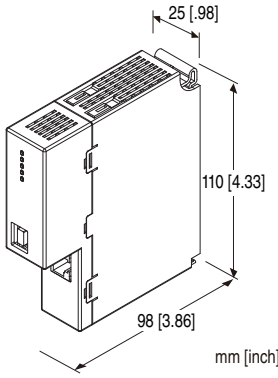
## Remote I/O R30 Series

## MODBUS/TCP INTERFACE MODULE

Functions & Features

• Interchanges analog or discrete I/O signals with the filedbus (Modbus/TCP)

• Combined with R3 Series I/O modules

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## MODEL: R30NE1[1]

## ORDERING INFORMATION

• Code number: R30NE1[1]

Specify a code from below for [1].
(e.g. R30NE1/Q)

• Specify the specification for option code /Q
(e.g. /C01/SET)

## [1] OPTIONS

blank: none

/Q: With options (specify the specification)

### SPECIFICATIONS OF OPTION: Q (multiple selections)

**COATING (For the detail, refer to M-System's web site.)**

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

**EX-FACTORY SETTING**

/SET: Preset according to the Ordering Information Sheet (No. ESU-9019)

## CAUTION

• The internal bus communication period for R3 series I/O modules installed on the R30EBS is as follows.

Internal bus communication period = 6 msec. × number of I/O module + 10 msec. (Data update period of main CPU)

Example: Four R3 I/O modules

6 msec. × 4 + 10 msec. = 34 msec.

Even when the R30EBS is mounted to the R30BS, the internal bus communication period of R30 series is kept to approx. 1 msec.

## RELATED PRODUCTS

• PC configurator software (model: R30CFG)

• PC configurator software (model: R3CON)

Downloadable at M-System's web site.

For connecting to PC, use commercially available Mini-B type USB cable. (provided by user)

• R3 series I/O modules (except R3-TC2)

## GENERAL SPECIFICATIONS

Connection

Ethernet: RJ-45 connector

Internal bus: Via the Installation Base (model: R30BS)

Internal power: Via the Installation Base (model: R30BS)

Isolation: Ethernet to internal bus or internal power

Setting input type & input range:

R30 series I/O module: PC configuration software (model: R30CFG)

R3 series I/O module: PC configuration software (model: R3CON)

Internal bus communication cycle: Approx. 1 msec.

Status indicator LEDs: PWR, RUN, ERR

(Refer to the instruction manual for details.)

## ETHERNET COMMUNICATION

Communication Standard: IEEE 802.3u

Transmission: 10BASE-T, 100BASE-TX

Baud rate: 10/100 Mbps (Auto Negotiation function)

Protocol: Modbus/TCP

Data: RTU (Binary)

Max. number of socket connections: 2

Transmission media: 10BASE-T (STP, Category 5), 100BASE-TX (STP, Category 5e)

Max. length of fieldbus segment: 100 meters

Ethernet indicator LEDs: LINK10, LINK100

IP address: 192.168.0.1 (factory setting);
can be set/changed using PC Configurator Software (model: R30CFG)

Port No.: 502

## INSTALLATION

Current consumption: 110 mA

Operating temperature: -10 to +55°C (14 to 131°F)

Storage temperature: -20 to +65°C (-4 to +149°F)

Operating humidity: 10 to 90 %RH (non-condensing)

Atmosphere: No corrosive gas or heavy dust

Mounting: Installation Base (model: R30BS)

**Weight**: 105 g (0.23 lb)

## PERFORMANCE

**Insulation resistance**: ≥ 100 MΩ with 500 V DC
**Dielectric strength**: 1500 V AC @ 1 minute
(Ethernet to internal bus or internal power)
1500 V AC @ 1 minute (power input to FE; isolated on the power supply module)

## STANDARDS & APPROVALS

**EU conformity**:
EMC Directive
EMI EN 61000-6-4
EMS EN 61000-6-2
RoHS Directive

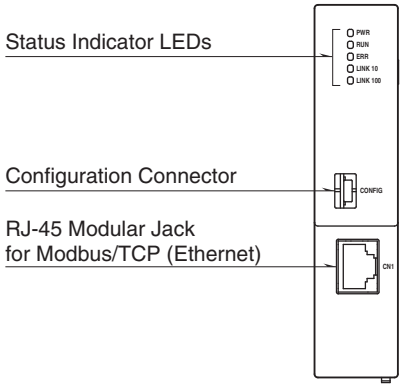
## PC CONFIGURATOR

The following parameters can be set with using PC Configurator Software (model: R30CFG)
Refer to the users manual for the R30CFG for detailed operation of the software program.

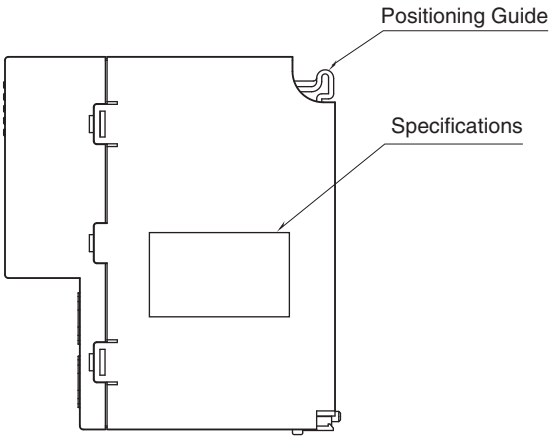
| PARAMETER | SETTING RANGE | DEFAULT SETTING |
|---|---|---|
| Timeout | 0.2. to 3200.0 (sec.) | 3.0 (sec.) |
| IP address | 0.0.0.0 to 255.255.255.255 | 192.168.0.1 |
| Subnet mask | 0.0.0.0 to 255.255.255.255 | 255.255.255.0 |
| Default gateway | 0.0.0.0 to 255.255.255.255 | 192.168.0.100 |
| Port No. 1 | 1 to 32000 | 502 |
| Port No. 2 | 1 to 32000 | 502 |
| Port No. 3 | 1 to 32000 | 502 |
| Port No. 4 | 1 to 32000 | 502 |
| Linger time | 3.0 to 3200.0 (sec.) | 180.0 (sec.) |

## EXTERNAL VIEW

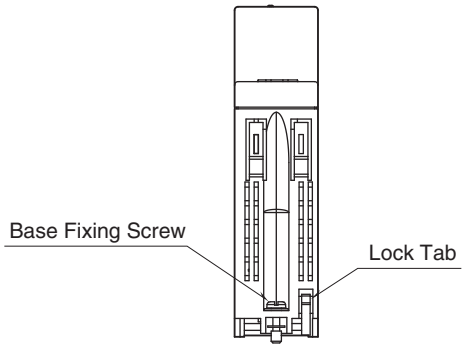
■ **FRONT VIEW**




■ **SIDE VIEW**




■ **BOTTOM VIEW**




## 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 | X | |
| 09 | Program 484 | | |
| 10 | Poll 484 | | |
| 11 | Fetch Comm. Event Counter | X | Fetch a status word and an event counter |
| 12 | Fetch Comm. Event Log | X | 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 (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 | | |

■ **Diagnostic Subfunctions**

| CODE | NAME | | |
|---|---|---|---|
| 00 | Return Query Data | X | Loop back test |
| 01 | Restart Comm. Option | X | Reset the slave and clear all counters |
| 02 | Return Diagnostic Register | X | Contents of the diagnostic data (2 bytes) |
| 03 | Change ASCII Input Delimiter | X | Delimiter character of ASCII message |
| 04 | Force Listen Only Mode | X | Force the slave into Listen Only Mode |

## MODBUS I/O ASSIGNMENT

| | ADDRESS | DATA TYPE | DATA |
|---|---|---|---|
| Coil (0X) | 1 to 2048 | | Discrete Output |
| Input (1X) | 1 to 2048 | | Discrete Input |
| | 2049 to 2064 | | Module Status (R30 series) |
| | 2065 to 2080 | | Module Status (R3 series) |
| | 2081 to 2096 | | Error Status (R30 series) |
| | 2097 to 2112 | | Error Status (R3 series) |
| | 2113 to 2128 | | Data Error Status (R30 series) |
| | 2129 to 2144 | | Data Error Status (R3 series) |
| Input Register (3X) | 1 to 512 | I | Analog Input |
| Holding Register (4X) | 1 to 512 | I | Analog Output |

■ **DATA TYPE**

I: Integer; 0 to 10000 (0 to 100%)

Note: DO NOT access addresses other than mentioned above.
Accessing such an address may result in problem such as malfunction of the unit.

1) Module Status indicates whether or not an I/O module is mounted on each slot.
The bit corresponding to the mounted slot turns to '1', and the unmounted slot to '0'.

2) Error Status indicates occurrence of an error of each module as described below.
The bit corresponding to the module having an error turns to '1'.
- R3-TSx, R3x-RSx, R3-US4 (input type: T/C or RTD): Input burnout
- R3x-DA16A: Power input error or disconnection
- R3x-YS4: Output disconnection
- R3-PC16A: External power supply in error or disconnection

3) Data Error Status indicates occurrence of an error of each module as described below.
The bit corresponding to the module having an error turns to '1'.
- Analog input modules transmitting 0 to 100% scaling value: Input overrange (≤ -15% or ≥ 115%)
- R30YS4: Output disconnection
- R30TS4, R30RS4, R30USx (input type: T/C or RTD): Input burnout
- R3-TSx, R3x-RSx, R3-US4 (input type: T/C or RTD): Input burnout
- R3-US4 (input type: voltage): Input overrange (≤ -10% or ≥ 110%)

4) I/O Data (discrete input, discrete output, analog input, analog output) Assignment

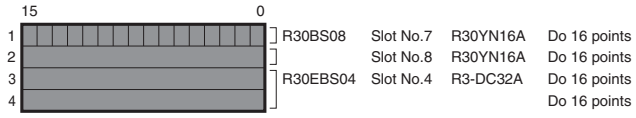
This unit recognizes type (No. of data areas) of each I/O module mounted on the same base, and automatically assigns it to each data area in the order of slot number. See table below.

Each data area is allocated only with the data of the assigned module and still has space.
When data of each data area is transmitted to the host PC/PLC in the order of slot number, other types of data of the latter slot number, if any, are allocated and transmitted together so that each type of data is transmitted sequentially; that is, no blank data is transmitted. See figures below.

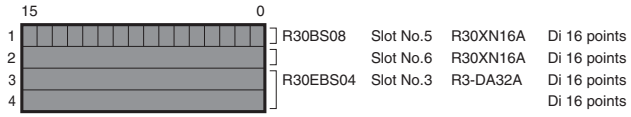
I/O Data Assignment is performed only when the power is turned on.
Be sure to turn the power off and on again when the module configuration has been changed.
The max. number of data areas per node is 64.
Thus, the total number of data areas of the mounted I/O modules must be equal to or less than 64.
When there is a blank slot, data of the latter slot number is transmitted to the host PC/PLC so that no blank data is transmitted.
The table below shows an example of I/O configuration and the figures show how I/O data are assigned.

| BASE | SLOT NO. | MODEL | DATA AREAS |
|---|---|---|---|
| R30BS08 | PWR | R30PS1 | – |
| | COM | R30NE1 | – |
| | 1 | R30SV4 | 4 |
| | 2 | R30US2 | 2 |
| | 3 | R30TS4 | 4 |
| | 4 | R30YV4 | 4 |
| | 5 | R30XN16A | 1 |
| | 6 | R30XN16A | 1 |
| | 7 | R30YN16A | 1 |
| | 8 | R30YN16A | 1 |
| R30EBS04 | 1 | R3-SV8 | 8 |
| | 2 | R3-YV8 | 8 |
| | 3 | R3-DA32A | 2 |
| | 4 | R3-DC32A | 2 |

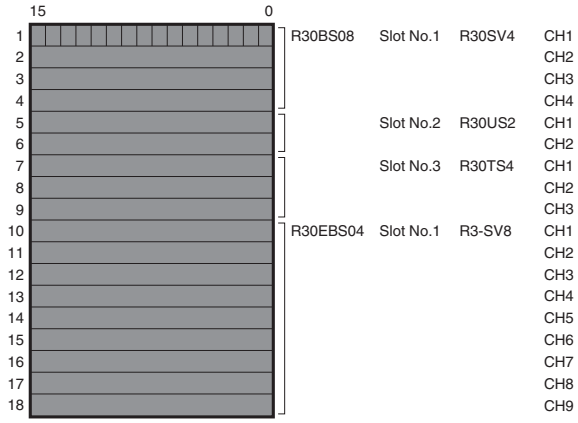
**■ Coil (0X)**
The figure below indicates discrete output.



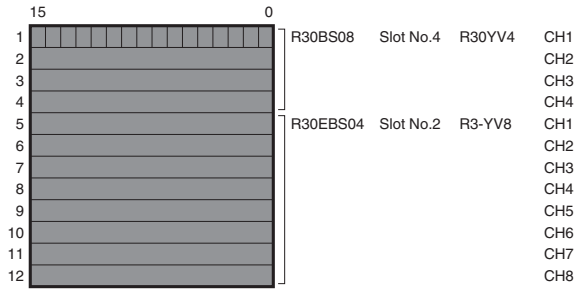

**■ Input (1X)**
The figure below indicates discrete input.




**■ Input Register (3X)**
The figure below indicates analog input.

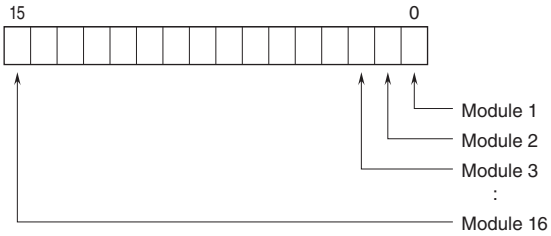



**■ Holding Register (4X)**
The figure below indicates analog output.



## MODULE STATUS, ERROR STATUS, DATA ERROR STATUS

Shows each module's availability and error status.

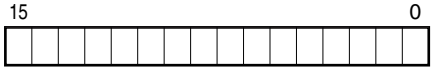



## I/O DATA DESCRIPTIONS

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: R30SV2, R30SV4, R30YV4, R30YS4, R30US2, R30US4 etc.)

16-bit binary data.
Basically, 0 to 100% of the selected I/O range is converted into 0 to 10000 (binary).
Negative percentage is represented in 2's complements.

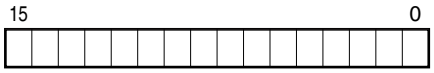



### ■ ANALOG DATA (16-bit data, models: R30RS4, R30TS4, R30US2, R30US4, etc.)

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.

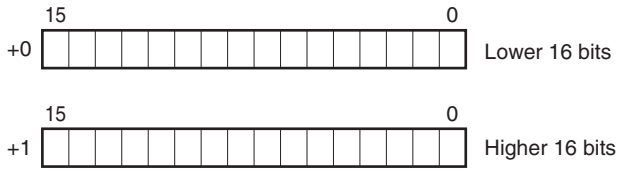
### ■ ANALOG DATA (16-bit data, models: R30CT4E etc.)

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.



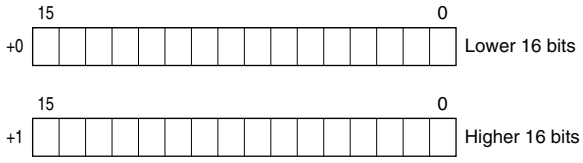

### ■ ANALOG DATA (32-bit data, models: R3-PA2, PA4A, WT1, WT4, etc.)

32-bit binary data is used for accumulated counts, encoder positions and active energy.
Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.

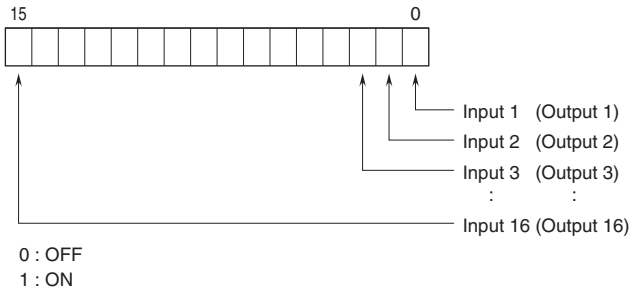


### ■ ANALOG DATA (32-bit data, models: R3-BA32A, BC32A, etc.)

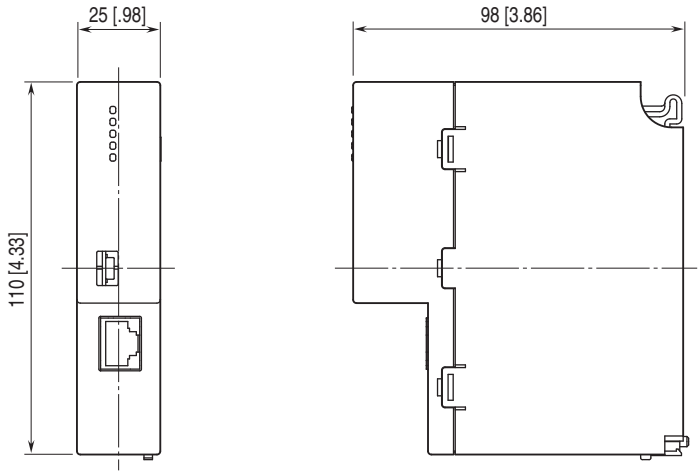
32-bit binary data is used for BCD.
Lower 16 bits are allocated from the lowest address to higher ones, higher 16 bits in turn.



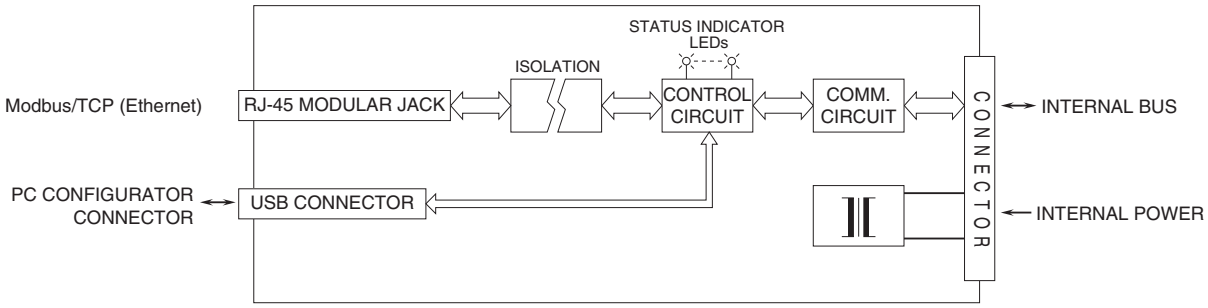

### ■ 16-POINT DISCRETE DATA (models: R30XN16A, R30YN16A, R30YN16C etc.)




## EXTERNAL DIMENSIONS unit: mm [inch]



## SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM




⚠ Specifications are subject to change without notice.