POWER/NETWORK MODULE
(DeviceNet®, Automatic area size optimization)

MODEL **R8-ND2**

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:

Power/network module ....(1)
Protective cover ....(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

• The equipment must be mounted inside a panel.
• 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.
  * For example, installation of noise filters and clamp filters for the power source, input and output connected to the unit, etc.

■ GENERAL PRECAUTIONS

• Before you remove or mount the unit, turn off the power supply.
• Switches on the side of the module can be set for maintenance only while the power supply is off. Do not access them while the power is supplied.

■ POWER INPUT RATING & OPERATIONAL RANGE

• Locate the power input rating marked on the product and confirm its operational range as indicated below:
  DC Power supply: 24V DC rating
       24V DC ± 10%, approx. 12W
       (@ internal power max. current 1.6A)
  Excitation supply (excitation for I/O module):
       24V DC ± 10%, operational current 10A
  (From power supply (excitation supply) connector, via connector for internal bus, supplied to each I/O module. Power output current consumption must be under operational current.)

■ 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 30 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.

■ AND ....

• The unit is designed to function as soon as power is supplied, however for analog module, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.
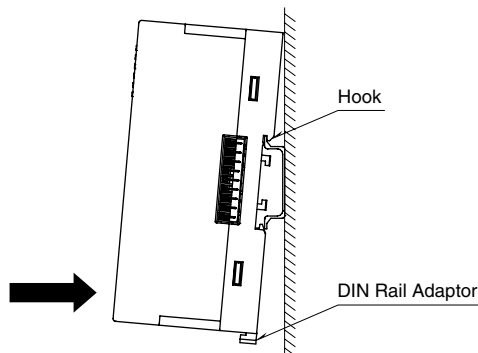
INSTALLATION

Internal power supply/communication is connected via each module's connector, therefore no backplane base is required, however, hot-swapping of modules is not possible.
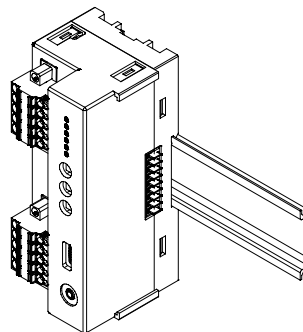
■ NODE ADDRESS & NETWORK SETTING

Settings of node address and baud rate must be completed before mounting the module.

■ HOW TO MOUNT THE MODULE ON DIN RAIL
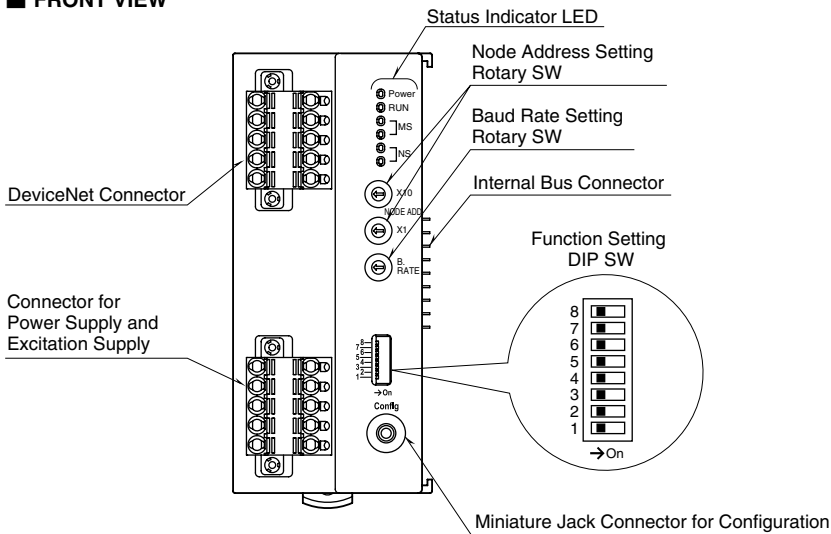
• **Power/Network Module**

Hang the upper hook at the rear on the DIN rail and push in the lower.
When removing the module, push down the DIN rail adaptor utilizing a minus screwdriver and pull.

DeviceNet is registered trademaek of ODVA.

COMPONENT IDENTIFICATION

■ **FRONT VIEW**

Status Indicator LED

Node Address Setting
Rotary SW

Baud Rate Setting
Rotary SW

Internal Bus Connector

Function Setting
DIP SW

DeviceNet Connector

Connector for
Power Supply and
Excitation Supply

Miniature Jack Connector for Configuration

■ **FRONT SWITCHES**

• **Node Address**

Node Address is selected from 0 to 63 in decimal. The upper switch determines the tens' place digit, while the lower switch does the ones' place digit of the address.
(Factory setting: 00)

Node Address Setting (x10)

Node Address Setting (x1)
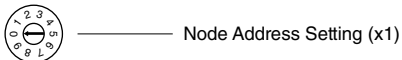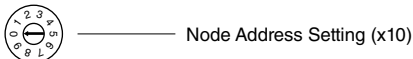
• **Baud Rate**

Baud Rate is selected with the rotary switch. Positions 3 through 9 are unused. Be sure to select from 0 to 2.

0：125kbps
1：250kbps
2：500kbps

Baud Rate Setting
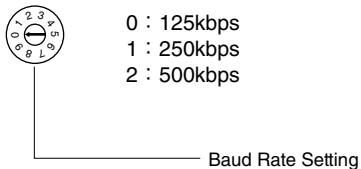
■ **STATUS INDICATOR LED**

ID	STATE	COLOR	TO INDICATE
Power	ON	Green	Power supplied
RUN	ON / Blink	Green	Turns on or blinks depending on the status
MS	ON	Green	Normal operation
	ON	Red	Critical failure
	Blink		Minor failure
NS	ON	Green	Connections are established
	Blink		Connections are not established
	ON	Red	Critical Link failure
	Blink		Minor Link failure

■POWER SUPPLY, EXCITATION SUPPLY CONNECTOR ASSIGNMENT

Printed-circuit board connector (Phoenix Contact)
  Unit side connector: MSTBV2,5/5-GF-5,08AU
  Cable side connector: TFKC2,5/5-STF-5,08AU
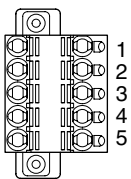
PIN No.	ID	FUNCTION
1	24V	Power supply 24V DC
2	0V	Power supply 0V DC
3	+	Excitation supply 24V DC
4	–	Excitation supply 0V DC
5	FE1	Grounding

■ NETWORK CONNECTOR ASSIGNMENT

Printed-circuit board connector (Phoenix Contact)
  Unit side connector: MSTBV2,5/5-GF-5,08AU
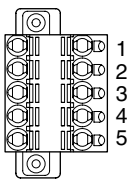 Cable side connector: TFKC2,5/5-STF-5,08AU M

PIN No.	ID	FUNCTION
1	V–	Power (–)
2	CAN_L	Signal Low
3	Drain	Shield
4	CAN_H	Signal High
5	V+	Power (+)

TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

■ **EXTERNAL DIMENSIONS unit: mm (inch)**
 • **Unit**

50 (1.97) [3 (.12)] 55 (2.17) [4 (.16)]

115 (4.53)

[4 (.16)]

[7 (.28)]

DIN RAIL
(35 mm wide)

 • **PROTECTIVE COVER**

5 (.20) 50 (1.97)

115 (4.53)

M-SYSTEM CO., LTD.

5-2-55, Minamitsumori, Nishinari-ku, Osaka 557-0063 JAPAN
Phone: +81(6)6659-8201   Fax: +81(6)6659-8510   E-mail: info@m-system.co.jp

EM-9671   P. 4 / 8
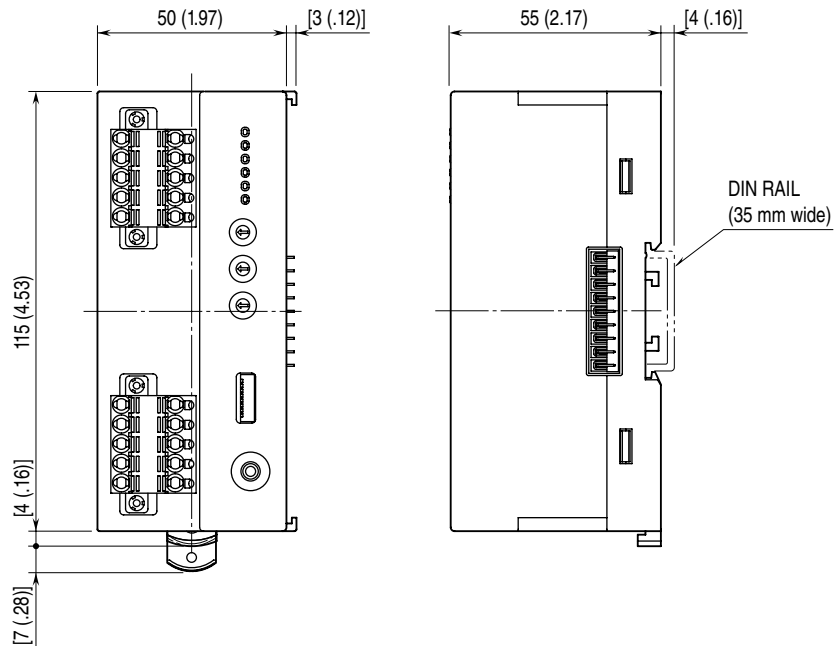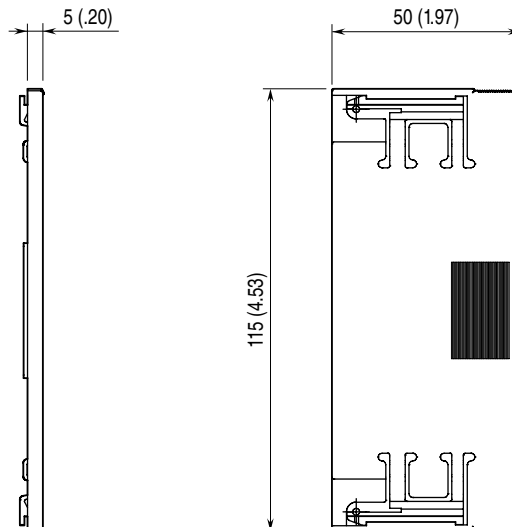
■ **CONNECTION DIAGRAM**

Note: In order to improve EMC performance, bond the FE1 terminal to ground.

Caution: FE1 terminal is NOT a protective conductor terminal.

WIRING INSTRUCTIONS

■ **TENSION CLAMP TERMINAL BLOCK**

• **Power input, excitation supply**

Applicable wire size: 0.2 – 2.5 mm^2
Stripped length: 10 mm

• **DeviceNet**

Transmission cable: Approved for DeviceNet
Stripped length: 10 mm

DeviceNet I/O ASSIGNMENTS

■ **IN AREA (R8-ND2 to Master device)**

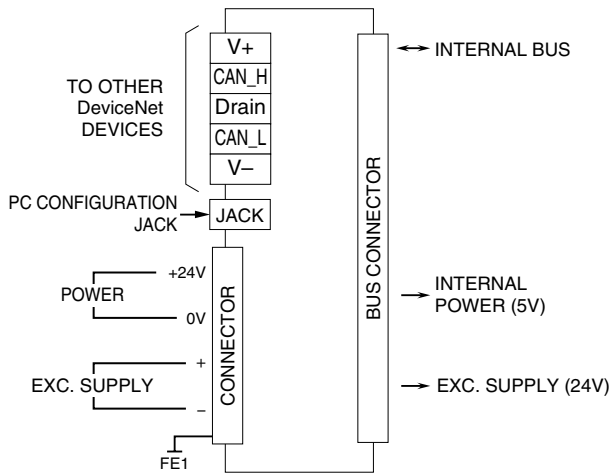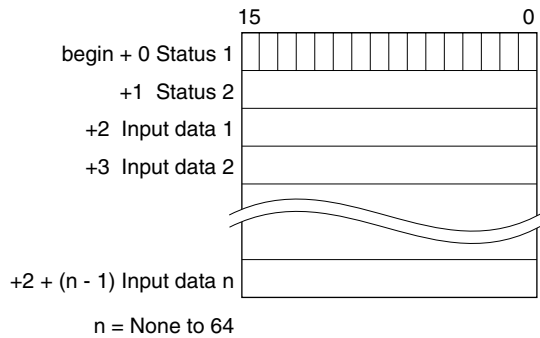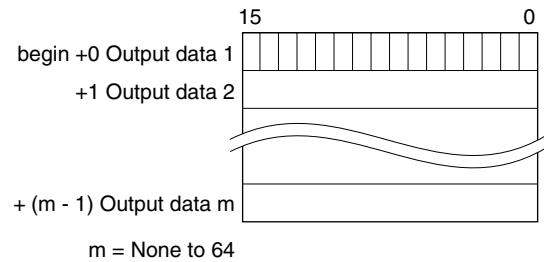|	15	0
begin + 0 Status 1		
+1 Status 2		
+2 Input data 1		
+3 Input data 2		
+2 + (n - 1) Input data n		

n = None to 64

■ **OUT AREA (Master device to R8-ND2)**

	15	0
begin +0 Output data 1		
+1 Output data 2		
+ (m - 1) Output data m		

m = None to 64

R8-ND2 automatically determines IN/OUT area size of DeviceNet when the power is turned on according to the configuration of the connected I/O module.

If the I/O module is an input type, input data is assigned in order from the 3rd word of IN area (R8-ND2 to master device). If the I/O module is an output type, output data is assigned in order from the beginning of OUT area (master device to R8-ND2). Temperature control module are allocated to both IN area and OUT area.

Assign the addresses in ascending order of the module address setting.

The data size of each I/O module is determined by the "Data Allocation Mode" × "Addresses in Use" unique to each I/O card. For the details of Data Allocation Mode and Address in Use, refer to "General specifications" in R8 series common specifications (ES-9721).

Status data is assigned to the first two words of IN area regardless of the congiduration of the I/O module.

■ **DeviceNet DATA EXAMPLE**

As an example, the data size of DeviceNet data for the following I/O module configuration are described.

• **I/O module configuration example**

Network module + nine I/O modules
• DeviceNet data size (word) = Data Allocation Mode × Address in Use
• Module addresses for I/O modules are set in order from top, by leaving space for the address in use.

I/O MODULE CONFIGURATION	MODULE TYPE	I/O TYPE	DATA ALLOCATION MODE	ADDRESS IN USE	DeviceNet DATA SIZE (word)		MODULE ADDRESS SETTING
					IN	OUT	
R8-ND2	Power/network module	-	-	-	-	-	-
R8-DA4A	Discrete input module (4 points)	Input	1	1	1	-	0
R8-DAM16A	Discrete input module (16 points)	Input	1	1	1	-	1
R8-DC4A	Discrete output module (4 points)	Output	1	1	-	1	2
R8-DCM16A	Discrete output module (16 points)	Output	1	1	-	1	3
R8-SV2	DC voltage input mpdule (2 points)	Input	2	1	2	-	4
R8-SST8	DC current input module (8 points)	Input	2	4	8	-	5
R8-YS2	DC current output mpdule (2 points)	Output	2	1	-	2	9
R8-YV4N	DC voltage output module (4 points)	Output	2	2	-	4	10
R8-TC2	Temperature control module	Input / Output	2	8	16	16	12

⇩

• **DeviceNe Data**

IN AREA (R8-ND2 to master device)

Begin + 0	Status 1
+1	Status 2
+2	R8 -DA4A (ch1 to 4)
+3	R8 -DAM16A (ch1 to 16)
+4	R8 -SV2 (ch1)
+5	R8 -SV2 (ch2)
+6	R8 -SST8 (ch1)
+7	R8 -SST8 (ch2)
+8	R8 -SST8 (ch3)
+9	R8 -SST8 (ch4)
+10	R8 -SST8 (ch5)
+11	R8 -SST8 (ch6)
+12	R8 -SST8 (ch7)
+13	R8 -SST8 (ch8)
+14	R8 -TC2 (Data 1)
+15	R8 -TC2 (Data 2)
+16	R8 -TC2 (Data 3)
:	:
+29	R8 -TC2 (Data 16)

IN size = 30-word (60-byte)

OUT AREA (Master device to R8-ND2)

Begin + 0	R8 -DC4A (ch1 to 4)
+1	R8 -DCM16A (ch1 to 16)
+2	R8 -YS2 (ch1)
+3	R8 -YS2 (ch2)
+4	R8 -YV4N (ch1)
+5	R8 -YV4N (ch2)
+6	R8 -YV4N (ch3)
+7	R8 -YV4N (ch4)
+8	R8 -TC2 (Data 1)
+9	R8 -TC2 (Data 2)
+10	R8 -TC2 (Data 3)
:	:
+23	R8 -TC2 (Data 16)

OUT size = 24-word (48-byte)

■ **EDS FILE**

EDS files are downloadable at M-System's web site.
8-ND2 automatically determines IN/OUT area size of DeviceNet when the power is turned on according to the configuration of the connected I/O module.
Only the largest data size is registered on the EDS files. When registering to the master device, set the data size according to the configuration of I/O modules.

STATUS

■ **STATUS**
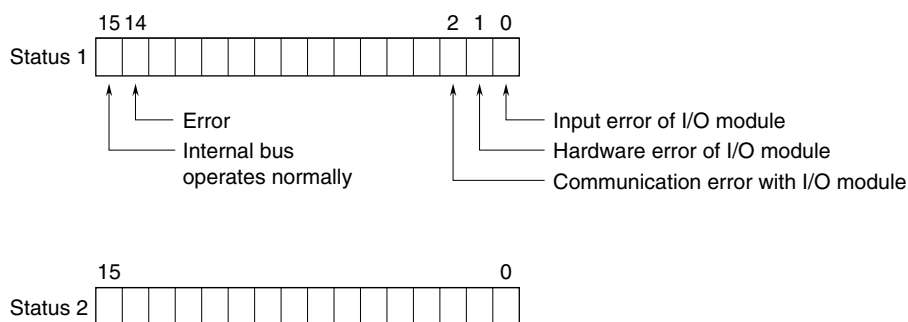
Status 1	bit15	Internal bus operates normally
		  1: Normal
		  0: Error

	bit14	Error
		  1: One of bit0 to 2 turns to 1
		  0: All af bit0 to 2 is 0

	bit3 to 13	0

	bit2	Communication error with I/O module
		  1: Some I/O modules cannot communicate
		  0: Communication with all I/O modules is normal

	bit1	Hardware error of I/O modules
		  1: Some I/O modules are in hardware error.
		  0: Hardware of all I/O modules are normal

	bit0	Input error of I/O modules
		  1: Some I/O modules are out of input range, or in burnout
		  0: Input of all I/O modules are normal

Status 2 (reserved)	bit0 to 15	0

I/O DATA DESCRIPTIONS

■ ANALOG DATA

0 to 100% of the selected I/O range is converted into 0 to 10000 (binary).

Negative values are represented in 2's complements.

```
15                              0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

■ PULSE DATA (16-bit data)

Negative value is not available, the data is shown with the range 0 to 65535.

16-bit binary data is used for pulse data (16-bit data).

```
15                              0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

■ PULSE DATA (32-bit data)

32-bit binary data is used for pulse data (32-bit data).

Lower 16 bits are allocated a lower address and higher 16 bits are allocated a higher address.
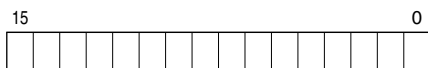
```
      15                              0
+0  ┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐   Lower 16 bits
    └─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

```
      15                              0
+1  ┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐   Higher 16 bits
    └─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

■ ANALOG DATA (Temperature date)

16-bit binary data is used for temperature data.

With °C, K 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.

```
15                              0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

■ ANALOG DATA (CT data)

16-bit binary data is used for CT data.

Conversion data is shown by the engineering unit value multiplied by 100 or 1000. For example, for 520.35 A when 0 to 600 A range, the data is 52035 as the conversion data is the engineering value multiplied by 100.

Negative value is not available, the data is shown with the range 0 to 65535.

```
15                              0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
```

■ DISCRETE DATA

```
15                              0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
 │                        │ │ │
 │                        │ │ └─ Input 1   (Output 1)
 │                        │ └─── Input 2   (Output 2)
 │                        └───── Input 3   (Output 3)
 │                              :          :
 └────────────────────────────── Input 16 (Output 16)

0 : OFF
1 : ON
```