R3 SERIES GENERAL SPECIFICATIONS

MODEL **R3**

MODEL & SUFFIX CODE SELECTION

■NETWORK INTERFACE MODULE

R3–❑–❑

MODEL
NC1 : CC-Link (Ver. 1; 16-point analog)
NC2 : CC-Link (Ver. 1; 32-point analog)
NC3 : CC-Link (Ver. 2)
ND1 : DeviceNet (16-point analog)
ND2 : DeviceNet (32-point analog)
ND3 : DeviceNet (64-point analog)
NE1 : Ethernet (Modbus/TCP)
NF1 : T-Link (Fuji Electric)
NM1 : Modbus
NP1 : PROFIBUS-DP
NL1 : LonWorks (16-point analog)

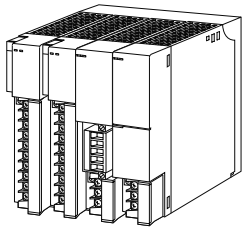
POWER INPUT
K3 : 100 – 120V AC
L3 : 200 – 240V AC
R : 24V DC
N : No power supply

■BASE

R3–❑❑

MODEL
BS : Base
BSW: Base, free I/O address

NUMBER OF SLOTS
02 : 2 slots (R3-BS only)
04 : 4 slots
06 : 6 slots
08 : 8 slots
10 : 10 slots
12 : 12 slots
14 : 14 slots
16 : 16 slots



Functions & Features
• Free combination of analog and discrete I/O
• Various open field bus (DeviceNet, Modbus, etc.)
• Direct sensor inputs
• Dual redundancy in communication

Typical Applications
• Remote I/O for DCS and PLC
• Personal computer I/O

■POWER SUPPLY MODULE

R3–❑–❑

MODEL
PS1 : Power Supply Module, single slot
PS3 : Power Supply Module, double slot

POWER INPUT

AC Power	DC Power
K : 85 – 132V AC	**R** : 24V DC
L : 170 – 264V AC	**P** : 110V DC

■I/O MODULE

R3–❑❑

MODEL

Analog I/O

SS4 : DC current input, 4 ch.
SS8 : DC current input, 8 ch.
SS8N : DC current input, 8 ch., non-isolated
SS16N: DC current input, 16 ch., non-isolated
SV4 : DC voltage input, 4 ch.
SV4A : DC voltage input, 4 ch., narrow span
SV4B : DC voltage input, 4 ch., wide span
SV8 : DC voltage input, 8 ch.
SV8A : DC voltage input, 8 ch., narrow span
SV8B : DC voltage input, 8 ch., wide span
SV8N : DC voltage input, 8 ch., non-isolated
SV16N: DC voltage input, 16 ch., non-isolated
YV4 : DC voltage output, 4 ch.
YV8 : DC voltage output, 8 ch.
YS4 : 4 – 20mA output, 4 ch.
TS4 : Thermocouple input, 4 ch.
TS8 : Thermocouple input, 8 ch.
RS4 : RTD input, 4 ch.
RS8 : RTD input, 8 ch.
RS8A : RTD input, 8 ch., high accuracy
MS4 : Potentiometer input, 4 ch.
MS8 : Potentiometer input, 8 ch.
DS4 : 4 – 20mA input w/exc., 4 ch.
DS8N : 4 – 20mA input w/exc., 8 ch., non-isolated
CT4 : CT (AC current) input, 4 ch.
CT4A : AC current input, 4 ch., clamp-on current sensor CLSA use
CT4B : AC current input, 4 ch., clamp-on current sensor CLSB use
CT8A : AC current input, 8 ch., clamp-on current sensor CLSA use
CT8B : AC current input, 8 ch., clamp-on current sensor CLSB use
PT4 : PT (AC voltage) input, 4 ch.
WT1 : Multi-power input, 1 circuit
WT1A: Multi power input, 4 ch., clamp-on current sensor CLSA use
WT1B: Multi power input, 4 ch., clamp-on current sensor CLSB use
WT4 : AC power input, 4 points
WT4A: AC power input, 4 ch., clamp-on current sensor CLSA use
WT4B: AC power input, 4 ch., clamp-on current sensor CLSB use

Pulse I/O

PA2 : Encoder input, 2 ch. (speed and position)
PA4 : High speed pulse input, 4 ch.
PA4A : High speed totalized pulse input, 4 ch.
PA16 : Totalized pulse input, 16 ch.
PC16A: Pulse output, 16 ch.

COMMUNICATION MODE

S : Single
W : Dual

■I/O MODULE

R3–❑❑

MODEL

Discrete I/O

BA32A : BCD input, 4 ch.
BC32A : BCD output, 4 ch.
DA16 : Optical isolation discrete input, 16 ch. (13V DC)
DA16A : Optical isolation discrete input, 16 ch. (ext. 24V DC)
DA16B : Optical isolation discrete input, 16 ch. (ext. 100V AC)
DA32A : Optical isolation discrete input, 32 ch. (ext. 24V DC)
DA64A : Optical isolation discrete input, 64 ch. (ext. 24V DC)
DC16 : Relay output, 16 ch.
DC16A : Open collector output, 16 ch.
DC16B : Triac output, 16 ch.
DC32A : Open collector output, 32 ch.
DC64A : Open collector output, 64 ch.

Alarm

AS4 : DC current input alarm, 4 ch.
AV4 : DC voltage input alarm, 4 ch.
AT4 : Thermocouple input alarm, 4 ch.
AR4 : RTD input alarm, 4 ch.
AD4 : 4 - 20mA input alarm w/exc., 4 ch.

COMMUNICATION MODE

S : Single
W : Dual

ORDERING INFORMATION

Specify model number (e.g. R3-ND1-N)

GENERAL SPECIFICATIONS

Connection

Network: Terminal block

I/O: M3 or M3.5 (CT/PT) screw terminals

Power input: M3 screw terminals

Housing material: Flame-resistant resin (grey)

INSTALIATION

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

Operating humidity: 30 to 90% RH (non-condensing)

Ambience: No corrosive gas or heavy dust; no strong electric/magnetic field; no direct effect of vibration or physical impact

Mounting: Surface or DIN rail

PERFORMANCE

■INTERNAL COMMUNICATION BUS

The read rate is of approx. 1 msec. per I/O card. Total communication cycle is multiplied by the number of I/O module.

■DATA CONVERSION

Depends upon the type of I/O and ranges.

Temperature input (T/C or RTD) is converted into signed binary data which equals 10 times its engineering unit value (°C). e.g. 25.5°C is converted to 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 value, represented in 2's complements.

The calibrated range 0 – 100% of a DC voltage or current input and output is converted into hexadecimal 0000 – 2710 (0 – 10000). Within -15 – 0%, the values are represented in 2's complements.

■ZERO & SPAN SCALING

The network module inputs or outputs the internal conversion data by the preset scale.

DESCRIPTIONS

■GENERAL

The R3 Series Remote I/O consists of power supply module(s), network interface module(s), I/O module(s) and a backplane (base) in free combinations.

Basically, each module only requires DIP switch setting before it is installed.

A large variety of network and I/O modules are selectable, which are usable for many different field applications.

The power supply and I/O access is via removable screw terminal blocks, while the network is via a DIN terminal block.

• Power Supply Module

Converts AC or DC power inputs for use in the network modules, I/O modules and for exciting discrete I/O.

• Network Module

Converts data between the open network fieldbus (DeviceNet, etc.) and the internal communication bus, functioning as a Gateway between two buses.

• I/O Module

Performs A/D conversion of field analog inputs; D/A conversion of data received through the internal bus into analog/discrete outputs.

Single and dual communication modes are selectable.

• Base

Backplane with two independent communications buses and a power supply bus.

■SINGLE COMMUNICATION MODE

When the single communication mode is employed, the network module receives data from the field bus and sends it to analog/discrete output modules through the internal bus. The output modules convert the data into analog or discrete outputs.

The input modules send out via the internal bus analog or discrete inputs to the network module. The network module outputs the data to the field bus.

■DUAL COMMUNICATION MODE

A dual redundant communication system can be easily achieved by employing two network modules and using dual communication type I/O modules (model suffix code 'W').

Each I/O module is equipped with two independent communication ports, which are connected to the separate network modules. In normal conditions, output modules receive data from both network modules and output the signal from the preferred communication bus A.

When an error is detected in the fieldbus wiring, network module, or in the internal bus (comm. time error, data error, etc.), the output is switched to the data from the communication bus B. The bus A is checked and automatically back for use if it is in normal conditions.

If both are in error, the output modules hold the signal and stand by until one of the communications recovers. (The output could be turned to OFF by setting.)

Input modules continuously respond to request-to-send from the both lines. This secures two independent communications.

■HOT INSERTION/REMOVAL OF I/O MODULES

Each I/O and network module has an independent CPU. Data is renewed by serial communications between modules. Therefore no momentary lapse or bumping of analog output occurs when switching communication buses in the dual communication mode.

Furthermore, removing or replacing modules does not affect other modules on the same backplane. It is possible to replace them without removing the power supply. However, replacing multiple modules at once may greatly change line voltage levels. We recommend that you replace them one by one.

CURRENT CONSUMPTION

The network and I/O modules operates by the DC voltage (20V) supplied from the power module. Arrange these modules in order that the total current consumed by these modules be within this capacity. If the current consumption exceeds the limit, reduce the number of modules to be supplied from the power module.

■NETWORK INTERFACE MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-NC1	230 (350) *2	380 (500) *2	---	120
R3-NC2	220 (350) *2	370 (500) *2	---	130
R3-NC3	230 (350) *2	380 (500) *2	---	120
R3-ND1	270 (350) *2	420 (500) *2	---	80
R3-ND2	270 (350) *2	420 (500) *2	---	80
R3-ND3	270 (350) *2	420 (500) *2	---	80
R3-NE1	250 (350) *2	400 (500) *2	---	100
R3-NF1	220 (350) *2	370 (500) *2	---	130
R3-NM1	250 (350) *2	400 (500) *2	---	100
R3-NP1	220 (350) *2	370 (500) *2	---	130
R3-NL1	250 (350) *2	400 (500) *2	---	100

■POWER SUPPLY MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-PS1	750	1000	---	---
R3-PS3	2000	2200	---	---

■ANALOG I/O MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-SS4	---	---	---	60
R3-SS8	---	---	---	100
R3-SS8N	---	---	---	100
R3-SS16N	---	---	---	100
R3-SV4	---	---	---	60
R3-SV4A	---	---	---	60
R3-SV4B	---	---	---	60
R3-SV8	---	---	---	100
R3-SV8A	---	---	---	100
R3-SV8B	---	---	---	100
R3-SV8N	---	---	---	100
R3-SV16N	---	---	---	100
R3-YV4	---	---	---	150
R3-YV8	---	---	---	200
R3-YS4	---	---	150	180
R3-TS4	---	---	---	70
R3-TS8	---	---	---	100
R3-RS4	---	---	---	70
R3-RS8	---	---	---	100
R3-RS8A	---	---	---	100
R3-MS4	---	---	---	50
R3-MS8	---	---	---	100
R3-DS4	---	---	150	210
R3-DS8N	---	---	---	100
R3-CT4	---	---	---	60
R3-CT4A	---	---	---	60
R3-CT4B	---	---	---	60
R3-CT8A	---	---	---	100
R3-CT8B	---	---	---	100
R3-PT4	---	---	---	60

■ANALOG I/O MODULE (continued)

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-WT1	---	---	---	150
R3-WT1A	---	---	---	150
R3-WT1B	---	---	---	150
R3-WT4	---	---	---	150
R3-WT4A	---	---	---	150
R3-WT4B	---	---	---	150

■PULSE I/O MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-PA2	---	---	---	80
R3-PA4	---	---	80	130
R3-PA4A	---	---	80	130
R3-PA16	---	---	---	100
R3-PC16A	---	---	---	100

■DISCRETE I/O MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-BA32A	---	---	---	90
R3-BC32A	---	---	---	150
R3-DA16	---	---	80	100
R3-DA16A	---	---	---	80
R3-DA16B	---	---	---	80
R3-DA32A	---	---	---	90
R3-DA64A	---	---	---	100
R3-DC16	---	---	130	180
R3-DC16A	---	---	100	100
R3-DC16B	---	---	130	140
R3-DC32A	---	---	150	150
R3-DC64A	---	---	160	160

■ALARM MODULE

MODEL	CONTINUOUS OUTPUT RATING (mA)	MAXIMUM *1 OUTPUT RATING (mA)	MINIMUM CURRENT CONSUMPTION (mA)	MAXIMUM CURRENT CONSUMPTION (mA)
R3-AS4	---	---	---	70
R3-AV4	---	---	---	70
R3-AT4	---	---	---	70
R3-AR4	---	---	---	70
R3-AR4	---	---	---	70

*1. 10-minute output rating.

*2. Values in parentheses exclude the current consumption by the network module.

'---' under the Minimum Current Consumption indicates that the Maximum Current Consumption is always applied.

The Maximum Current Consumption for the output modules such as R3-DS4, R3-YS4, R3-DC16, R3-DC16A, R3-DC16B is applied when all channels are at their full-scale value or at ON. The Minimum Current Consumption for these modules is applied when all channels are at their minimum value or at OFF.

The total of the Maximum Current Consumption must be within the limit of the Continuous Output Rating. If the ON ratio is clearly identified, the current consumption can be calculated according to the following equation:

Current Consumption = Min. Consumption + (Max. Consumption – Min. Consumption) × ON Ratio

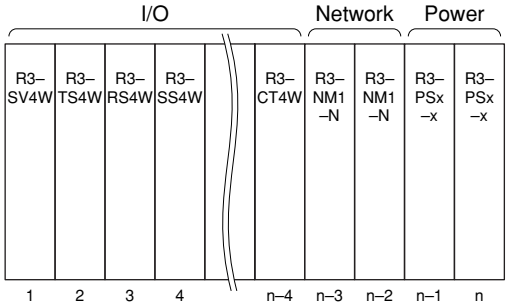
In this case, the total of the Maximum Current Consumption must not exceed the Maximum Output Rating.

MODULE ASSIGNMENTS

■MODULE LOCATIONS

I/O data are assigned on the PLC's data area according to the physical locations of I/O modules, network modules and power supply modules, and to the network module's DIP switch setting.

Basically, install from the left-most slot (No. 1) in order of the I/O modules, the network modules and the power supply modules. If the I/O modules are not mounted next to each other, blank slots are also counted on the PLC's data area for blank data frames.



■DIP SWITCH SETTING OF NETWORK MODULE

Network modules are equipped with DIP switches at the side to specify the data allocations for the PLC.

Data Allocation Type must be assigned to each I/O module position to specify how many data areas (four types) are to be occupied by each.

Two bits from SW1 and SW2 are assigned to each position, and data areas can be specified from the module No. 1 through 8. Setting for No. 9 and later modules is identical to No. 8.

■LIMITATIONS

The maximum possible data areas depend upon types of network modules. For example, the model R3-NC1, CC-Link Interface Module, requires four (4) nodes per unit, limiting the maximum analog points to sixteen (16).

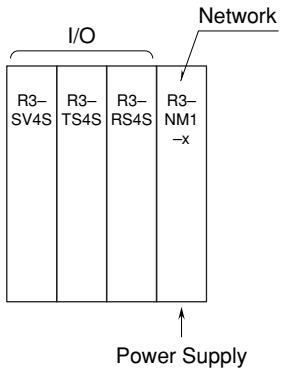
Refer to the data sheet for each model.

SW ASSIGNMENT		MODULE NO.
SW1-1	SW1-2	1
SW1-3	SW1-4	2
SW1-5	SW1-6	3
SW1-7	SW1-8	4
SW2-1	SW2-2	5
SW2-3	SW2-4	6
SW2-5	SW2-6	7
SW2-7	SW2-8	8
SW SETTTING		DATA ALLOCATION
OFF	OFF	1
ON	OFF	4
OFF	ON	8
ON	ON	16

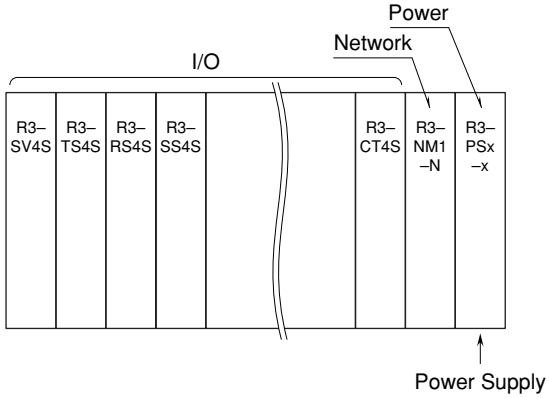
BASIC CONFIGURATIONS

■SINGLE COMMUNICATION MODE

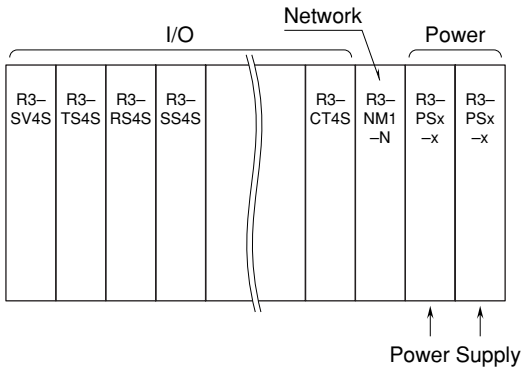
• Single network module with internal power supply; no power supply module



• Single network module with external power supply module



• Single network module with two external power supply modules

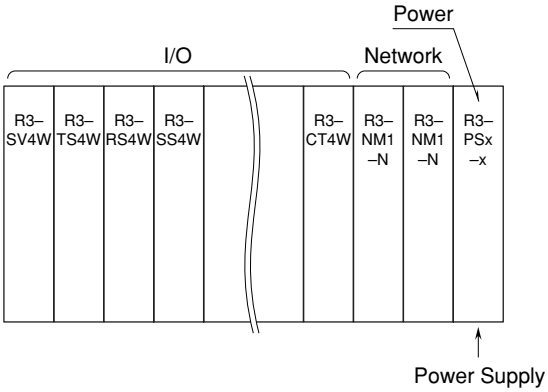


Caution:

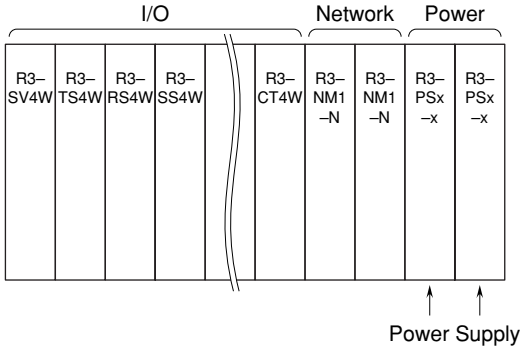
• No additional power supply module is avaialble for the network module with internal power supply.

■DUAL COMMUNICATION MODE

• Single power supply module



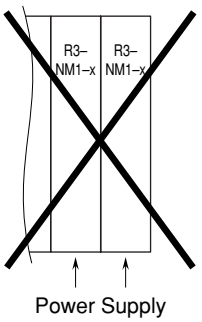
• Two power supply modules

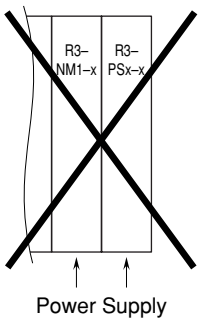


Caution:

• Network module with internal power supply cannot be used for dual communication mode. Combinations of two network modules with internal power supply, or of a network module with internal supply and an external power supply is not possible.

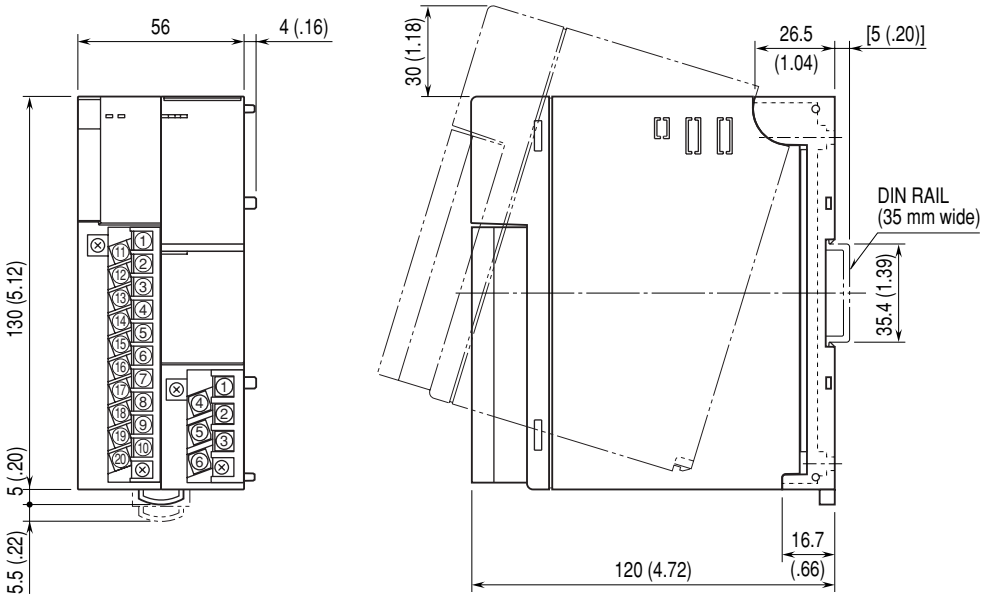
• One of the network modules must be set to 'Main, ' while the other must be set to 'Sub' with DIP switches at the side of the module.



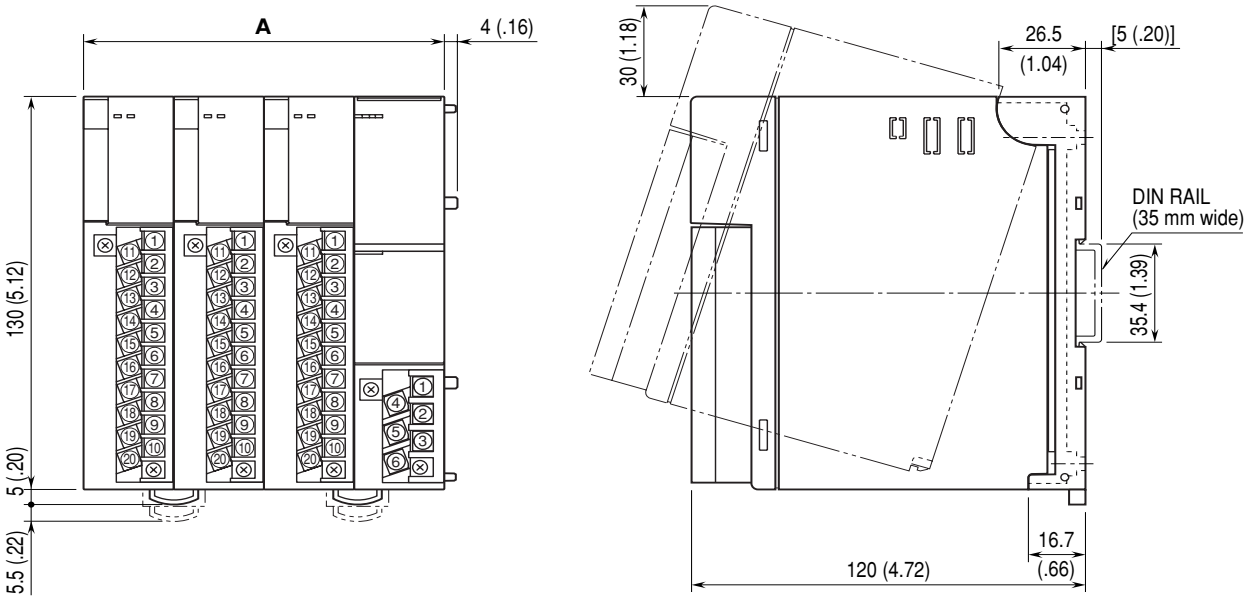


EXTERNAL DIMENSIONS mm (inch)

■R3-BS02



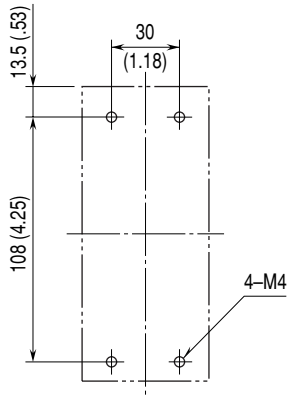
■R3-BS04, BS06, BS08, BS10, BS12, BS14, BS16



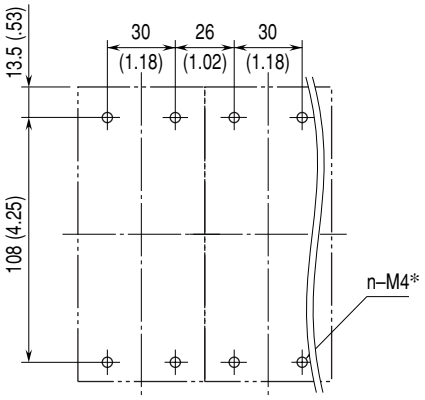
MODEL \ SIZE	A
R3-BS04	112 (4.40)
R3-BS06	168 (6.61)
R3-BS08	224 (8.82)
R3-BS10	280 (11.02)
R3-BS12	336 (13.23)
R3-BS14	392 (15.43)
R3-BS16	448 (17.64)

MOUNTING REQUIREMENTS mm (inch)

■R3-BS02



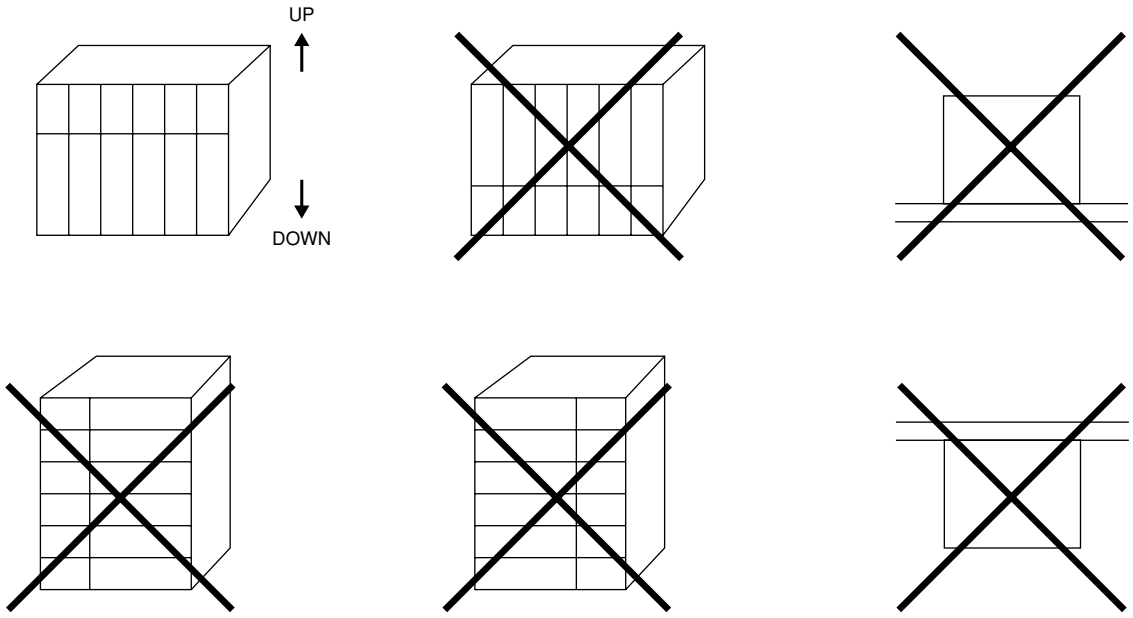
■R3-BS04, BS06, BS08, BS10, BS12, BS14, BS16



*n = Number of I/O module × 2

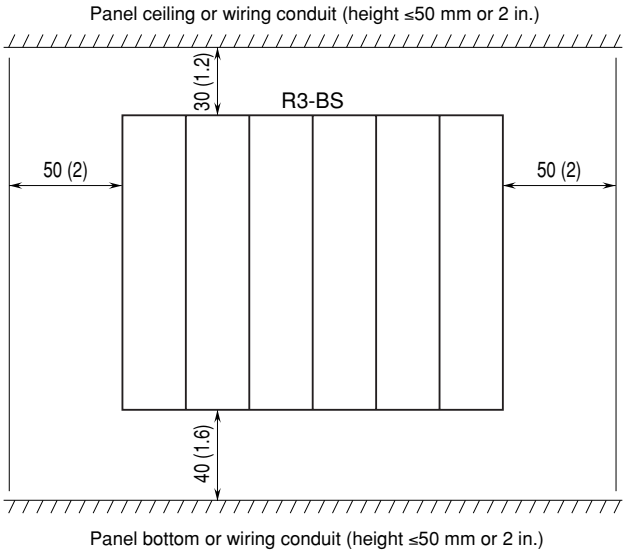
■MOUNTING DIRECTION

The unit must be mounted on a vertical panel. Mounting in any other angle will cause internal temperature to rise, may shorten the product's life expentation or deteriorate its performance.



■VENTILATION & MAINTENANCE SPACE

Maintain sufficient ventilation space. Do not mount the unit directly above devices which radiate great heat such as heaters, transformers or resistors.
Maintenance space is also required above and below the unit.



CONFORMITY WITH CE MARKING

■CE MARKING

CE marking requires to integrate safety regulations existed in each country in EU territory and to secure smooth distribution of products of which safety is guaranteed. It is mandatory by law that products distributed and sold in EU territory to have CE mark which shows that the product conforms with the requirements of EC Directive. Each EC Directive describes the scope of apparatuses to which that EC Directive is applied. M-System's R3 series must conform with EMC Directive (89/336/EEC).
Each Directive states only basic requirements. In order to mark the CE on an assembled machinery equipment, its manufacturer needs to check the overall conformity with Directives applicable to it.

■EMC DIRECTIVE

(1) Requirements of EMC Directive

EMC Directive applies to an apparatus which is liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance.
EMC Directive requires that electromagnetic disturbance generated by the apparatus stays within an acceptable limit and that the apparatus has a certain level of resistance for the electromagnetic disturbance.
Points of cautions which should be considered for the R3 to conform with EMC Directive are described in this document. Besides, it is necessary for a manufacturer which builds final products using the R3 to confirm and declare that his final product conforms with EMC Directive.

(2) Applied standards of EMC Directive

Standards that are applied to the R3 series are as stated in Tables 1 and 2.
Modules which declare conformity with CE marking satisfy the standard value and performance level stated in the tables. Refer to data sheets for respective models to see if they conform with CE marking.
The R3 series needs to be installed in a control panel. This is effective not only to ensure general safety but also to contain noise emissions by the R3 series inside the control panel. We conduct a series of testing to see that the product conforms to EMC Directive while it is installed in the control panel.

Table 1. EMC Directive Standard (Emission)

Applied standard	Test name/Reference	Content of the test	Standard value
EN61000-6-4	Electromagnetic radiation disturbance EN55011 Class A Group 1 CISPR11	Measure the volume of noise which the apparatus emits to the air as an electric wave.	30 – 230 MHz: 40 dBμV/m (QP*1, 10 m method) 230 – 1000 MHz: 47 dμV/m (QP, 10 m method)
	Terminal disturbance EN55011 Class A Group 1 CISPR11	Measure the volume of noise which the apparatus emits to power source line.	0.15 – 0.5 MHz: 79 dBμV (QP), 66dBμV (AV*1) 0.5 – 30 MHz: 73 dBμV (QP), 60 dBμV (AV) The standard does not apply: AC powered modules are not CE marked.

*1. QP: Quasi-Peak value, AV: Average value

Table 2. EMC Directive Standard (Immunity)

Applied standard	Test name/Reference	Content of the test	Standard value [Performance Standard]*2
EN61000-6-2	Electrostatic discharge EN61000-4-2 IEC61000-4-2	Measure the immunity of the apparatus for emissions of static electricity.	Contact discharge ±4kV Aerial discharge ±8kV [Performance Standard B]
	Radiated electromagnetic field EN61000-4-3 IEC61000-4-3	Measure the immunity of the apparatus when an electric field noise is emitted to it.	10V/m: 80 – 1000 MHz (80%AM modulation, 1 kHz) [Performance Standard A]
	Electrical fast transient/burst EN61000-4-4 IEC61000-4-4	Measure the immunity of the apparatus when an burse noise is overlapped at power source line or signal line.	±2kV: Power source line ±1kV: Communication and signal line (Tr / Th = 5 ns / 50 ns, Cyclic frequency 5 kHz, Burst width 15 ms Burst cycle 300 ms) [Performance Standard B]
	Surge EN61000-4-5 IEC61000-4-5	Measure the immunity of the apparatus when surge voltage is overlapped at power source line or signal line by switching or induced lightning transient.	Between lines, ±0.5kV: Power source line To ground, ±0.5kV: Power source line ±1kV: Communication and signal line (Tr / Th = 1.2 μs / 50 μs, (8 μs / 20 μs)) [Performance Standard B]
	Conducted disturbance EN61000-4-6 IEC61000-4-5	Measure the immunity of the apparatus when an electric field noise from outside is overlapped at power source line or signal line.	10V:0.15 – 80 MHz (80% AM modulation, 1kHz) [Performance Standard A]
	Power frequency magnetic field EN61000-4-8 IEC61000-4-8	Measure the immunity of the apparatus when a magnetic field that arises from power supply frequency is applied to it.	30 A/m (50/60Hz) [Performance Standard A] The standard does not apply: components that sympathize with magnetic fields are not used for CE marked modules.
	Voltage dips, short interruptions and voltage variations EN61000-4-11 IEC61000-4-11	Confirm the operations of the apparatus when the supply voltage momentarily lowers or fails.	30% 0.5 cycle [Performance Standard B] 60% 5 cycle [Performance Standard C] 60% 50 cycle [Performance Standard C] >95% 250 cycle [Performance Standard C] The standard does not apply: AC powered modules are not CE marked.

*2. Standards that are used to see conformity with each Standard are as listed below.

Performance standard A: Apparatus mainains its normal operation.

Performance standard B: Performance degrades for a while but resumes normal operation once the noise is removed.

Performance standard C: Temporary loss of function which can be recovered by itself or by an operator intervention.

(3) Warnings and cautions when installing the R3 Series

The R3 series needs to be installed in a control panel. This is effective not only to ensure general safety but also to contain noise emissions by the R3 series inside the control panel. We conduct a series of testing to see that the product conforms to EMC Directive while it is installed in the control panel.

Warning and cautions when installing R3 series are stated below.

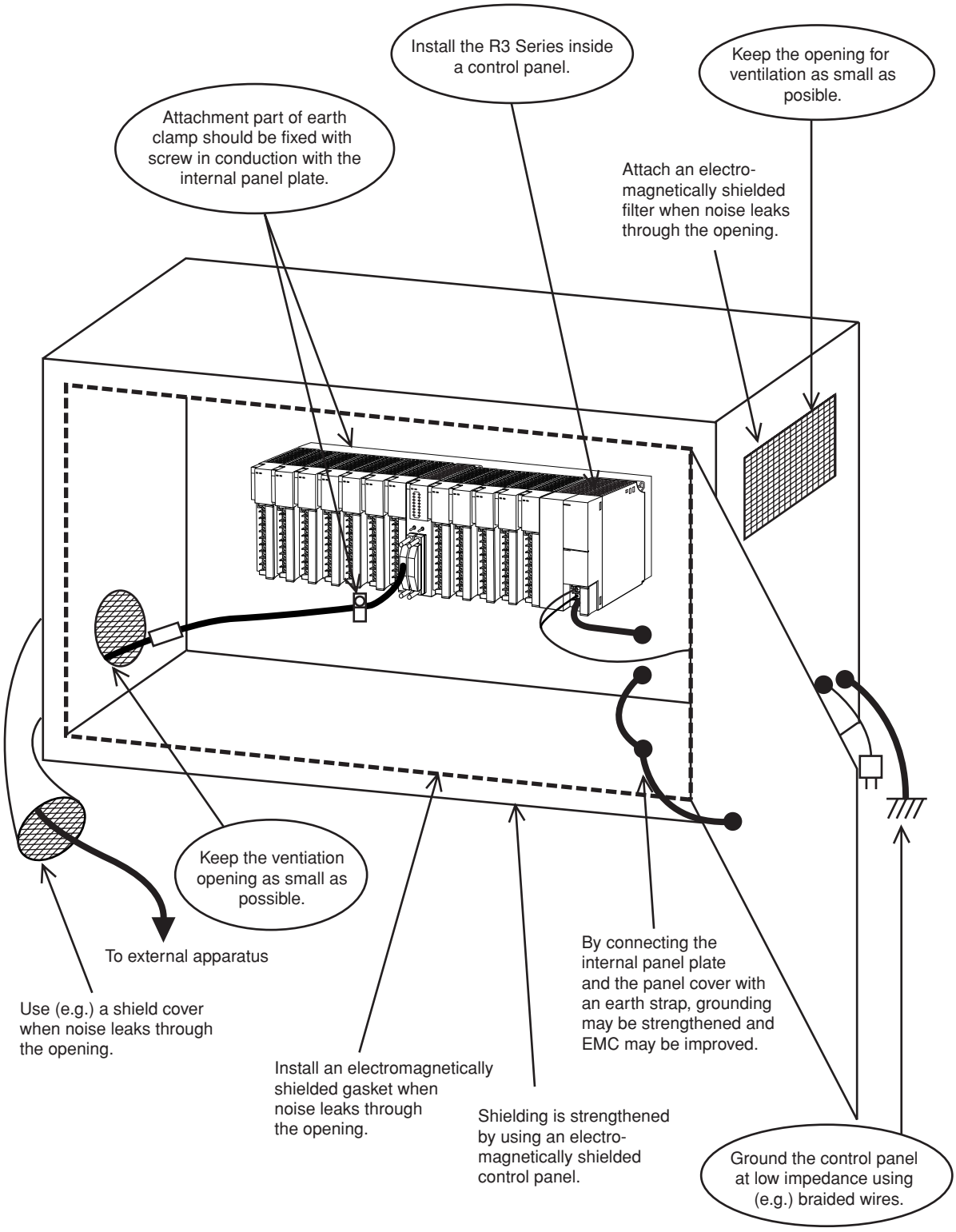
- Use control panels with an internal panel plate, both made of metal, when installing the R3 series.
- Make sure to adequately ground the control panel and the internal panel plate with a thick cable to maintain low impedance at high frequency.
- Use shielded cables for the signals taken out of the control panel.
- Choose a thick and short cable to ground the FG terminal of the Power Supply Module(s) and the Network Module(s) to the internal panel plate of the control panel.
  Note: If electromagnetic radiation disturbance increases by grounding the FG terminal, remove the grounding.
- When paining the internal plate of the control panel, apply masking to expose metal surface to secure conductivity at the sections where the following parts are attached:
  - Volts attaching the internal panel to the control panel
  - Ground for the FG of the Power Supply Module(s) and the Network Module(s)
  - Earth clamp on the shielded cable
- Noise emissions inside the control panel might leak through its openings. Design them as small as possible. Recommended diameter is 10 cm or less.

Supplement:

Additional measures may be taken depending upon actual installation sites. These points of cautions are illustrated in the next page.

- Prevent noise leakage by wrapping cables using shield covers, shield tubes and flexible conduits etc. if noise leaks through the cable outlet.
- Use an electromagnetic shield gasket and block up the gap between the control panel cabinet and its cover, if noise leaks through it.
- Connecting the internal panel plate and the cover of the control panel to the main cabinet using an earth strap may be effective to strengthen the grounding.
- Electromagnetically shielded control panel cabinet is effective for shielding.

■Points of cautions applicable when installing the R3 Series



(4) Warning and cautions when laying cables

Signal cables connected to the R3 Series contain high-frequency components. Since these cables has the same effect as an antenna, they emit these high-frequency components to the external space as noise or overlaps noise from the external space on themselves.

Cables with shielding should be used for the signal line due to the above reason.

EMC conformance test is conducted in the condition that shielded cables and earth clamps are used with the R3 Series.

Warning and cautions when laying cables are stated below. These points of cautions are illustrated in the next page.

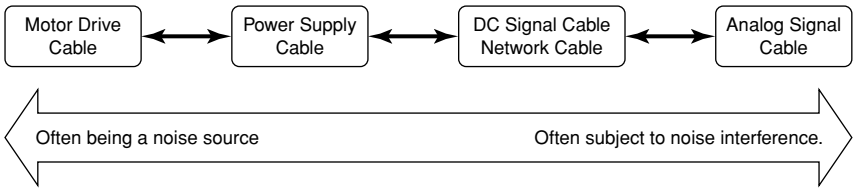
- Use shielded cables for those signal cables installed out of the control panel and for thermocouple and RTD extension wires.
- All the network cables connected to R3 series should be shielded.
- Use STP cables, called either S/FTP or SF/UTP in ISO/IEC11801 : 2002, for R3-NEx.
- Use exclusively designed cables for the CC-Link, DeviceNet or PROFIBUS-DP.
- Expose the shield at a part of the cable cover, clip it with an earth clamp, and ground it to the internal panel of the control panel. A drain wire connected to the panel in a pig-tail form cannot maintain low impedance against high-frequency noise, thus grounding (noise shielding) in this form will not be effective.
  For DeviceNet, grounding should be taken at single point in the network.
- Attach a ferrite core to the shielded cable for the following modules at the points as described below:
  Ferrite core electric property: Impedance 100 [Ω] min. [50 to 500 MHz]

Proximity of the input terminals:	R3-AV4, R3-AS4, R3-AT4, R3-AR4, R3-AD4, R3-TS4, R3-TS8, R3-RS4, R3-RS8, R3-RS8A, R3-SS4, R3-SS8, R3-SV4, R3-SV4A, R3-SV8, R3-SV8A, R3-DS4 R3-MS4, R3-MS8
Proximity of the input connector:	R3Y-SV8, R3Y-SS8, R3Y-RS8, R3Y-MS8
Proximity of the cable outlet of the control panel:	R3-ND1, R3-ND2, R3-ND3

Supplement:

Additional measures may be taken depending upon actual installation sites. These points of cautions are illustrated in the next page.

- Keep cables as short as possible. It prevents noise emissions from the cables and noise overlapping to the cables.
- Attach a ferrite core to reduce noise impact to the signal cables susceptible to the noise. Ferrite core can be attached close to the cable outlet of the control panel or close to the I/O terminal or connector, whichever is more effective. Also, the impact might be reduced by winding the cable around the ferrite core for extra turns or attaching multiple ferrite cores.
- Keep cables which are easily affected by noise away from those which can be a noise source.



In the following are examples of effective ways to lay cables separately:

- Keeping physical distance (farther than 20 cm from motor drive cables, farther than 10 cm for other groups).
- Dividing off by a grounded metal plate
- Grouping into separate grounded metal pipes or cable shields.

Wires on each side of a filter should not be too close to each other. Noise could ride onto the other side of cable.

Extra attention needs to be paid at the following parts.

- Noise filter that is enclosed in power cables.
- Ferrite core that is attached to signal cables.
- Noise limiting circuit (surge quenching circuit, transient absorber circuit, etc.) that is enclosed in signal cables.

■**Points of cautions applicable when wiring the R3 Series**