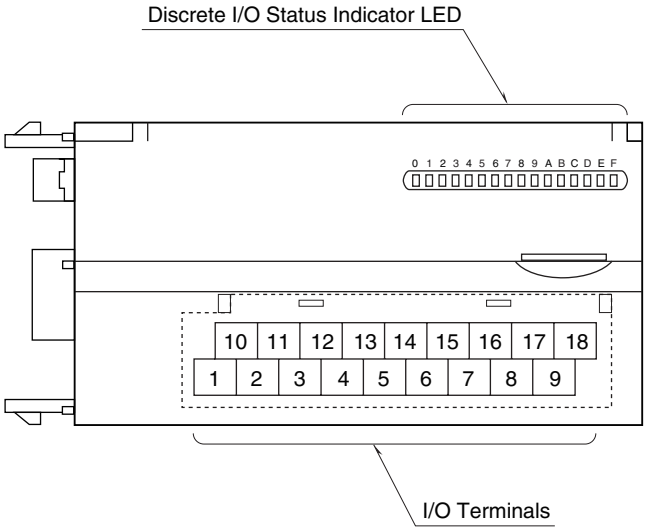


■ EXTENSION MODULE

- **DISCRETE, 8 POINTS**

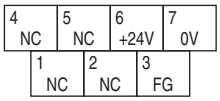


• **DISCRETE, 16 POINTS**



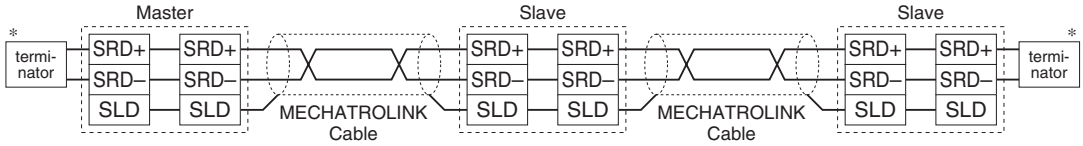
CONNECTION DIAGRAMS

■ 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

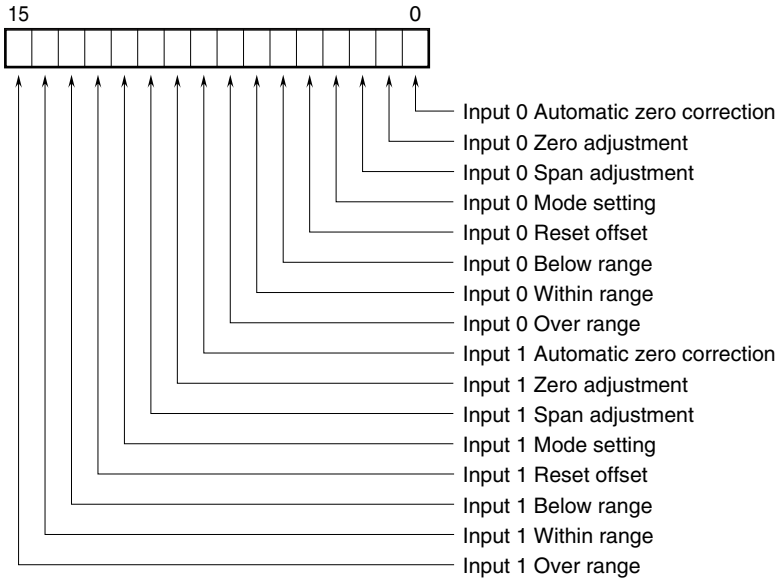
■ STATUS INDICATOR LED

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

• CONNECT (0EH) Command Data Format

Starts communication with the master

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

• DISCONNECT (0FH) Command Data Format

Stops communication with the 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

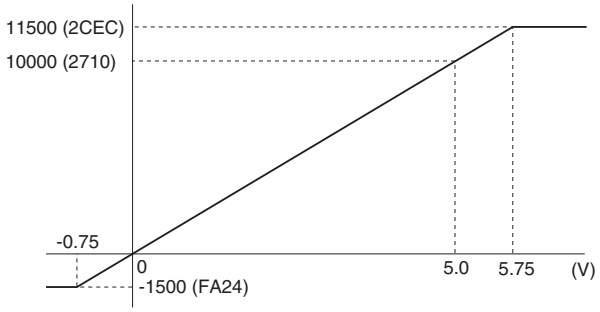
DATA CONVERSION

■ 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



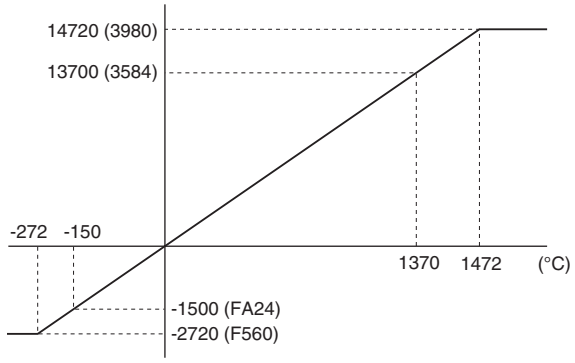
Analog output is converted in the reverse order of the input data. The output range 0 – 5V DC is expressed as 10000 at 5.0V (100%) and 0 at 0V (0%).

■ 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.

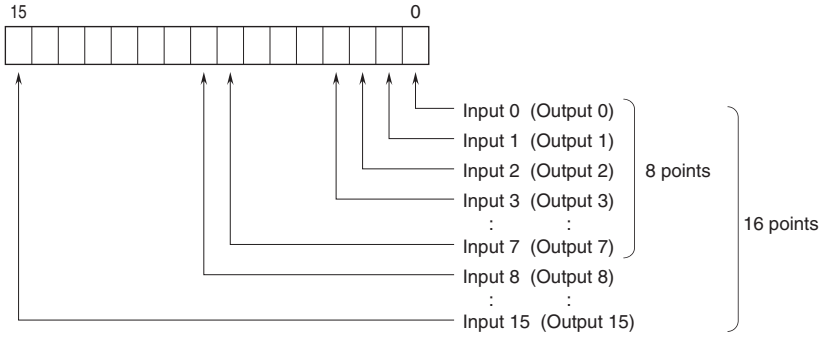
•Input Type K Thermocouple

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



0 : OFF
1 : ON

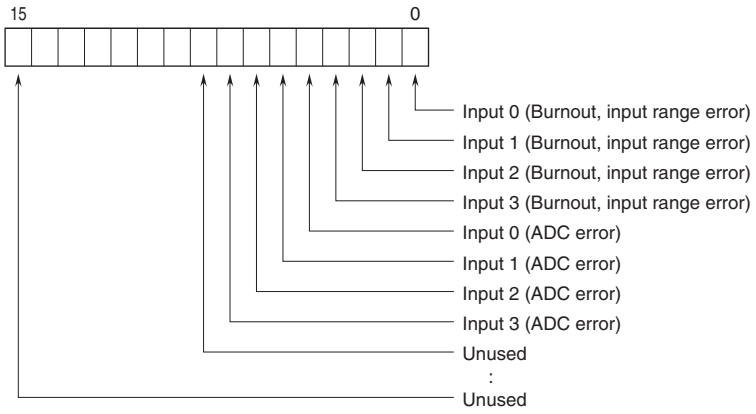
■ ANALOG I/O



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

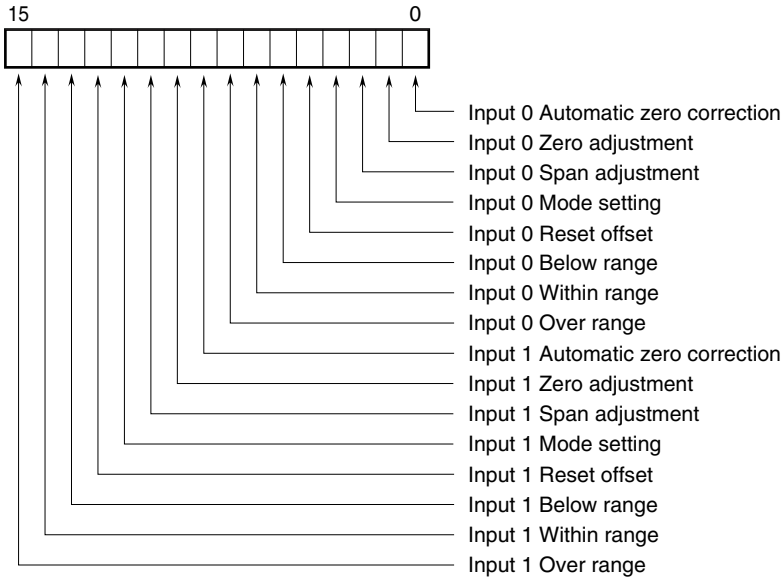
■ **STATUS**

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



Burnout, input range error (≤-15%, ≥+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

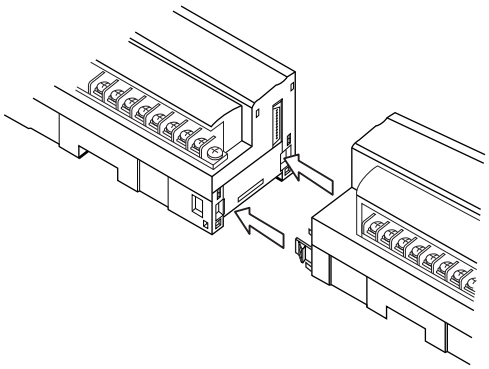
A 'basic' module can be attached with one 'extension' module. The extension module is powered from the basic module. By combining two modules, single station can handle mixed analog and discrete signals, 32-point discrete inputs, 32-point discrete outputs, 16-point discrete I/Os and other combinations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

■ OUTPUT AT THE LOSS OF COMMUNICATION

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

■ CONNECTING THE EXTENSION MODULE

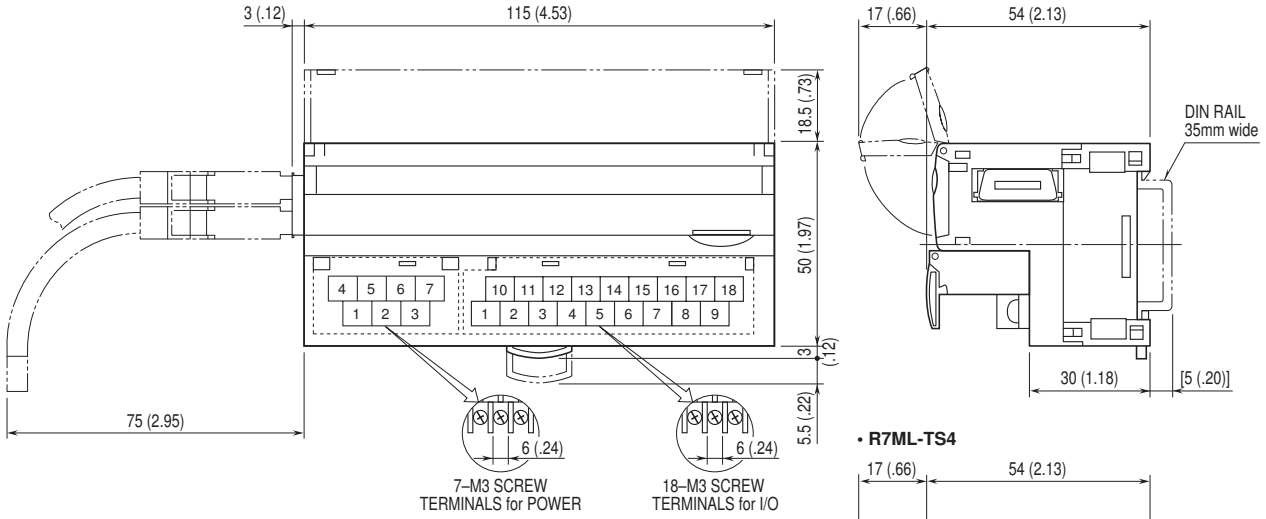
1) Remove the extension connector cover located at the side of the basic module.
2) Connect the extension module.



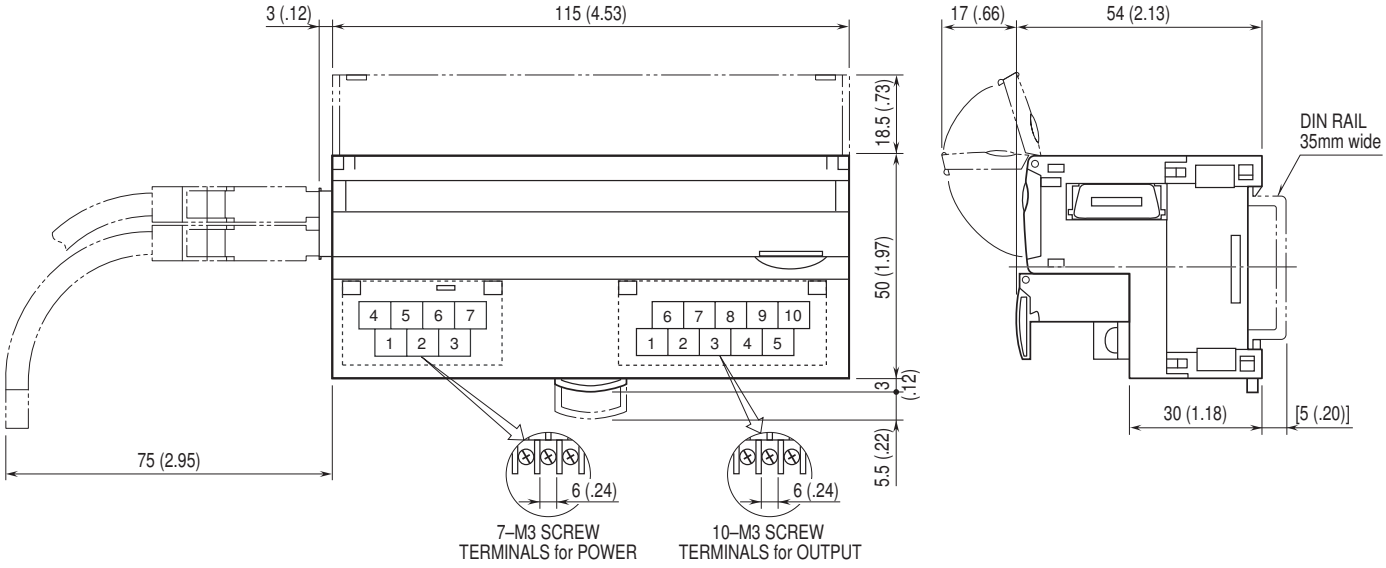
3) Mount the combined module on a DIN rail.

DIMENSIONS unit: mm (inch)

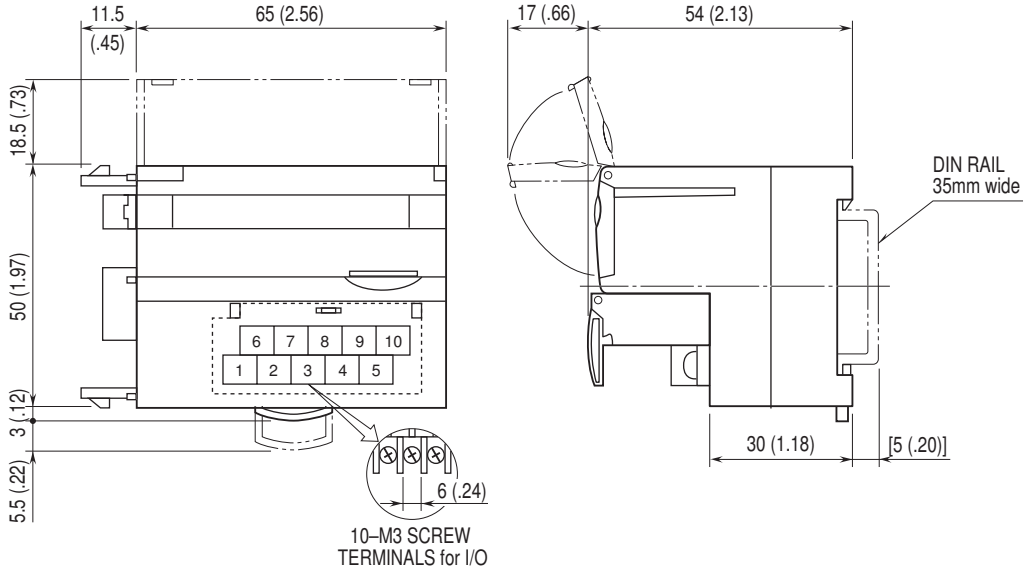
■ BASIC MODULE



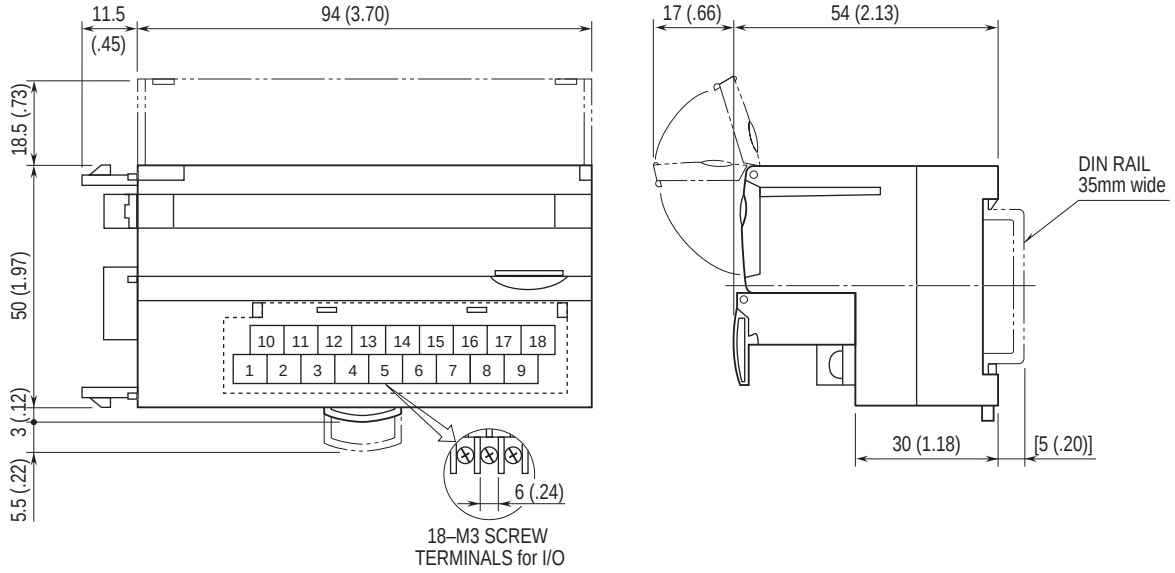
■ ANALOG OUTPUT



■ EXTENSION MODULE, 8 POINTS



■ **EXTENSION MODULE, 16 POINTS**



DISCRETE INPUT MODULE, 16 points

MODEL: R7ML-DA16

SPECIFICATIONS

Common: Positive or negative common (PNP/NPN) 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 ±10 %; ripple 5 %p-p max.
ON voltage / current: ≥ 15 V DC (input – COM) / ≥ 3.5 mA
OFF voltage / current: ≤ 5 V DC (input – COM) / ≤ 1 mA
Input current: ≤ 5.5 mA per point at 24 V DC
Input resistance: Approx. 4.4 kΩ
ON delay: ≤ 2.0 msec.
OFF delay: ≤ 2.0 msec.

OPERATING MODE SETTING

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

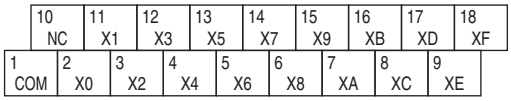
• Extension (SW1-1, 1-2)

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	≤10 msec. (*)
ON	OFF	OFF	≤1 msec.
OFF	ON	OFF	≤5 msec.
ON	ON	OFF	≤20 msec.
OFF	OFF	ON	≤50 msec.
ON	OFF	ON	≤70 msec.
OFF	ON	ON	≤100 msec.
ON	ON	ON	≤200 msec.

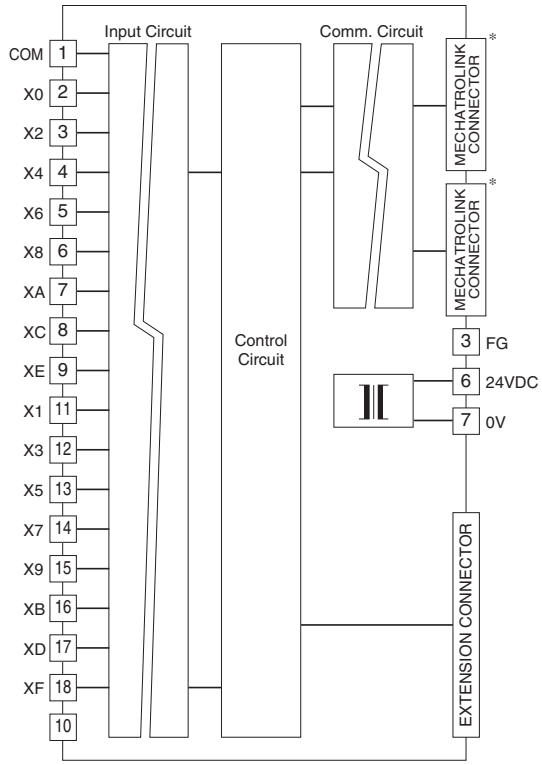
TERMINAL ASSIGNMENTS



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

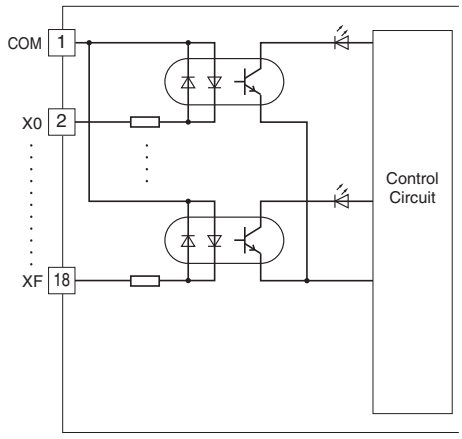
CIRCUIT DIAGRAM

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

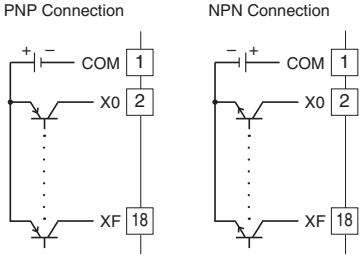


*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **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 ±10 %
Rated output current: 0.25 A per point, 2.0 A per common
Residual voltage: ≤ 1.2 V
Leakage current: ≤ 0.1 mA
ON delay: ≤ 0.5 msec.
OFF delay: ≤ 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.

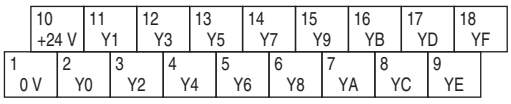
• Output at the Loss of Communication (SW1-4)

SW1-4	Output at the loss of communication
OFF	Reset the output (turned off)
ON	Hold the output (*) (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

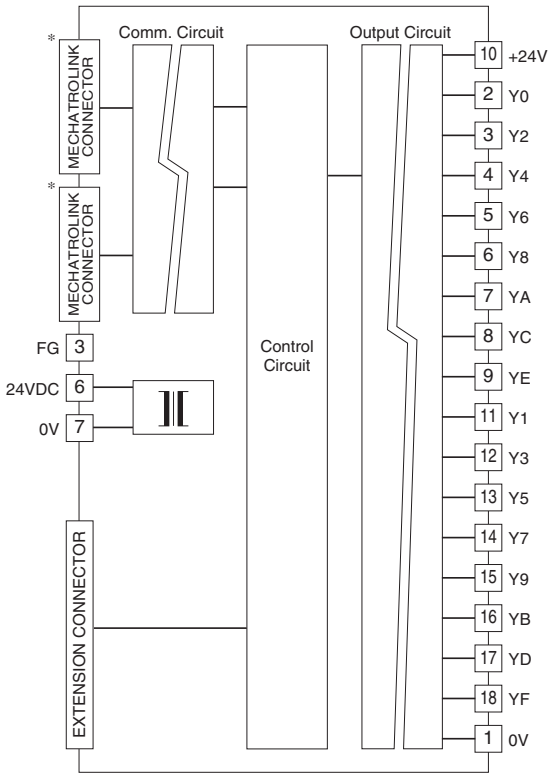
TERMINAL ASSIGNMENTS



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

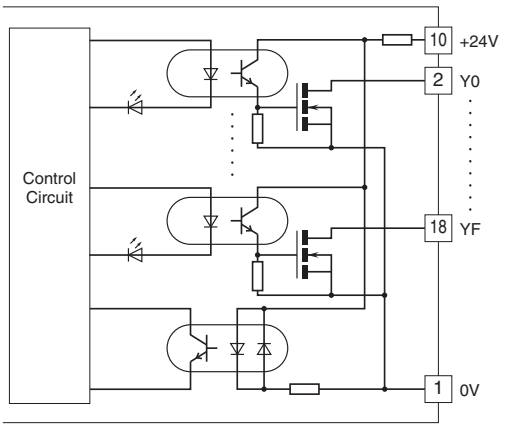
CIRCUIT DIAGRAM

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

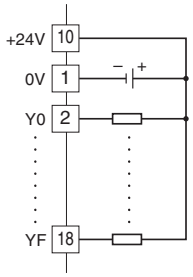


*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **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 ±10 %
Rated output current: 0.25 A per point, 2.0 A per common
Residual voltage: ≤ 1.2 V
Leakage current: ≤ 0.1 mA
ON delay: ≤ 0.5 msec.
OFF delay: ≤ 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.

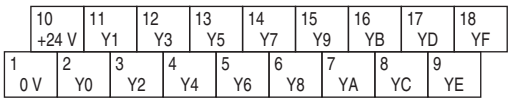
• Output at the Loss of Communication (SW1-4)

SW1-4	Output at the loss of communication
OFF	Reset the output (turned off)
ON	Hold the output (*) (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

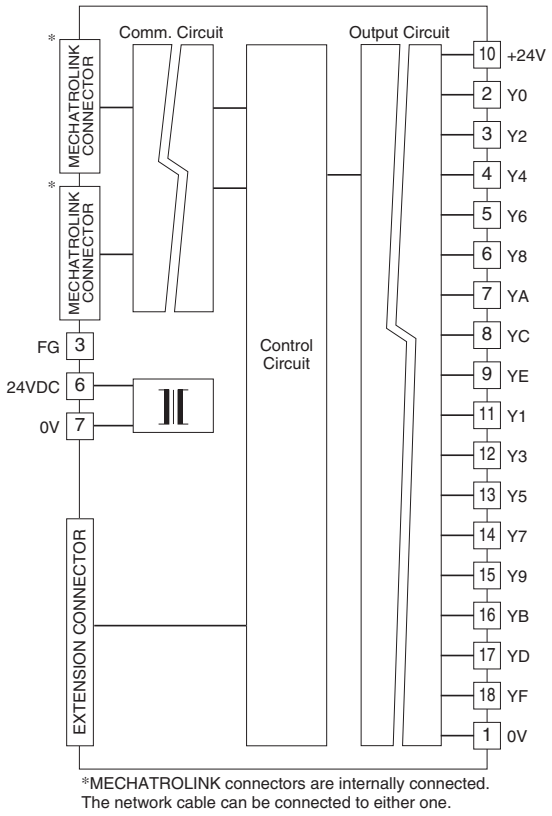
TERMINAL ASSIGNMENTS



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

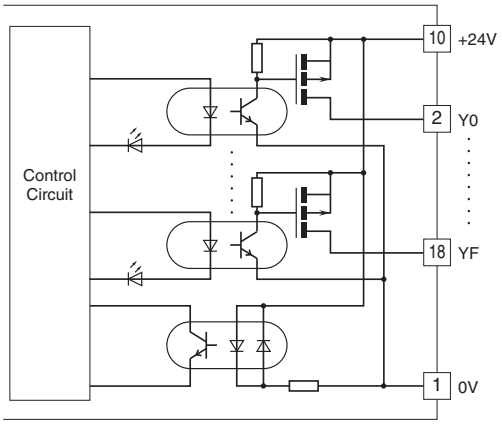
CIRCUIT DIAGRAM

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

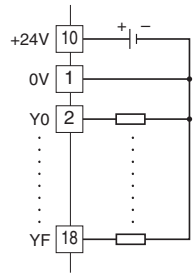


*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **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: ≤ 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.)

OPERATING MODE SETTING

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

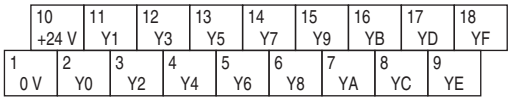
• Output at the Loss of Communication (SW1-4)

SW1-4	Output at the loss of communication
OFF	Reset the output (turned off)
ON	Hold the output (*) (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

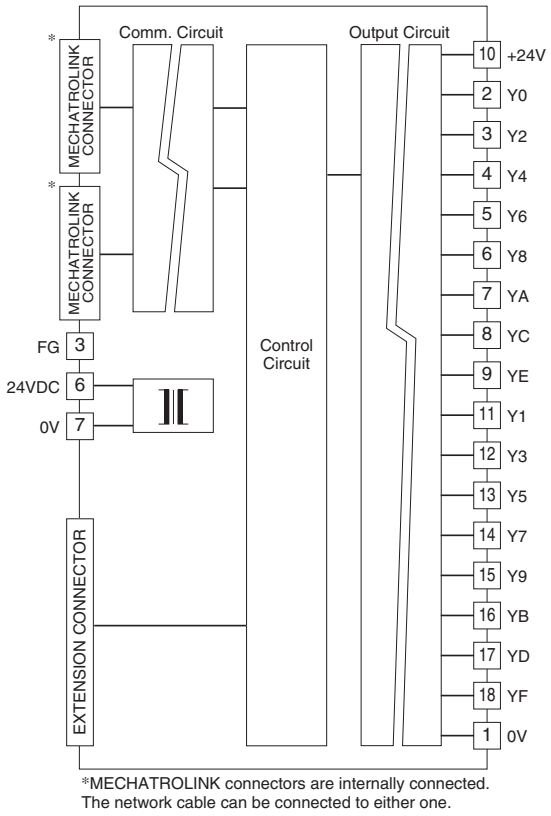
TERMINAL ASSIGNMENTS



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

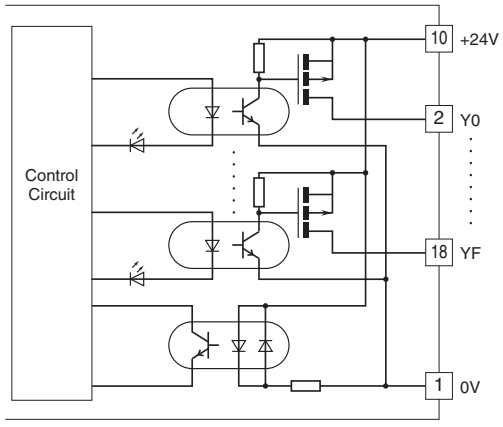
CIRCUIT DIAGRAM

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

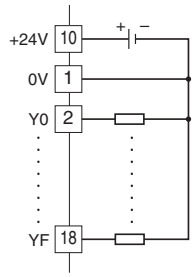


*MECHATROLINK connectors are internally connected.
The network cable can be connected to either one.

■ **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: ≥ 1 MΩ

Narrow span voltage: ≥ 100 kΩ

Current range: 70 Ω

Conversion rate / conversion accuracy: 10 msec./±0.8 %, 20 msec./±0.4 %, 40 msec./±0.2 %, 80 msec./±0.1 %

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

Temperature coefficient: ±0.015 %/°C (±0.008 %/°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

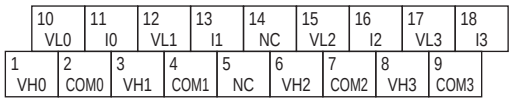
• Conversion Rate / Accuracy (SW1-3, 1-4)

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

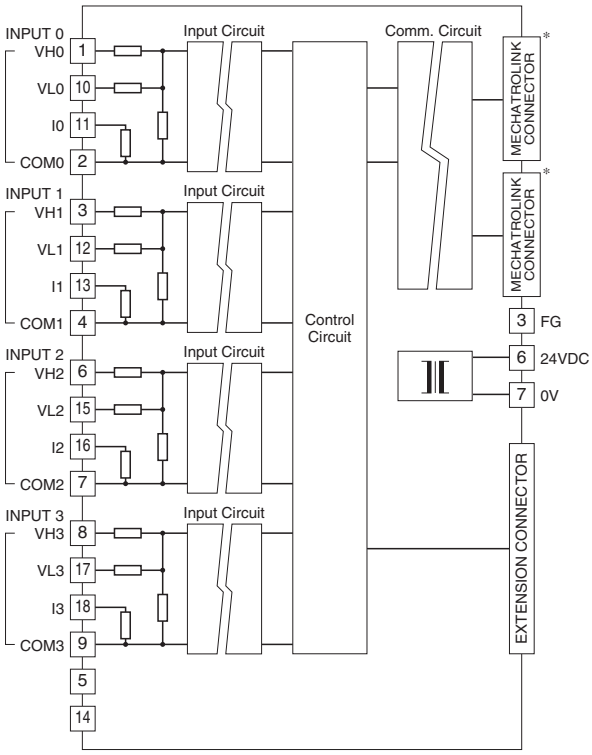


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	VH0	Wide span volt. 0	10	VL0	Narrow span volt. 0
2	COM0	Common 0	11	I0	Current range 0
3	VH1	Wide span volt. 1	12	VL1	Narrow span volt. 1
4	COM1	Common 1	13	I1	Current range 1
5	NC	No connection	14	NC	No connection
6	VH2	Wide span volt. 2	15	VL2	Narrow span volt. 2
7	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

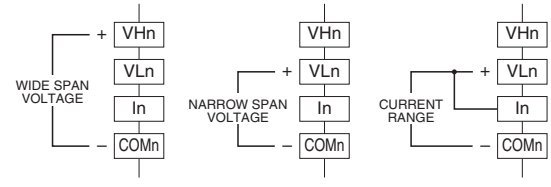
Note: In order to improve EMC performance, bond the FG terminal to ground.

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.

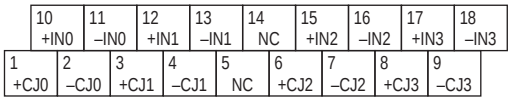
• Burnout (SW1-4)

SW1-4	Burnout
OFF	Upscale (*)
ON	Downscale

• Extension (SW1-1, 1-2)

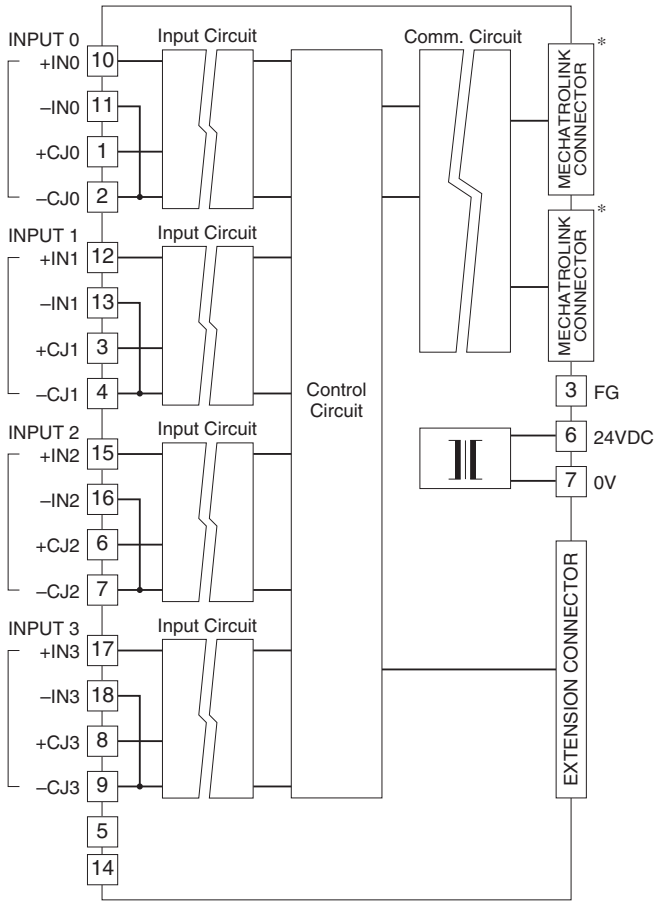
SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

TERMINAL ASSIGNMENTS



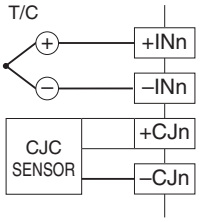
NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	+CJ0	CJC + 0	10	+IN0	T/C + 0
2	–CJ0	CJC – 0	11	–IN0	T/C – 0
3	+CJ1	CJC + 1	12	+IN1	T/C + 1
4	–CJ1	CJC – 1	13	–IN1	T/C – 1
5	NC	No connection	14	NC	No connection
6	+CJ2	CJC + 2	15	+IN2	T/C + 2
7	–CJ2	CJC – 2	16	–IN2	T/C – 2
8	+CJ3	CJC + 3	17	+IN3	T/C + 3
9	–CJ3	CJC –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

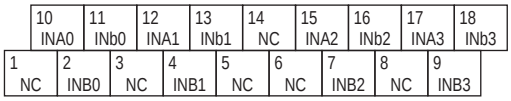
• Burnout (SW1-4)

SW1-4	Burnout
OFF	Upscale (*)
ON	Downscale

• Extension (SW1-1, 1-2)

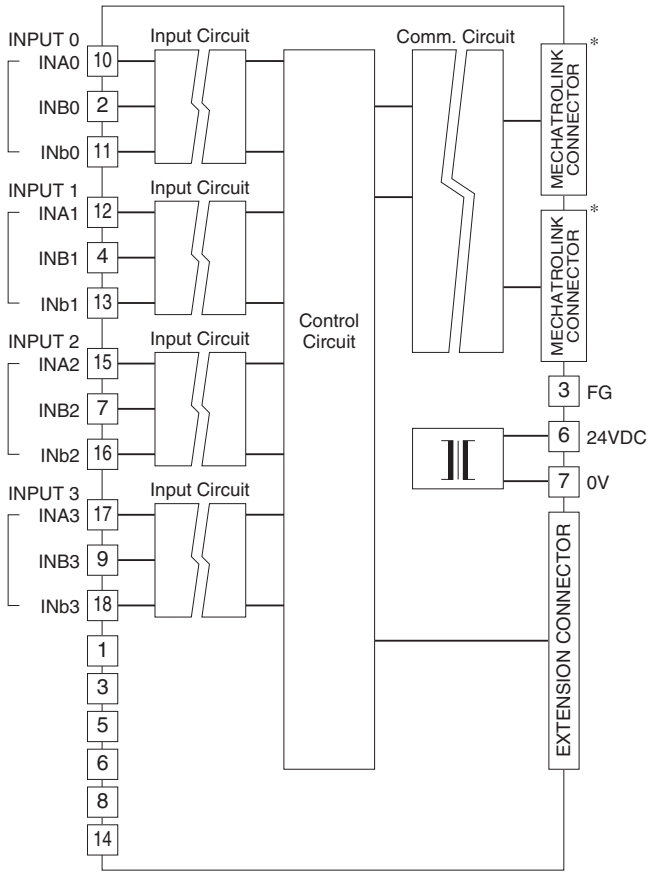
SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

TERMINAL ASSIGNMENTS



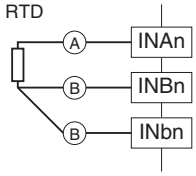
NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	10	INA0	RTD 0-A
2	INB0	RTD 0-B	11	INb0	RTD 0-b
3	NC	No connection	12	INA1	RTD 1-A
4	INB1	RTD 1-B	13	INb1	RTD 1-b
5	NC	No connection	14	NC	No connection
6	NC	No connection	15	INA2	RTD 2-A
7	INB2	RTD 2-B	16	INb2	RTD 2-b
8	NC	No connection	17	INA3	RTD 3-A
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 ±10% or 2.5 V ±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 Ω 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
±0.04% (Averaging 128 samples or more)
±0.05% (Averaging 64 samples)
±0.10% (Averaging 8, 16, 32 samples)
±0.15% (Averaging 4 samples)
±0.20% (Averaging 2 samples)
Option code /R05
±0.05% (Averaging 512 samplesor more)
±0.10% (Averaging 64, 128, 256 samples)
±0.20% (Averaging 16, 32 samples)
±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 coefficien: 10.00 – 100.00 (%)

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

Temperature coefficient: ±0.015 %/°C (±0.008 %/°F)

■ OUTPUT

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

Operational range: -115 – +115 %

Load resistance: ≥ 100 kΩ

Conversion accuracy: ±0.1 %

Output delay time: ≤ 250 msec. (0 – 90 %)

Temperature coefficient: ±0.015 %/°C (±0.008 %/°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

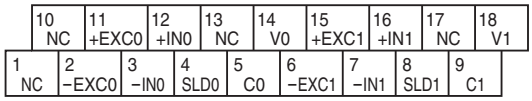
• Averaging (SW1-4, 1-5, 1-6, 1-7)

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

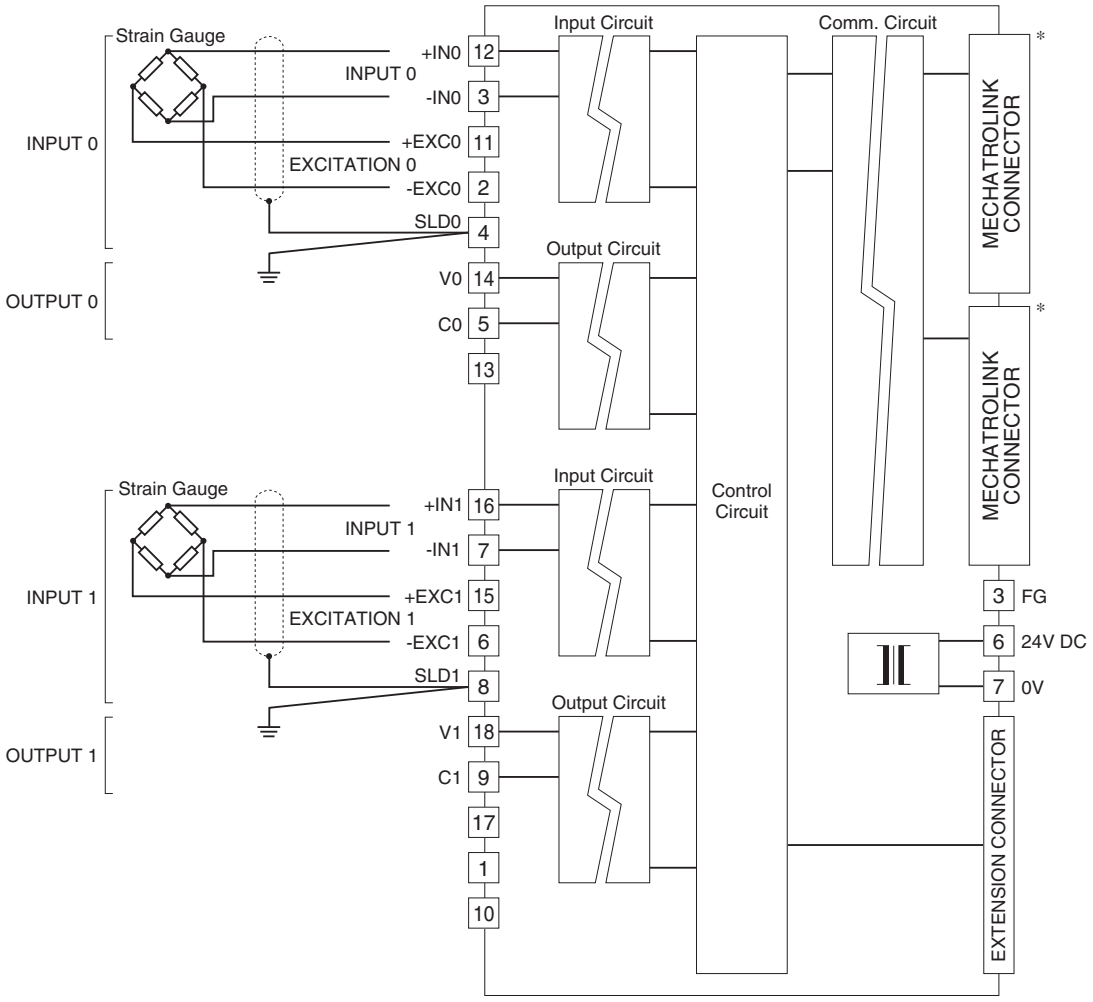
TERMINAL ASSIGNMENTS



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: ≥ 100 kΩ
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 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 (*) (maintains the last data received normally)

• Extension (SW1-1, 1-2)

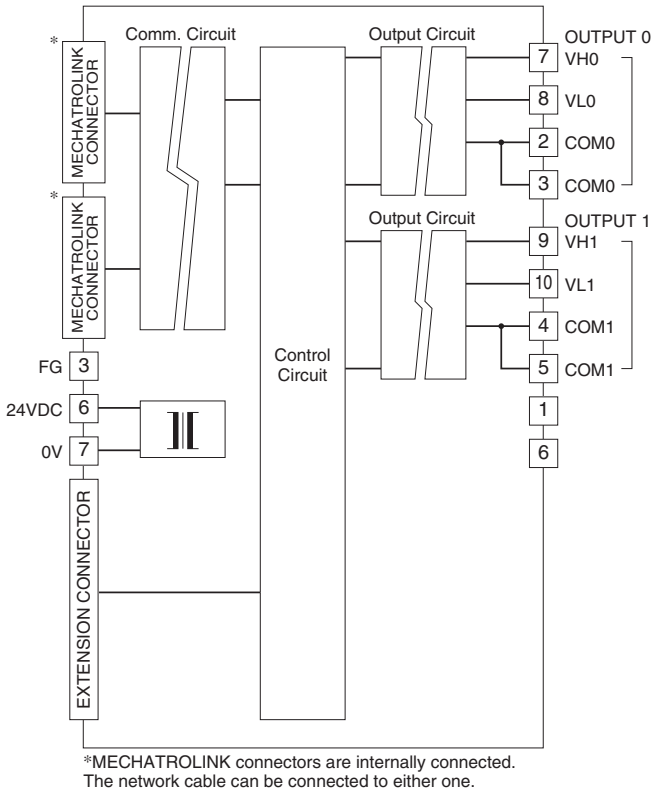
SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

TERMINAL ASSIGNMENTS



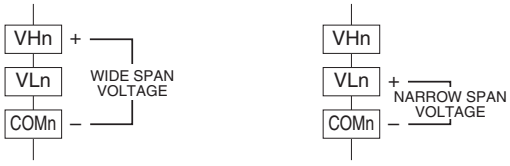
NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	NC	No connection	6	NC	No connection
2	COM0	Common 0	7	VH0	Wide span volt. 0
3	COM0	Common 0	8	VL0	Narrow span volt. 0
4	COM1	Common 1	9	VH1	Wide span volt. 1
5	COM1	Common 1	10	VL1	Narrow span volt. 1

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.

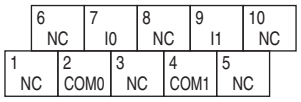
• Output at the Loss of Communication (SW1-4)

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

• Extension (SW1-1, 1-2)

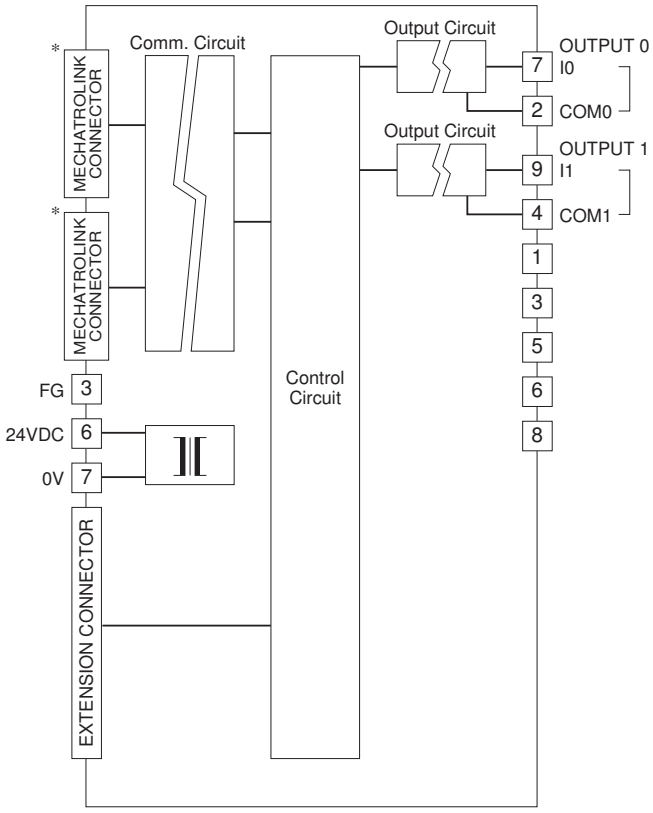
SW1-1	SW1-2	Extension
OFF	OFF	No extension (*)
ON	OFF	Discrete input, 8 or 16 points
OFF	ON	Discrete output, 8 or 16 points

TERMINAL ASSIGNMENTS



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

CIRCUIT DIAGRAM



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

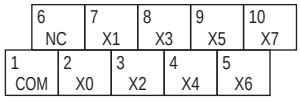
DISCRETE INPUT EXTENSION MODULE, 8 points

MODEL: R7ML-EA8

SPECIFICATIONS

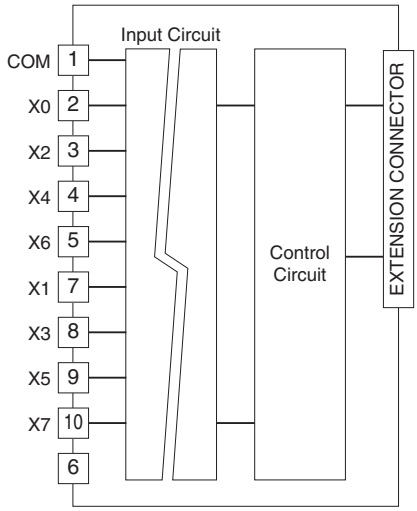
Common: Positive or negative common (NPN/PNP) per 8 points
Number of I/O: Input, 8 points
Maximum inputs applicable at once: No limit (at 24 V DC)
Input status indicator: LED turns ON with contact ON
Isolation: Input to internal circuits
Rated input voltage: 24 V DC ±10 %; ripple 5 %p-p max.
ON voltage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

TERMINAL ASSIGNMENTS

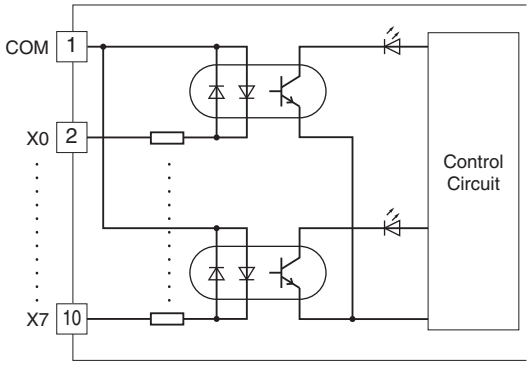


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	COM	Common	6	NC	No Connection
2	X0	Input 0	7	X1	Input 1
3	X2	Input 2	8	X3	Input 3
4	X4	Input 4	9	X5	Input 5
5	X6	Input 6	10	X7	Input 7

CIRCUIT DIAGRAM

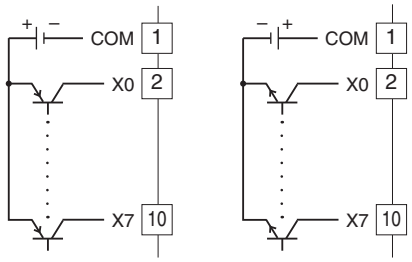


■ **Input Circuit**



■ **Input Connection Examples**

PNP Connection **NPN Connection**



DISCRETE INPUT EXTENSION MODULE, 16 points

MODEL: R7ML-EA16

SPECIFICATIONS

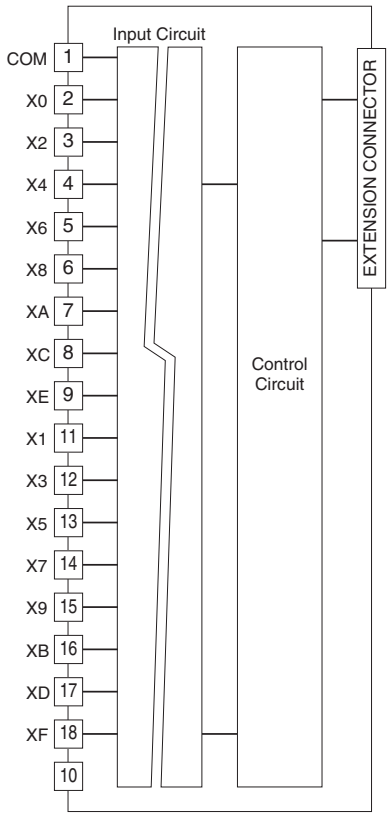
Common: Positive or negative common (PNP/NPN) per 16 points
Number of I/O: Input, 16 points
Maximum inputs applicable at once: No limit (at 24 V DC)
Input status indicator: LED turns ON with contact ON
Isolation: Input to internal circuits
Rated input voltage: 24 V DC ±10 %; ripple 5 %p-p max.
ON voltage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

TERMINAL ASSIGNMENTS

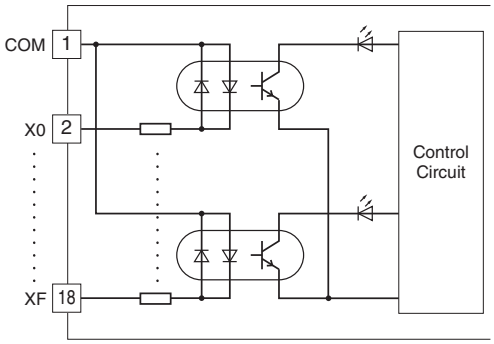
10	11	12	13	14	15	16	17	18
NC	X1	X3	X5	X7	X9	XB	XD	XF
1	2	3	4	5	6	7	8	9
COM	X0	X2	X4	X6	X8	XA	XC	XE

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

CIRCUIT DIAGRAM

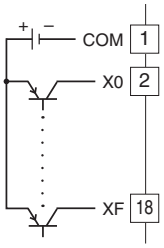


■ **Input Circuit**

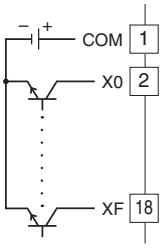


■ **Input Connection Examples**

PNP Connection



NPN Connection



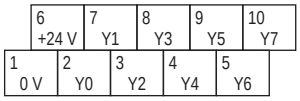
NPN TRANSISTOR OUTPUT EXTENSION MODULE, 8 points

MODEL: R7ML-EC8A

SPECIFICATIONS

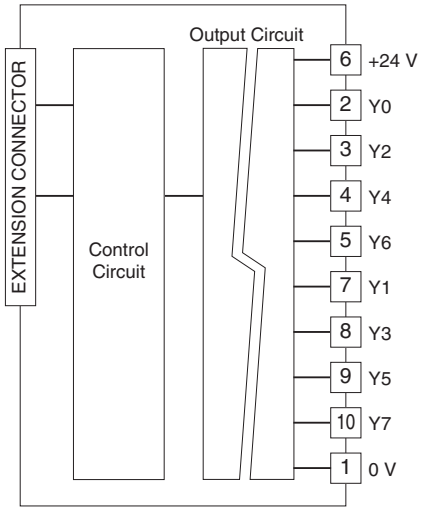
Common: Negative common (NPN) per 8 points
Number of I/O: Output, 8 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage: 24 V DC ±10 %
Rated output current: 0.25 A per point, 2.0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

TERMINAL ASSIGNMENTS

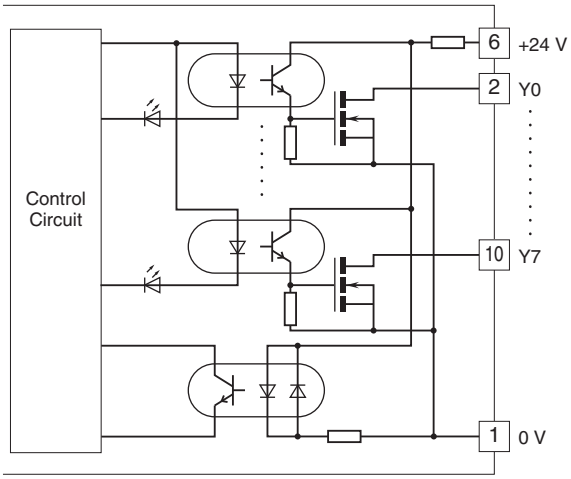


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V (common)	6	+24 V	24 V DC
2	Y0	Output 0	7	Y1	Output 1
3	Y2	Output 2	8	Y3	Output 3
4	Y4	Output 4	9	Y5	Output 5
5	Y6	Output 6	10	Y7	Output 7

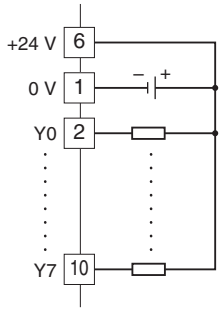
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



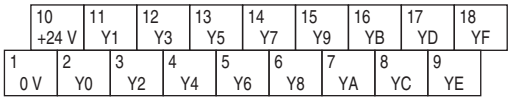
NPN TRANSISTOR OUTPUT EXTENSION MODULE, 16 points

MODEL: R7ML-EC16A

SPECIFICATIONS

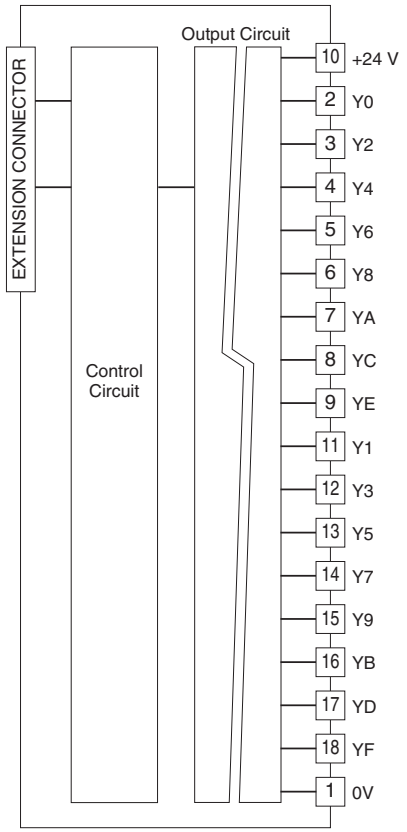
Common: Negative common (NPN) per 16 points
Number of I/O: Output, 16 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage: 24 V DC ±10 %
Rated output current: 0.25 A per point,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

TERMINAL ASSIGNMENTS

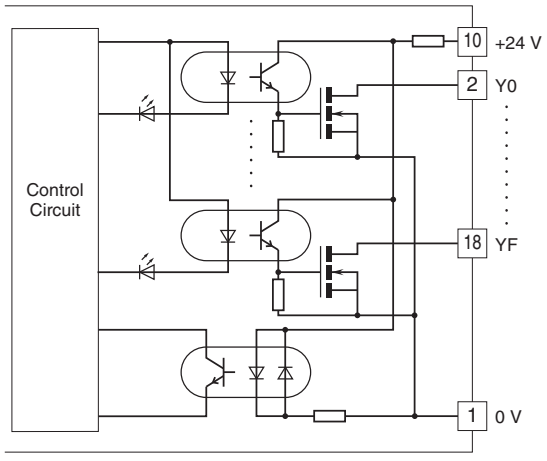


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V (common)	10	+24 V	24 V DC
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output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

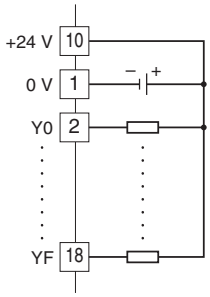
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



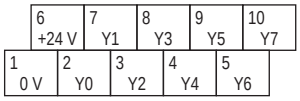
PNP TRANSISTOR OUTPUT EXTENSION MODULE, 8 points

MODEL: R7ML-EC8B

SPECIFICATIONS

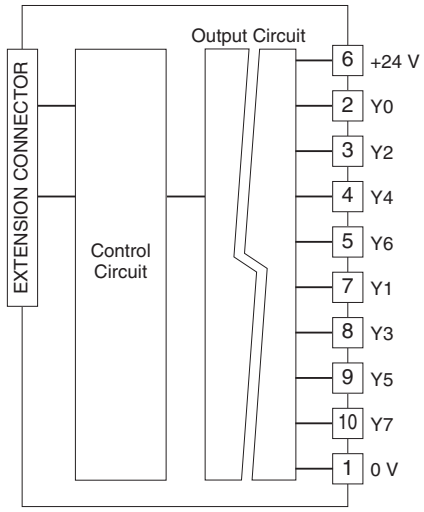
Common: Positive common (PNP) per 8 points
Number of I/O: Output, 8 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage: 24 V DC ±10 %
Rated output current: 0.25 A per point, 2.0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

TERMINAL ASSIGNMENTS

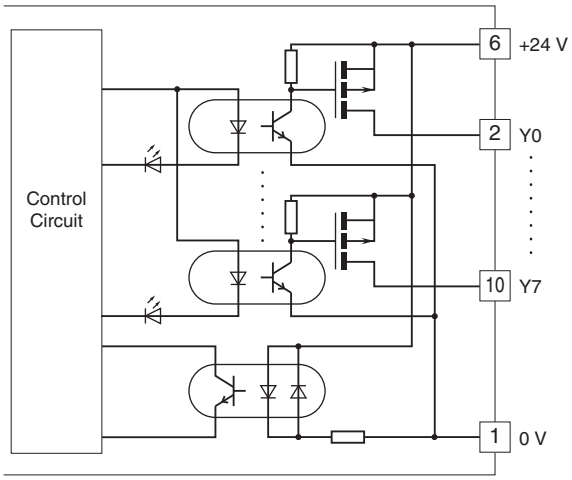


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V	6	+24 V	24 V DC (common)
2	Y0	Output 0	7	Y1	Output 1
3	Y2	Output 2	8	Y3	Output 3
4	Y4	Output 4	9	Y5	Output 5
5	Y6	Output 6	10	Y7	Output 7

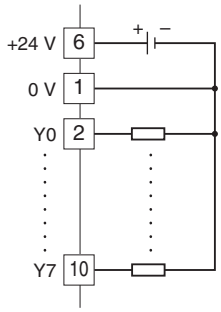
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



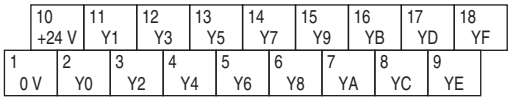
PNP TRANSISTOR OUTPUT EXTENSION MODULE, 16 points

MODEL: R7ML-EC16B

SPECIFICATIONS

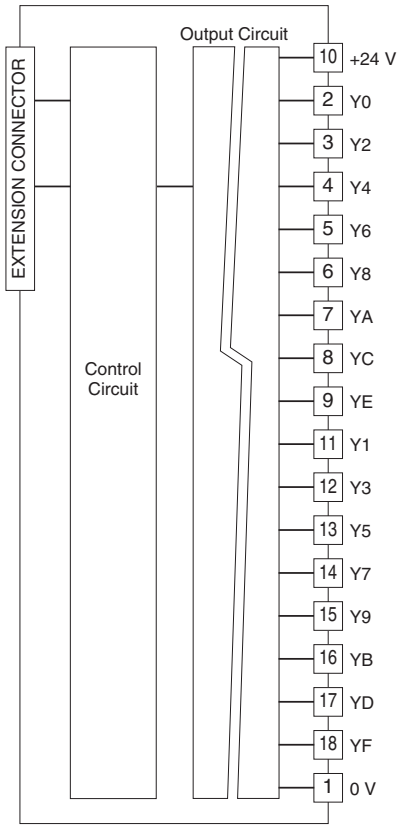
Common: Positive common (PNP) per 16 points
Number of I/O: Output, 16 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage: 24 V DC ±10 %
Rated output current: 0.25 A per point,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

TERMINAL ASSIGNMENTS

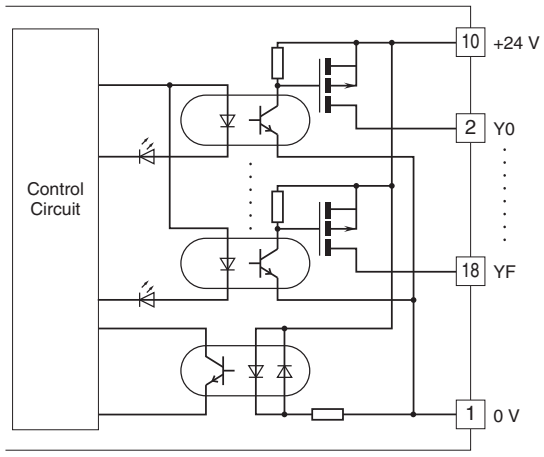


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V	10	+24 V	24 V DC (common)
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output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

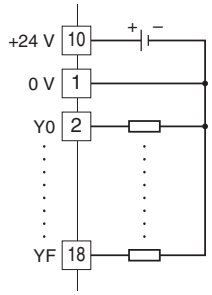
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



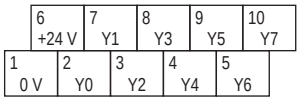
PNP TRANSISTOR OUTPUT EXTENSION MODULE, 8 points
(shortcircuit protection)

MODEL: R7ML-EC8D

SPECIFICATIONS

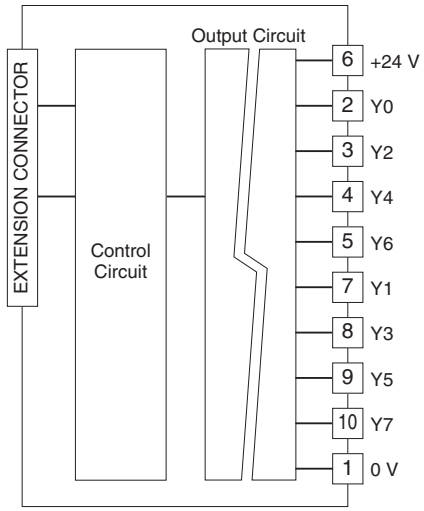
Common: Positive common (PNP) per 8 points
Number of I/O: Output, 8 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage
Nominal: 19.2 to 30 V DC
Absolute: 15 to 45 V DC
Rated output current: 0.25 A per point, 2.0 A per common
Residual voltage: ≤ 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

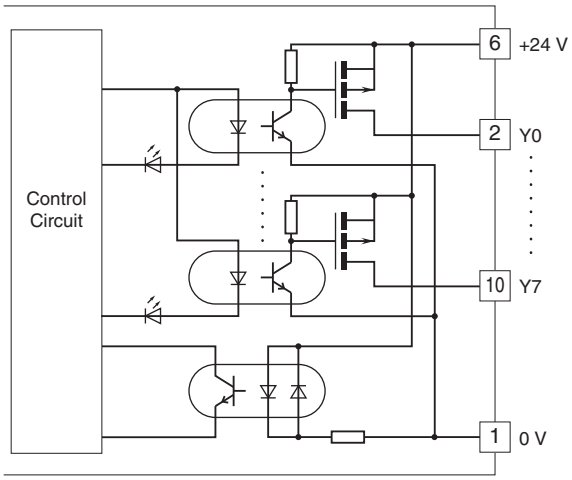


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V	6	+24 V	24 V DC (common)
2	Y0	Output 0	7	Y1	Output 1
3	Y2	Output 2	8	Y3	Output 3
4	Y4	Output 4	9	Y5	Output 5
5	Y6	Output 6	10	Y7	Output 7

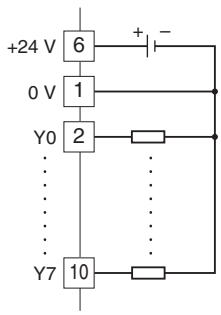
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



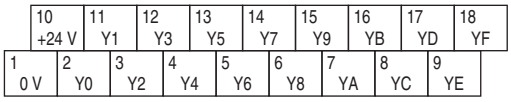
PNP TRANSISTOR OUTPUT EXTENSION MODULE, 16 points
(shortcircuit protection)

MODEL: R7ML-EC16D

SPECIFICATIONS

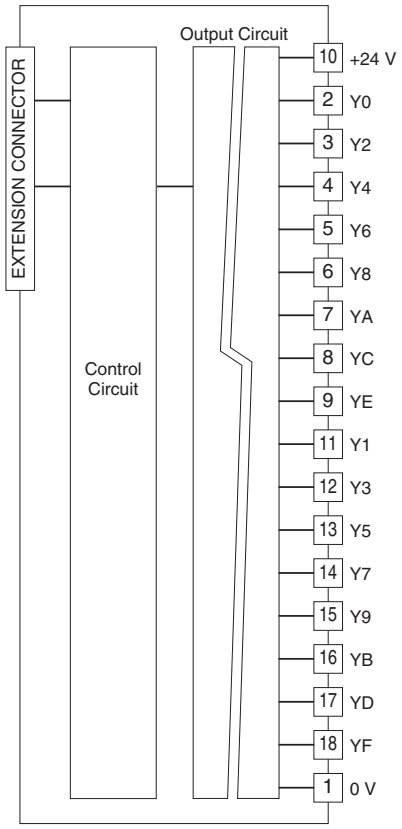
Common: Positive common (PNP) per 16 points
Number of I/O: Output, 16 points
Maximum outputs applicable at once: No limit (at 24 V DC)
Output status indicator: LED turns ON with contact ON
Isolation: Output to internal circuits
Rated load voltage
Nominal: 19.2 to 30 V DC
Absolute: 15 to 45 V DC
Rated 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

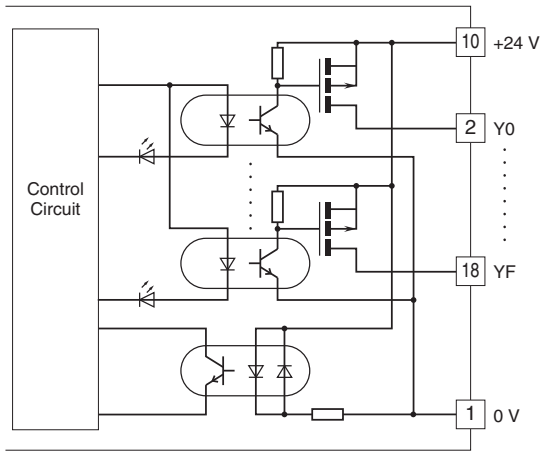


NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	0 V	0 V	10	+24 V	24 V DC (common)
2	Y0	Output 0	11	Y1	Output 1
3	Y2	Output 2	12	Y3	Output 3
4	Y4	Output 4	13	Y5	Output 5
5	Y6	Output 6	14	Y7	Output 7
6	Y8	Output 8	15	Y9	Output 9
7	YA	Output 10	16	YB	Output 11
8	YC	Output 12	17	YD	Output 13
9	YE	Output 14	18	YF	Output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

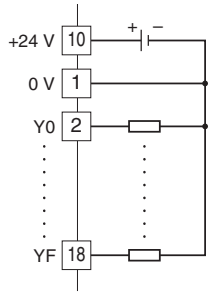
CIRCUIT DIAGRAM



■ **Output Circuit**



■ **Output Connection Example**



⚠ Specifications are subject to change without notice.