

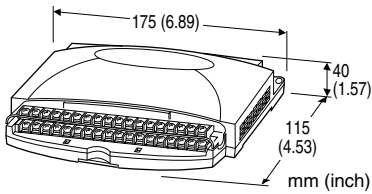
Remote I/O R1M Series

THERMOCOUPLE & DC INPUT MODULE

(8 points, isolated)

Functions & Features

- 8-point thermocouple or DC inputs
- Complete channel-to-channel isolation
- Trigger input and alarm contact output
- Filtering protection against 50/60 Hz noise
- Modbus RS-485 and RS-232-C interface
- Easy system expansion via Modbus RTU



MODEL: R1MS-GH3T-[1][2]

ORDERING INFORMATION

- Code number: R1MS-GH3T-[1][2]
- Specify a code from below for each [1] and [2].
(e.g. R1MS-GH3T-M2/Q)
- Specify the specification for option code /Q
(e.g. /C01)

FIELD TERMINAL TYPE

T: M3 screw terminals

[1] POWER INPUT

AC Power

M2: 100 – 240 V AC (Operational voltage range 85 – 264 V, 47 – 66 Hz)

DC Power

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

[2] OPTIONS

blank: none

/Q: With options (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

RELATED PRODUCTS

- Resistor module (model: REM3-250)
- R1X configurator software (model: R1CON)

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

Connection

Power input, transmission: Euro type connector terminal
(Applicable wire size: 0.2 – 2.5 mm² (AWG24 – 12), stripped length 7 mm)

RS-232-C: 9-pin D-sub connector (male)
(Lock screw No. 4-40 UNC)

I/O: M3 screw terminals (torque: 0.6N·m)

PC Configurator: Miniature jack, RS-232-C level

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (gray)

Isolation: Input 1 to input 2 to input 3 to input 4 to input 5 to input 6 to input 7 to input 8 to trigger input to alarm output to RS-232-C or RS-485 or configurator jack to power to FG

Burnout: Upscale, downscale or no burnout selectable with the operating mode setting rotary switch (default: No). Set to 'No Burnout' when other devices are connected in parallel to the R1MS.

Operating mode setting: Rotary switch; burnout type and line noise frequency setting

Line noise filtering: Specifying line frequency to 50 Hz or 60 Hz in order to increase normal mode noise rejection ratio. (default: 50/60 Hz for use with both frequencies)

Node address setting: Rotary switch; 1 – F (15 nodes)

RUN indicator LED: Green light blinks in normal conditions.

COMMUNICATION

Baud rate: 38.4 kbps

Communication: Half-duplex, asynchronous, no procedure

Protocol: Modbus RTU

Refer to Modbus Protocol Reference Guide (EM-5650) for supported functions.

■ RS-232-C

Standard: Conforms to RS-232-C, EIA

Transmission distance: 10 meters max.

■ RS-485

Standard: Conforms to TIA/EIA-485-A

Transmission distance: 500 meters max.

Transmission media: Shielded twisted-pair cable (CPEV-S 0.9 dia.)

INPUT SPECIFICATIONS

Input: Thermocouple or DC input within ± 10 V, 8 points

• **Input resistance**

Thermocouple: ≥ 1 M Ω when powered;

≥ 200 k Ω when not powered

DC: ≥ 800 k Ω when powered;

≥ 700 k Ω when not powered

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

Sampling rate: 50 millisecon./8 points

• **Trigger input:** Dry contact; ON detected at ≤ 1.5 V

Sensing: Approx. 3 V DC @ 0.8 mA

• **Burnout detecting:** ≤ 45 nA for upscale or downscale;

≤ 5 nA with no burnout (when measuring 0°C)

Burnout response: ≤ 10 seconds

OUTPUT SPECIFICATIONS

■ **Alarm Output:** Photo MOSFET relay (no polarity);

≤ 50 Ω at ON, ≥ 1 M Ω at OFF; OFF when not powered

Peak load voltage: 50 V max.

Continuous load current: 50 mA max.

Peak load current: 300 mA max. (≤ 0.1 sec.)

INSTALLATION

Power consumption

• **AC:** Approx. 9 VA

• **DC:** Approx. 3.5 W

Operating temperature: -5 to +60°C (23 to 140°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Mounting: Surface or DIN rail

Weight: 450 g (0.99 lb)

PERFORMANCE (% of measuring range)

Accuracy

DC input: ± 0.05 % (± 10 mV)

Thermocouple input: See the table below.

Cold junction compensation error: (°C)

$\leq \pm(1.0 + [\text{Ambient Temp.} - 20] \times 0.04)$ in stable ambient temperature (e.g. ± 1.4 °C at 10°C and 30°C)

Sudden ambient temperature change affects the cold junction compensation. Be sure to place the R1MS in stable ambient.

Temp. coefficient: $\leq (\text{Accuracy} / 4) / ^\circ\text{C}$

(e.g. DC: ± 0.0125 %/°C or ± 2.5 mV/°C,

TC: ± 12.5 $\mu\text{V}/^\circ\text{C}$, ± 0.2 °C/°C with type E)

Response time: Approx. 0.55 sec. (0 - 90 %)

Insulation resistance: ≥ 100 M Ω with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute

(input 1 to input 2 to input 3 to input 4 to input 5 to input 6 to input 7 to input 8 to trigger input to alarm output to RS-232-C or RS-485 or configurator jack)

2000 V AC @ 1 minute (input or alarm output or RS-232-C or

RS-485 or configurator jack to power to FG)

Normal mode noise rejection: ≥ 85 dB (50/60 Hz) with the filtering set to a specific frequency; ≥ 35 dB with 50/60 Hz setting

Common mode noise rejection: ≥ 120 dB (50/60 Hz)

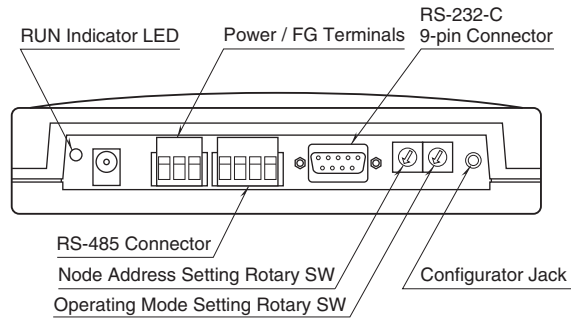
Accuracy (T/C)

T/C	USABLE RANGE (°C)	CONFORMANCE RANGE (°C)	ACCURACY (°C)
(PR)	0 to 1770	400 to 1770	± 4.6
K (CA)	-270 to +1370	0 to 1370	± 1.5
E (CRC)	-270 to +1000	0 to 1000	± 0.8
J (IC)	-210 to +1200	0 to 1200	± 1.0
T (CC)	-270 to +400	0 to 400	± 1.3
B (RH)	100 to 1820	700 to 1820	± 7.2
R	-50 to +1760	400 to 1760	± 4.8
S	-50 to +1760	400 to 1760	± 5.3
C (WRe 5-26)	0 to 2320	0 to 2320	± 4.9
N	-270 to +1300	0 to 1300	± 1.9
U	-200 to +600	0 to 600	± 1.3
L	-200 to +900	0 to 900	± 1.0
P (Platinel II)	0 to 1395	0 to 1395	± 1.7
T/C	USABLE RANGE (°F)	CONFORMANCE RANGE (°F)	ACCURACY (°F)
(PR)	32 to 3218	752 to 3218	± 8.28
K (CA)	-454 to +2498	32 to 2498	± 2.7
E (CRC)	-454 to +1832	32 to 1832	± 1.44
J (IC)	-346 to +2192	32 to 2192	± 1.8
T (CC)	-454 to +752	32 to 752	± 2.34
B (RH)	212 to 3308	1292 to 3308	± 13.0
R	-58 to +3200	752 to 3200	± 8.64
S	-58 to +3200	752 to 3200	± 9.54
C (WRe 5-26)	32 to 4208	32 to 4208	± 8.82
N	-454 to +2372	32 to 2372	± 3.42
U	-328 to +1112	32 to 1112	± 2.34
L	-328 to +1652	32 to 1652	± 1.8
P (Platinel II)	32 to 2543	32 to 2543	± 3.06

Note 1: Measuring accuracy at 50 μV emf.

Note 2: CJC error is not included.

EXTERNAL VIEW

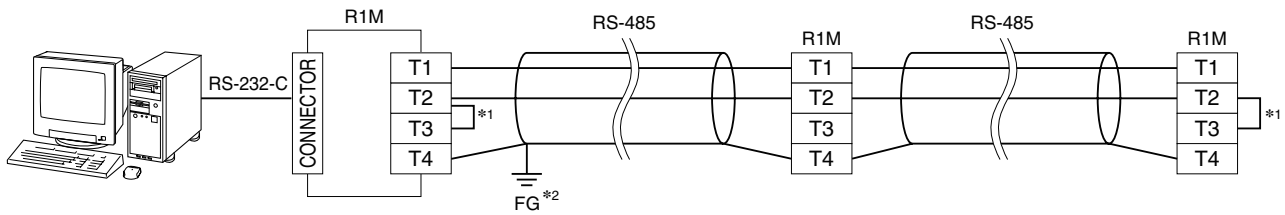


■ RS-232-C INTERFACE



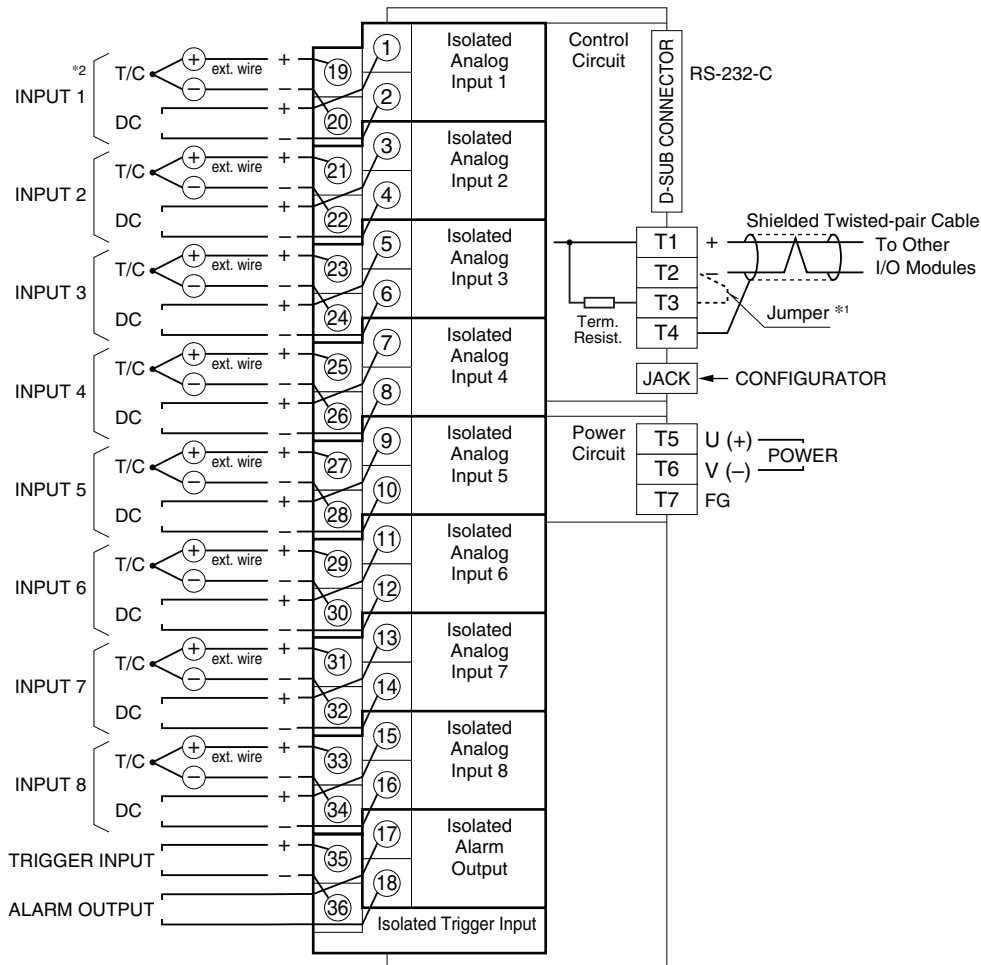
ABBR.	PIN NO.	EXPLANATION OF FUNCTION
BA (SD)	2	Transmitted Data
BB (RD)	3	Received Data
AB (SG)	5	Signal Common
CB (CS)	7	Clear to Send
CA (RS)	8	Request to Send
	1	Not Used.
	4	DO NOT connect. Connecting may cause malfunctions.
	6	
	9	

COMMUNICATION CABLE CONNECTIONS



- *1. Internal terminating resistor is used when the device is at the end of a transmission line.
- *2. Install shielded cables to all sections and ground them at single point.

CONNECTION DIAGRAM



*1. When the device is located at the end of a transmission line via twisted-pair cable, (when there is no cross-wiring), close across the terminal T2 – T3 with the attached jumper pin (or with a leadwire). When the device is not at the end, remove the jumper pin.

*2. Separate sets of terminals for DC and TC are assigned to each channel, however, DO NOT connect to both sets of terminals at once. Duplicate connection may affect measuring accuracies. DC and TC can be mixed among eight channels.

Note 1: Be careful to eliminate noise as much as possible by e.g. using shielded cables.
 Note 2: Be sure to earth the FG terminal and the cable shielding to a most stable earth point in the environment.

Note 3: Resistor modules (model: REM3-250) can be used to convert current inputs into voltage. However, use of REM3 is not recommended when TC inputs are mixed because the heat developed on and around the REM3 affects the cold junction compensation performance.

Caution: FG terminal is NOT a protective conductor terminal.

MODBUS COMMUNICATION

■ COMMUNICATION PARAMETERS

PARAMETER	SPECIFICATION
Data Mode	RTU
Baud Rate	9600 / 19200 / 38400 (*) bps
Parity	None / Odd (*) / Even
Bit Length	8
Stop Bit	1 (*) / 2
Node Address	1 (*) to 15
Floating Point Data	N/A
Interface	RS-232-C/ RS-485

(*) Ex-factory setting

■ FUNCTION CODES & SUPPORTED CODES

CODE	NAME		
01	Read Coil Status	X	Digital output from the slave
02	Read Input Status	X	Status of digital inputs to the slave
03	Read Holding Registers	X	General purpose register within the slave
04	Read Input Registers	X	Collected data from the field by the slave
05	Force Single Coil	X	Digital output from the slave
06	Preset Single Registers	X	General purpose register within the slave
07	Read Exception Status		
08	Diagnostics		
09	Program 484		
10	Poll 484		
11	Fetch Comm. Event Counter		Fetch a status word and an event counter
12	Fetch Comm. Event Log		A status word, an event counter, a message count and a field of event bytes
13	Program Controller		
14	Poll Controller		
15	Force Multiple Coils	X	Digital output from the slave
16	Preset Multiple Registers	X	General purpose register within the slave
17	Report Slave ID		Slave type / 'RUN' status
18	Program 884/M84		
19	Reset Comm. Link		
20	Read General Reference		
21	Write General Reference		
22	Mask Write 4X Register		
23	Read/Write 4X Register		
24	Read FIFO Queue		

■ DATA ADDRESS

	ADDRESS	DATA FORMAT	NAME	
Coil (0X)	1 – 32	bit	DO: Alarm (Only Address 10001 is enabled.)	
	33 – 40	bit	Cold junction compensation SW (0: Disable, 1: Enable) *1	
Input Status (1X)	1 – 32	bit	DI: Trigger contact input (Only Address 10001 is enabled.)	
	33 – 40	bit	ADC overrange	
Input Register (3X)	1 – 8	I	AI per channel in engineering unit (DC: x 1000, TC: x 10)	
	17 – 32	F	AI per channel in engineering unit	
	33 – 48	F	Calibrated voltage value	
	49 – 64	F	Cold junction temperature *2	
	65 – 72	F	Temperature measured at Ch.1 thr. 4	
	81 – 88	I	Channel status	
	513	I	Bit	System Status
		0 to 5		Reserved for system use
		6		E ² PROM diagnostics (0: Normal, 1: Error)
		7		ADC error (0: Normal, 1: Error)
	8 to 15		Reserved for system use	
514 – 521	B16	Model No.		
522 – 529	B16	Serial No.		
530 – 537	B16	Hardware version No.		
538 – 545	B16	Firmware version No.		
Holding Register (4X)	49 – 50	F	Input filter time constant (seconds)*3	
	145 – 152	I	I/O type No.	
	514	I	Burnout type (0: No burnout, 1: Upscale, 2: Downscale) *1	
	515	I	Line noise filtering type (0: 50/60 Hz, 1: 50 Hz, 2: 60 Hz) *1	

bit = 1 bit, I = 16-bit integer, F = 32-bit floating, B16 = 16-byte character

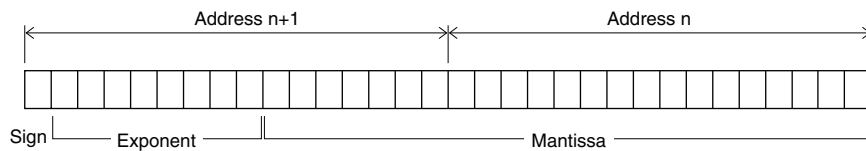
*1. Changeable only when the mode SW is set to 0 for R1MS-GH3.

*2. Thermocouple input only.

*3. Effective for large noise in the input signal. 0 sec.= No Filtering.

■ INPUT DATA

- 32-bit Floating



■ INPUT REGISTERS DESCRIPTION

(1) ANALOG INPUT IN ENGINEERING UNIT (30017 to 30032)

Indicates analog input values in engineering unit for each channel (1 – 8). The unit is specific to each input type: °C for temperature, Volts for voltage. The data are 32-bit floating values, which requires two consecutive registers for one module.

(2) CHANNEL STATUS (30081 to 30088)

Indicates the current status of analog inputs (1 – 8). The following list shows the names and descriptions of each bit.

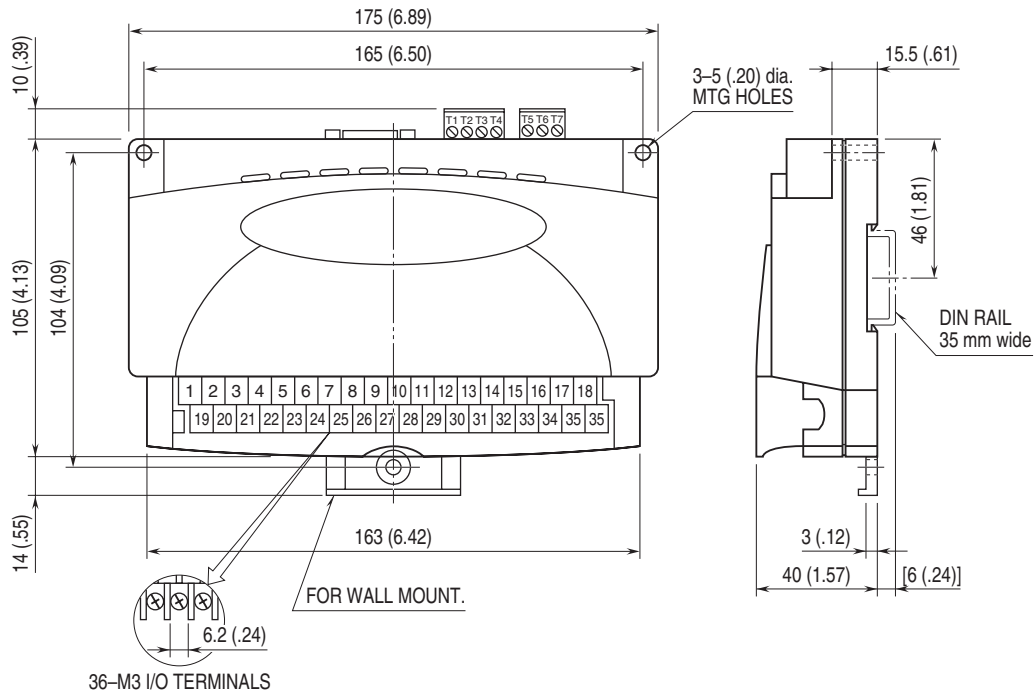
BIT	NAME	DESCRIPTION
6	Input Overage	Indicates the designated analog input is in overrange, defined as one or more of the following condition: <ul style="list-style-type: none"> • ADC input value 0x0000 or 0xFFFF • Burnout status for thermocouple input • Out of range defined in the temperature table (thermocouple) • ADC error 0 : Normal 1 : Overage
7	ADC Error	Indicates the status of ADC. 0 : Normal 1 : Error
12	Cold Junction Compensation SW	Indicates whether the cold junction compensation is enabled or disabled, for thermocouple input. 0 : Disable 1 : Enable
Others	Reserved	For system's use

■ INPUT REGISTERS DESCRIPTION

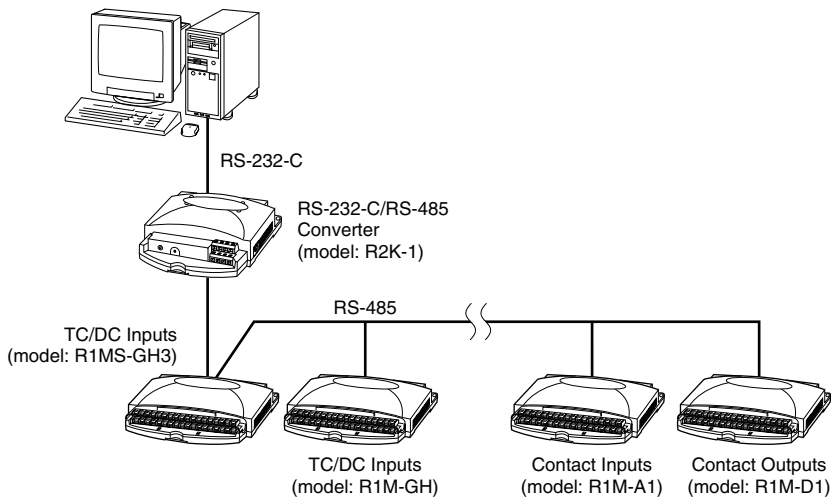
Indicates I/O type for each channel. The data are 16-bit integer values.

MODEL	I/O	I/O TYPE	SELECTION	USABLE RANGE	NOTES
R1MS-GH3 R2M-2G3	DC input	0x00	-10 to +10 V	-10 to +10 V	
R1M-GH2	DC input	0x00	-20 to +20 V	-22.7 to +22.7 V	ATT SW ON
		0x01	-5 to +5 V	-5.6 to +5.6 V	ATT SW ON
		0x02	-1 to +1 V	-1.4 to +1.4 V	ATT SW ON
		0x03	-800 to +800 mV	-860 to +860 mV	
		0x04	-200 to +200 mV	-215 to +215 mV	
		0x05	-50 to +50 mV	-53 to +53 mV	
		0x06	-10 to +10 mV	-13.4 to +13.4 mV	
R1M-GH2 R1MS-GH3 R2M-2H3	T/C input	0x10	(PR)	0 to 1770°C	
		0x11	K (CA)	-270 to +1370°C	
		0x12	E (CRC)	-270 to +1000°C	
		0x13	J (IC)	-210 to +1200°C	
		0x14	T (CC)	-270 to +400°C	
		0x15	B (RH)	100 to 1820°C	
		0x16	R	-50 to +1760°C	
		0x17	S	-50 to +1760°C	
		0x18	C (WRe 5-26)	0 to 2320°C	
		0x19	N	-270 to +1300°C	
		0x1A	U	-200 to +600°C	
		0x1B	L	-200 to +900°C	
		0x1C	P (Platinel II)	0 to 1395°C	
R1M-J3	RTD input	0x30	JPt 100 (JIS '89)	-200 to +500°C	
		0x31	Pt 100 (JIS '89)	-200 to +660°C	
		0x32	Pt 100 (JIS '97, IEC)	-200 to +850°C	
		0x33	Pt 50 Ω (JIS '81)	-200 to +649°C	
		0x34	Ni 508.4 Ω	-50 to +280°C	
		0x35	Pt 1000	-200 to +850°C	
	POT input	0x40	0 to 100 ohms	0 to 100 %	
		0x41	0 to 500 ohms	0 to 100 %	
		0x42	0 to 1 kohms	0 to 100 %	
		0x43	0 to 10 kohms	0 to 100 %	
R1M-D1	DO	0x60			
R1M-A1	DI	0x70			

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm (inch)



SYSTEM CONFIGURATION EXAMPLES



When the cable distance between the PC and the R1Ms is long, insert an RS-232-C/RS-485 Converter for isolation.



Specifications are subject to change without notice.