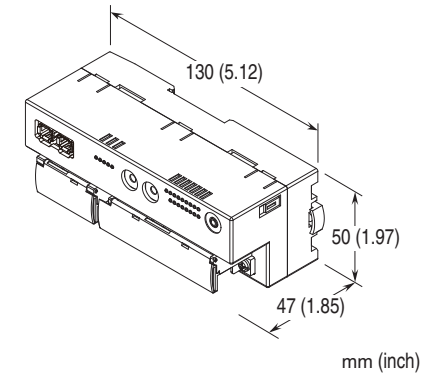
Remote I/O R7G4F Series

MECHATROLINK I/O MODULE

(MECHATROLINK-III)



MODEL: R7G4FML3-[1]-[2]-R[3]

ORDERING INFORMATION

• Code number: R7G4FML3-[1]-[2]-R[3]
Specify a code from below for each [1] through [3].
(e.g. R7G4FML3-6-DC16A-R/UL/Q)
• Specify the specification for option code /Q
(e.g. /C01)

[1] TERMINAL BLOCK

6: Screw terminal block for power supply
Connector for MECHATROLINK- III
Screw terminal block for I/O
B: Tension clamp terminal block for power supply
Connector for MECHATROLINK- III
e-CON connector for I/O

[2] I/O TYPE

DA16: NPN/PNP discrete input, 16 points
DA16A: NPN discrete input, 16 points
(Option /UL Not selectable)
DC16A: NPN transistor output, 16 points
DC16B: PNP transistor output, 16 points

POWER INPUT

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

[3] OPTIONS (multiple selections)

Standards & Approvals
blank: CE marking
/UL: UL approval, CE marking
Other Options
blank: none
/Q: Option other than the above (specify the specification)

■ **SELECTABLE TERMINAL BLOCK SPECIFIC TO I/O TYPE**

'N' marked combinations are not selectable.

Terminal Block \ I/O TYPE	DA16	DA16A	DC16A	DC16B
6	Y	N	Y	Y
B	N	Y	N	N

SPECIFICATIONS OF OPTION: Q

COATING (For the detail, refer to M-System's web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating (UL not available)

FUNCTIONS & FEATURES

MECHATROLINK I/O module (this module), interfaces discrete I/Os and PLC or PC via MECHATROLINK-III. Removable terminal blocks make the module replaceable without disconnection of wiring

RELATED PRODUCTS

• PC configurator software (model: R7CFG)
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: 1500 V AC @1 minute
(between isolated circuits)
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
Housing material: Flame-resistant resin (gray)
Status indicator LEDs: PWR, ERR, CON, LNK1, LNK2
(Refer to the instruction manual for details)
■ Current Consumption & Weight
R7G4FML3-6-DA16: 75 mA, 190 g (0.42 lb)

R7G4FML3-B-DA16A: 75 mA, 130 g (0.29 lb)
R7G4FML3-6-DC16A: 80 mA, 190 g (0.42 lb)
R7G4FML3-6-DC16B: 80 mA, 190 g (0.42 lb)
(Discrete I/O load charge is not included in the above-mentioned current consumption.)

MECHATROLINK-III COMMUNICATION

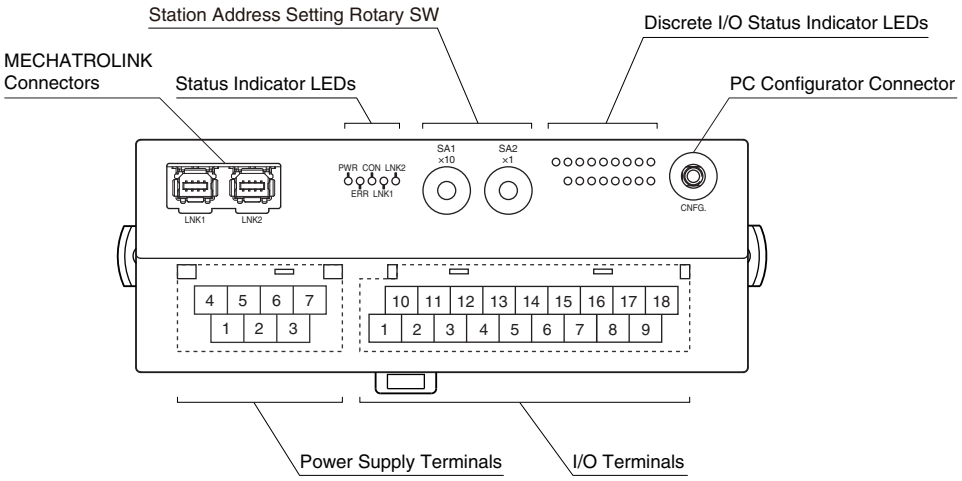
Baud rate: 100 Mbps
Transmission distance: 6300 m max.
Distance between stations: 100 m max.
Transmission media: MECHATROLINK cable (Model JEPMC-W6013-x-E, Yaskawa Controls Co., Ltd.)
Connector: TYCO AMP Industrial mini I/O connector
Max. number of slaves: 62
(The maximum number of slaves might change depending on the master unit. Refer to the manual of the master unit)
Transmission cycle: 125 µsec., 250 µsec., 500 µsec., 1 – 64 msec. (with 1 msec. increments)
Communication cycle: 125 µsec. 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

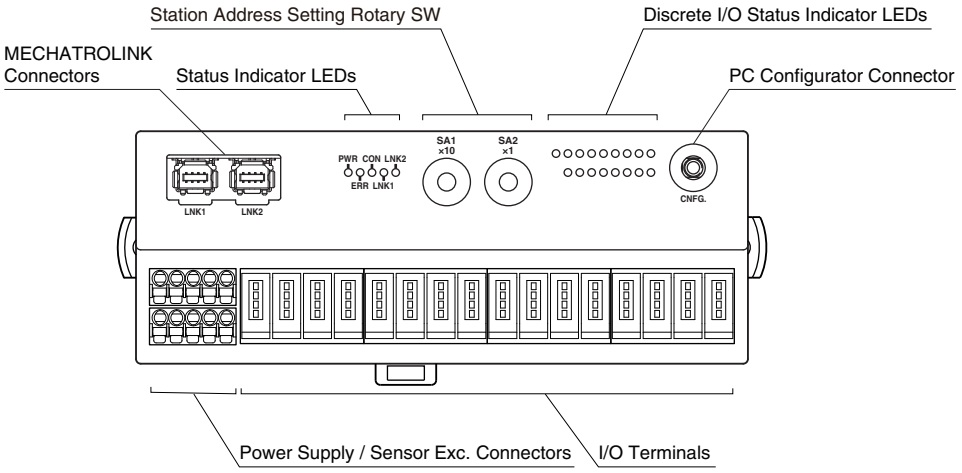
Refer to the manuals to comply with the standards.
EU conformity:
EMC Directive
EMI EN 61000-6-4
EMS EN 61000-6-2
RoHS Directive
EN 50581
Safety approval:
UL/C-UL general safety requirements
(UL 61010-1, CAN/CSA-C22.2 No.61010-1-12)
(UL 61010-2-201, CAN/CSA-C22.2 No.61010-2-201)

EXTERNAL VIEW

■ TERMINAL BLOCK CODE 6 (Screw terminal block)



■ TERMINAL BLOCK CODE B (e-CON)

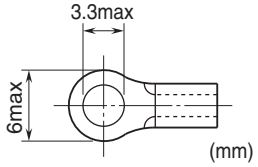


CONNECTION DIAGRAMS

■ **I/O (Refer to each model terminal assignment)**

• Screw terminal block

M3 separable screw terminals (torque 0.5 N·m)
Screw terminal material: Nickel-plated steel
Recommended manufacturer:
Japan Solderless Terminal MFG.Co.Ltd,
Nichifu Co.,Ltd
Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)
Recommended solderless terminal



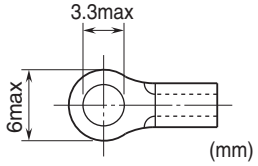
• e-CON connector

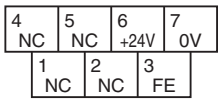
Recommended cable connector: 37104-( )-000FL (3M Company)
(The cable connector is not included in the package. Specify wire size instead of ( ); refer to the specifications of the product.)

■ **POWER SUPPLY**

• Screw terminal block

M3 separable screw terminals (torque 0.5 N·m)
Screw terminal material: Nickel-plated steel
Recommended manufacturer:
Japan Solderless Terminal MFG.Co.Ltd,
Nichifu Co.,Ltd
Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)
Recommended solderless terminal

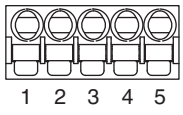




1. NC	—
2. NC	—
3. FE	Functional earth
4. NC	—
5. NC	—
6. +24V	Power Supply (24V DC)
7. 0V	Power Supply (0V)

• Tension clamp terminal block

Cable connector: FMC1,5/5-ST-3,5 (Phoenix Contact)
(The cable connector is included in the package.)
Applicable wire size: 0.2 to 1.5 mm²
stripped length: 10 mm
Recommended solderless terminal
- AI0,25–10YE 0.25 mm² (Phoenix Contact)
- AI0,34-10TQ 0.34 mm² (Phoenix Contact)
- AI0,5-10WH 0.5 mm² (Phoenix Contact)
- AI0,75-10GY 0.75 mm² (Phoenix Contact)
- A1-10 1.0 mm² (Phoenix Contact)
- A1,5-10 1.5 mm² (Phoenix Contact)



1. PWR +	Power Supply
2. PWR –	Power Supply
3. FE	Functional earth
4. SNSR.EXC +	Sensor excitation
5. SNSR.EXC –	Sensor excitation

Note: The numbers marked on the connector have no relationship to the pin number of the unit.
Wire according to the instruction manual of the unit.

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

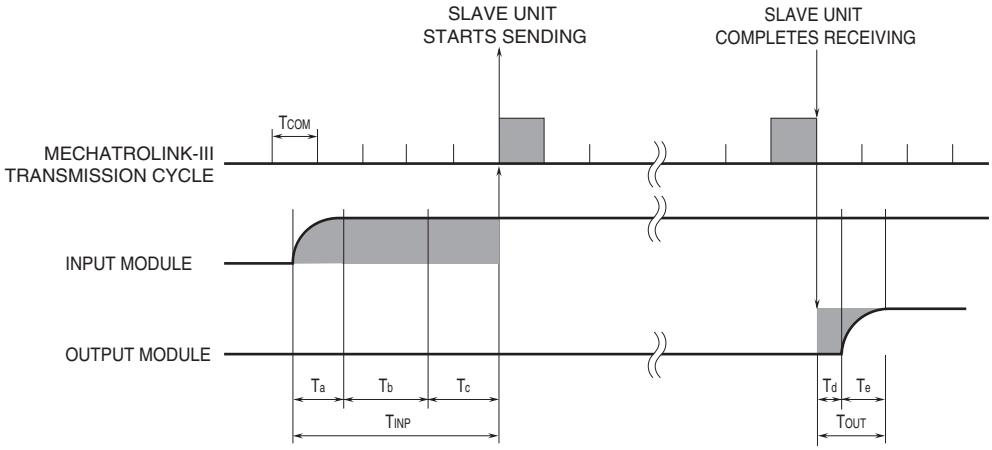
Response time of discrete input module is the time till when the unit starts sending to a transmission line when a signal is applied to the input module.
Response time of discrete output module is the time till when the module outputs a signal when the unit completes receiving from a transmission line.

T_{COM}: MECHATROLINK-III transmission cycle configured by a host device.
MECHATROLINK-III transmission cycle vavies depends on system and configuration.
T_{INP}: Response time of input module ≤ Ta Delay of input circuit (ON delay time or OFF delay time) +
Tb Read rate setting time +
Tc Internal processing delay time (2 cycle of MECHATROLINK-III transmission cycle)

T_{OUT}: Response time of output module ≤ Td Internal processing delay time (1 cycle of min. transmission cycle units can handle) + Te Delay of output circuit (ON delay time or OFF delay time)

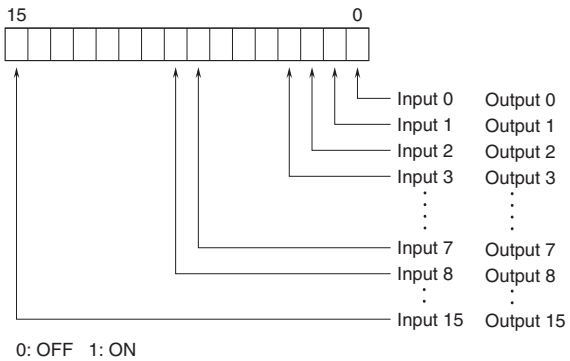
E.g. 1. DA16 module: Read rate of 1 msec., MECHATROLINK-III transmission cycle of 0.25 msec.
Response time of input module (T_{INP}): Delay of input circuit (0.2 msec.) + Read rate setting time (1 msec.) +
Internal processing delay time (0.25 msec.) x 2 = 1.7 [msec.]

E.g. 2. DA16 module: MECHATROLINK-III transmission cycle of 0.5 msec.
Response time of output module (T_{OUT}): Internal processing delay time (0.125 msec.) + Delay of output circuit (0.5 msec.) = 0.625 [msec.]



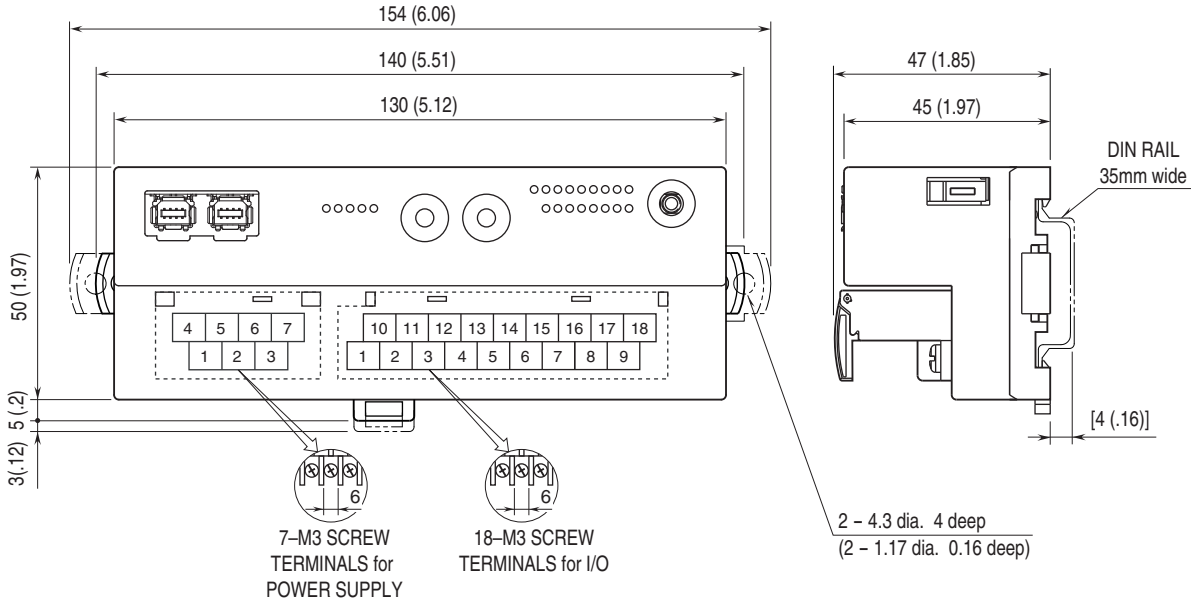
I/O DATA DESCRIPTIONS

■ **DISCRETE I/O**

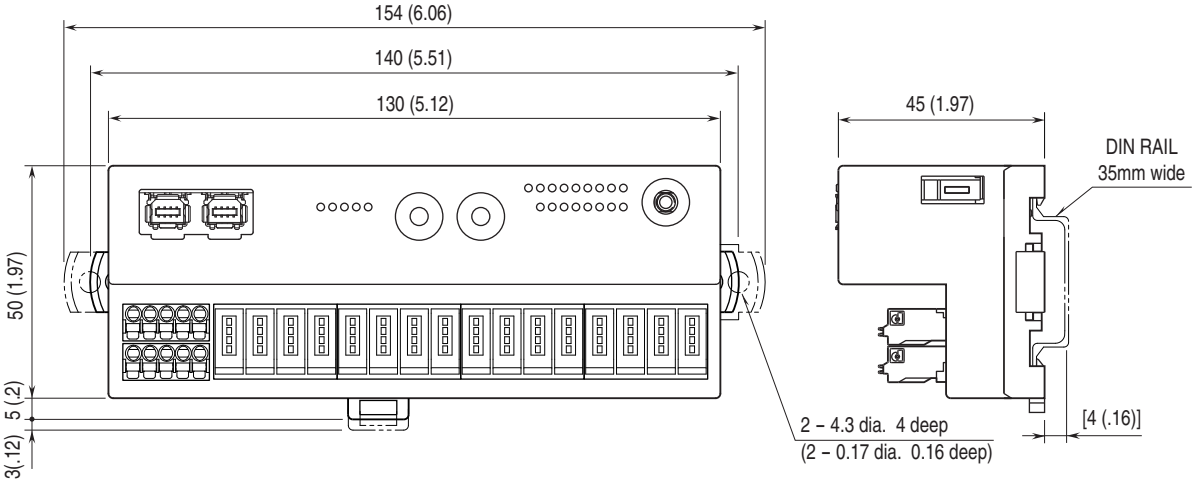


DIMENSIONS unit: mm (inch)

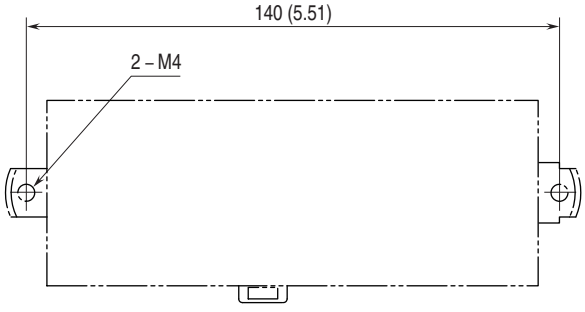
■ **TERMINAL BLOCK CODE 6 (Screw terminal block)**



■ **TERMINAL BLOCK CODE B (e-CON)**



MOUNTING REQUIREMENTS unit: mm (inch)



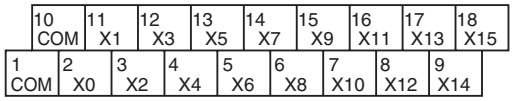
NPN/PNP DISCRETE INPUT MODULE, 16 points
(screw terminal block)

MODEL: R7G4FML3-6-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: Green LED turns ON with contact ON
Isolation: Input to MECHATROLINK or FE 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: ≤ 0.2 msec.
OFF delay: ≤ 0.5 msec.
Read rate: 1 msec., 5 msec., 10 msec., 20 msec., 50 msec., 70 msec., 100 msec., 200 msec.
by using PC configurator (model: R7CFG)
(factory default: 10 msec.)

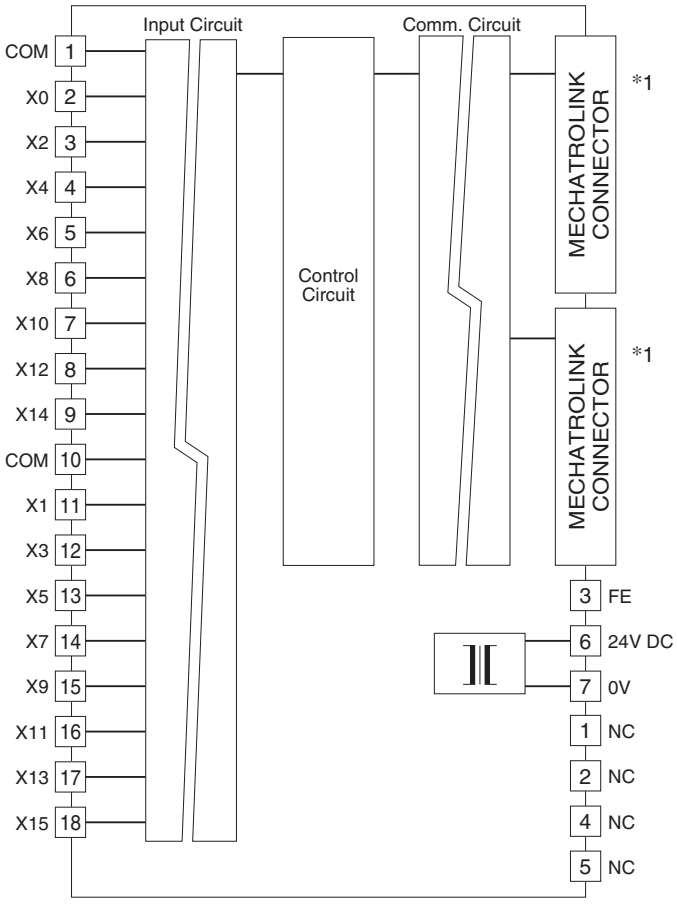
TERMINAL ASSIGNMENTS



NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	COM	Common	10	COM	Common
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	X10	Input 10	16	X11	Input 11
8	X12	Input 12	17	X13	Input 13
9	X14	Input 14	18	X15	Input 15

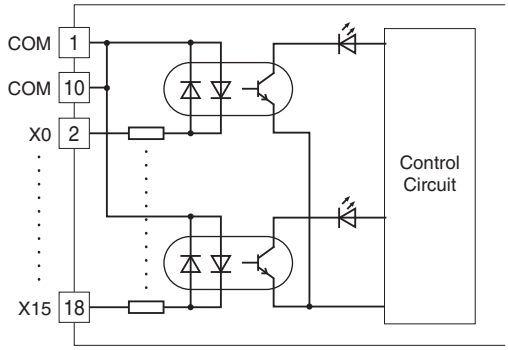
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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

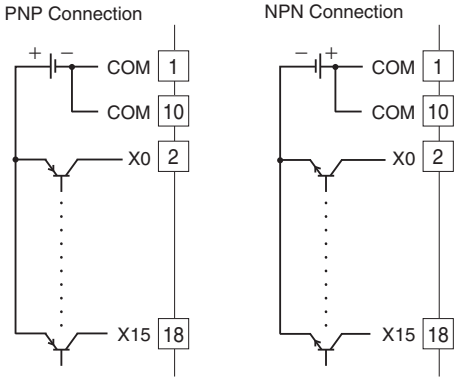


*1. The network cable can be connected to either one.

■ **Input Circuit**



■ **Input Connection Examples**



NPN DISCRETE INPUT MODULE, 16 points

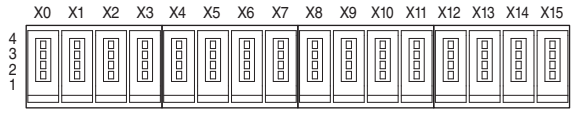
(e-CON connector)

MODEL: R7G4FML3-B-DA16A

SPECIFICATIONS

Sensor Excitation (External):
24 V DC ± 10 % (ripple 5 %p-p max.),
≤ 2 A (including discrete input load charge);
rated current 8 A
Common: Positive common (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: Green LED turns ON with contact ON
Isolation: Input or sensor excitation to MECHATROLINK or FE to power input
Rated input voltage: 24 V DC ±10 %; ripple 5 %p-p max.
ON voltage / current: ≥ 15 V DC (Input's X0 through X15 to +24 V) / ≥ 3.5 mA
OFF voltage / current: ≤ 5 V DC (Input's X0 through X15 to +24 V) / ≤ 1 mA
Input current: ≤ 5.5 mA per point at 24 V DC
Input resistance: Approx. 4.4 kΩ
ON delay: ≤ 0.2 msec.
OFF delay: ≤ 0.5 msec.
Read rate: 1 msec., 5 msec., 10 msec., 20 msec., 50 msec., 70 msec., 100 msec., 200 msec.
by using PC configurator (model: R7CFG)
(factory default: 10 msec.)

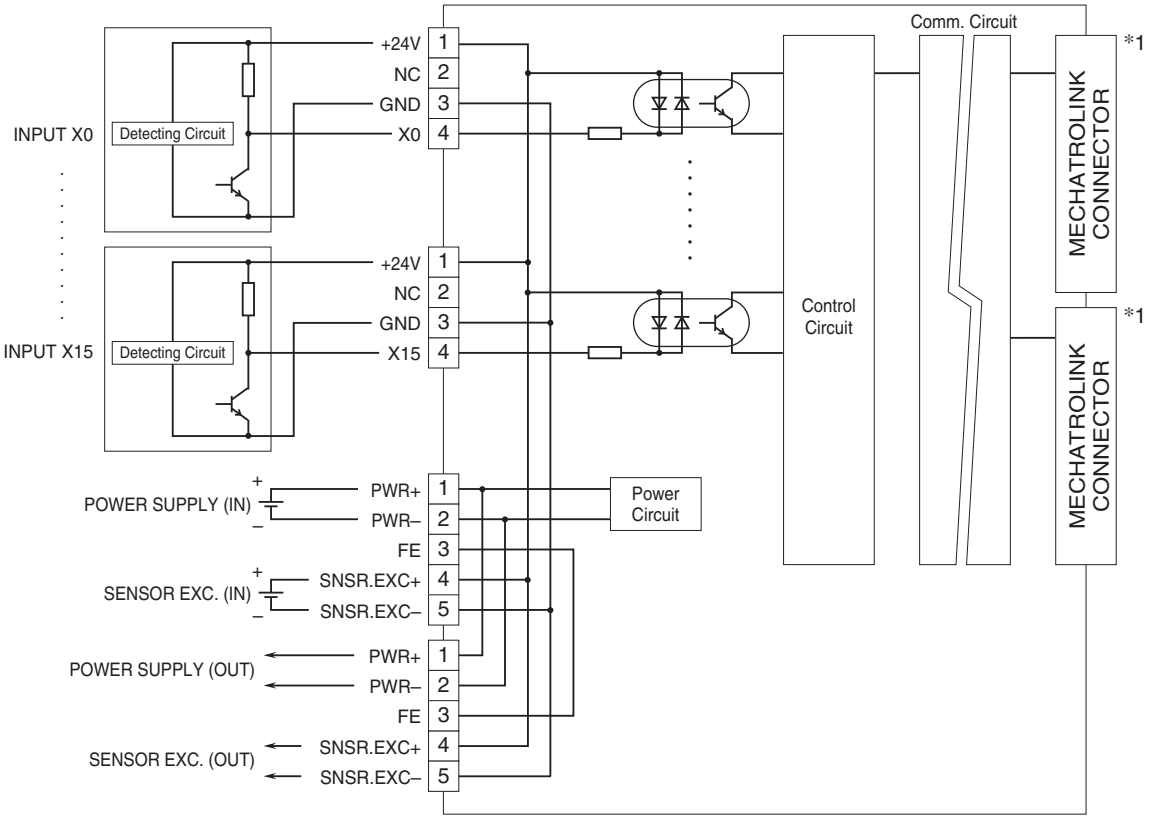
TERMINAL ASSIGNMENTS



PIN No.		ID	FUNCTION	PIN No.		ID	FUNCTION
X0	1	+24V	24V DC	X8	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X0	Input 0		4	X8	Input 8
X1	1	+24V	24V DC	X9	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X1	Input 1		4	X9	Input 9
X2	1	+24V	24V DC	X10	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X2	Input 2		4	X10	Input 10
X3	1	+24V	24V DC	X11	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X3	Input 3		4	X11	Input 11
X4	1	+24V	24V DC	X12	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X4	Input 4		4	X12	Input 12
X5	1	+24V	24V DC	X13	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X5	Input 5		4	X13	Input 13
X6	1	+24V	24V DC	X14	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X6	Input 6		4	X14	Input 14
X7	1	+24V	24V DC	X15	1	+24V	24V DC
	2	NC	Unused		2	NC	Unused
	3	GND	0V		3	GND	0V
	4	X7	Input 7		4	X15	Input 15

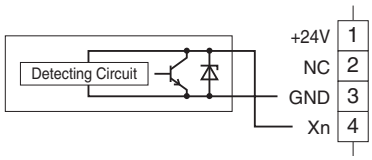
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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.

■ **2-Wire Sensor**



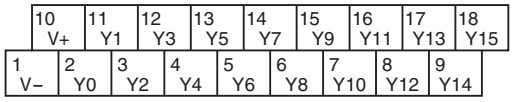
NPN TRANSISTOR OUTPUT MODULE, 16 points
(screw terminal block)

MODEL: R7G4FML3-6-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: Green LED turns ON with contact ON
Isolation: Output to MECHATROLINK or FE to power input
Rated load voltage: 24 V DC ±10 % (ripple 5 %p-p max.)
Rated output current: 0.1 A per point, 1.6 A per common
Residual voltage: ≤ 1.2 V
Leakage current: ≤ 0.1 mA
ON delay: ≤ 0.2 msec.
OFF delay: ≤ 0.5 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.)
Output at the loss of communication:At communication error, the output status until normal data is received (Hold or OFF) can be set with PC configurator (model: R7CFG).
(factory default: Hold)

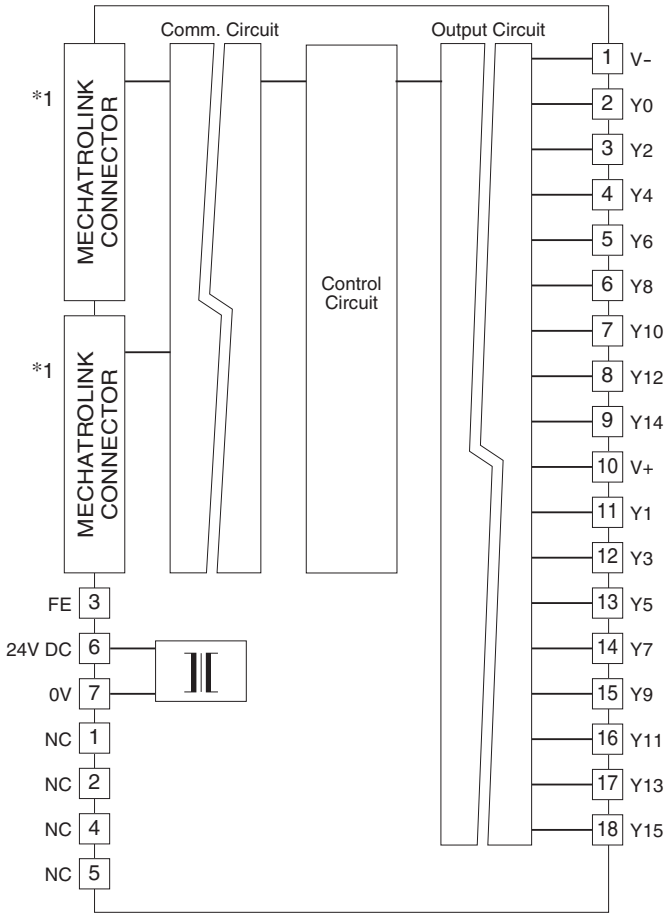
TERMINAL ASSIGNMENTS



NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	V–	0V (Out. Common)	10	V+	24VDC
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	Y10	Output 10	16	Y11	Output 11
8	Y12	Output 12	17	Y13	Output 13
9	Y14	Output 14	18	Y15	Output 15

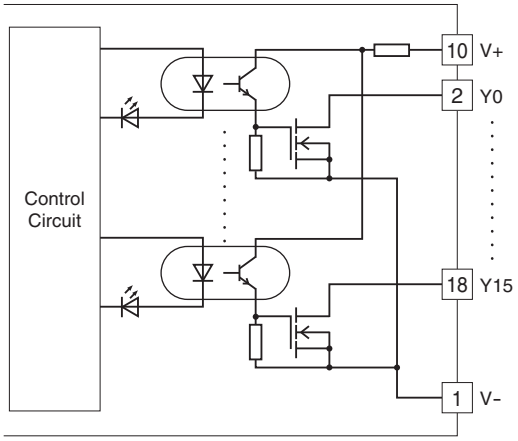
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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

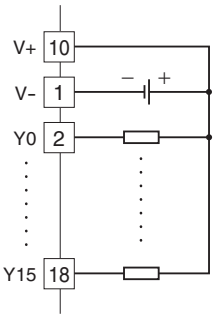


*1. The network cable can be connected to either one.

■ **Output Circuit**



■ **Output Connection Examples**



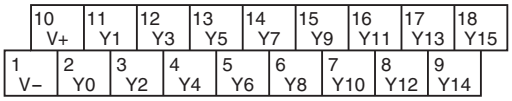
PNP TRANSISTOR OUTPUT MODULE, 16 points
(screw terminal block)

MODEL: R7G4FML3-6-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: Green LED turns ON with contact ON
Isolation: Output to MECHATROLINK or FE to power input
Rated load voltage: 24 V DC ±10 % (ripple 5 %p-p max.)
Rated output current: 0.1 A per point, 1.6 A per common
Residual voltage: ≤ 1.2 V
Leakage current: ≤ 0.1 mA
ON delay: ≤ 0.2 msec.
OFF delay: ≤ 0.5 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.)
Output at the loss of communication:At communication error, the output status until normal data is received (Hold or OFF) can be set with PC configurator (model: R7CFG).
(factory default: Hold)

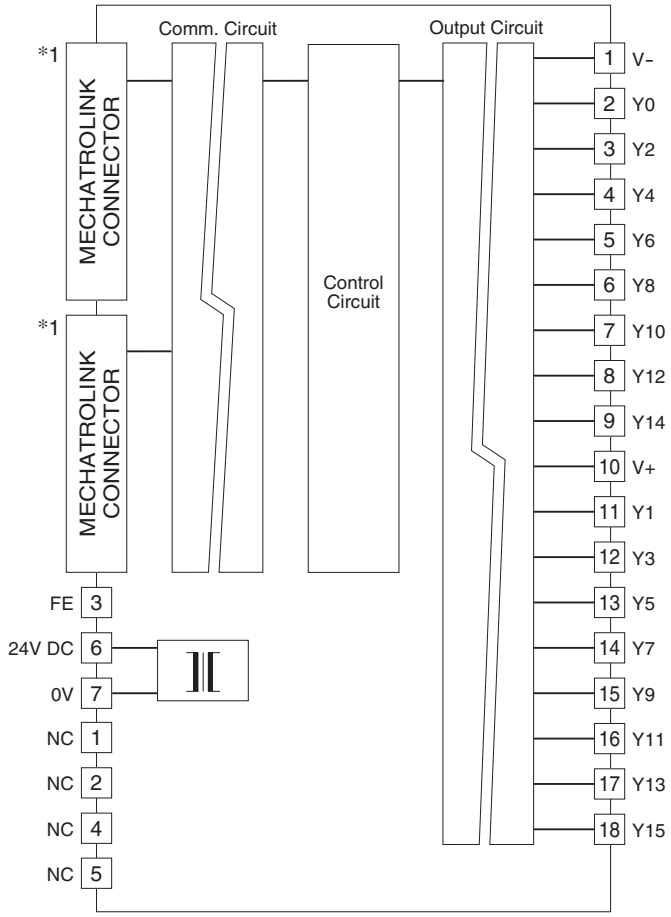
TERMINAL ASSIGNMENTS



NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	V–	0V	10	V+	24VDC (Out. 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	Y10	Output 10	16	Y11	Output 11
8	Y12	Output 12	17	Y13	Output 13
9	Y14	Output 14	18	Y15	Output 15

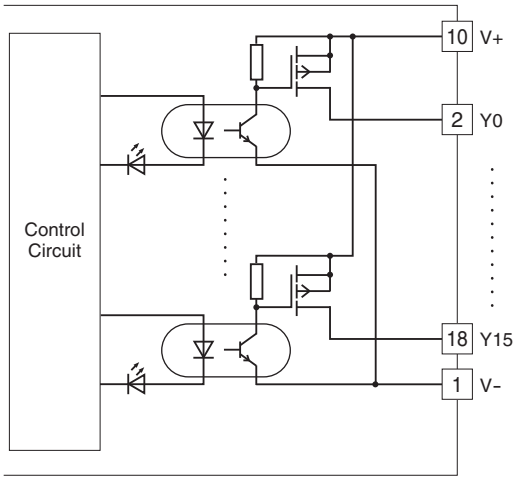
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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

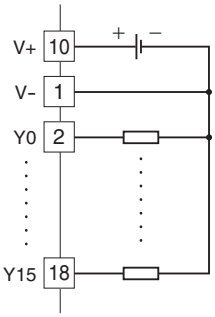


*1. The network cable can be connected to either one.

■ **Output Circuit**



■ **Output Connection Examples**



⚠ Specifications are subject to change without notice.