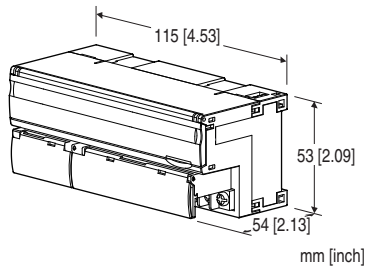
Remote I/O R7 Series

MODBUS I/O MODULE

(thermocouple input, 4 points, isolated)

Functions & Features

• 4 points thermocouple input module for Modbus
• Extension module can be connected
• Input sensor can be selected with the front DIP switches for all channels
• Individual channels, zero adjustment, span adjustment, and scaling can be set with the configurator software (model: R7CON)



MODEL:R7M–TS4-R[1]

ORDERING INFORMATION

• Code number: R7M-TS4-R[1]
Specify a code from below for [1].
(e.g. R7M-TS4-R/Q)
• Specify the specification for option code /Q
(e.g. /C01/SET)

I/O TYPE

TS4: Thermocouple input, 4 points

POWER INPUT

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

[1] OPTIONS

Standards & Approvals
blank: CE marking
/UL: UL approval, CE marking
Other Options
blank: none
/Q: Option other than the above (specify the specification)
(UL not available)

SPECIFICATIONS OF OPTION: Q (multiple selections)

COATING (For the detail, refer to our web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating
EX-FACTORY SETTING
/SET: Preset according to the Ordering Information Sheet (No. ESU-7803-B)

RELATED PRODUCTS

• PC Configurator cable (model: MCN-CON or COP-US)
• PC configurator software (model: R7CON)
Downloadable at our web site.
• Discrete input extension module (model: R7M-EAx)
• Discrete output extension module (model: R7M-ECx)

PACKAGE INCLUDES...

• Terminating resistor (110 Ω, 0.25 W)

GENERAL SPECIFICATIONS

Connection: M3 separable screw terminal (torque 0.5 N·m)
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)
Screw terminal: Nickel-plated steel
Housing material: Flame-resistant resin (gray)
Isolation: Input 0 to input 1 to input 2 to input 3 to Modbus or FG to power
Zero adjustments: Configurable via R7CON
Span adjustments: Configurable via R7CON
Extension: No extension (*), Discrete input 8 or 16 points, Discrete output 8 or 16 points
Selectable with the front DIP SW
(*) Factory default setting
Conversion rate: Selectable with the front DIP SW
Thermocouple setting: Configurable via the front DIP switch or R7CON
Burnout setting: Selectable between upscale (*) and downscale with the front DIP switch
(*) Factory default setting
Linearization: Standard
Cold junction compensation: CJC sensor attached to the input terminals
Status indicator LEDs: PWR, RUN, ERR, SD, RD
(Refer to the instruction manual)
Configurator connection: 2.5 dia. miniature jack

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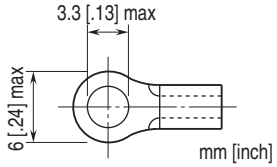
■**Recommended solderless terminal**



MODBUS COMMUNICATION

Standard: Conforms to TIA/EIA-485-A
Transmission distance: 500 meters max.
Transmission media: Shielded twisted-pair cable (CPEV-S 0.9 dia.)
Communication parameter: With Configurator Software (model: R7CON)
• **Data Mode**: RTU (default) or ASCII
• **Parity:** NONE (default), ODD or EVEN
• **Data bit:** 8: RTU (default), 7: ASCII
• **Stop bit:** 1 or 2 (default)
Baud rate setting: With rotary switch
38.4 kbps (default), 19.2 kbps, 9600 bps, 4800 bps
Node address setting: 1 - 99 (with rotary switch) (factory default setting: 00)

INPUT SPECIFICATIONS

Input resistance: ≥ 30 kΩ
Burnout sensing: ≤ 0.1 μA

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

INSTALLATION

Current consumption
•**DC**: Approx. 90 mA
Operating temperature: -10 to +55°C (14 to 131°F)
Storage temperature: -20 to +65°C (-4 to +149°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Atmosphere: No corrosive gas or heavy dust
Mounting: DIN rail (35 mm rail)
Weight: 200 g (0.44 lb)

PERFORMANCE

Conversion accuracy: ±1°C (±1.8°F) except ±2°C (±3.6°F) for B, R, S, C, PR
Conversion rate: 250 msec. (*) or 500 msec. selectable
(*) Factory default setting
Converted data range:
• Engineering unit value (°C, K) × 10 (integer)
• Engineering unit value (°F)
Cold junction compensation error:
±1.0°C at 25 ±10°C (±1.8°F at 77 ±18°F)
±1.5°C (±2.7°F) for R, S, PR
Temp. coefficient: ±0.015 %/°C (±0.008 %/°F) of max. span
Response time: Conversion rate × 2 + 50 msec. (0 – 90 %)
Insulation resistance: ≥ 100 MΩ with 500 V DC
Dielectric strength: 1500 V AC @ 1 minute (input 0 to input 1 to input 2 to input 3 to Modbus or FG to power)

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
Approval:
UL/C-UL nonincendive Class I, Division 2,
Groups A, B, C, and D
(ANSI/UL 121201, CAN/CSA-C22.2 No.213-17)
UL/C-UL general safety requirements
(UL 61010-1, CAN/CSA-C22.2 No.61010-1)
Note: This equipment is to be supplied by a Class 2 power supply when using as conformity with UL/C-UL.

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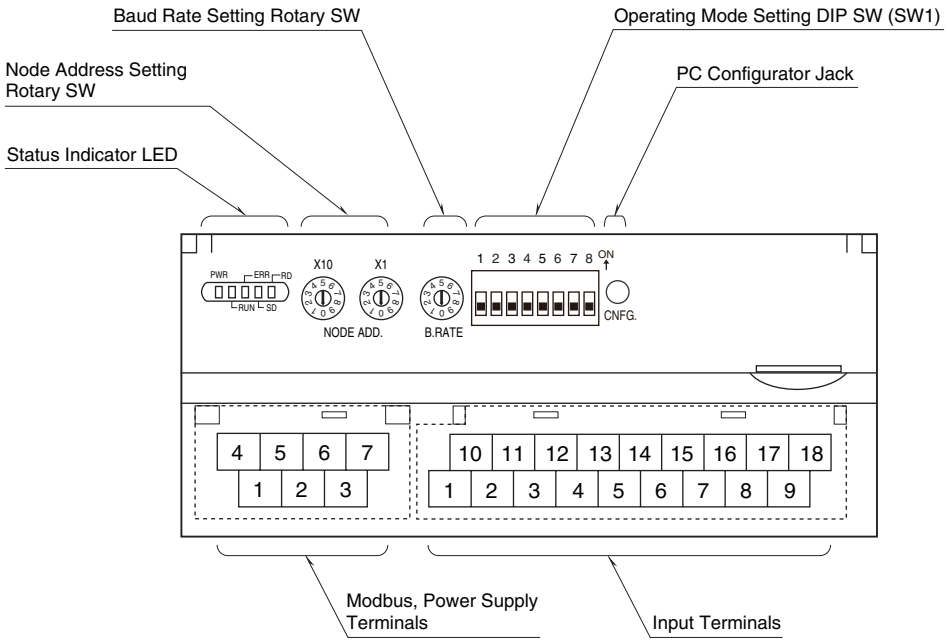
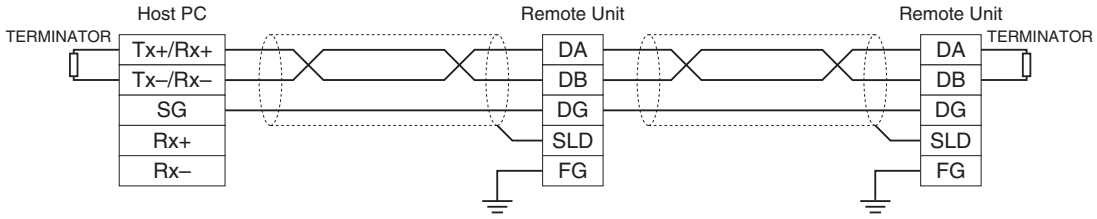
EXTERNAL VIEW



COMMUNICATION CABLE CONNECTIONS

■ MASTER CONNECTION



Be sure to connect the terminating resistor included in the product package to the unit at both ends of transmission line.
The terminator must be connected across DA and DB.
The Host PC can be located other than at the extreme ends of transmission line.

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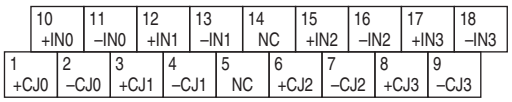
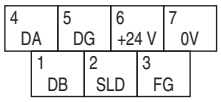
TERMINAL ASSIGNMENTS

■ INPUT TERMINAL ASSIGNMENT



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

■ POWER SUPPLY, MODBUS TERMINAL ASSIGNMENT



NO.	ID	FUNCTION, NOTES
1	DB	----
2	SLD	Shield
3	FG	FG
4	DA	-----
5	DG	----
6	+24 V	Power input (24 V DC)
7	0 V	Power input (0 V DC)

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MODBUS FUNCTION CODES & SUPPORTED CODES

■ **Data and Control Functions**

CODE	NAME	
01	Read Coil Status	Digital output from the slave
02	Read Input Status	Status of digital inputs to the slave
03	Read Holding Registers	General purpose register within the slave
04	Read Input Registers	Collected data from the field by the slave
05	Force Single Coil	Digital output from the slave
06	Preset Single Register	General purpose register within the slave
08	Diagnostics	
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
15	Force Multiple Coils	Digital output from the slave
16	Preset Multiple Registers	General purpose register within the slave
17	Report Slave ID	Slave type/ 'RUN' status

■ **Exception Codes**

CODE	NAME	
01	Illegal Function	Function code is not allowable for the slave
02	Illegal Data Address	Address is not available within the slave
03	Illegal Data Value	Data is not valid for the function

■ **Diagnostic Subfunctions**

CODE	NAME	
00	Return Query Data	Loop back test

MODBUS I/O ASSIGNMENT

	ADDRESS	DATA TYPE	DATA
Coil (0X)	1 – 16		Digital Output (discrete output of the basic module) (unused)
	17 – 32		Digital Output (discrete output of the extension module)
Inputs (1X)	1 – 16		Digital Input (discrete input of the basic module) (unused)
	17 – 32		Digital Input (discrete input of the extension module)
	33 – 48		Reserved (unused)
	49 – 64		Module Status
	65 – 80		Reserved (unused)
Input Registers (3X)	1 – 4	I	Analog Input
	5 – 16	----	Reserved (unused)
	17 – 24	F	Analog Input
	25 – 48	----	Reserved (unused)
Holding Registers (4X)	1 – 48	----	Analog Output (unused)

I : Integer, -1500 – +11500 (-15 – +115%)
F : Floating
Note: DO NOT access addresses other than mentioned above. Such access may cause problems such as inadequate operation.

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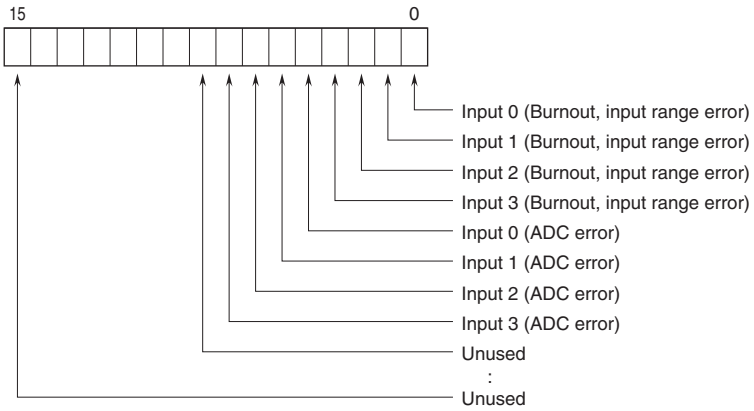
■ **STATUS**



Burnout, input range error (≤ -15%, ≥ +115%)
0 : Normal 1 : Error
ADC error (no response from ADC)
0 : Normal 1 : Error

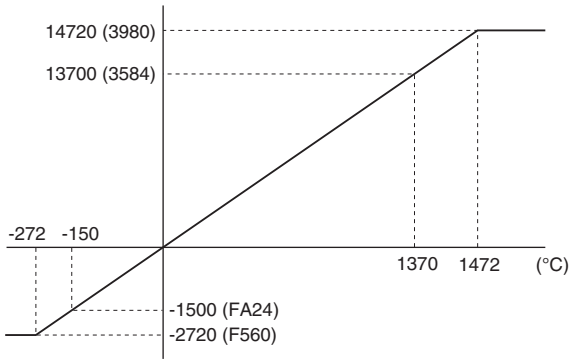
DATA CONVERSION

■ **INPUT RANGE AND DATA CONVERSION (FACTORY DEFAULT SETTING)**

Engineering unit value °C or K is multiplied by 10 and expressed in 16 bits. °F data is represented in engineering unit value, without multiplication. Negative value is represented in 2's complements.

• 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



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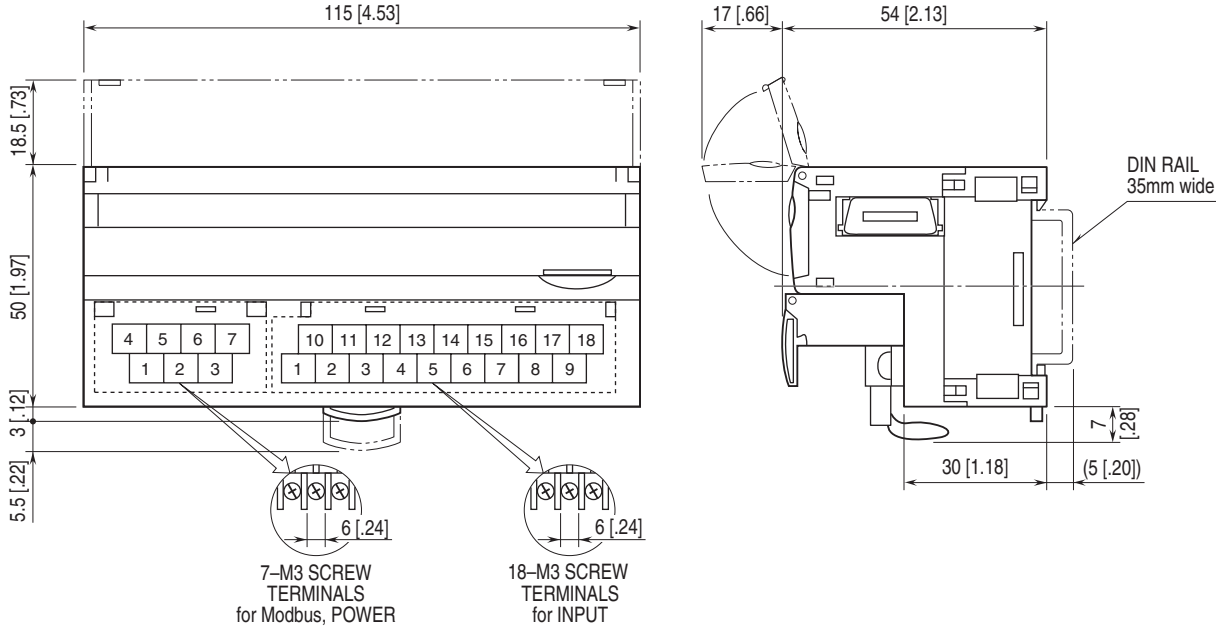
EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]



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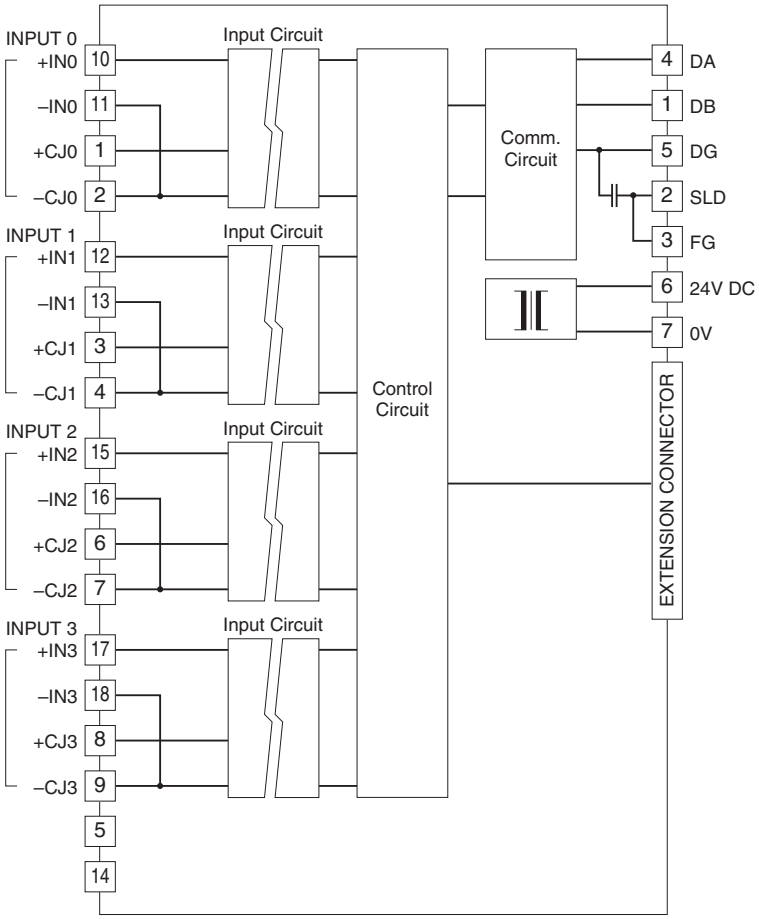
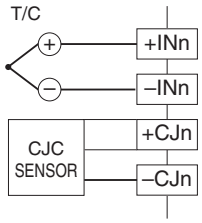
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

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



■ **Input Connection Example**



⚠ Specifications are subject to change without notice.

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