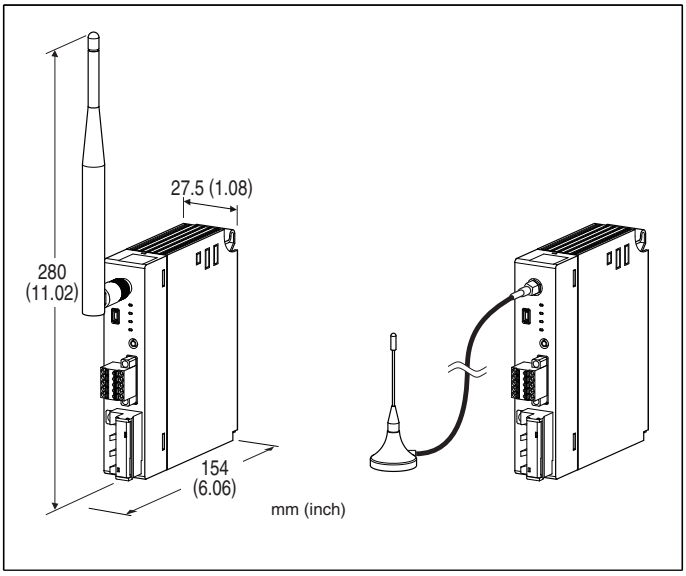
Remote I/O R3 Series

MODBUS INTERFACE MODULE

(Modbus Wired Communication, Modbus-RTU Transparent 900 MHz Band Devices Use)



MODEL: R3–NMW1F-[1][2]

ORDERING INFORMATION

• Code number: R3-NMW1F-[1][2]
Specify a code from below for each of [1] and [2].
(e.g. R3-NMW1F-N/E/Q)
• Specify the specification for option code /Q
(e.g. /C01)

[1] POWER INPUT

N: No power supply
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.) *
* Not selectable for use with independent power modules or network modules with the internal power input options.

[2] OPTIONS (multiple selections)

Antenna
/S: Sleeve antenna
/E: Rooftop antenna
Other Options
blank: none
/Q: Option other than the above (specify the specification)

SPECIFICATIONS OF OPTION: Q

COATING (For the detail, refer to our web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating

FUNCTIONS & FEATURES

• Equipped with 900 MHz band wireless device
• Uses Modbus-RTU protocol wired com. as main network, and monitors I/O signal with wireless
• Available to use wireless device as main network
• Wireless deive incorporates a module conforming to FCC part 15, and can be used within the United States only.
• Modbus-RTU gateway function available, outputs data received with wireless to wired network

RELATED PRODUCTS

For the details of the wireless device related products, please refer to our website.
• PC configurator software (model: R3CON)
Downloadable at our 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.
Maintenance software
Maintenance console: MH920 Console for International (model: MH920CI) (OKI)
(Maintenance software is downloadable at our web site.)
Coaxial cable
• 7.5 m extension cable for rooftop antenna (model: CX-SAC0SAD0Q0750) (OKI)

PACKAGE INCLUDES...

• Terminating resistor (110 Ω, 0.25 W)

GENERAL SPECIFICATIONS

Connection
Wireless network: SMA coaxial connector
Wired network: Tension clamp terminal (Front Twin connection)
Applicable wire size: 0.2 - 1.5 mm^2, stripped length: 10 mm
Internal bus: Via the Installation Base (model: R3-BSx)
Internal power: Via the Installation Base (model: R3-BSx)
Power input, RUN contact output: M3 separable screw terminal (torque 0.5 N·m)
Maintenance: Mini USB type B female connector
Screw terminal: Nickel-plated steel
Isolation: Modbus to internal bus or internal power or antenna connector to power supply to RUN contact output

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to FE1

■Configuration

Slot assignment: Set with the side DIP switch

Main/Sub setting: Set with the side DIP switch

Input error data: Input value setting, hold or clear, at input module error with side DIP SW

Operation mode: Output switchable from host in duplex communication with the side DIP SW

LED indication: Set with the side DIP

■Indicator LEDs

RUN indicator: Bi-color (red/green) LED

Green ON in normal communication; Red ON when receiving data (Function selected with DIP SW)

ERR indicator: Bi-color (red/green) LED

Green ON or blinks at communication error (ON when abnormal data receiving or communication setting error (approx. 0.1 sec.))

Red ON at transmitting data (Function selected with DIP SW)

■ RUN CONTACT OUTPUT

RUN contact: ON when RUN indicator is green (Modbus in normal communication)

Rated load: 250 V AC @ 0.5 A (cos ø = 1)

30 V DC @ 0.5 A (resistive load)

Maximum switching voltage: 250 V AC or 30 V DC

Maximum switching power: 125 VA AC or 15 W DC

Minimum load: 1 V DC @ 1 mA

Mechanical life: 2×10^7 cycles (300 cycles/min.)

When driving an inductive load, external contact protection and noise quenching recommended.

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.)

Max. no. of connections at once: 31 (Gateway funcion in use)

Transmission configuration: Multidrop (Gateway funcion in use)

WIRELESS SPECIFICATIONS

Communication Standard: IEEE802.15.4g

Frequency: 900 MHz band (902 - 928 MHz)

Max. Tx power: 20 mW

Bandwidth: 400 kHz

Modulation: GFSK

Baud rate: Max. 100 kbps

Channel: 1 - 43ch

Security: 128 bit AES

Indicator LEDs: 920Run, 920Link

Protocol: Modbus-RTU

Communication module: Router module incorporated (OKI)

Antenna

• Sleeve antenna (model:MH920-NODE-ANT(S))
Indoor
Non-waterproof
Nondirectional
Gain: 3dBi max.

• Rooftop antenna (model:MH920-NODE-ANT(R))
Outdoor/indoor
Cable length: 2.5 m
Waterproof performance: IPx6 (except connector)
Nondirectional
Gain: 3dBi max.

INSTALLATION

Power consumption

•**AC**:

Approx. 15 VA at 100 V AC (approx. 20 VA when 400 mA for 10 minutes)

Approx. 20 VA at 200 V AC (approx. 26 VA when 400 mA for 10 minutes)

Approx. 21.5 VA at 240 V AC (approx. 28 VA when 400 mA for 10 minutes)

•**DC**: Approx. 8.5 W (24 V DC)

(400 mA/ approx. 13.0 W for 10 minutes (24 V DC))

Current consumption (no power supply): ≤ 100 mA

Output current (power supply): 250 mA continuous at 20 V DC; 400 mA for 10 minutes

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

Mounting: Installation Base (model: R3-BSx)

Weight

Unit (with power supply): Approx. 240 g (0.53 lb)

Unit (without power supply): Approx. 190 g (0.42 lb)

Sleeve antenna: 27 g (0.95 oz)

Rooftop antenna: 52 g (1.83 oz)

PERFORMANCE

Insulation resistance: ≥ 100 MΩ with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute (Modbus to internal bus or internal power or antenna connector to power input to RUN contact output to FE1)

STANDARDS & APPROVALS

Module conforming to FCC Part 15 incorporated

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CONFIGURATOR SOFTWARE SETTING

With configurator software, settings shown below are available.
Refer to the software manual of R3CON for detailed operation.

■ WIRED SETTING

ITEM	SETTING RANGE	DEFAULT
Communication timeout	2 – 32000 (100 msec.)	30 (100 msec.)

■ MODBUS SETTING

ITEM	SETTING RANGE	DEFAULT
Address	1 – 247	1
Data Mode	RTU / ASCII	RTU
Baud rate	38.4 kbps / 19.2 kbps / 9600 bps / 4800 bps	38.4 kbps
Parity	Odd / Even / None	None
Write enable port	RS–485 / wireless	RS-485
Slave or Relay	Slave / Relay	Slave

■ WIRELESS SETTING

ITEM	SETTING RANGE	DEFAULT
PAN-ID	0000 to FFFE (hexadecimal, 4 digits)	0000
Radio channel number	0 (invalid), 1 to 43 (selectable up to 10 channels)	0
Short address	0000 (invalid), 0001 to FFFD (hexadecimal, 4 digits)	0000
Network name	English one-byte characters within 16 characters (one-byte space, “-”, “_”, “.”, “@” are usable.)	Blank
Encryption key	0000...0 to FFFF...F (hexadecimal, 32 digits)	0000...0
Transmitter power output	0.16 mW / 1 mW / 20 mW	20 mW
Communication timeout	0 to 32767 (100 msec.)	30
Number of devices in a network	1 – 30 (devices) / 31 – 60 (devices) / 61 – 100 (devices) / Fixed + Low speed movement	1 – 30
Packet filtering	Disable / Enable	Enable
Filter timeout on polling (100msec)	10 to 600 (100 msec.)	10
Fixed route	Disable / Enable	Disable
Destination short address	0000 to FFFD (hexadecimal, 4 digits)	0000
Temporary detour	Disable / Enable	Enable
Low speed moving mode	Disable / Enable	Disable
Set network quality	Standard / Changing frequency • delaytime middle / Changing frequency • delaytime large	Standard
Network join mode	V3-compatible mode / Fast join mode	V3-compatible mode
Retry times before route switching	1 to 3 (times)	3

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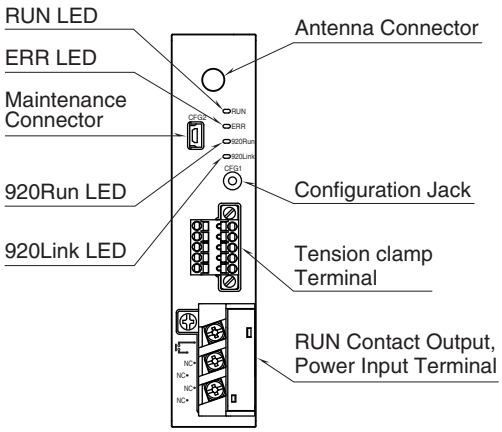
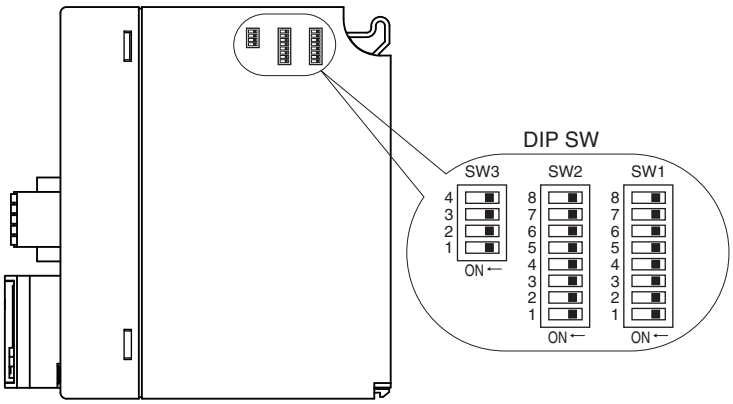
EXTERNAL VIEW

■ **FRONT VIEW**

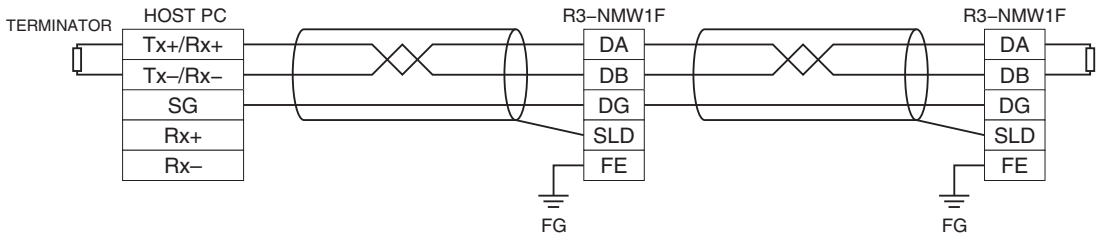


■ **SIDE VIEW**

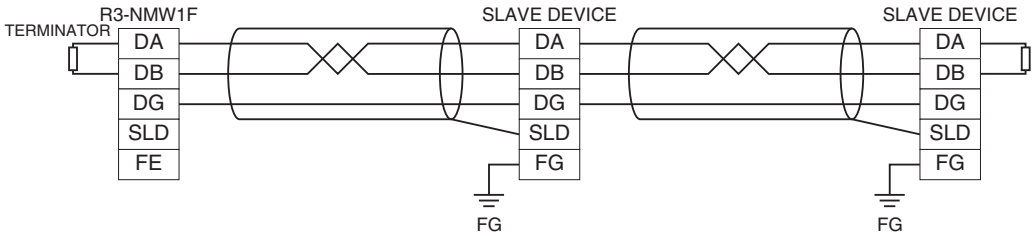


COMMUNICATION CABLE CONNECTIONS

■ SLAVE MODE



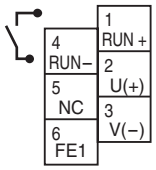
■ GATEWAY MODE



TERMINAL ASSIGNMENTS

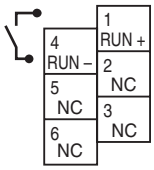
■ **POWER INPUT CONNECTOR**

• **WITH POWER SUPPLY**



No.	ID	FUNCTION
1	RUN +	RUN contact output +
2	U (+)	Power input (+)
3	V (–)	Power input (–)
4	RUN –	RUN contact output –
5	NC	Unused
6	FE1	Functional earth

• **W/O POWER SUPPLY**



No.	ID	FUNCTION
1	RUN +	RUN contact output +
2	NC	Unused
3	NC	Unused
4	RUN –	RUN contact output –
5	NC	Unused
6	NC	Unused

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MODBUS FUNCTION CODES & SUPPORTED CODES

■ **Data & Control Functions**

CODE	NAME		
01	Read Coil Status	X	Digital output from the slave (read/write)
02	Read Input Status	X	Status of digital inputs to the slave (read only)
03	Read Holding Registers	X	General purpose register within the slave (read/write)
04	Read Input Registers	X	Collected data from the field by the slave (read only)
05	Force Single Coil	X	Digital output from the slave (read/write)
06	Preset Single Register	X	General purpose register within the slave (read/write)
07	Read Exception Status		
08	Diagnostics		
09	Program 484		
10	Poll 484		
11	Fetch Comm. Event Counter		
12	Fetch Comm. Event Log		
13	Program Controller		
14	Poll Controller		
15	Force Multiple Coils	X	Digital output from the slave (read/write)
16	Preset Multiple Registers	X	General purpose register within the slave (read/write)
17	Report Slave ID	X	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		

■ **Exception Codes**

CODE	NAME		
01	Illegal Function	X	Function code is not allowable for the slave
02	Illegal Data Address	X	Address is not available within the slave
03	Illegal Data Value	X	Data is not valid for the function
04	Slave Device Failure		
05	Acknowledge		
06	Slave Device Busy		
07	Negative Acknowledge		
08	Memory Parity Error		

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MODBUS I/O ASSIGNMENT

	ADDRESS	DATA FORMAT	NAME
Coil (0X)	1 – 1024		Digital Output (discrete output)
	1025		Main / Sub Switching Command (valid only with SW3-3 set to ON)
Inputs (1X)	1 – 1024		Digital Input (discrete input)
	1025 – 1040		Module Status
	1041 – 1056		Error Status
	1057 – 1072		Data Error Status
Input Registers (3X)	1 – 256	I	Analog Input
	257 – 768	F	Analog Input
Holding Registers (4X)	1 – 256	I	Analog Output
	257 – 768	F	Analog Output

I : Integer, 0 – 10000 (0 – 100%)
F : Floating (32-bit data cannot be accessed using floating addresses.)
Note: DO NOT access addresses other than mentioned above. Such access may cause problems such as inadequate operation.

- Module Status indicates whether individual I/O modules are mounted or not. The bit corresponding to the mounted slot turns to "1", and the unmounted slot to "0".
- Error Status indicates error status for each module as described below. The bit corresponding to such module turns to "1".
  R3-TSx, R3-RSx, R3-US4: Input burnout
  R3-DA16A: Power input in error or disconnected
  R3-YSx: Output current error (e.g. load unconnected)
  R3-PC16A: External power supply in error or disconnected
- Data Error Status indicates overrange (R3-US4: out of -10% to +110%; the other types: out of -15% to +115%) status for each module. The bit corresponding to such module turns to "1".
- Main / Sub Switching Commands given to the network modules result as follows:

MAIN' MODULE	'SUB' MODULE	OUTPUT MODE
1	0	Main bus is used; Red LED turns on at RUN LED of the I/O modules.
0	1	Sub bus is used; Green LED turns on at RUN LED of the I/O modules.
1	1	Main bus is used; Amber LED turns on at RUN LED of the I/O modules.
0	0	Output is invalid; RUN LED of the I/O modules turns off.

- Writing to Coil (0X) and Holding Registers (4X) is only available with either Wireless or Modbus communication. It is available to change the configuration with Configurator Software (model: R3CON). Factory default setting is Modbus communication.

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TRANSMISSION DATA DESCRIPTIONS

The DIP SW located at the side of the module specifies each I/O module's data allocation (occupied data area).
For example, when the data areas are assigned as shown below:

Module 1	4
Module 2	4
Module 3	4
Module 4	1
Module 5	1
Module 6	1
Module 7	1

Then the I/O data are assigned as in the table below:

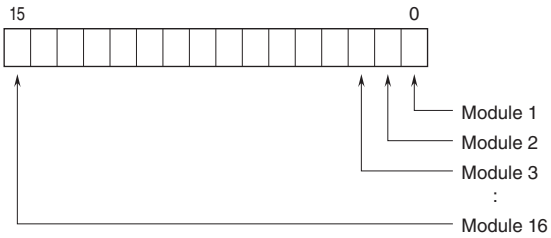
	ADDRESS		POSITION
Input Registers (3X) Holding Registers (4X)	1 – 4,	257 – 264	Slot 1
	5 – 8,	265 – 272	Slot 2
	9 – 12,	273 – 280	Slot 3
	13,	281 – 282	Slot 4
	14,	283 – 284	Slot 5
	15,	285 – 286	Slot 6
	16,	287 – 288	Slot 7

	ADDRESS	POSITION
Coil (0X) Inputs (1X)	1 – 64	Slot 1
	65 – 128	Slot 2
	129 – 192	Slot 3
	193 – 208	Slot 4
	209 – 224	Slot 5
	225 – 240	Slot 6
	241 – 256	Slot 7

For Coil (0X) and Inputs (1X), addresses 16 times assigned data areas (Data Allocation Type) are allotted with the Data Allocation Type '1' and '4.' With '8' and '16,' 64 (4 × 16) are automatically allotted.

MODULE STATUS, ERROR STATUS, DATA ERROR STATUS

Shows each module's availability and error status.

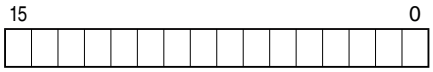


I/O DATA DESCRIPTIONS

The data allocations for typical I/O modules are shown below.
Refer to the manual for each module for detailed data allocations.

■ ANALOG DATA (16-bit data, models: R3-SV4, YV4, DS4, YS4, US4, etc.)

16-bit binary data.
Basically, 0 to 100% of the selected I/O range is converted into 0 to 10000 (binary).
-15 to 0 % is a negative range represented in 2's complement.
In case of R3-US4, -10 to 0% is a negative range represented in 2's complement.



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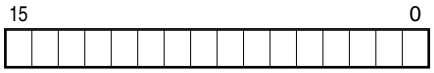
■ TEMPERATURE DATA (16-bit data, models: R3-RS4, TS4, US4, etc.)

16-bit binary data.
With ℃ temperature unit, raw data is multiplied by 10. For example, 25.5℃ is converted into 255.
With ℉ temperature unit, the integer section of raw data is directly converted into the data.
For example, 135.4℉ is converted into 135.
Minus temperature is converted into negative values, represented in 2's complements.

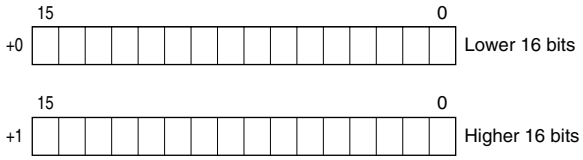
■ ANALOG DATA (16-bit data, models: R3-CT4A, CT4B, etc.)

16-bit binary data.
Integer obtained by multiplying unit value (A) by 100.
In case of CLSE-R5, integer obtained by multiplying unit value (A) by 1000.



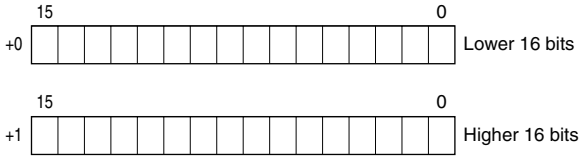
■ ACCUMULATED COUNT DATA (32-bit data, models: R3-PA2, PA4A, WT1, WT4, etc.)

32-bit binary data is used for accumulated counts and encoder positions.
Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.
32-bit data cannot be accessed using floating addresses.

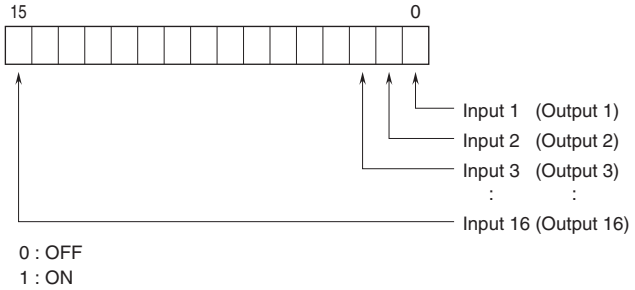


■ BCD DATA (32-bit data, models: R3-BA32A, BC32A, etc.)

32-bit binary data is used for BCD.
Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.
32-bit data cannot be accessed using floating addresses.



■ 16-POINT DISCRETE DATA (models: R3-DA16, DC16, etc.)



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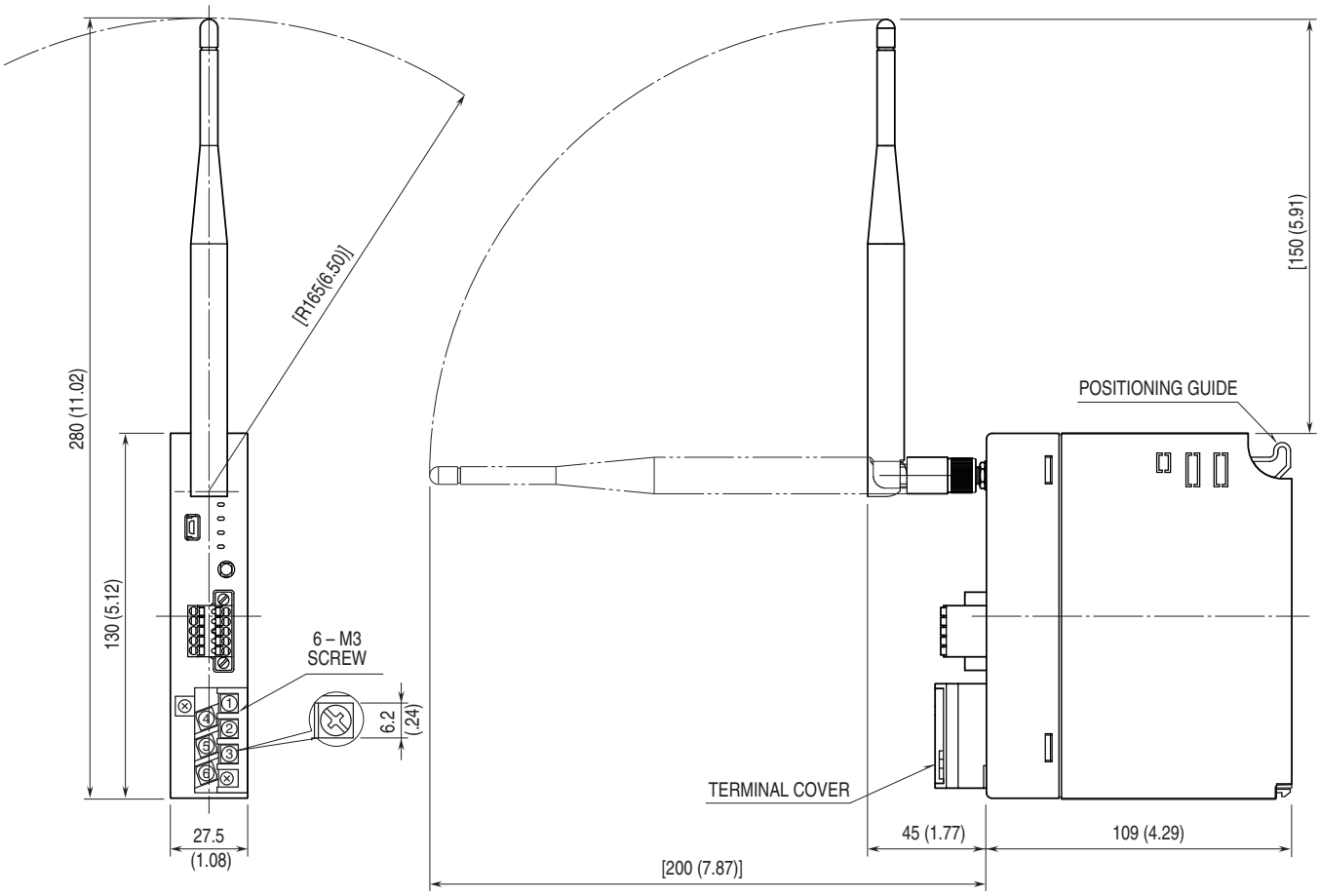
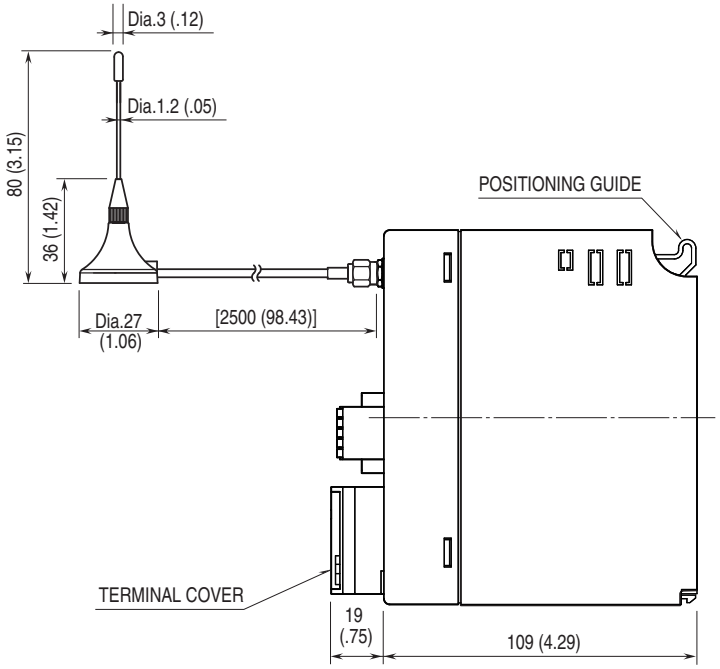
EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]

• WITH SLEEVE ANTENNA



• WITH ROOFTOP ANTENNA



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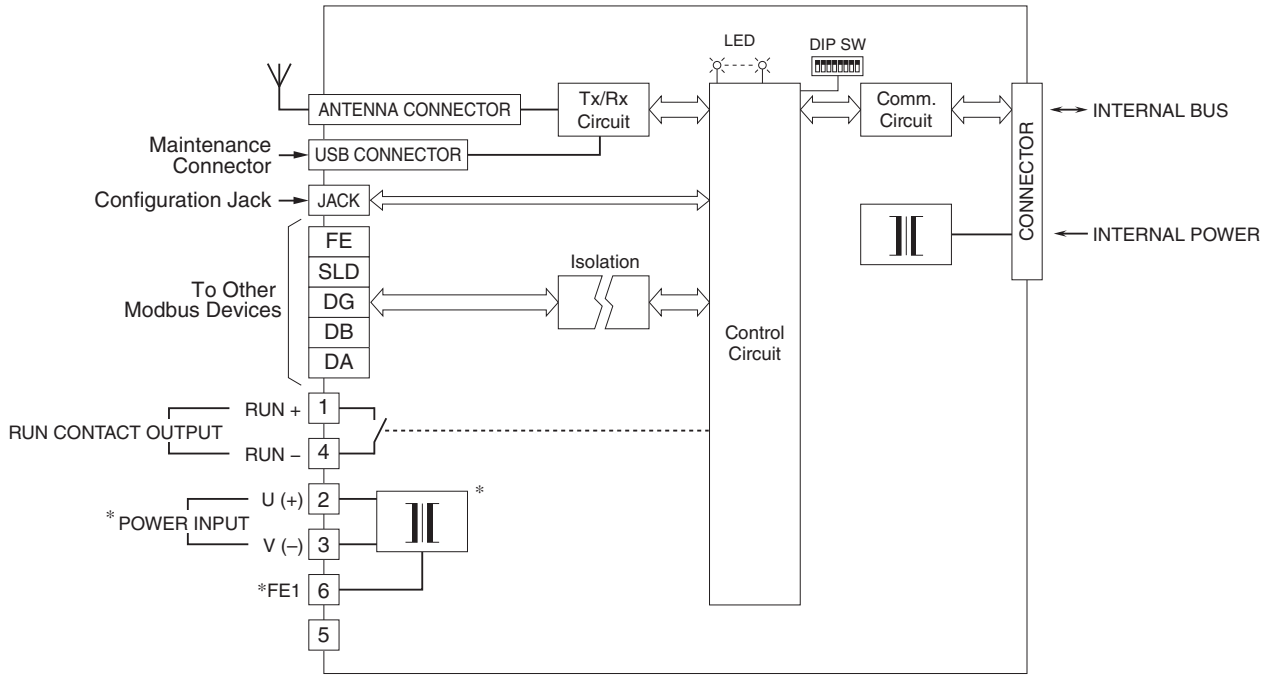
SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

Caution: FE1 terminal is NOT a protective conductor terminal.



* Not provided with 'No Power Supply' type module.

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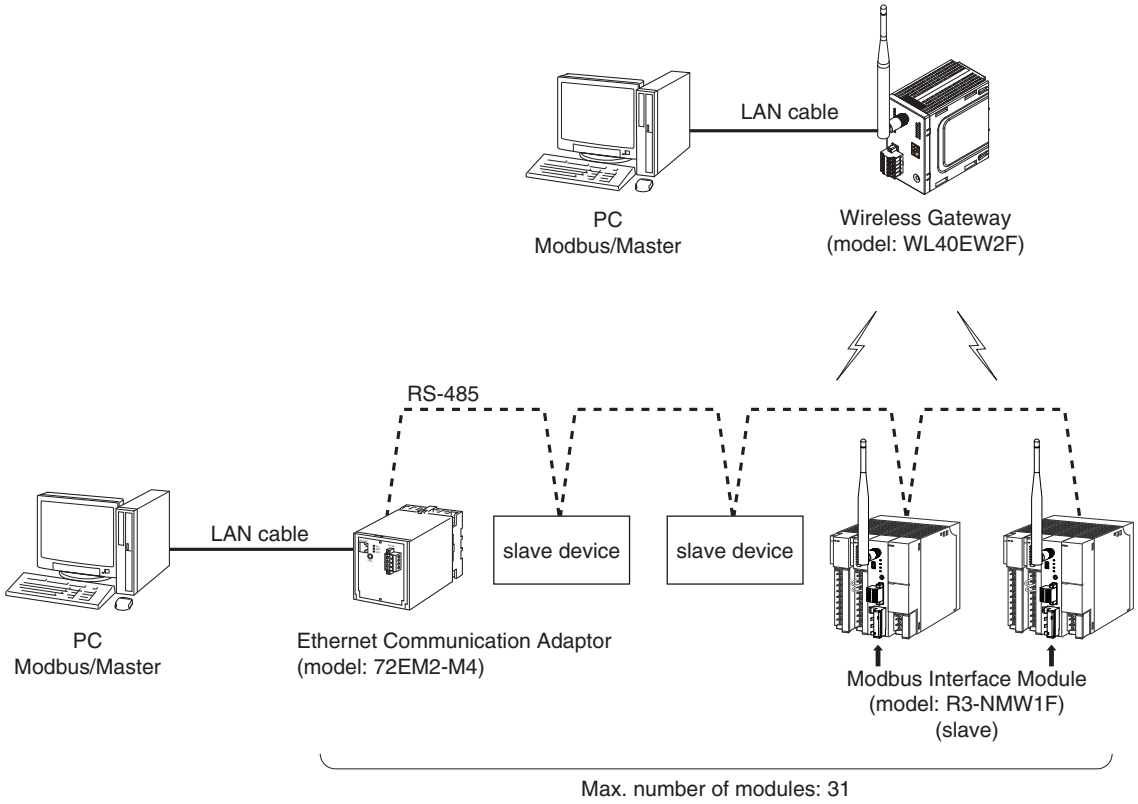
SYSTEM CONFIGURATION EXAMPLES

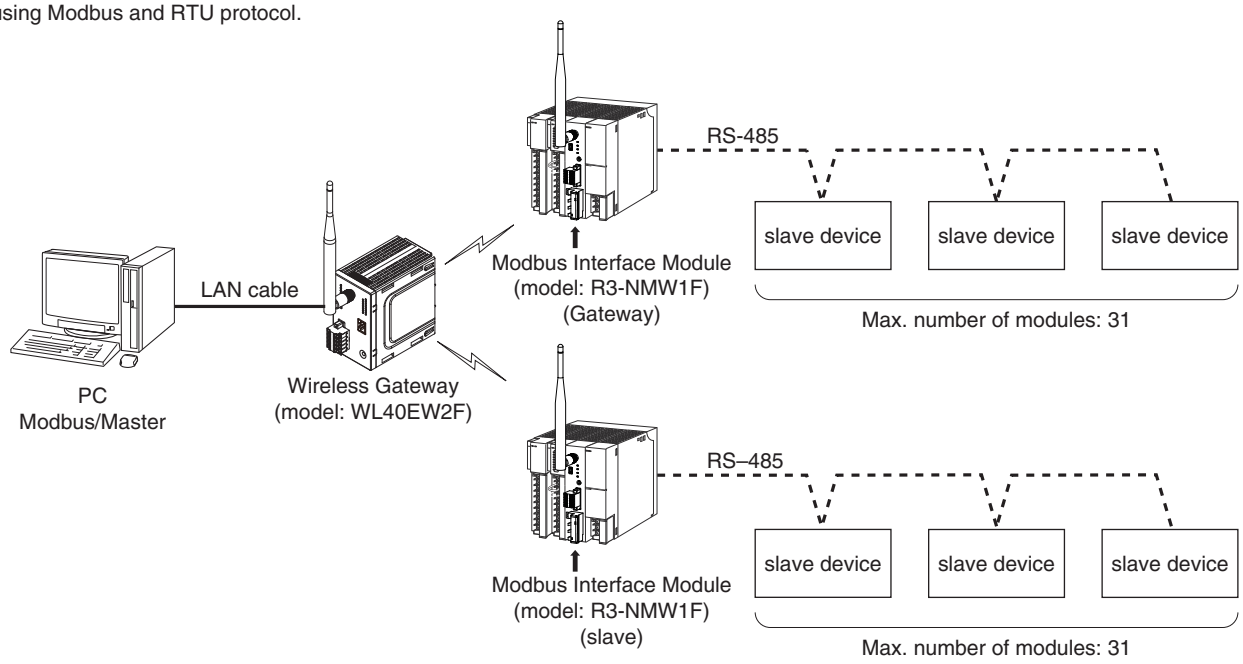
■ WHEN GATEWAY FUNCTION IS DISABLED

With wired PC as Modbus/Master, communicates with slave devices via RS-485 using Modbus/TCP and RTU protocol.
With wireless PC as Modbus/Master, communicates with slave devices via wireless module using Modbus/TCP and RTU protocol.



■ WHEN GATEWAY FUNCTION IS ENABLED

With PC as Modbus/Master, communicates with slave devices via wireless module using Modbus/TCP and RTU protocol.
Also, Gateway function allows to communicate with slave devices connected in multi-drop configuration with wired network, using Modbus and RTU protocol.



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⚠ Specifications are subject to change without notice.

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