

**Remote I/O R1M Series**

**THERMOCOUPLE & DC INPUT MODULE**  
(16 points)

MODEL **R1M-GH**

**MODEL & SUFFIX CODE SELECTION**

MODEL \_\_\_\_\_ R1M-GH2T-□  
 Modbus protocol \_\_\_\_\_  
 I/O TYPE \_\_\_\_\_  
 GH2 : Thermocouple or DC input, 16 points  
 FIELD TERMINAL TYPE \_\_\_\_\_  
 T : M3 screw terminals  
 POWER INPUT \_\_\_\_\_  
 M2: 100 – 240V AC  
 R : 24V DC

**ORDERING INFORMATION**

Specify code number. (e.g. R1M-GH2T-M2)

**RELATED PRODUCTS**

- Resistor module (model: REM3-250)
- R1X configurator software (model: R1CON)  
 Downloadable at M-System's web site:  
<http://www.m-system.co.jp>
- PC configurator cable (model: MCN-CON)

**GENERAL SPECIFICATIONS**

**Connection**

**Power input, transmission:** terminal block  
**RS-232C:** 9-pin D-sub connector (male)  
**I/O:** M3 screw terminals

**Isolation:** input to RS-232C or RS-485 to power

**Address setting:** rotary switch; 1 – F (15 nodes)

**COMMUNICATION SPECIFICATIONS**

**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-232C**

**Standard:** conforms to RS-232C, EIA

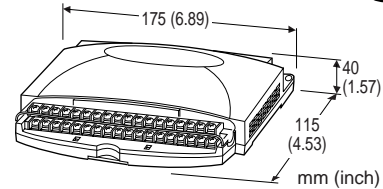
**Transmission distance:** 10 meters max.

**■RS-485**

**Standard:** conforms to RS-485, EIA

**Transmission distance:** 500 meters max.

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



**Functions & Features**

- 16-point thermocouple or DC inputs
- Easy system expansion via Modbus RTU

**INPUT & OUTPUT**

■INPUT: thermocouple or DC input\*, 16 points

MEASURING RANGE	NOTES
±20V, ±5V, ±1V	Atten. SW ON (3)
±0.8V, ±0.2V, ±50mV, ±10mV	Atten. SW OFF (1)

**Input resistance:** 300kΩ

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

**Sampling rate:** 100 millisec./16 points

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

**Sensing:** approx. 5V DC @1mA

\*Common negative for DC input

**INSTALLATION**

**Power input**

**AC:** operational voltage range 85 – 264V;  
47 – 66 Hz, approx. 10VA

**DC:** operational voltage range 24V ±10%;  
ripple 10% p-p max., approx. 7W

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

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

**Mounting:** surface or DIN rail

**Dimensions:** W175×H115×D40 mm  
(6.89"×4.53"×1.57")

**Weight:** 400 g (0.88 lbs)

**PERFORMANCE****Accuracy****DC input:**  $\pm 0.3\%$ **Thermocouple input:** (at over 400°C or 750°F for R, S and PR; over 770°C or 1420°F for B)

T/C	USABLE RANGE		ACCURACY
	°C	°F	
(PR)	0 to 1770	32 to 3218	$\pm 0.5^{*1}(\%)$
K (CA)	-270 to +1370	-454 to +2498	$\pm 0.3$
E (CRC)	-270 to +1000	-454 to +1832	$\pm 0.7$
J (IC)	-210 to +1200	-346 to +2192	$\pm 0.7$
T (CC)	-270 to +400	-454 to +752	$\pm 1.0$
B (RH)	100 to 1820	212 to 3308	$\pm 0.7^{*2}$
R	-50 to +1760	-58 to +3200	$\pm 0.7^{*1}$
S	-50 to +1760	-58 to +3200	$\pm 0.7^{*1}$
C (WRe 5-26)	0 to 2320	32 to 4208	$\pm 0.7$
N	-270 to +1300	-454 to +2372	$\pm 0.5$
U	-200 to +600	-328 to +1112	$\pm 0.5$
L	-200 to +900	-328 to +1652	$\pm 0.3$
P (Platinel II)	0 to 1395	32 to 2543	$\pm 0.5$

\*1.  $\geq 400^{\circ}\text{C}$  or  $\geq 752^{\circ}\text{F}$ \*2.  $\geq 700^{\circ}\text{C}$  or  $\geq 1292^{\circ}\text{F}$ **Cold junction compensation error:**  $\pm 3^{\circ}\text{C}$  or  $\pm 5.4^{\circ}\text{F}$   
maximum (at  $20^{\circ}\text{C} \pm 10^{\circ}\text{C}$  or  $68^{\circ}\text{F} \pm 18^{\circ}\text{F}$ )**Temp. coefficient:**  $\pm 0.015\%/^{\circ}\text{C}$  ( $\pm 0.008\%/^{\circ}\text{F}$ )  
 $\pm 0.05\%/^{\circ}\text{C}$  ( $\pm 0.03\%/^{\circ}\text{F}$ ) for 10mV range**Insulation resistance:**  $\geq 100\text{M}\Omega$  with 500V DC**Dielectric strength:** 2000V AC @1 minute (input to RS-232C or RS-485 to power to ground)**STANDARDS & APPROVALS****CE conformity:** EMC Directive (89/336/EEC)

EMI EN61000-6-4

EMS EN61000-6-2

Low Voltage Directive (73/23/EEC)

Installation category II

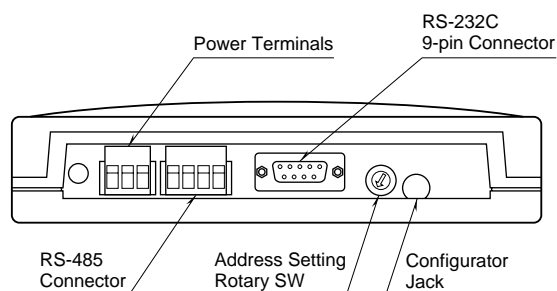
Pollution degree 2

Max. operating voltage 300V

Input or RS-232C/RS-485 to power  
– Reinforced insulation

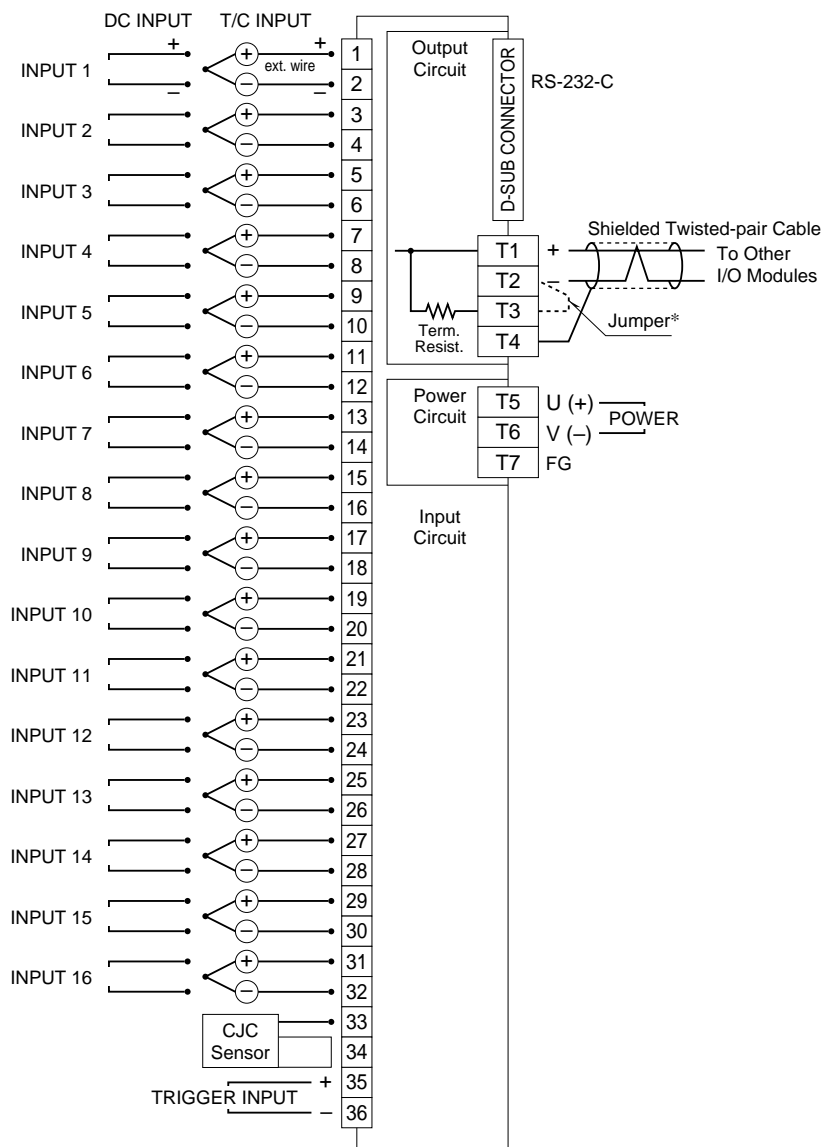
Input to RS-232C/RS-485

– Basic insulation

**REAR VIEW****RS-232C 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	

# CONNECTION DIAGRAM

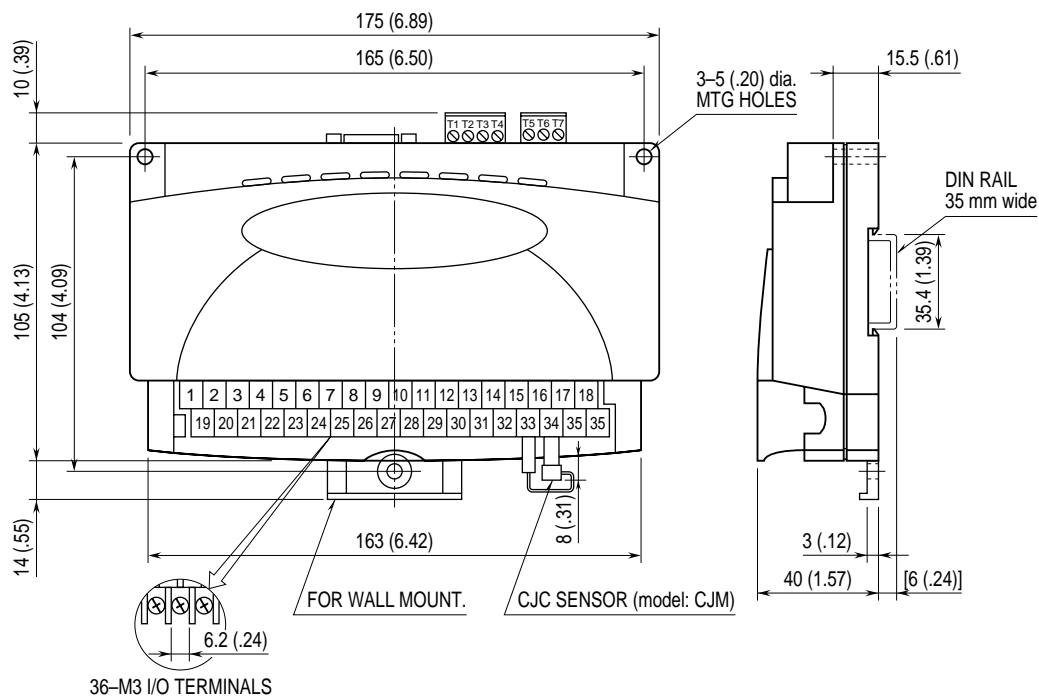


\* When the device is located at the end of a transmission line via twisted-pair cable, (when there is no cross-wiring), close across the terminal T2 – T3 with the attached jumper pin (or with a leadwire).  
When the device is not at the end, remove the jumper pin.

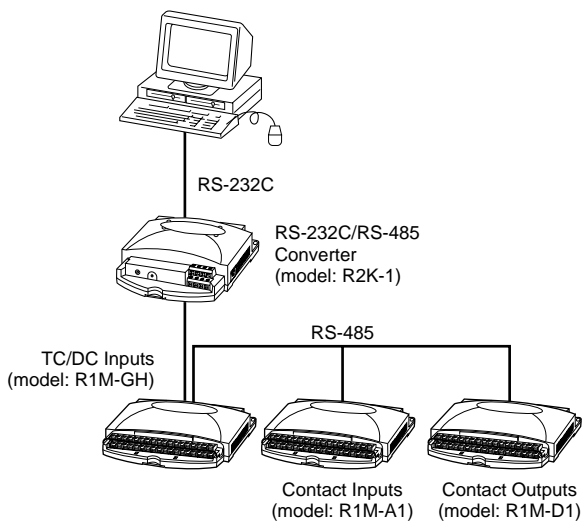
Remark 1: This device is not designed to cancel noise included in the input signals. Be careful to eliminate such noise by using shielded cables.

Remark 2: Be sure to maintain the same potential at all the common negative terminals for DC input.

**EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS mm (inch)**



**SYSTEM CONFIGURATION EXAMPLE**



When the cable distance between the PC and the R1Ms is long

## MODBUS COMMUNICATION

### ■COMMUNICATION PARAMETERS

PARAMETER	R1M SERIES	R2M SERIES
Data Mode	RTU	RTU
Baud Rate	9600 / 19200 / 38400 (*) bps	9600 / 19200 / 38400 (*) bps
Parity	None / Odd (*) / Even	None / Odd (*) / Even
Bit Length	8	8
Stop Bit	1 (*) / 2	1
Node Address	1 (*) to 15	1 (*) to 15
Floating Point Data	N/A	Normal (*) / Swapped
Interface	RS-232C / RS-485	RS-232C

(\*) Ex-factory setting

### ■FUNCTION CODES & SUPPORTED CODES

CODE	NAME	RxM	
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 ADDRESSES

	ADDRESS	TYPE				DATA FORMAT	NAME	
		GH2	J3	A1	D1			
Coil (0X)	1 – 32	---	---	---	Y	bit	DO *1	
	33 – 48	Y	---	---	---	bit	Cold junction compensation SW (0: Disable, 1: Enable) *2	
Input Status (1X)	1 – 32	Y	Y	Y	---	bit	DI *3	
	33 – 48	Y	Y	---	---	bit	ADC overrange	
Input Register (3X)	1 – 16	Y	---	---	---	I	AI in %	
	17 – 48	Y	Y	---	---	F	AI per channel in engineering unit	
	49 – 50	Y	---	---	---	F	Cold junction temperature *2	
	81 – 96	Y	Y	---	---	I	Channel status	
	513	Y	Y	Y	Y	I	System status	
							Bit	System Status
							0 to 5	Reserved for system use
							6	E <sup>2</sup> PROM diagnostics (0: Normal, 1: Error)
							7	ADC error (0: Normal, 1: Error)
	8 to 15	Reserved for system use						
514 – 521	Y	Y	Y	Y	B16	Model No. ("R1M-x")		
522 – 529	Y	Y	Y	Y	B16	Serial No.		
530 – 537	Y	Y	Y	Y	B16	Hardware version No.		
538 – 545	Y	Y	Y	Y	B16	Firmware version No.		
Holding Register (4X)	1 – 16	---	---	---	---	I	(Reserved for AO in %)	
	17 – 48	---	---	---	---	F	(Reserved for AO in engineering unit)	
	145 – 160	Y	Y	---	---	I	I/O type No.	
	161 – 176	Y	---	---	---	I	Burnout type *4 (0: No burnout, 1: Upscale, 2: Downscale) *4	

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

\*1. Discrete output only.

\*2. Thermocouple input only.

\*3. Trigger contact input for Types GH2 and J3. (Only Address 10001 is enabled.)

\*4. Same setting for all channels.

## INPUT REGISTERS DESCRIPTION

### (1) ANALOG INPUT IN % (30001 to 30016)

Indicates analog input values in percentage for each channel (1 – 16).

INPUT TYPE & RANGE	A/D DATA (Decimal)
±20V	±20000
±5V	±5000
±1V	±10000
±0.8V	±8000
±0.2V	±20000
±50mV	±5000
±10mV	±10000
Thermocouple	Temperature x 10

### (2) ANALOG INPUT IN ENGINEERING UNIT (30017 to 30048)

Indicates analog input values in engineering unit for each channel (1 – 16). The unit is specific to each input type: °C for temperature, Volts for voltage, and % for potentiometer. The data are 32-bit floating values, which requires two consecutive registers for one module.

### (3) CHANNEL STATUS (30081 to 30096)

Indicates the current status of analog inputs (1 – 16 for GH2 type, 1 – 8 for J3 type). The following list shows the names and descriptions of each bit.

BIT	NAME	DESCRIPTION
6	Input Overrange	Indicates the designated analog input is in overrange, defined as one or more of the following condition: <ul style="list-style-type: none"> <li>• ADC input value 0X0000 or 0XFFFF</li> <li>• Burnout status for thermocouple input</li> <li>• Out of range defined in the temperature table (thermocouple and RTD)</li> <li>• ADC error</li> </ul> 0 : Normal 1 : Overrange
7	ADC Error	Indicates the status of ADC. 0 : Normal 1 : Error
11	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 (1 – 16). 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 10V	-10 to 10V	
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	
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/DIN/IEC)	-200 to 850 °C	
		0X33	Pt 50Ω (JIS '81)	-200 to 649 °C	
		0X34	Ni 508.4Ω	-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 1k ohms	0 to 100 %	
		0X43	0 to 10k ohms	0 to 100 %	
R1M-D1	DI	0X60			
R1M-A1	DO	0X70			