

R3-NFL1 and R3-GFL1
FL-net Network Interface Module
FL-net CONFIGURATION BUILDER
Model: R3-NFLBLD

Users Manual

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1. GETTING STARTED

1.1 GENERAL DESCRIPTION

M-System R3-NFLBLD FL-net Configuration Builder (hereafter referred to as 'the builder') is used to program parameters for the FL-net (OPCN-2) Network Interface Module (model: R3-NFL1 and R3-GFL1) which connects the R3 Series Remote I/O modules to the FL-net. It enables reading via Ethernet the node information from FL-net and the I/O module information from local nodes. This manual describes common functions between R3-NFL1 and R3-GFL1 in R3-NFL1's functions. The functions that R3-GFL1 does not have are indicated.

1.2 PC REQUIREMENTS

The following PC performance is required for adequate operation of the R3-NFLBLD.

PC	IBM PC compatible
OS	Windows 7 (32-bit/64-bit) Windows 10 (32-bit/64-bit)
Screen area	1024 x 768 pixels (XGA) or higher
LAN card	Required to connect with Ethernet

1.3 INSTALLING & DELETING THE PROGRAM

INSTALL

The program, provided as compressed archive, can be downloaded at M-System's web site: <http://www.m-system.co.jp>.

Decompress the archive and execute 'setup.exe' to start up the R3-NFLBLD installer program. Follow instructions on the Windows.

If you already have the R3-NFLBLD program installed in your PC, delete it before installing a new one.

If the installation program does not start automatically, install manually via Control Panel > Add/Remove Programs.

When the installation is complete, the R3-NFLBLD is shown under the program list.

DELETE

Open Control Panel > Add/Remove Programs. Select the R3-NFLBLD from the program list and click Delete button.

1.4 POINTS OF CAUTION

- 1) Adequate operations of this program is not guaranteed when other application programs are running at once.
- 2) If you intend to use the R3-NFL1 in the following environments or conditions, redundant and/or failsafe system designs should be used to ensure the proper degree of reliability and safety.
 - Environments or conditions which are not defined in this manual
 - Nuclear power control devices, railway control devices, aircraft control devices, transportation vehicles, fuel control equipment, medical equipment, recreational equipment, safety equipment, and other critical equipment for which safety must be secured according to relevant laws.
 - Those devices which inherently require extremely high level of safety and reliability.

1.5 HARDWARE CONNECTION

Connect the R3-NFL1 module and the PC to the network hub via straight cables, or directly via a cross cable. If you intend to create / modify / save configuration files only without downloading to / uploading from the module, you can do it without connecting to the R3-NFL1.

The PC must be available with environment settings for LAN use, such as IP address, while the FL-net host functions with node number assignments are not needed because the FL-net protocol is not used when configuring the module.

CAUTIONS !

The builder communicates with the R3-NFL1 module using the IP multicasting of the UDP protocol. Even though the FL-net technically does not allow other protocols used on the same network, the R3-NFLBLD, communicating small number of small packets in delay if necessary, does not give any ill effects on the running FL-net in most cases.

If, however, the timing is so tight and critical that even such small packets should not be allowed in the network, remove the R3-NFL1 from the FL-net and connect it to the R3-NFLBLD directly or via an independent network hub.

Be aware that multiple FL-net modules on a LAN start the cyclic transmissions when you connect the R3-NFL1 to another network hub.

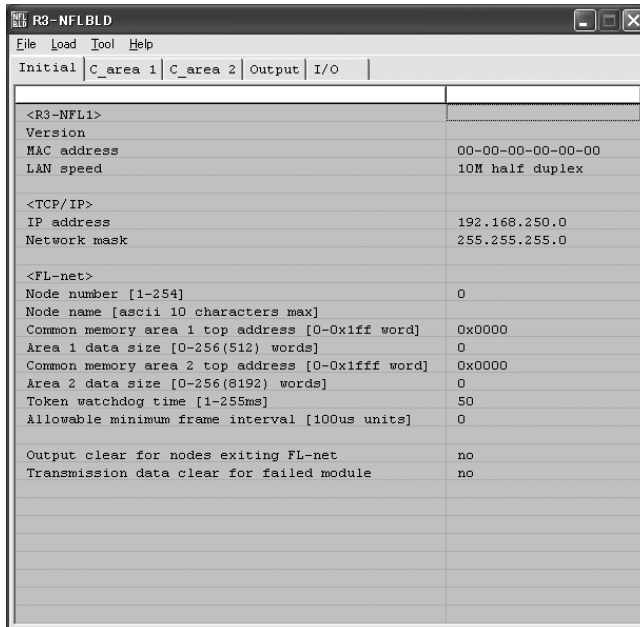
When the PC has more than one LAN ports, enable the LAN port connected to the R3-NFL1 and disable other LAN ports.

2. BASIC OPERATIONS

2.1 BASIC SETTING FLOW

2.1.1 STARTING THE R3-NFLBLD

Double-click the R3-NFLBLD icon on the desktop and the initial window appears on the screen. Basic setting flow is explained in the following. Detailed information on each tab/field is given in Section 3.



Caution ! When you start the builder software, run it as administrator.

2.1.2 SETTING THE NODE NUMBER

The R3-NFL1 module is factory set with the node number '1' (default value). The node number can be confirmed and changed using the following procedures:

Initial Setting (factory setting = 1)

- 1) Turn the RUN/CFG switch at the front of the R3-NFL1 to CFG side and turn on the power supply.
- 2) Choose [Initial] tab and set the node number under <FL-net> to '1'.
- 3) Choose [Read] under [Load] menu to upload the current configuration setting of the R3-NFL1.
- 4) Enter a new node number. You can configure other fields at this stage, or later when the module is connected online.
- 5) Choose [Write] under [Load] menu to download the new configuration to the module. A dialog box asking you confirmation of the node number change will appear on the screen. Click <OK> to acknowledge the message. Node number can be changed only immediately after uploading configurations of the node and downloaded to this node.
- 6) The CFG indicator LED starts flashing in high speed and the R3-NFL1 automatically restarts.
- 7) The restarting process is complete when the LED's blinking speed has slowed down. Turn the RUN/CFG switch to RUN side.

If Node Number is Unknown (safe boot mode)

- 1) Turn the RUN/CFG switch at the front of the R3-NFL1 to CFG side and turn on the power supply.
- 2) The CFG indicator LED immediately starts blinking for three times in 1-second intervals. Turn the switch to RUN side while in this status to start up in the safe boot mode:

Temporary node number: 254
FL-net functions: inactive

The LED continues blinking in 1-second intervals when the module has successfully started in the safe boot mode.

Caution ! Only one node on the network can be in the safe boot mode at any given time.

- 3) Choose [Initial] tab and set the node number under <FL-net> to '254'.
- 4) Choose [Read] under [Load] menu to upload the current configuration setting of the R3-NFL1.
- 5) Enter a new node number. You can configure other fields at this stage, or later when the module is connected online.
- 6) Choose [Write] under [Load] menu to download the new configuration to the module. A dialog box asking you confirmation of the node number change will appear on the screen. Click <OK> to acknowledge the message. Node number can be changed only immediately after uploading configurations of the node and downloaded to this node.
- 7) Turn the RUN/CFG switch to RUN side.

Caution ! For writing in the safe boot mode:

You do not need to turn the RUN/CFG switch to CFG side.
The R3-NFL1 does not restart automatically after writing.

2.1.3 CREATING A NEW CONFIGURATION FILE

- 1) Choose [New] under [File] menu to open a blank configuration window.
- 2) Fill in the following fields under [Initial] tab:
 - <R3-NFL1> LAN speed
 - <TCP/IP> All fields
 - <FL-net> All fields (FL-net parameters)
- 3) Choose [Area 1] tab.

Define the cyclic data assigned to Common Memory Area 1 for the module. Map the I/O module data in the memory area in the word / bit unit.
- 4) Choose [Area 2] tab.

Define the cyclic data assigned to Common Memory Area 2 for the module. The area 2 accepts only the word-unit data.
- 5) Downloading the new configuration to the R3-NFL1.
 - Turn the RUN/CFG switch to CFG side.
 - Choose [Write] under [Load] menu.
 - The R3-NFL1 automatically restarts to reconfigure the setting.
 - Wait for the CFG LED's blinking speed getting slower (after several seconds) and turn the switch to RUN side.
- 6) Save the configuration to a file.

Choose [Save as] under [File] menu and specify a location. The file must be in binary format (default).

Caution !

The R3-NFLBLD configures the common memory areas on the FL-net. For configuring each I/O module's data range or fine zero/span calibrations, the R3CON PC Configurator is available.

The R3CON is connected to the R3-NFL1 module via a dedicated cable and used to configure the I/O modules such as scaling, calibrating zero/span, choosing unused inputs (terminals) and monitoring.

2.1.4 WRITING FROM A FILE

- 1) Choose [Open] under [File] menu and locate/open a previously saved file.
- 2) Modify the configuration if necessary and write it to the R3-NFL1 or to a new file.

2.1.5 MODIFYING & SAVING THE CURRENT R3-NFL1 CONFIGURATION

- 1) Enter the target node number in the relevant field.
- 2) Choose [Read] from [Load] menu to upload the configuration setting of the node.
- 3) Modify it if necessary and write it to the R3-NFL1 or to a new file.

2.2 MENU BAR

FILE MENU

New

The main window is replaced with one with blank fields. Current parameters on the screen is discarded. If you have opened a previously saved file, it is closed without saving modifications applied to the file.

Open

Opens a previously saved file. Binary format only.

Save

Saves modifications created on the screen to the previously saved file.

Save as

Saves configurations currently on the screen as a newly named file. Binary or Text format is selectable.

Binary (.bin) file can be re-opened, modified and downloaded to the module. Other formats except .txt are also usable. When you open a file and choose 'Save', .bin format is automatically used.

Text (.txt) file can be printed and saved, but not opened or modified. It is typically used to open on a text editor to compare with other texts.

Print

Prints as a text file.

Quit

Quits the builder program.

LOAD MENU

In order to use the commands under [Load] menu, the R3-NFL1 module must be connected via LAN cable and powered up.

Read

Uploads on the screen the configuration setting of the designated R3-NFL1 node.

Caution ! Current parameters on the screen is discarded when [Read] command is used. Be sure to save them in advance if necessary.

Write

Downloads the current configuration setting too the designated R3-NFL1 node.

The RUN/CFG selector must be in CFG position (configuration mode).

The R3-NFL1 module restarts as soon as the downloading is complete in order to apply the new setting. The CFG LED flashes in high speed during the restarting.

TOOL MENU

Node info

Uploads the FL-net internal status information of the designated R3-NFL1 node and shows it on Windows note pad.

I/O info

Uploads the I/O module internal status information of the designated R3-NFL1 node and shows it on Windows note pad.

Log count clear

Resets to zero the statistical count data indicated in the node information and the I/O information of the designated R3-NFL1 node.

Caution ! This command clears the log data accessed by FL-net protocol.

HELP MENU

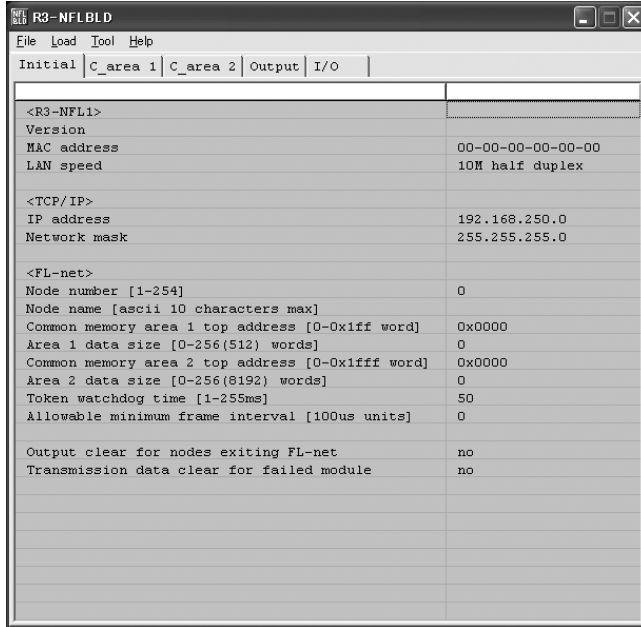
Version

Indicates the version number of the R3-NFLBLD.

3. PARAMETER DETAILS

3.1. INITIAL SETTING

Clicking [Initial] tab opens the initial setting parameters. The left column shows the parameter items, and the right shows the parameter values. An editing field or a selections menu will appear for those which can be modified when you click on the values.



Version

Shows the firmware version number of the R3-NFL1. Reading only. The value is valid only after [Read] command is executed.

The R3CON PC Configurator also shows a version number but it may not match the one read on the R3-NFLBLD. The R3-NFLBLD reads the one concerns the FL-net.

Mac address

Shows Mac address (Ethernet address) assigned to the R3-NFL1. Reading only. The value is valid only after [Read] command is executed.

LAN speed

Baud rate, full-duplex/half-duplex, and with/without negotiation is selected from the list.

Selections: 10M half duplex, 10M full duplex, 100M half duplex, 100M full duplex, 10M auto, 100M auto, Auto half duplex, Auto

IP address (network address and host address)

The R3-NFL1 IP address, represented in decimal figures divided with dot (".) by every 8 bits. The FL-net standard requires the fixed network address '192.168.250.0' and the host address identical to the node number of the module. The address '192.168.250.0' is the module's factory default value.

When the host address is set to '0' (= network address) in this row, the node number value indicated under <FL-net> section, is automatically set as the host address.

[Example] 192.168.250.0 (mask = 255.255.255.0)

When you set '3' as the node number, the IP address '192.168.250.3' is set to the module even though '192.168.250.0' is indicated on the builder.

Network mask

The network address section of the R3-NFL1 IP address. The address '250.250.250.0' is the module's factory default value.

Node number

Range: 1 to 254 (decimal)

Default: 0

Shows the node number of the R3-NFL1 module uploaded or to be downloaded. Enter a new value in the right field to apply a new node number to the module. Refer to Section 2.1.2. SETTING THE NODE NUMBER for detailed procedures.

The default value '0' does not exist in the FL-net. The user must consciously set a node number first before modifying any parameters.

Node name

Range: ASCII code, 10 characters max.

Common memory area 1 top address

Range: 0 to 0x1ff (HEX word)

Default: 0x0000

Specify the top word address where the transmitting data is allotted in Common Memory Area 1.

Area 1 data size

Range: 0 to 256 (or 512) (decimal word)

Default: 0

Specify how many word units following the top address should be transmitted.

Max. 512 words can be specified but only 256 words can be transmitted.

Common memory area 2 top address

Range: 0 to 0x1fff (HEX word)

Default: 0x0000

Specify the top word address where the transmitting data is allotted in Common Memory Area 2.

Area 2 data size

Range: 0 to 256 (or 8192) (decimal word)

Default: 0

Specify how many word units following the top address should be transmitted.

Max. 8192 words can be specified but only 256 words can be transmitted.

Token watchdog time

Range: 1 to 255 milliseconds

Default: 50 milliseconds

Sets the time for which the own node can take when a token frame is received before it sends the token to the next node. It is used to monitor the node by its own and others.

Allowable minimum frame interval

Range: 0 to 50, in 100-microsecond units

Default: 0

Sets the minimum time for which the own node must wait when a token frame is received before it can transmit any frame. All nodes on the network shares the information and the maximum value observed on the network is used for actual transmitting.

Output clear for nodes exiting FL-net

Selections: yes, no, switch to sub-system

Default: no

Specifies the output behaviour of the own node when a node supplying the cyclic data to the local output modules exits the network.

No: Holds the last received output values.

Yes: Resets the output values to zero.

Switch to sub-system: The control of the I/O signals is handed to the dual redundant network (main to sub or sub to main).

Caution ! The output is reset when the own node restarts after a power failure even when 'No' (hold) is specified.

Transmission data clear for failed module

Selections: yes, no

Default: no

Specifies the cyclic transmission behaviour of the own node when a local input module fails and the input signal is lost.

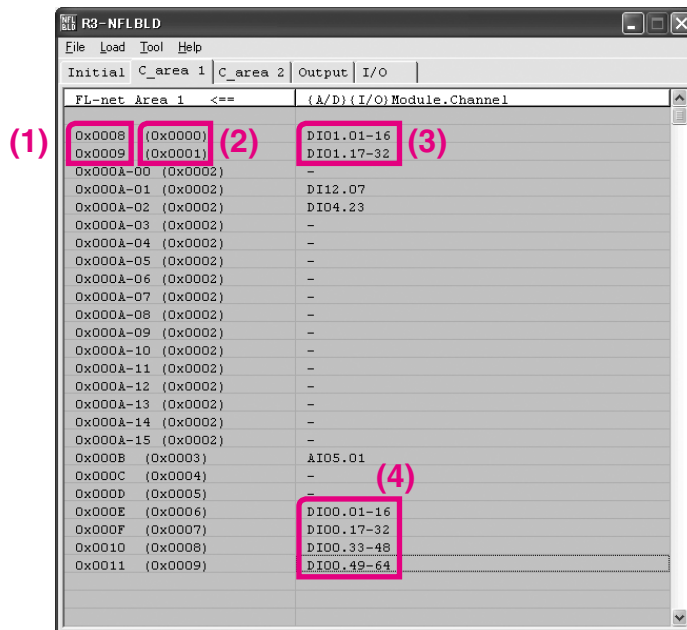
No: Holds the last transmitted input values.

Yes: Resets the input values to zero.

Caution ! The input is reset when the own node restarts after a power failure even when 'No' (hold) is specified. Since R3-GFL1 is a virtual I/O module, the selection for R3-GFL1 is ignored.

3.2 COMMON MEMORY AREA 1

Parameters specified in this tab define the cyclic data contents in the common memory area 1. The I/O modules are assigned to each 16-bit word of the memory area.



Common memory address (absolute) (1)

All addresses for the whole common memory area of the own node are listed in the ascending order. Addresses are assigned in the following units:

- Word unit: 1 word corresponds to 16-bit data of I/O modules.
 - Bit unit: 1 bit corresponds to 1-bit data of discrete I/O modules.
- Bit number (0 to 15 in decimal, LSB=0) is added to the tail of the address (e.g. 0x000A-00 = Address 0x000A, Bit 0).

In order to switch from 'word unit' to 'bit unit': when a word-unit address is indicated in the left column, click in the right column and choose 'bit unit' from the selections list. On the other way, when bit-unit addresses are indicated in the left column, click in the right column of 'bit 0' row and choose 'word unit' from the list.

Common memory address (offset) (2)

Offset from the top address of the common memory area of the own node is indicated.

I/O module data address (3)

I/O module data addresses are designated in the following text format:

"ttnn.cc"

..... where
tt : I/O module type*1

DI : Discrete input
AI : Analog input
DO : Discrete output
AO : Analog output,
- : not assigned ("nn.cc" section is deleted)

nn : I/O module number (1 to 16, decimal)

cc : Channel number (1 to 64, decimal)

Discrete I/O

1 channel data requires 1 bit. Specify the top channel number in the 16-channel units (16n+1) when using the word units. Specify the channel number itself when using the bit units.

[Example] DO01.17 Slot 1 discrete input module, channel 17
 DO01.17-31 Same as above in the word units.
 ('31' showing the channel range is automatically added.)

Analog I/O

1 channel data requires 16 bits. Only the word-unit assignment is usable.

*1. For R3-GFL1, only AI and AO are applicable.

Module status word (4)

DI00 is specifically assigned to the module status information.*2 The 'cc' part of the address means the following:

01...16: Module status

Shows each I/O module is mounted or not. '1' when mounted, '0' when not.

17...32: Module error

Shows each I/O module's physical I/O error. '1' when the following condition occurs:

- R3-TSx, R3-RSx: Input burnout
- R3-DAx: Error or no connection of the input excitation source
- R3-YSx: Error of the output current (e.g. caused by no load connection)

33...48: Data error

Shows overrange error of each input module. '1' when the signal goes below -15% or above 115% of the full-scale range. Only for R3-US4, bit is '1' when the signal goes below -10% or above 110% of the full scale range.

*2. For R3-GFL1, only "Module status" and "Source node error" are applicable.

49...64: Source node error

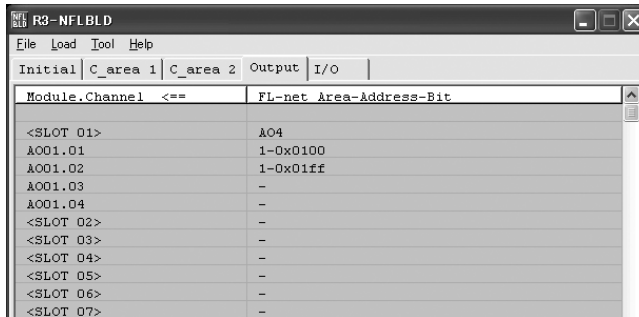
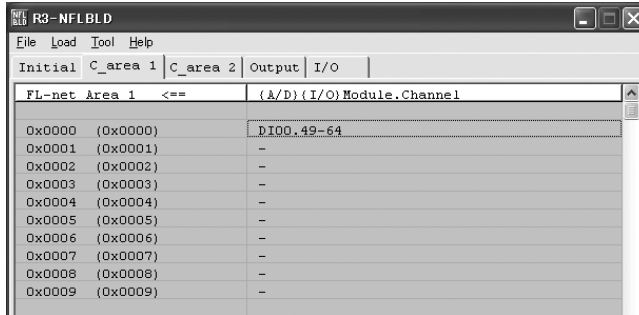
'1' when any one node transmitting to the common memory area assigned to output modules has exited from FL-net network.

[Example]

The output module is mounted at Slot (module) 1, Node 1, with the following configuration on the builder:

Slot 1, Ch. 1 is assigned to output data from Common Memory Area 1, 0x0100 (Node 2)

Slot 1, Ch. 2 is assigned to output data from Common Memory Area 1, 0x01ff (Node 3)

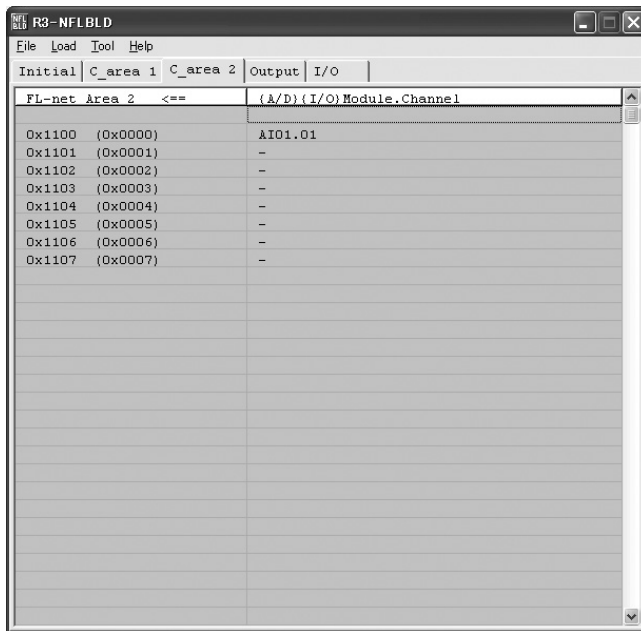


If Node 2 and/or Node 3 exit the FL-net ring, Bit 49 which corresponds to Slot 1, Node 1 turns to '1'.

3.3 COMMON MEMORY AREA 2

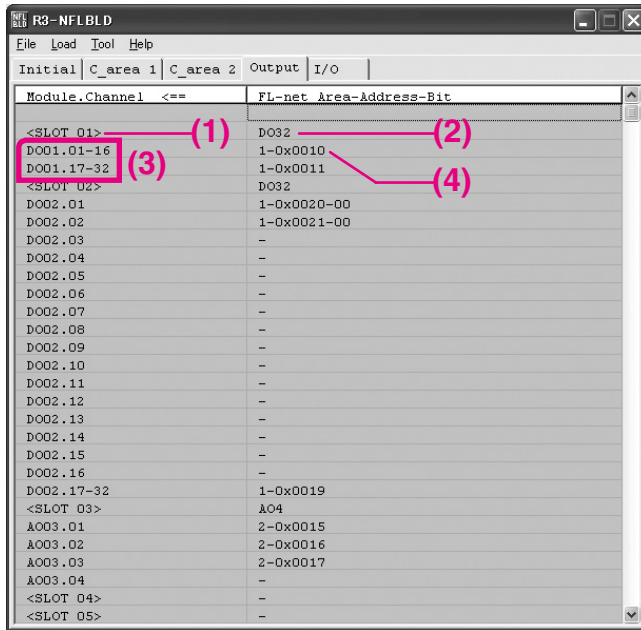
Refer to 3.2. COMMON MEMORY AREA 2.

- Explanations given in Section 3.2 are applied also to Common Memory Area 2.
- Memory allocation in the bit units is not available for Common Memory Area 2.



3.4 OUTPUT

Parameters in this tab define assignments of the cyclic data of other nodes for output modules of the own node.



Caution! When you use this module with discrete output modules, before installing the modules, set the output tab and write it to the R3-NFL1.

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.

Slot (1)

Slot (module) numbers 1 through 16 are indicated.

Module type (2)

Click the right column to show the list of output module types and choose.

AOnn: Analog (nn= number of channels)

DOnn: Discrete (nn=number of channels)

When the module type is selected, corresponding channel numbers (3) are listed below the slot number.

Channel numbers (3)

[Example]

D001.33-48: Slot 1, Discrete output module, Channel 33 through 48 (16 bits)

D001.02: Slot 1, Discrete output module, Channel 2

A003.02: Slot 3, Analog output module, Channel 2

Common memory address (4)

This is a text field with a selection list.

Enter the FL-net common memory address of the source data in the following text format.

"a-0xbbbb-cc"

where a : Common memory area

1 : Common memory area 1

2 : Common memory area 2

bbbb : Common memory address (hexadecimal)

cc: Bit (0 to 15, decimal) (Used only when assigning discrete signals in the bit units.)

Choose between the following selections from the menu.

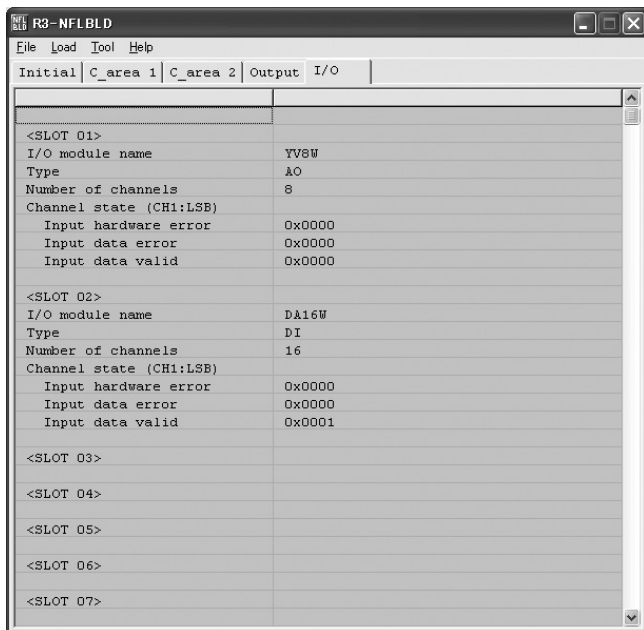
Bit unit: 1 bit corresponds to 1-bit data of discrete I/O modules.

Word unit: 1 word corresponds to 16-bit data of I/O modules.

- : Not assigned

3.5 I/O

When you have uploaded the configuration setting from the R3-NFL1 module, I/O module descriptions are given in this tab. When a slot is without any module, only the slot number is indicated.



Caution !

These fields are blank until you have uploaded the configuration setting, or when the R3-NFL1 has started in Configuration mode (RUN/CFG switch at CFG position) (the R3-NFL1 has not transferred data from the internal communication board). In order to have the data, turn the RUN/CFG switch to RUN position and execute [Load] > [Read] command.

[Example]

```
<SLOT 01>
I/O module name           YV8W
Type                       AO
Number of channels         8
Channel state (CH1:LSB)
  Input hardware error     0x0000
  Input data error         0x0000
  Input data valid         0x0000
```

```
<SLOT 02>
:
:
:
```

```
<R3BUS Communication Module>
Module name                R3-RTU
Module version             104
```

where:

- I/O module name: I/O module's model number suffix code
- Type: I/O type (DI : discrete input, AI : analog input, DO : discrete output, DO : analog output)
- Number of channels: Number of discrete contact points (DI/DO) or of analog signal points (AI/AO)
- Channel state: Each bit of a 16-bit word shows each channel's hardware error, input data error and input data valid states (Positive logic, Channel 1 = LSB)

Caution ! The information in this tab is not included when the configuration setting is saved in .bmp file. Save it in .txt file to have it exported.

APPENDIX A. NODE INFORMATION

The following is an example of Node Information. Click [Tool] > [Node info].

```
===== NODE 1 =====
<FL-net Log Data>  (): offset

Transmission/reception
  563045 Total number of transmissions at socket unit (000,must)
    0 Total number of transmission errors at socket unit (004,must)
    0 Number of Ethernet transmission errors (008,option,-)
  563043 Total number of receptions at socket unit (024,must)
    0 Total number of reception errors at socket unit (028,must)
    0 Number of Ethernet reception errors (032,option,-)

Frame types
  281522 Number of tokens transmitted (048,option)
  281522 Number of cyclic frames transmitted (052,option)
    0 Number of peer-to-peer messages transmitted (056,option)
    0 Number of broadcast messages transmitted (060,option)
  281520 Number of tokens received (072,option)
  281520 Number of cyclic frames received (076,option)
    0 Number of peer-to-peer messages received (080,option)
    0 Number of broadcast messages received (084,option)

Cyclic transmission
  0 Number of cyclic reception errors (096,must)
  0 Number of cyclic address size errors (100,option)
  0 Number of cyclic CBN errors (104,option)
  0 Number of cyclic TBN errors (108,option)
  0 Number of cyclic BSIZE errors (112,option)

Message transmission
  0 Number of message retransmissions (144,must)
  0 Number of message over-retransmissions (148,must)
  0 Number of message reception errors (172,must)
  0 Number of message version-of-sequence number errors (176,option)
  0 Number of message sequence number retransmissions recognized (180,option)

ACK-related
  0 Number of ACK errors (192,must)
  0 Number of ACK version-of-sequence number errors (196,option)
  0 Number of ACK sequence number errors (200,option)
  0 Number of ACK node number errors (204,option)
  0 Number of ACK TCD errors (208,option)

Token-related
  0 Number of token multiplications recognized (240,must)
  0 Number of tokens discarded (244,must)
  1 Number of tokens re-issued (248,must)
  0 Number of token holding timeouts (264,option)
  1 Number of token monitoring timeouts (268,option)

Status 1
  0 Total service time (288,option,-)
  0 Number of frame waiting states (292,must)
  1 Number of participations (296,must)
  0 Number of self-exits (300,must)
  0 Number of exits by skipping (304,must)
  0 Number of exits of other nodes recognized (308,must)
```

```
Status 2 (option,-)
    0 List of participation recognized nodes 0
    0 List of participation recognized nodes 1
    0 List of participation recognized nodes 2
    0 List of participation recognized nodes 3
    0 List of participation recognized nodes 4
    0 List of participation recognized nodes 5
    0 List of participation recognized nodes 6
    0 List of participation recognized nodes 7
```

<Node>

```
[NODE 1 (Own node)]
```

```
FA link status sts_LKS= 0x61 ( network_participation, cmem_valid, cmem_set ),
Upper layer status sts_ULS= 0x8000 ( RUN )
Token watchdog time TW= 50, Allowable minimum frame interval time MFT[100us]= 0,
Allowable refresh cycle time RCT= 3,
C1_AD= 0x0000, C1_SZ= 0x000a, C2_AD= 0x0000, C2_SZ= 0x000a,
```

```
Own node status sts_OWN= 0x80 ( network_participation ),
Max MFT[100us]= 0,
```

```
[NODE 240]
```

```
FA link status sts_LKS= 0x61 ( network_participation, cmem_valid, cmem_set ),
Upper layer status sts_ULS= 0x8000 ( RUN )
Token watchdog time TW= 50, Allowable minimum frame interval time MFT[100us]= 0,
Allowable refresh cycle time RCT= 3,
C1_AD= 0x0000, C1_SZ= 0x0000, C2_AD= 0x0000, C2_SZ= 0x0000,
```

FL-net Log Data

The FL-net log data, defined in FL-net protocol, is stored in the R3-NFL1 node. The information is identical to that provided as Log Data Read service of the FL-net.

() following each item shows FL-net defined data offset and 'must/option' identification, and ' - ' means that the item is not supported by the R3-NFL1.

Node

Node status is managed in the own node management table and the participating node management tables.

The following status words show the bit patterns and the text set. Important items are given with texts even when cleared.

FA link status byte (sts_LKS)	
0x01	Node Status (0 = 'OUT-RING' indicated)
0x02	Communication invalid
0x10	Upper layer operation signal error
0x20	Common memory valid
0x40	Common memory set
0x80	Address overlapping
Upper layer status word (sts_ULS)	
0x8000	RUN (0 = 'STOP' indicated)
0x4000	ALARM
0x2000	WARNING
0x0FFF	Error code (user defined); CODE = 0xnxxx

Token watchdog time TW: in milliseconds.

Allowable minimum frame interval time: in 100 microsecond increments.

C1_AD=, C1_SZ=, C2_AD=, C2_SZ=: Common memory area 1 top address and data size, area 2 top address and data size.

The following information is given in addition for the own node.

Own node status byte (sts_OWN)	
0x08	Token holding timeout
0x10	Common memory range error
0x20	Receiving waiting status (no frame received)
0x40	Node number overlap
0x80	Participation complete

Max MFT: Measured minimum frame interval time in 100 microsecond increments. (Max. value among the minimum frame interval time of all nodes)

APPENDIX B. I/O MODULE INFORMATION

The following is an example of I/O Module Information. Click [Tool] > [I/O info].
(The [I/O] tab shows a part of the I/O Module Information.)

```
===== NODE    1 =====

<SLOT 01>
I/O module name           YV8W
Type                       AO
Number of channels         8
Channel state (CH1:LSB)
  Input hardware error     0x0000
  Input data error         0x0000
  Input data valid         0x0000
I/O module state          2
System                     0x42
Protocol_version          1
Module_type                4
I/O module status         0x05

<SLOT 02>
I/O module name           DA16W
Type                       DI
Number of channels         16
Channel state (CH1:LSB)
  Input hardware error     0x0000
  Input data error         0x0000
  Input data valid         0x0001
I/O module state          2
System                     0x41
Protocol_version          1
Module_type                2
I/O module status         0x05

<SLOT 03>

<SLOT 04>

<SLOT 05>

<SLOT 06>

<SLOT 07>

<SLOT 08>

<SLOT 09>

<SLOT 10>

<SLOT 11>

<SLOT 12>

<SLOT 13>

<SLOT 14>

<SLOT 15>
```

```

<SLOT 16>

<R3BUS Communication Module>
Module name           R3-RTU
Module version        104

<DPMEM I/O Statistics>
Scans                 309241
Unexpected_int        0
Busy                  0
Timeout               0
Protocol_error        0

<I/O Unit Summary(LSB:slot1)>
Module status         0x0003
Module error          0x0000
Data error            0x0000
Source node error     0x0000
FL-net cyclic transmission setting 0x0083

<Ethernet Controller Counter>
Transmit retry over counter      0
Collision detect counter        0
Lost carrier counter            0
Carrier not detect counter      0
Illegal frame length counter    0
CRC error frame receive counter 0
Frame receive error counter     0
Too-short frame receive counter 0
Too-long frame receive counter  0
Residual-bit frame counter      0
Multicast address frame counter 261

```

SLOT 01 ... SLOT 16

Shows the type and status of the I/O module mounted on each slot.

I/O module name: I/O module's model number suffix code
 Type: I/O type (DI : discrete input, AI : analog input, DO : discrete output, AO : analog output)
 Number of channels: Number of discrete contact points (DI/DO) or of analog signal points (AI/AO)
 Channel state: Each bit of a 16-bit word shows each channel's input hardware error, input data error and input data valid status

DPMEM I/O Statistics

Shows the communications related data of the backplane communication processor.

Scans: Number of scanning
 Unexpected_int: Number of internal communication errors
 Busy: Number of internal communication errors
 Timeout: Number of internal communication errors
 Protocol_error: Number of internal communication errors

I/O Unit Summary

Shows the summary of I/O module status information. Each words shows a hexadecimal number of which the LSB corresponds to Slot 1.

Top four (4) words: Module status (mounted or not), Module error, Data error and Source node error.
The information is provided as Module Status Word in Common Memory Area 1.

FL-net cyclic transmission setting: Indicates I/O modules active for the cyclic transmission, i.e. input modules to transmit as own-node data, and output modules to receive other node data.

When the module status is on and this status is off for a certain module, it means the module is not configured yet.

Ethernet Controller Counter

Error counter registers incorporated in the Ethernet controller. It starts counting at the startup, and stops at the maximum of 16-bit value. They can be cleared by [Tool] > [Log count clear] command in the builder.