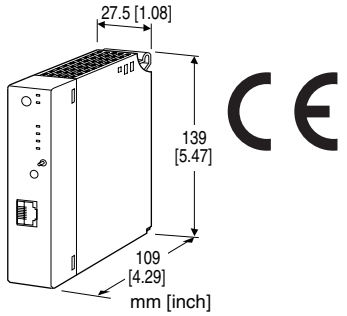
Remote I/O R3 Series

FL-net INTERFACE MODULE

(OPCN-2, Ver.2.0 supported)

Functions & Features

• FL-net (OPCN-2), Ethernet based, controller level network, compatible remote I/O
• 10 Mbps/100 Mbps cyclic transmission for the maximum of 4k bits + 256 words (1 word = 16 bits) allows data shared among the devices connected to the bus
• FL-net bus extended to max. 500 meters, up to 2.5 kilometers with a repeater
• I/O data can be assigned to any bits or words in the common memory
• No need of ladder programming
• Request/response type data access of message transmission is also possible
• Any other network module can be assigned to the dual redundant internal bus
• Supports multiple protocol of FL-net plus DeviceNet, CC-Link, and others
• Masterless configuration allows the FL-net I/Os function as local multiplex transmission system



MODEL: R3–NFL1[1]

ORDERING INFORMATION

• Code number: R3-NFL1-[1]
Specify a code from below for [1].
(e.g. R3-NFL1/CE/Q)
• Specify the specification for option code /Q
(e.g. /C01)

[1] OPTIONS (multiple selections)

Standards & Approvals
blank: Without CE
/CE: CE marking
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

■ The R3-NFL1 is used to access field signals at the R3 I/O modules via FL-net.
No ladder programming is required to assign these I/O signals.
■ Analog and discrete input signals are transmitted cyclically.
Any PC or PLC compatible with FL-net, up to 254 nodes, can retrieve the updated data by accessing the common memory without interfering with the communication traffic.
■ Analog and discrete input signals cyclically transmitted from other devices can be output at the R3 output modules.
The FL-net Configuration Builder software (model: R3-NFLBLD) is used to assign these I/O signals on the common memory in the bit or word units.
■ The R3-NFL1, constantly scanning its I/O modules via the internal bus, has the updated data always ready for a request from the FL-net. High speed response without any loss time is possible.
■ Request/Response type message communication, accessing I/O data only when necessary, is also possible.
■ Dual redundant network configuration using two network modules is available.
Two different network protocols, e.g. FL-net and DeviceNet or FL-net and CC-Link, can be used to access one field signal.
■ Masterless configuration allows two FL-net nodes function as local multiplex transmission system.

CAUTION !
• FL-net standard requires a dedicated Ethernet bus for the FL-net compatible devices. Connecting the R3-NFL1 to a general-purpose LAN, or connecting a general-purpose TCP/IP device to FL-net is Not allowed.
• FL-net uses UDP/IP protocol for transmission. ISDN, ADSL or similar types of LAN are Not to be used.

RELATED PRODUCTS

• FL-net configuration builder (Model: R3-NFLBLD)
Downloadable at our web site.

MG CO., LTD.
www.mgco.jp

GENERAL SPECIFICATIONS

Connection

FL-net: RJ-45 connector

Internal bus: Via the Installation Base (model: R3-BSx)

Internal power: Via the Installation Base (model: R3-BSx)

RUN contact output: Euro type connector terminal (applicable wire size: 0.2 to 2.5 mm^2, stripped length 7 mm)

RUN/CFG selector: Toggle switch; RUN or Configuration

Isolation: Ethernet to internal bus or internal power to RUN contact output

Dual communication setting: Set with the side DIP switch

Indicator LEDs

PWR: Green LED turns on when the CPU and the internal bus function normally.

ERR: Red LED turns on in an abnormality of the system.

LNK: Red LED turns on while the R3-NFL1 is participating FL-net (normal communication)

HER: Red LED turns on in an abnormality of I/O data.

PER: Red LED blinks on with the parameter setting error.

CFG: Red LED blinks in high speed at the startup; blinks in low speed while the builder software is used.

TX: Green LED turns on while transmitting.

RX: Amber LED turns on while receiving.

■ **RUN Contact output**

RUN contact: Relay turns on when the CPU and the internal bus function normally.

Rated load: 100 V AC @ 0.5A (cos ø = 1)
30 V DC @ 0.5 A (resistive load)
(< 50 V AC, < 75 V DC for EU conformity)

Maximum switching voltage: 250 V AC or 220 V DC

Maximum switching power: 62.5 VA or 60 W

Minimum load: 10 mV DC @ 1 mA

Mechanical life: 5×10^7 cycles.

FL-net SPECIFICATIONS

FL-net: Ver.2.0 supported

Physical layer standard: IEEE 802.3u

Data link layer: 10BASE-T / 100BASE-TX

Baud rate: 10 / 100 Mbps, Auto Negotiation

Protocol: FL-net (OPCN-2) (UDP/IP)

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

Max. segment length: 100 meters

Max. number of nodes: 254

IP address: FL-net Configuration Builder is used to set up the IP address and the network address.

Factory setting:
192.168.250.1 (IP address)
255.255.255.0 (network address)

Max. cyclic data size:
8 k bits (area 1) + 8 k words (area 2) / system
4 k bits (area 1) + 256 words (area 2) / node

Max. message data size: 1024 bytes (per transmission cycle)

Performance (2k bits + 2k words / node, 32 nodes in total)

Token cycle time: 50 milliseconds (1.56 milliseconds/ node in average)

Message transmission time: 500 milliseconds (1 : 1 unidirectional message)

INSTALLATION

Current consumption: 130 mA

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: 200 g (0.44 lb)

PERFORMANCE

Insulation resistance: ≥ 100 MΩ with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute
(Ethernet to internal bus or internal power to RUN contact output)
2000 V AC @ 1 minute (power input to FG; isolated on the power supply module)

STANDARDS & APPROVALS

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

MG CO., LTD.
www.mgco.jp

FL-net DESCRIPTIONS

■ CYCLIC TRANSMISSION

• Transmitting discrete I/O status, analog I/O values and modules' information on hardware commissioning, hardware errors, data errors and signal source node errors.
• Supplying word data transmitted from another devices to local output modules. The R3-NFL1 operation when this device exits the FL-net is selectable: Hold output, Clear output, Switch to the sub system's control.
• Allotting the cyclic transmission output data of multiple devices bit by bit to local output modules.

■ MESSAGE TRANSMISSION

The module supports the FL-net defined functions listed in the following table. Only the server function is supported. Server function allows the module to build a response frame to a request message.
Client function allows the module to transmit a request message and to receive its response frame.

MESSAGE TYPE	SERVER	CLIENT
Byte block read	No	No
Byte block write	No	No
Word block read	Yes	No
Word block write	Yes	No
Network parameter read	Yes	No
Network parameter write	No	No
Stop command	Yes	No
Start command	Yes	No
Profile read	Yes	No
Transparent mode	No	No
Log data read	Yes	No
Log data clear	Yes	No
Message echo back	Yes	No

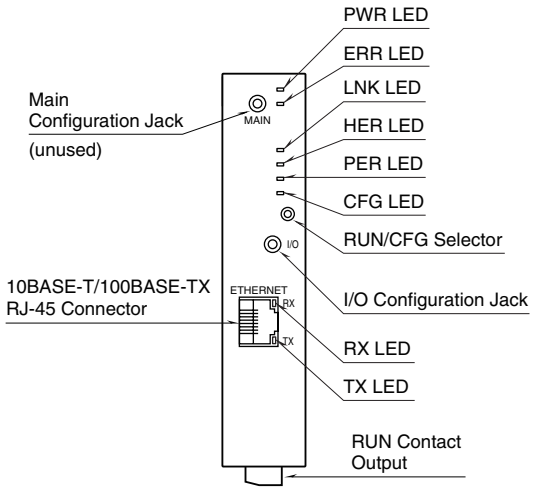
PC REQUIREMENTS (provided by the user)

The following PC environment is required to run the R3-NFLBLD program.
Operating system: Windows 7 (32-bit/64-bit) or Windows 10 (32-bit/64-bit)
Screen area: 1024 by 768 pixels
LAN card: Required to connect to Ethernet

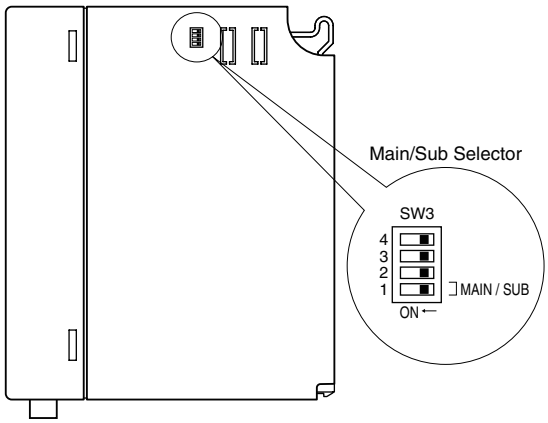
MG CO., LTD.
www.mgco.jp

EXTERNAL VIEW

■ FRONT VIEW



■ SIDE VIEW



MG CO., LTD.
www.mgco.jp

TRANSMISSION DATA DESCRIPTIONS

I/O data of each I/O module are assigned to specific areas of the common memory using the FL-net Configuration Builder software (model: R3-NFLBLD) by each channel, in the word / bit units.
For example, suppose as follows:

Common memory area 1 top address : 0x0000
Common memory area 1 data size : 8
Common memory area 2 top address : 0x0000
Common memory area 2 data size : 4

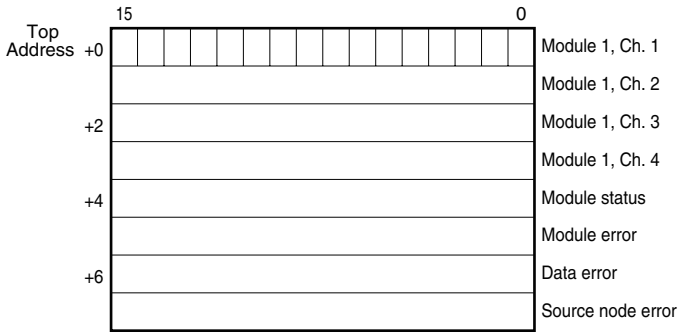
Module (slot) 1 : R3-SV4
Module (slot) 2 : R3-DA16
Module (slot) 3 : R3-YV4
Module (slot) 4 : R3-DC16

■ COMMON MEMORY AREA 1
The following shows the data transmitted to the common memory area 1 from the network module.

• R3-NFLBLD Setting Example

Address		I/O module/ch	Description
0x0000	<==	AI01.01	Transmitting the R3-SV4 ch.1 data to the common memory area 1, address 0x0000
0x0001	<==	AI01.02	Transmitting the R3-SV4 ch.2 data to the common memory area 1, address 0x0001
0x0002	<==	AI01.03	Transmitting the R3-SV4 ch.3 data to the common memory area 1, address 0x0002
0x0003	<==	AI01.04	Transmitting the R3-SV4 ch.4 data to the common memory area 1, address 0x0003
0x0004	<==	DI00.01 ... 16	Transmitting the module status to the common memory area 1, address 0x0004
0x0005	<==	DI00.17 ... 32	Transmitting the module error to the common memory area 1, address 0x0005
0x0006	<==	DI00.33 ... 48	Transmitting the data error to the common memory area 1, address 0x0006
0x0007	<==	DI00.49 ... 64	Transmitting the source node error to the common memory area 1, address 0x0007

• Data Frame



• 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.”

• Module Error 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 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.”

• Source Node Error indicates when any node, which transmits data to common memory area assigned to output module, is removed from FL-net, the bit corresponding to such module turns “1.”

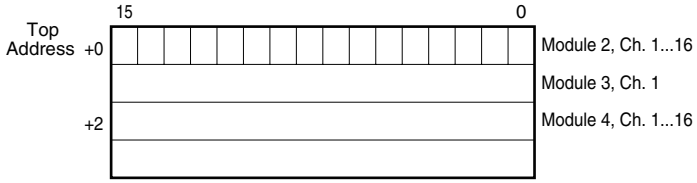
■ COMMON MEMORY AREA 2

The following shows the data transmitted to the common memory area 2 from the network module.

• R3-NFLBLD Setting Example

Address		I/O module/ch	Description
0x0000	<==	DI02.01 ... 16	Transmitting the R3-DA16 ch.1 through ch.16 data to the common memory area 2, address 0x0000
0x0001	<==	AO03.01	Transmitting the R3-YV4 ch.1 data to the common memory area 2, address 0x0001
0x0002	<==	DO04.01 ... 16	Transmitting the R3-DC16 ch.1 through ch.16 data to the common memory area 2, address 0x0002

• Data Frame



■ OUTPUT MODULE

The output data at designated addresses of the common memory area are transmitted to the R3 series output modules.

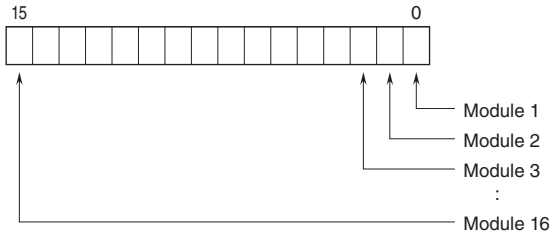
• R3-NFLBLD Setting Example

I/O module/ch		Address	Description
< Module 3 >			
AO03.01	<==	1-0x0000	Transmitting the data at the common memory area 1, address 0x0000 (R3-SV4 ch.1) to the R3-YV4 ch.1
AO03.02	<==	1-0x0001	Transmitting the data at the common memory area 1, address 0x0001 (R3-SV4 ch.2) to the R3-YV4 ch.2
AO03.03	<==	1-0x0002	Transmitting the data at the common memory area 1, address 0x0002 (R3-SV4 ch.3) to the R3-YV4 ch.3
< Module 4 >			
DO04.01	<==	2-0x0000-16	Transmitting the data at the common memory area 2, address 0x0000, 16th bit (R3-DA16 ch.16) to the R3-DC16 ch.1

Note: When output data is allocated from the common memory, be sure to mount an output module. Otherwise, an internal bus error is detected and PWR LED turns off.

MODULE STATUS, MODULE ERROR, DATA ERROR, SOURCE NODE ERROR

Shows each module's availability and error status.



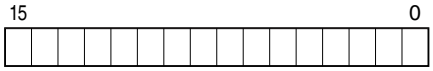
MG CO., LTD.
www.mgco.jp

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.

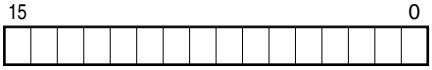


■ TEMPERATURE DATA (16-bit data, models: R3-RS4, TS4, US4, etc.)

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.

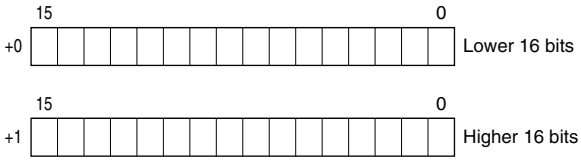
■ ANALOG DATA (16-bit data, models: R3-CT4A, CT4B, etc.)

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.



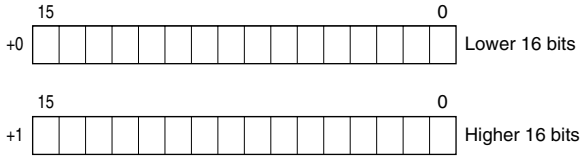
■ ACCUMULATED COUNT DATA (32-bit data, models: R3-PA2, PA4A, WT1, WT4, etc.)

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.



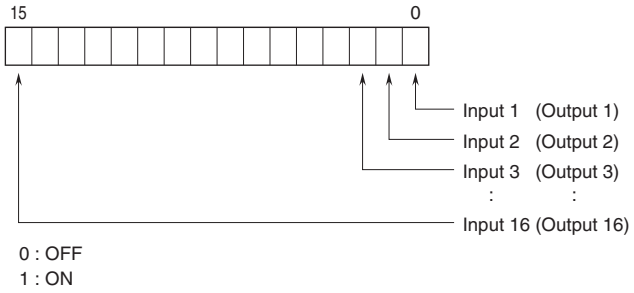
■ BCD DATA (32-bit data, models: R3-BA32A, BC32A, etc.)

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.

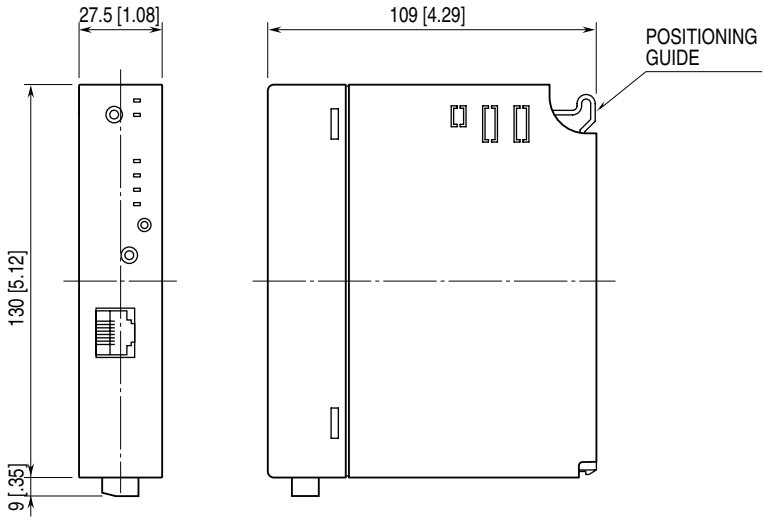


MG CO., LTD.
www.mgco.jp

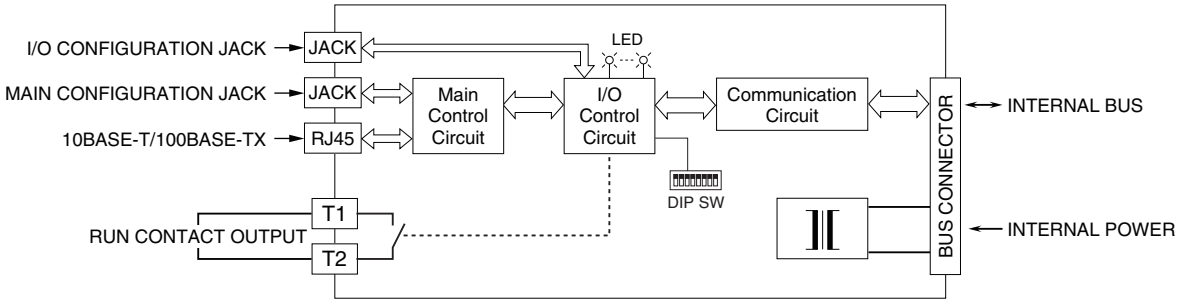
■ 16-POINT DISCRETE DATA (models: R3-DA16, DC16, etc.)



EXTERNAL DIMENSIONS unit: mm [inch]

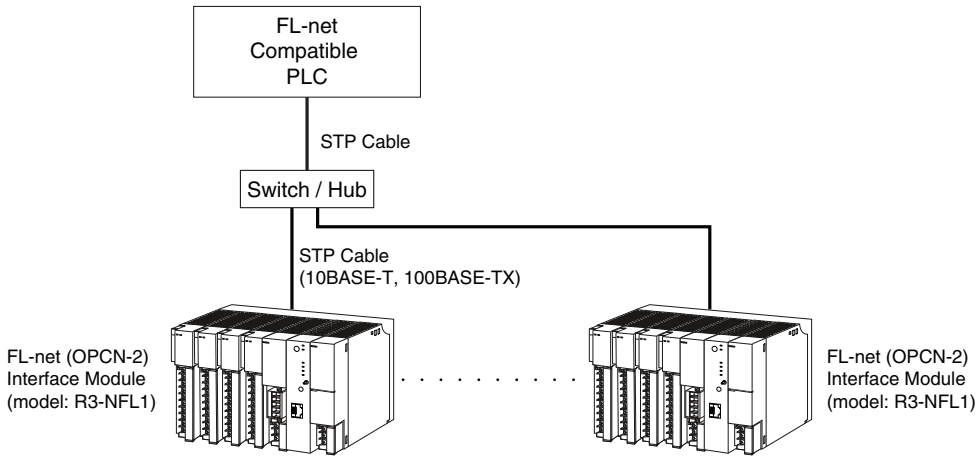


SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM



MG CO., LTD.
www.mgco.jp

SYSTEM CONFIGURATION EXAMPLES



⚠ Specifications are subject to change without notice.

MG CO., LTD.
www.mgco.jp