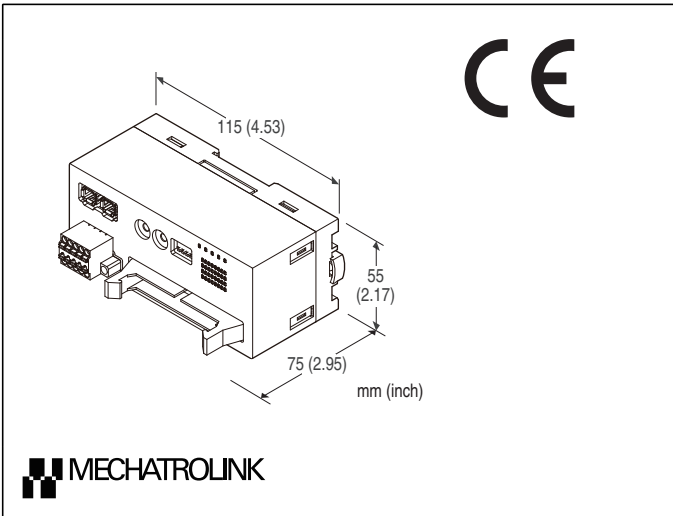


## Remote I/O R7F4H Series

### MECHATROLINK I/O MODULE

(MECHATROLINK-III)



### MODEL: R7F4HML3-D-[1]-R[2]

#### ORDERING INFORMATION

- Code number: R7F4HML3-D-[1]-R[2]  
Specify a code from below for each [1] and [2].  
(e.g. R7F4HML3-D-DAC32B-R/NR/Q)
- Specify the specification for option code /Q  
(e.g. /C01)

#### TERMINAL BLOCK: D

Tension clamp terminal block for power supply  
Connector for MECHATROLINK-III for communication  
MIL connector for I/O

#### [1] I/O TYPE

**DAC32A:** NPN/PNP discrete input &  
NPN transistor output, 16 points each  
**DAC32B:** NPN/PNP discrete input &  
PNP transistor output, 16 points each

#### POWER INPUT

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

#### [2] OPTIONS (multiple selections)

##### Output data read back

blank: With  
/NR: Without

#### Other 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

MECHATROLINK I/O module (this module), interfaces discrete I/Os and PLC or PC via MECHATROLINK-III.

#### GENERAL SPECIFICATIONS

- **Common Specifications**  
**Power input:** 24 V DC  $\pm 10\%$ ; ripple 10 %p-p max.  
**Operating temperature:** -10 to +55°C (14 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) or wall  
**Connection**  
**MECHATROLINK-III:** MECHATROLINK-III connector  
**I/O:** MIL connector  
**Power supply:** Tension clamp terminal block  
**Housing material:** Flame-resistant resin (gray)  
**Status indicator LEDs:** PWR, ERR, CON, LNK1, LNK2  
(Refer to the instruction manual for details)  
■ **Current Consumption & Weight**  
R7F4HML3-D-DAC32A: Approx. 100 mA/175 g (0.39 lb)  
R7F4HML3-D-DAC32B: Approx. 100 mA/175 g (0.39 lb)  
(Discrete I/O load charge is not included in the above-mentioned current consumption.)

#### OUTPUT DATA READ BACK

It is possible to send back by return the receiving output data of the unit to the host on MECHATROLINK-III communication data. Specifying option code for the output data read back to /NR enables to set invalid the output data read back.

(With or without the output data read back, the data allocation of DATA\_RWA(20H) command data format is different. Refer to the instruction manual for detailed information.)

#### MECHATROLINK-III COMMUNICATION

**Baud rate:** 100 Mbps  
**Transmission distance:** 6300 m max.  
**Distance between stations:** 100 m max.

**Transmission media:** MECHATROLINK cable (Model JEPMC-W6013-x-E, Yaskawa Controls Co., Ltd.)

**Connector:** TYCO AMP Industrial mini I/O connector

**Max. number of slaves:** 62

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

**Transmission cycle:** 125  $\mu$ sec., 250  $\mu$ sec., 500  $\mu$ sec., 1 - 64 msec. (with 1 msec. increments)

**Communication cycle:** 125  $\mu$ sec. through 64 msec.

**Applicable profile:** Standard I/O profile (cyclic communication)

Event-driven communication acquiring ID profile (event-driven communication)

**Transmission bytes:** 16 bytes

**Station address:** 03H through EFH (set with rotary switches)

**Cyclic communication:** Available

**Event-driven communication:** Available

**Slave monitoring:** None

## STANDARDS & APPROVALS

**EU conformity:**

EMC Directive

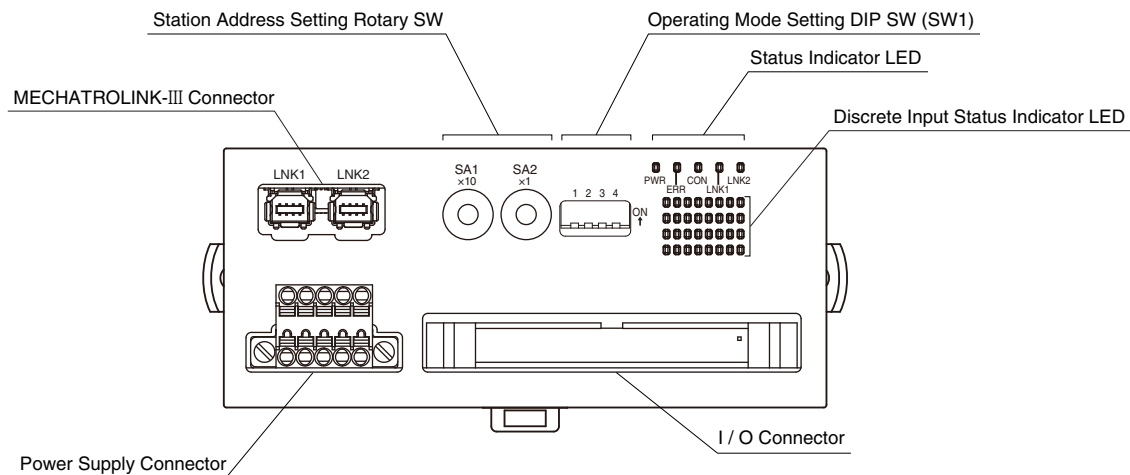
EMI EN 61000-6-4

EMS EN 61000-6-2

RoHS Directive

EN 50581

## EXTERNAL VIEW



## CONNECTION DIAGRAMS

### ■ I/O Connection

(Refer to the detailed specification for terminal assignment.)

Recommended cable connector: XG4M-2030 (OMRON)

The cable connector is not included in the package.

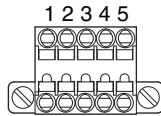
### ■ POWER SUPPLY

Cable connector: TFMC1,5 / 5-STF-3,5(Phoenix Contact)  
(included in the package)

Applicable wire size: 0.2 – 1.5 mm<sup>2</sup>; stripped length 10 mm

Recommended solderless terminal

- AI0,25-10YE 0.25 mm<sup>2</sup> (Phoenix Contact)
- AI0,34-10TQ 0.34 mm<sup>2</sup> (Phoenix Contact)
- AI0,5-10WH 0.5 mm<sup>2</sup> (Phoenix Contact)
- AI0,75-10GY 0.75 mm<sup>2</sup> (Phoenix Contact)
- A1-10 1.0 mm<sup>2</sup> (Phoenix Contact)
- A1,5-10 1.5 mm<sup>2</sup> (Phoenix Contact)



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

## MECHATROLINK RELATED COMMANDS

Commands available with this unit are the following.

PROFILE	COMMAND	CODE	FUNCTION
Common command	NOP	00H	No operation command
	ID_RD	03H	Read ID command
	CONFIG	04H	Setup device command
	ALM_RD	05H	Read alarm or warning command
	ALM_CLR	06H	Clear alarm or warning command
	CONNECT	0EH	Establish connection command
	DISCONNECT	0FH	Release connection command
Standard I/O profile	DATA_RWA	20H	Transmit I/O data

## RESPONSE TIME

Response time of discrete input module is the time till when the communication ASIC of the module transmits input data from when input signal is applied to the module.

Response time of discrete output module is the time till when the module output the signal from when output data is received by the communication ASIC of the module.

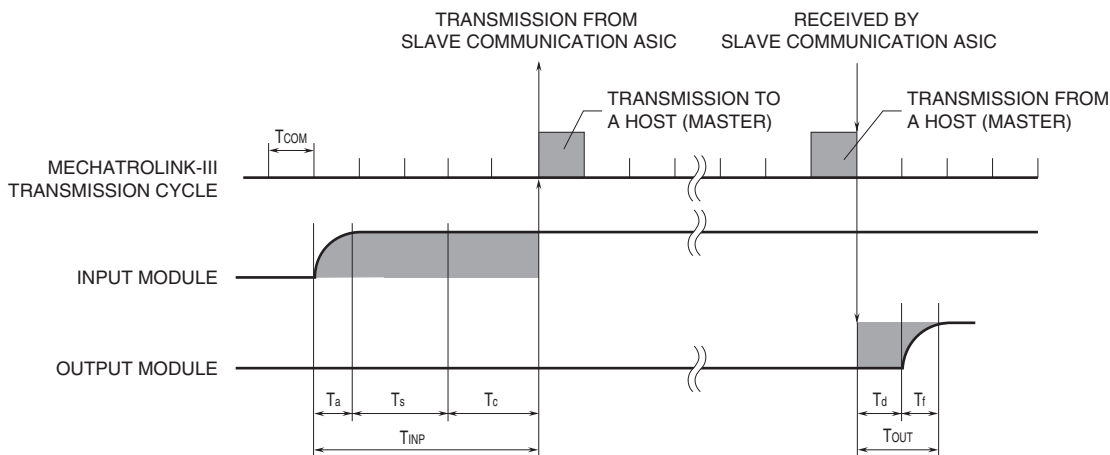
$T_{COM}$ : MECHATROLINK-III transmission cycle set at master  
(depends on system and configuration)

$T_{INP}$ : Response of input module  $\leq$  Delay of input circuit ( $T_a$ , ON delay time or OFF delay time) + Acquire cycle ( $T_s$ ) + input internal processing delay time ( $T_c$ , two transmission cycle)

$T_{OUT}$ : Response of output module  $\leq$  Output internal processing delay time ( $T_d$ , one minimum transmission cycle the unit can handle) + Delay of output circuit ( $T_f$ , ON delay time or OFF delay time)

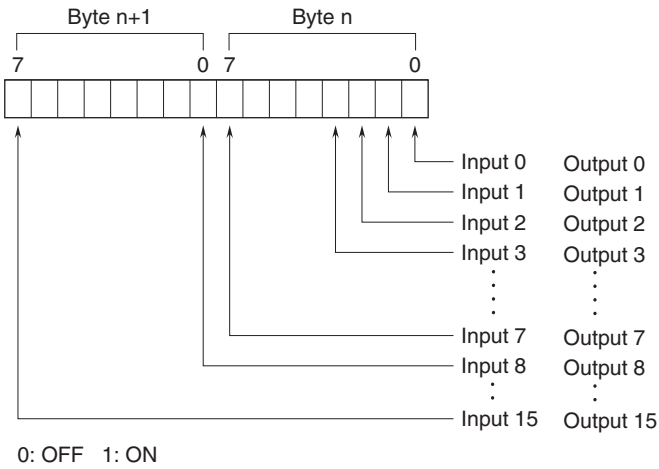
E.g. 1: R7F4HML3-D-DAC32B: Acquire cycle: 1 msec., MECHATROLINK-III transmission cycle: 0.125 msec., discrete input ON  
Response of input module ( $T_{INP}$ ): Delay of input circuit (0.2 msec.) + Acquire cycle (1 msec.) + input internal processing delay time (0.125 msec. x 2) = 1.45 [msec.]

E.g. 2: R4F4HML3-D-DAC32B: MECHATROLINK-III transmission cycle: 0.5 msec., discrete output OFF  
Response of output module ( $T_{OUT}$ ): Output internal processing delay time (0.125 msec.) + Delay of output circuit (0.5 msec.) = 0.625 [msec.]

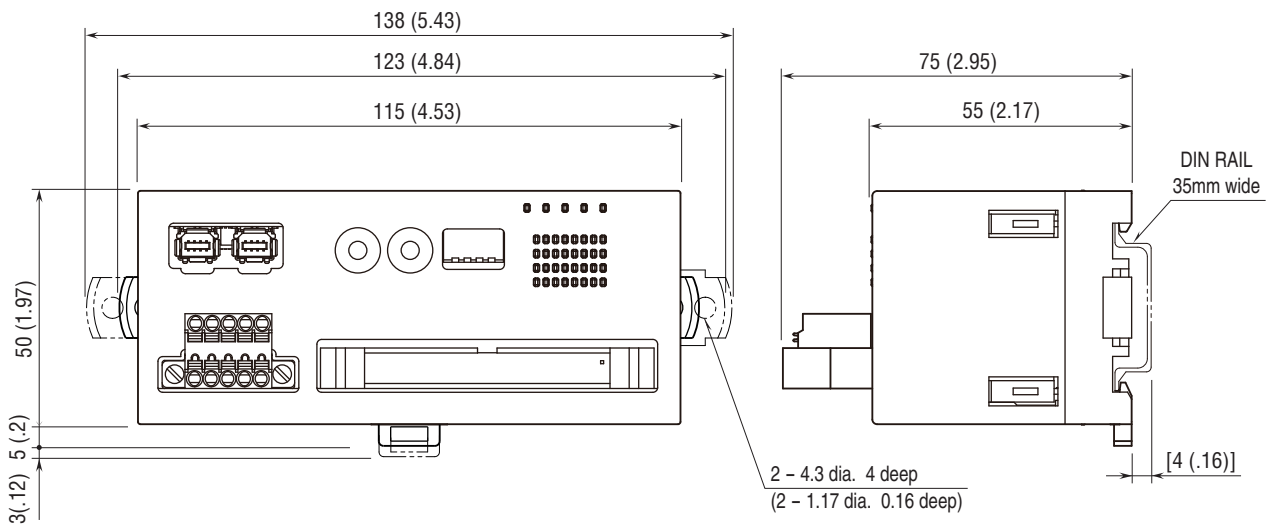


## I/O DATA DESCRIPTIONS

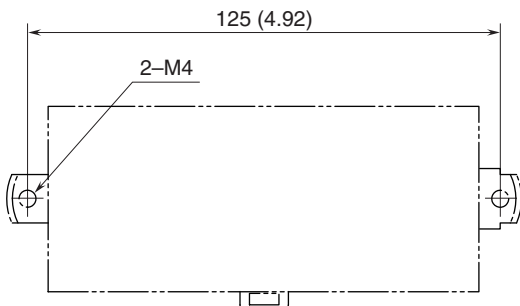
### ■ DISCRETE I/O



## EXTERNAL DIMENSIONS unit: mm (inch)



## MOUNTING REQUIREMENTS unit: mm (inch)



## NPN/PNP DISCRETE INPUT & NPN TRANSISTOR OUTPUT MODULE, 16 points

(MIL connector)

### MODEL: R7F4HML3-D-DAC32A

#### SPECIFICATIONS

##### COMMON SPECIFICATIONS

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

**Maximum I/O applicable at once:** No limit (at 24 V DC)

**I/O status indicator:** Green LED turns ON with contact ON

**Isolation:** Input to output to MECHATROLINK or FE to power input

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

**Dielectric strength:** 1500 V AC @ 1 minute (input or output to MECHATROLINK or FE to power)

500 V AC @ 1 minute (input to output)

##### INPUT

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

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

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

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

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

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

**ON delay:**  $\leq 0.2 \text{ msec.}$

**OFF delay:**  $\leq 0.5 \text{ msec.}$

##### OUTPUT

**Output common:** Negative common (NPN) per 16 points

**Rated load voltage:** 24 V DC  $\pm 10 \%$  (ripple 5 %p-p max.)

**Rated output current:** 0.1 A per point, 1.6 A per common

**Residual voltage:**  $\leq 1.2 \text{ V}$

**Leakage current:**  $\leq 0.1 \text{ mA}$

**ON delay:**  $\leq 0.2 \text{ msec.}$

**OFF delay:**  $\leq 0.5 \text{ msec.}$

**Overload current protection function:** Limits the current value when overcurrent is detected

##### Overheat Protection Function:

Turns OFF the output when overheat is detected

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

#### OPERATING MODE SETTING

(\*) Factory setting

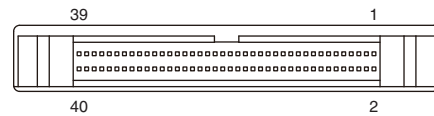
##### Output at the Loss of Communication (SW1-4)

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

##### Read Rate (SW1-1, 1-2, 1-3)

SW1-1	SW1-2	SW1-3	Read rate
OFF	OFF	OFF	$\leq 10 \text{ msec.}$ (*)
ON	OFF	OFF	$\leq 1 \text{ msec.}$
OFF	ON	OFF	$\leq 5 \text{ msec.}$
ON	ON	OFF	$\leq 20 \text{ msec.}$
OFF	OFF	ON	$\leq 50 \text{ msec.}$
ON	OFF	ON	$\leq 70 \text{ msec.}$
OFF	ON	ON	$\leq 100 \text{ msec.}$
ON	ON	ON	$\leq 200 \text{ msec.}$

#### TERMINAL ASSIGNMENTS

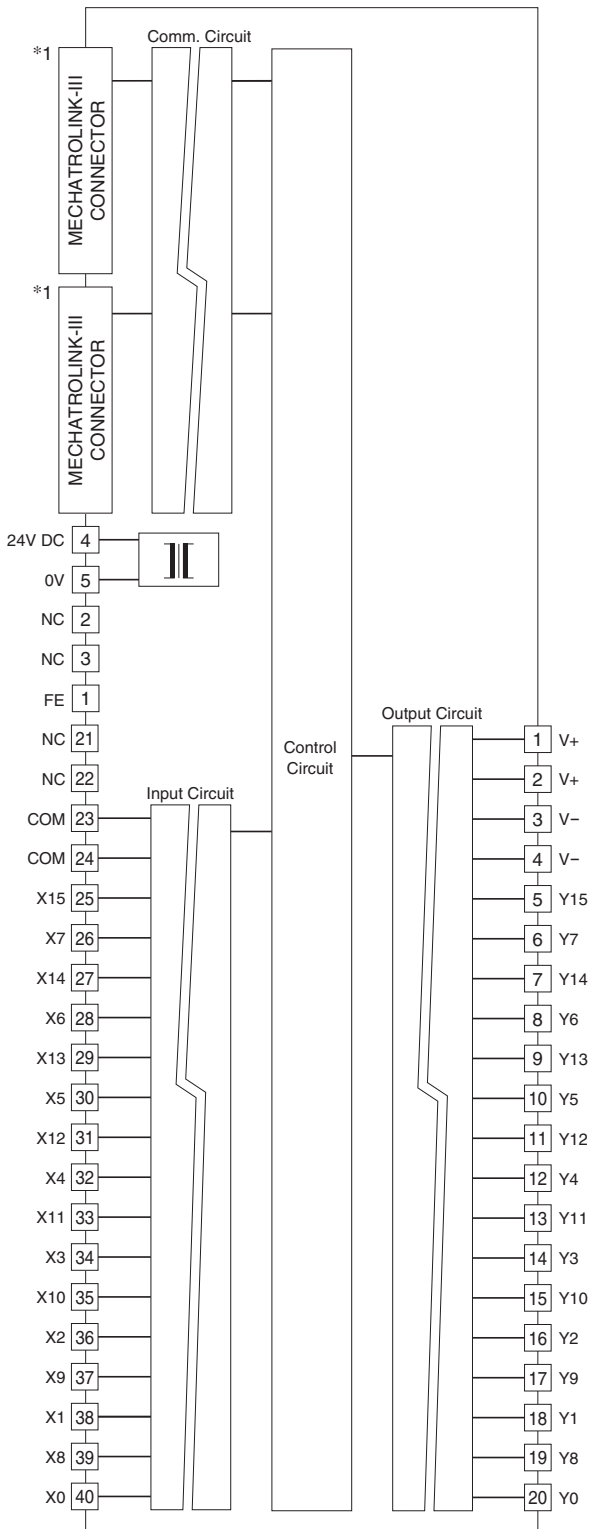


PIN No.	ID	FUNCTION	PIN No.	ID	FUNCTION
1	V+	External excitation	2	V+	External excitation
3	V-	Out. Common	4	V-	Out. Common
5	Y15	Output 15	6	Y7	Output 7
7	Y14	Output 14	8	Y6	Output 6
9	Y13	Output 13	10	Y5	Output 5
11	Y12	Output 12	12	Y4	Output 4
13	Y11	Output 11	14	Y3	Output 3
15	Y10	Output 10	16	Y2	Output 2
17	Y9	Output 9	18	Y1	Output 1
19	Y8	Output 8	20	Y0	Output 0
21	NC	NC	22	NC	NC
23	COM	In. common	24	COM	In. common
25	X15	Input 15	26	X7	Input 7
27	X14	Input 14	28	X6	Input 6
29	X13	Input 13	30	X5	Input 5
31	X12	Input 12	32	X4	Input 4
33	X11	Input 11	34	X3	Input 3
35	X10	Input 10	36	X2	Input 2
37	X9	Input 9	38	X1	Input 1
39	X8	Input 8	40	X0	Input 0

## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

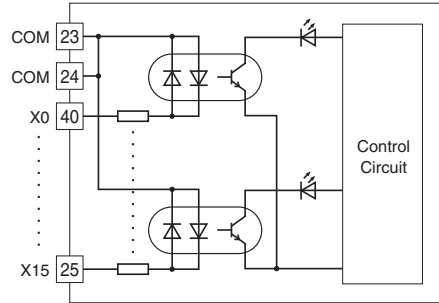
Note: In order to improve EMC performance, bond the FE terminal to ground.

Caution: FE terminal is NOT a protective conductor terminal.



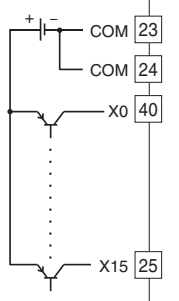
\*1. The network cable can be connected to either one.

### Input Circuit

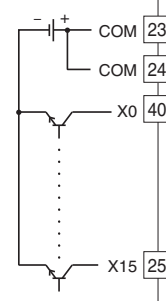


### Input Connection Examples

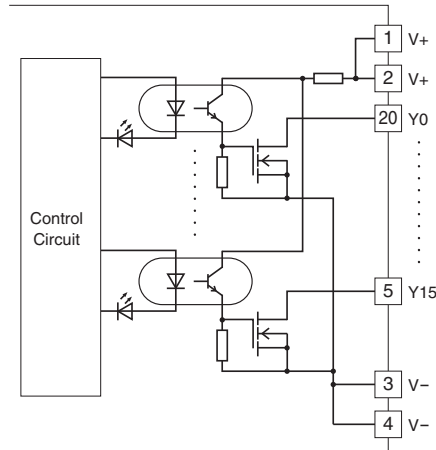
PNP Connection



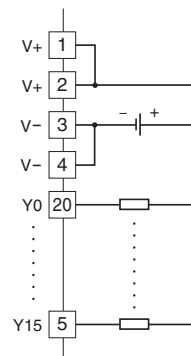
NPN Connection



### Output Circuit



### Output Connection Examples



## NPN/PNP DISCRETE INPUT & PNP TRANSISTOR OUTPUT MODULE, 16 points each

(MIL connector)

### MODEL: R7F4HML3-D-DAC32B

## SPECIFICATIONS

### COMMON SPECIFICATIONS

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

**Maximum I/O applicable at once:** No limit (at 24 V DC)

**I/O status indicator:** Green LED turns ON with contact ON

**Isolation:** Input to output to MECHATROLINK or FE to power input

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

**Dielectric strength:** 1500 V AC @ 1 minute (input or output to MECHATROLINK or FE to power)

500 V AC @ 1 minute (input to output)

### INPUT

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

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

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

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

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

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

**ON delay:**  $\leq 0.2 \text{ msec.}$

**OFF delay:**  $\leq 0.5 \text{ msec.}$

### OUTPUT

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

**Rated load voltage:** 24 V DC  $\pm 10 \%$  (ripple 5 %p-p max.)

**Rated output current:** 0.1 A per point, 1.6 A per common

**Residual voltage:**  $\leq 1.2 \text{ V}$

**Leakage current:**  $\leq 0.1 \text{ mA}$

**ON delay:**  $\leq 0.2 \text{ msec.}$

**OFF delay:**  $\leq 0.5 \text{ msec.}$

**Overload current protection function:** Limits the current value when overcurrent is detected

**Overheat Protection Function:**

Turns OFF the output when overheat is detected

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

## OPERATING MODE SETTING

(\*) Factory setting

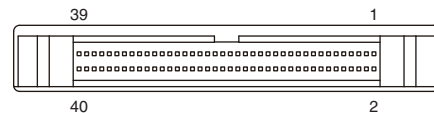
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SW1-1	SW1-2	SW1-3	Read rate
OFF	OFF	OFF	$\leq 10 \text{ msec.}$ (*)
ON	OFF	OFF	$\leq 1 \text{ msec.}$
OFF	ON	OFF	$\leq 5 \text{ msec.}$
ON	ON	OFF	$\leq 20 \text{ msec.}$
OFF	OFF	ON	$\leq 50 \text{ msec.}$
ON	OFF	ON	$\leq 70 \text{ msec.}$
OFF	ON	ON	$\leq 100 \text{ msec.}$
ON	ON	ON	$\leq 200 \text{ msec.}$

## TERMINAL ASSIGNMENTS



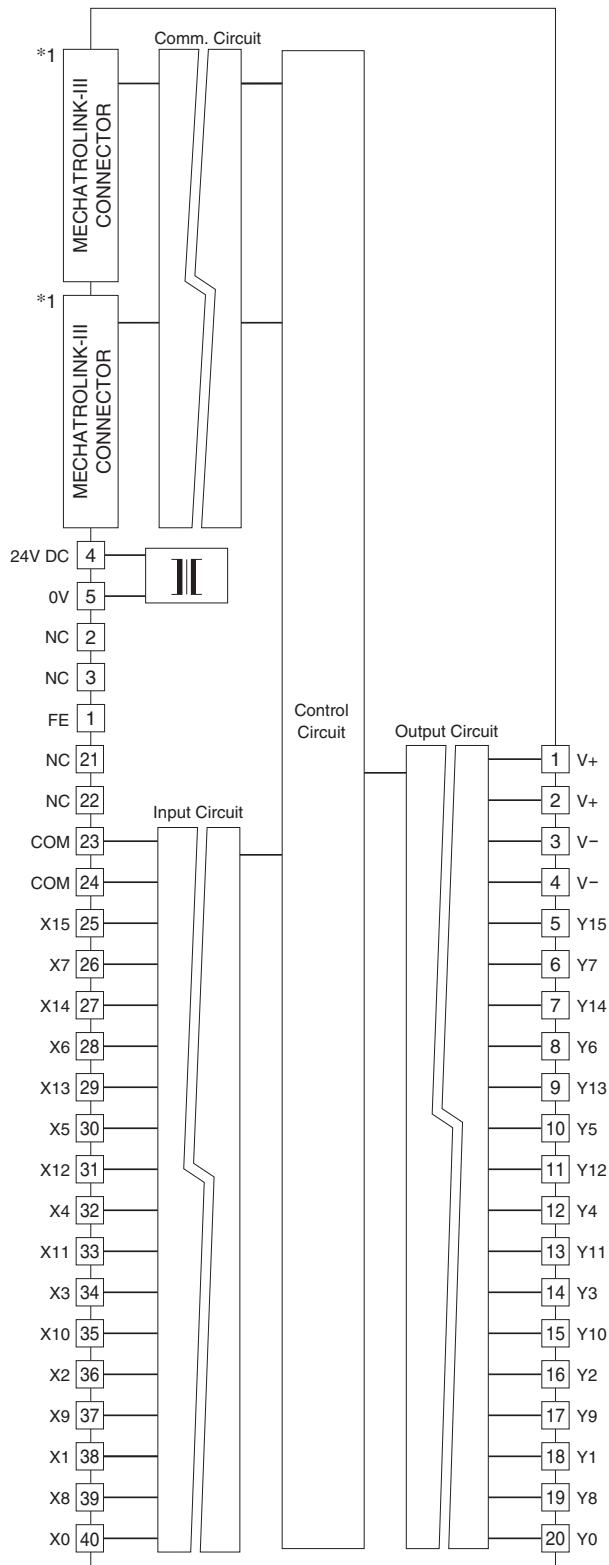
PIN No.	ID	FUNCTION	PIN No.	ID	FUNCTION
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3	V-	Out. Common	4	V-	Out. Common
5	Y15	Output 15	6	Y7	Output 7
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## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

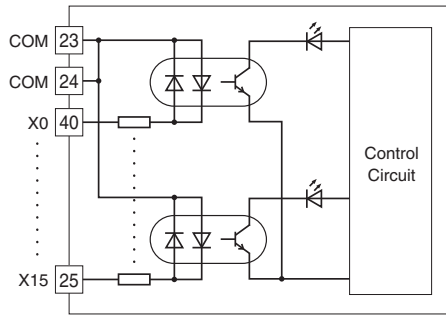
Note: In order to improve EMC performance, bond the FE terminal to ground.

Caution: FE terminal is NOT a protective conductor terminal.

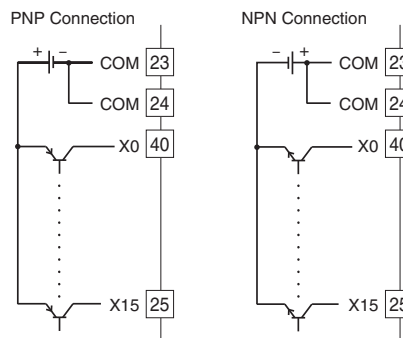


\*1. The network cable can be connected to either one.

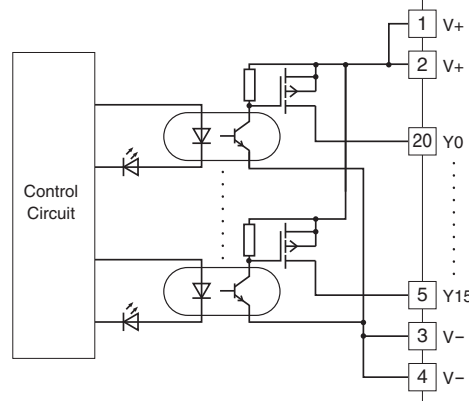
### Input Circuit



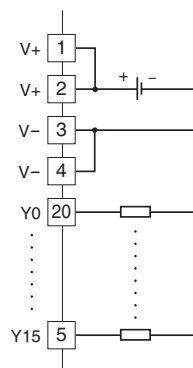
### Input Connection Examples



### Output Circuit



### Output Connection Examples





Specifications are subject to change without notice.