MODBUS/TCP INTERFACE MODULE | MODEL R30NE1

BEFORE USE ....

Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact M-System's Sales Office or representatives.

■ PACKAGE INCLUDES:

Network module ....(1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

• This unit must be mounted inside the instrument panel of a metal enclosure.
• The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.

■ HOT SWAPPABLE MODULES

• It is possible to replace a module with the power supplied provided that the module is replaced with one with the same model number and installed in the same base slot.
• Be sure to replace a module when it is not communicating with the host as it may affect the system. Note that replacing multiple modules at one time may greatly change line voltage levels. We strongly recommend to replace them one by one.
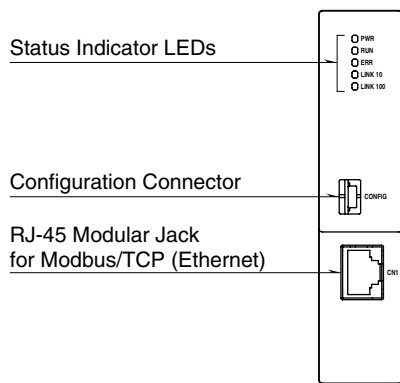
■ ENVIRONMENT

• Indoor use.
• When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
• Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
• Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 10 to 90% RH in order to ensure adequate life span and operation.
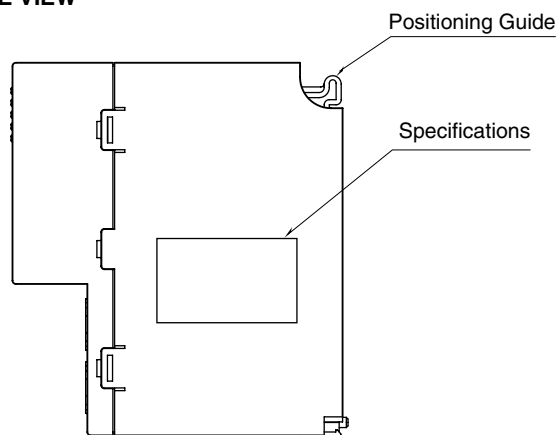
■ WIRING

• Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
• Do not bind these cables together with those in which noises are present. Do not install them in the same duct.
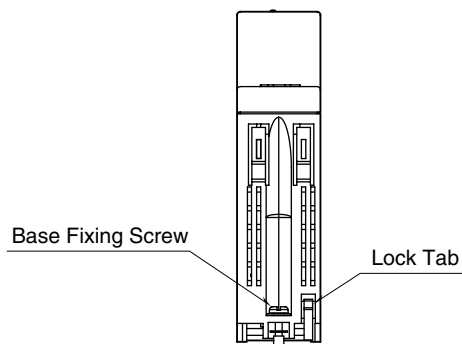
COMPONENT IDENTIFICATION

■ **FRONT VIEW**

Status Indicator LEDs

Configuration Connector

RJ-45 Modular Jack
for Modbus/TCP (Ethernet)

■ **SIDE VIEW**

Positioning Guide

Specifications

■ **BOTTOM VIEW**

Base Fixing Screw

Lock Tab

■ **STATUS INDICATOR LED**

| ID	FUNCTION	COLOR	STATUS	
PWR	Main Unit Internal Power	Green	OFF	Error / Power off
			ON	Normal
RUN	Communication Status with Host	Green	OFF	Error / Disconnected
			ON	Normal
ERR	Error Status	Red	OFF	No error
			ON	Hardware error, Communication error / Disconnected with host
LINK10	10 Mbps Connection Status	Green	OFF	Error / Disconnected
			ON	Normal
LINK100	100 Mbps Connection Status	Green	OFF	Error / Disconnected
			ON	Normal

INSTALLATION

■ INSTALLATION TO THE BASE

Use the Installation Base (model: R30BS).
The mounting slot for a network module is fixed to COM.
Do not mount the network module to any other slot.

PWR COM I/O1 · · · · I/On
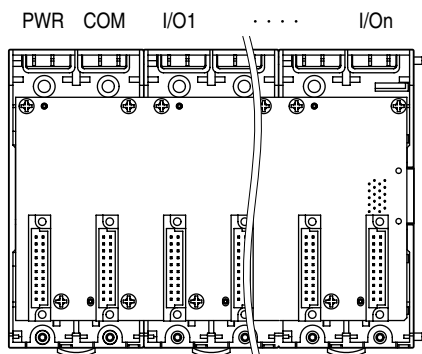
■ HOW TO MOUNT THE MODULE

1) Engage the positioning guide of the module with the Installation Base.
2) Pivot the module on the positioning guide and press it down until the lock tab sits into place.

Positioning guide
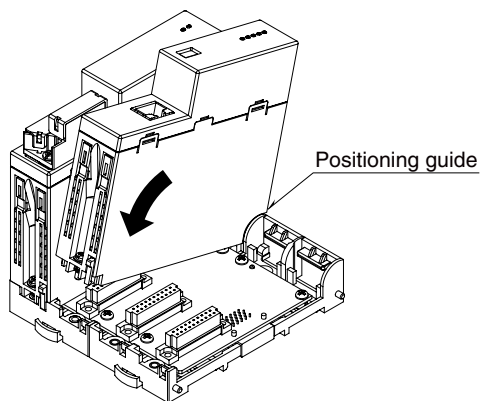
3) Tighten the base fixing screw using a screwdriver (stem length: 70 mm/2.76" or more) (torque 0.5 N·m).
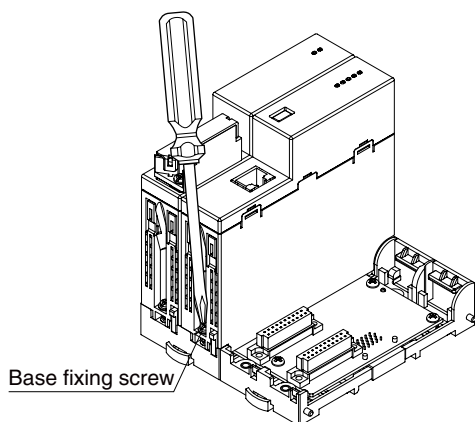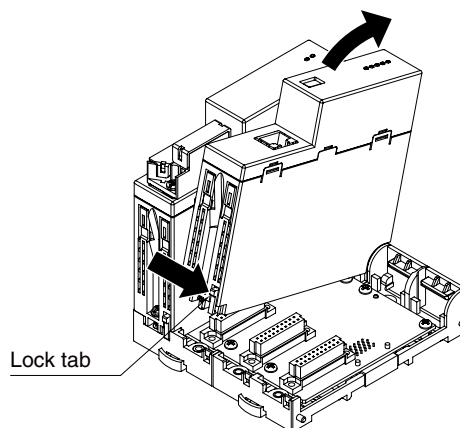
Base fixing screw

■ HOW TO REMOVE THE MODULE

1) Loosen the base fixing screw using a screwdriver (stem length: 70 mm/2.76" or more).

Base fixing screw
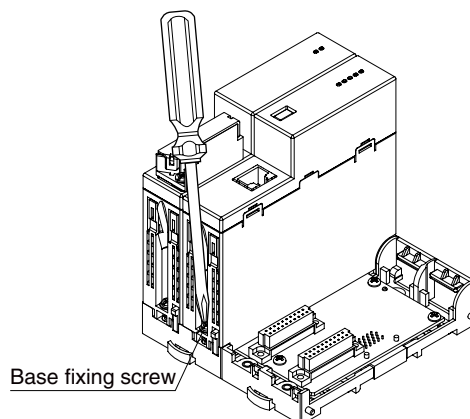
2) While pressing the projection on the lock tab, push the module upward.
3) Detach the positioning guide of the module from the Installation Base.

Lock tab

TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

■ EXTERNAL DIMENSIONS unit: mm (inch)

25 (.98)   98 (3.86)

110 (4.33)

■ CONNECTION DIAGRAM

Modbus/TCP (Ethernet) → RJ-45 MODULAR JACK → CONNECTOR → INTERNAL BUS

PC CONFIGURATOR CONNECTOR → USB CONNECTOR → CONNECTOR → INTERNAL POWER
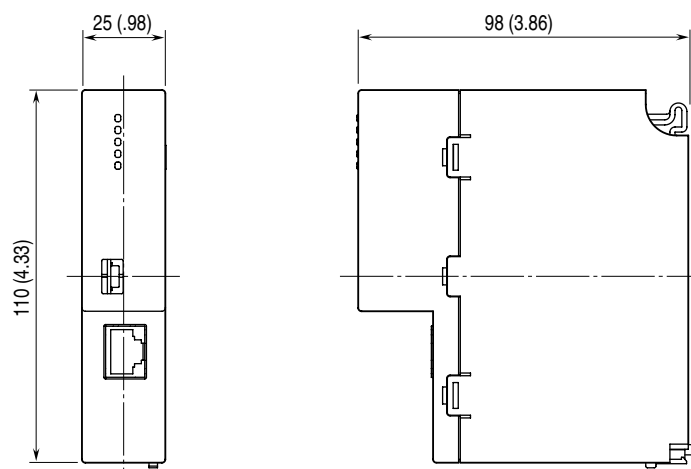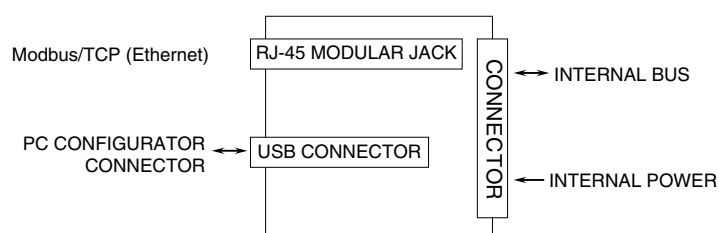
PC CONFIGURATOR SETTING

The following parameter items can be configured with PC Configurator Software (model: R30CFG).
Refer to the users manual of the software for detailed operations.

PARAMETER	AVAILABLE RANGE	DEFAULT SETTING
Timeout	0.2 – 3200.0 (sec.)	3.0 (sec.)
IP Address	0 – 255	192.168.0.1
Subnet mask	0 – 255	255.255.255.0
Default gateway	0 – 255	192.168.0.100
Port No.1	1 – 32000	502
Port No.2	1 – 32000	502
Port No.3	1 – 32000	502
Port No.4	1 – 32000	502
Linger time	3.0 – 3200.0 (sec.)	180.0 (sec.)

CHECKING ETHERNET CONNECTION

■ IP ADDRESS SETTING

R30NE1 does not support BootP Table Software.
Use PC Configurator Software (model: R30CFG) to set the IP Address.
The Modbus/TCP Port No. is fixed at 502.

■ WIRING

Connect an Ethernet cable to the RJ-45 port of your PC.

■ STATUS INDICATOR LEDs

Confirm that the LINK LED is turned on if the wiring is correct.
Specifically, the LINK10 LED is ON when the unit is connected at 10 Mbps while the LINK100 LED is ON when connected at 100 Mbps.

■ CHECKING CONNECTION OF R30NE1

Enter the following "ping command" in the Command Prompt on Windows OS.

    C:¥WINDOWS>ping ***.***.***.***
    (***.***.***.***: Enter IP address in decimal.)

If the R30NE1 is successfully connected, you will receive a response as follows.

    ping ***.***.***.*** with 32 bytes of data:
    Reply from ***.***.***.*** : bytes=32 time<10ms TTL=64
    Reply from ***.***.***.*** : bytes=32 time<10ms TTL=64
    Reply from ***.***.***.*** : bytes=32 time<10ms TTL=64
    Reply from ***.***.***.*** : bytes=32 time<10ms TTL=64

    Ping statistics for ***.***.***.***
    Packets:Sent=4,Received=4,Lost=0(0% loss)

In case of connection failure due to wrong IP address or the like, replies indicating, for example, 'timeout' will be received.

■ CHECKING CONNECTION TO THE APPLICATION SOFTWARE

Check Point 1: LINK LEDs

When connection is established normally, the LINK10 or LINK100 LED is turned on regardless of whether or not data communication is in progress.
Check power supply to the hub, etc. if neither LED is turned on.

Check Point 2: RUN Indicator LED

Confirm that the RUN Indicator LED turns green in normal data communication with the application software.

MODBUS FUNCTION CODES & SUPPORTED CODES

■ DATA AND 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	
02	Return Diagnostic Register	X	
03	Change Input Delimiter Character	X	
04	Force Slave to Listen Only Mode	X	

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

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 ($\leq$ -15% or $\geq$ 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 ($\leq$ -10% or $\geq$ 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.
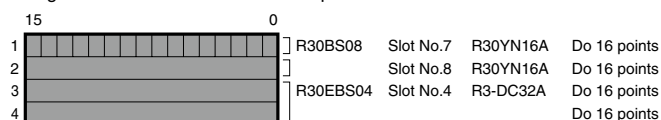
When there is a blank slot, data of the latter slot number is transmitted to the host PC/PLC so that no blank data is transmitted.

The table below shows an example of I/O configuration and the figures show how I/O data are assigned.

BASE	SLOT NO.	MEDEL	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.

1	R30BS08	Slot No.7	R30YN16A	Do 16 points
2		Slot No.8	R30YN16A	Do 16 points
3	R30EBS04	Slot No.4	R3-DC32A	Do 16 points
4				Do 16 points

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

1	R30BS08	Slot No.5	R30XN16A	Di 16 points
2		Slot No.6	R30XN16A	Di 16 points
3	R30EBS04	Slot No.3	R3-DA32A	Di 16 points
4				Di 16 points
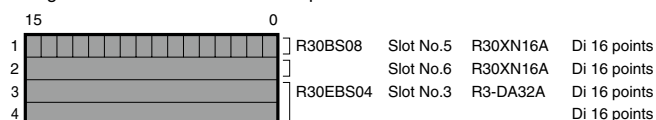
■ **Input Register (3X)**
The figure below indicates analog input.

1	R30BS08	Slot No.1	R30SV4	CH1
2				CH2
3				CH3
4				CH4
5		Slot No.2	R30US2	CH1
6				CH2
7		Slot No.3	R30TS4	CH1
8				CH2
9				CH3
10	R30EBS04	Slot No.1	R3-SV8	CH1
11				CH2
12				CH3
13				CH4
14				CH5
15				CH6
16				CH7
17				CH8
18				CH9
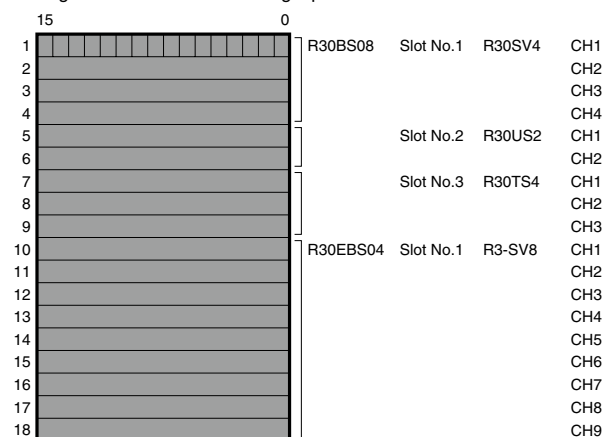
■ **Holding Register (4X)**
The figure below indicates analog output.

1	R30BS08	Slot No.4	R30YV4	CH1
2				CH2
3				CH3
4				CH4
5	R30EBS04	Slot No.2	R3-YV8	CH1
6				CH2
7				CH3
8				CH4
9				CH5
10				CH6
11				CH7
12				CH8

MODULE STATUS, ERROR STATUS, DATA ERROR STATUS

Shows each module's availability and error status.
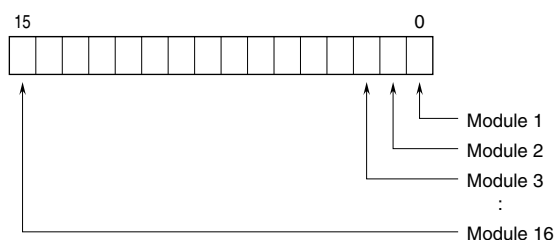
I/O DATA DESCRIPTIONS

■ ANALOG DATA (16-bit data, models: R30SV4, R30SV2, R30YV4, R30YS4, 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, R30US4, etc.)

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

■ ANALOG DATA (16-bit data, models: R30CT4E etc.)
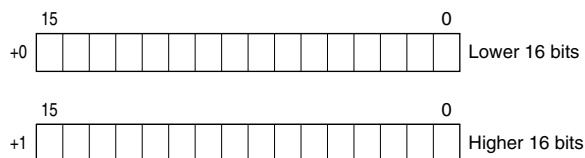
16-bit binary data.
Integer that engineering unit value (A) multiplied by 100 (for CLSE-R5, integer that engineering unit value (A) multiplied by 1000).

■ 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.

```
      15                                    0
+0  [ | | | | | | | | | | | | | | | ]  Lower 16 bits

      15                                    0
+1  [ | | | | | | | | | | | | | | | ]  Higher 16 bits
```

■**DISCRETE DATA (models: R30XN16A, R30YN16x, etc.)**

```
      15                                    0
    [ | | | | | | | | | | | | | | | ]
```

Input 1　(Output 1)
Input 2　(Output 2)
Input 3　(Output 3)
　　:　　　:
Input 16 (Output 16)

0 : OFF
1 : ON