NX100 OPTIONS
IINSTRUCTIONS
FOR ETHERNET FUNCTION

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
NX100 INSTRUCTIONS
NX100 OPERATOR'S MANUAL
NX100 MAINTENANCE MANUAL

The NX100 operator's manuals above corresponds to specific usage.
Be sure to use the appropriate manual.

YASKAWA

MANUAL NO.
HW0482354

MANDATORY

- **This manual explains the Ethernet function of the NX100 system and general operations. Read this manual carefully and be sure to understand its contents before handling the NX100.**
- **General items related to safety are listed in Section 1: Safety of the NX100 Instructions. To ensure correct and safe operation, carefully read the NX100 Instruction before reading this manual.**

CAUTION

- **Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.**
- **The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.**
- **YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.**
- **If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.**
- **YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.**

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the NX100.
In this manual, the Notes for Safe Operation are classified as “WARNING,” “CAUTION,” “MANDATORY,” or ”PROHIBITED.”

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.
 MANDATORY	Always be sure to follow explicitly the items listed under this heading.
 PROHIBITED	Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING.”

WARNING

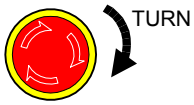
- **Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the NX100 and programming pendant are pressed.**
  When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

  Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

  Emergency Stop Button 

- **Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.**

  Injury may result from unintentional or unexpected manipulator motion.

  Release of Emergency Stop 

- **Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:**

  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Ensure that you have a safe place to retreat in case of emergency.

  Improper or unintended manipulator operation may result in injury.

- **Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:**

  - Turning ON the NX100 power.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

  Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop buttons are located on the right of the front door of the NX100 and the programming pendant.

CAUTION

- **Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.**

  -Check for problems in manipulator movement.
  -Check for damage to insulation and sheathing of external wires.

- **Always return the programming pendant to the hook on the NX100 cabinet after use.**

  The programming pendant can be damaged if it is left in the P-point maximum envelope of the manipulator, on the floor, or near fixtures.

- **Read and understand the Explanation of Warning Labels in the NX100 Instructions before operating the manipulator.**

Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product.
The manipulator usually consists of the controller, the programming pendant, and supply cables.
In this manual, the equipment is designated as follows:

Equipment	Manual Designation
NX100 controller	NX100
NX100 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

The programming pendant and playback panel keys, buttons, and displays are designated as follows:

Equipment		Manual Designation
Programming Pendant	Character Keys	The keys which have characters printed on them are denoted with [ ]. ex. [ENTER]
	Symbol Keys	The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. page key  The cursor key is an exception, and a picture is not shown.
	Axis Keys Number Keys	“Axis Keys” and “Number Keys” are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, ex. [SHIFT]+[COORD]
	Displays	The menu displayed in the programming pendant is denoted with { }. ex. {JOB}

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • • " means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

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1 Outline

Data transmission function of the NX100 is achieved by data exchange between the data transmission function which is the NX100 application, and the MTOTCOM32 which is the application of the personal computer. For the data transmission, Ethernet can be optionally used as a medium instead of RS-232C which is used as a standard. The NX100 data transmission function in case of using Ethernet for the transmission medium is peculiarly called the Ethernet function.
This instruction manual explains the settings and relevant information required in use of the Ethernet function.

1.1 Features

1.1.1 High-Speed Transmission

The Ethernet function with Ethernet (10 Mbps) for the transmission medium enables a faster transmission compared to RS-232C (max. 9600 bps).

1.1.2 Communication Station Switchable with Software

unlike RS-232C which requires a device to physically switch the stations, the Ethernet function can switch the communication station easily by changing the destination for connection with a software. (Note, however, that it is unable to communicate with one or more station simultaneously.)

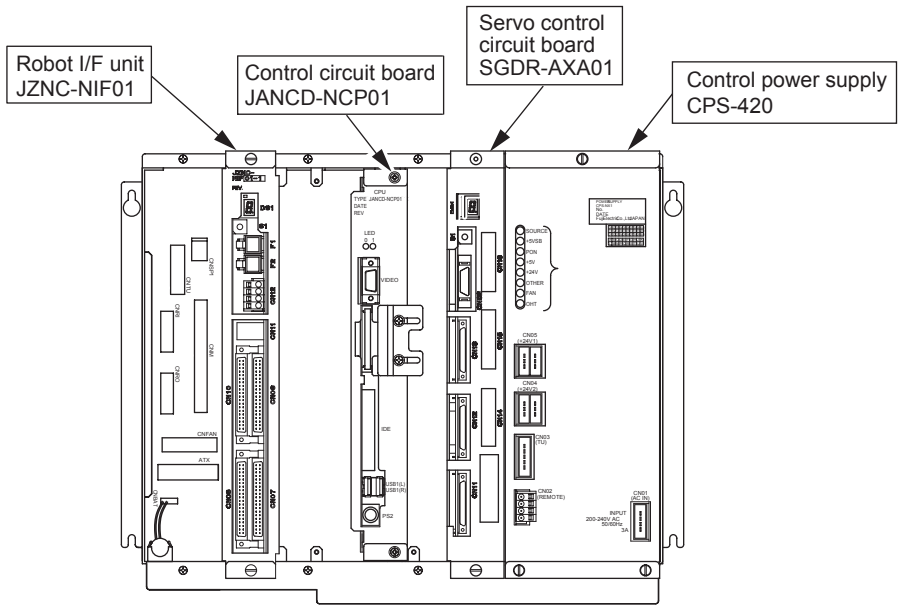
1.1.3 Easy Setup

The NX100 is provided with the Ethernet connector RJ-45 for deta transmission as standard equipment. Therefore, the Ethernet function can be used without adding any extra hardware.

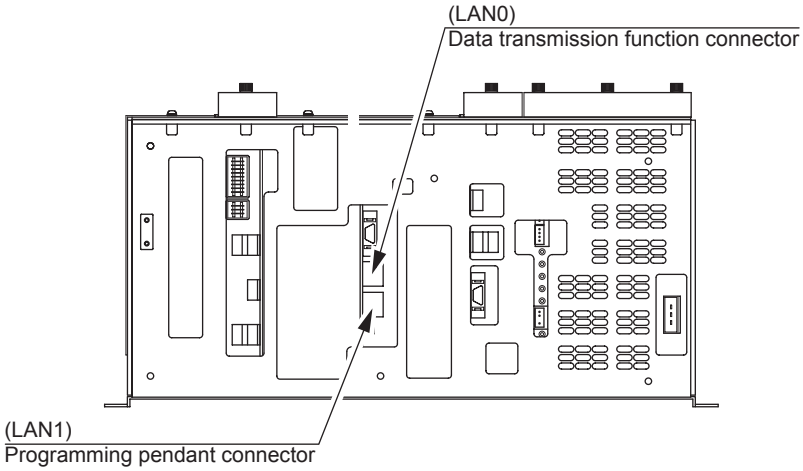
2 Ethernet Cable Connections

Connect the Ethernet cable (shielded cable; category 3 or more) to the RJ-45 transmission connector which is located on the bottom of the NCP01 board inside the CPU rack.

NOTE There are two RJ-45 connectors at the bottom of the NCP01 board, and LAN0 on the front side is the one for the transmission function. Do not touch LAN1 on the rear side since it is exclusively used for the programming pendant.



Front Face (View without Cover)



Bottom Face

3 Ethernet Function Settings

To make the NX100 Ethernet function available, perform the setting procedures below.

3.1 Transmission Function Settings

Set the parameters to enable the transmission function.
(The customers should not change the parameter settings themselves: contact your Yaskawa representative.)

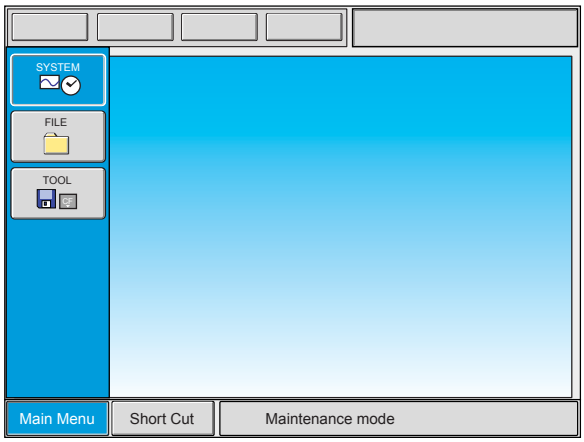
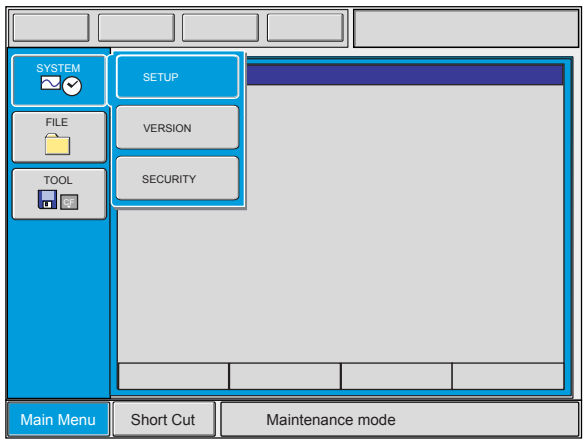
3.2 Ethernet Function Settings

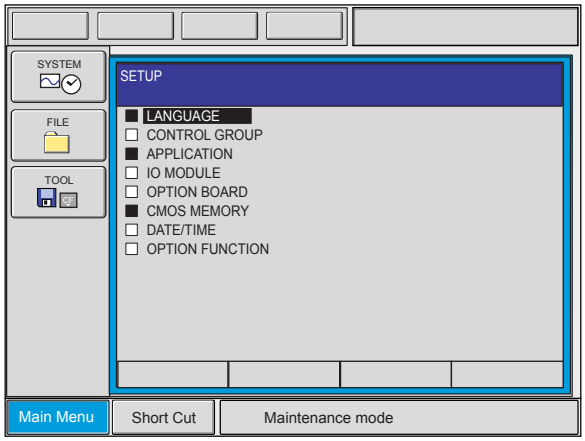
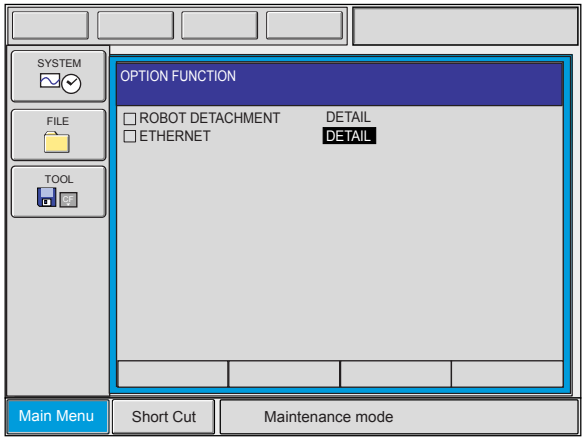
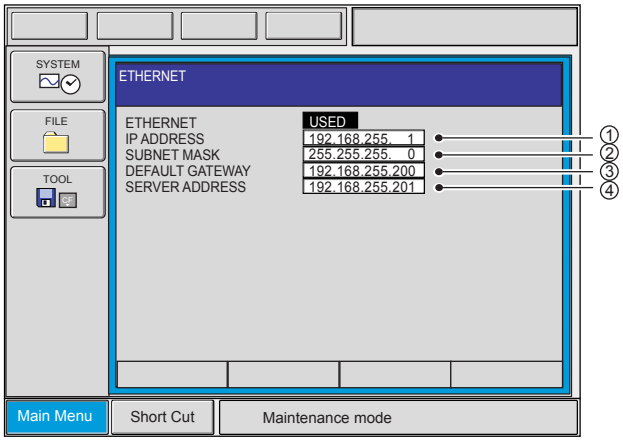
Set the parameters to enable the Ethernet function.
(The customers should not change the parameter settings themselves: contact your Yaskawa representative.)

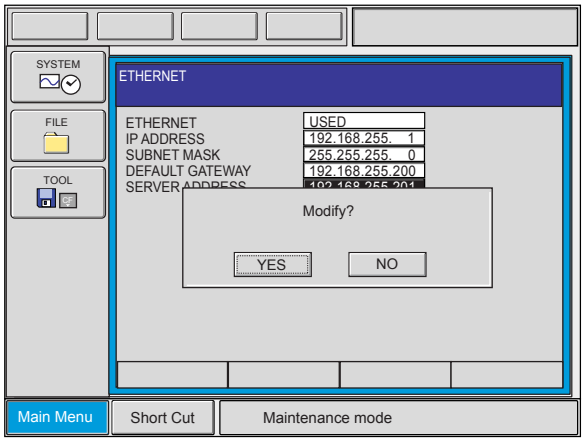
3.3 Ethernet Communication Settings

Perform the following procedures for Ethernet communications:

NOTE Perform the Ethernet communication settings in the management mode.
In the operation mode and the editing mode, the settings are for reference only.

	Operation	Explanation
1	Turn ON the power supply again while pressing [MAIN MENU] simultaneously.	The maintenance mode window appears. 
2	Select {SYSTEM} under the main menu.	The sub menu appears. 
3	Set the security mode to management mode.	

	Operation	Explanation
4	Select {SETUP}.	The SETUP window appears. 
5	Select {OPTION FUNCTION}.	The function selection window appears. 
6	Select {ETHERNET}.	The parameter setting window for Ethernet communication appears.  ① IP Address Set the IP address assigned for the NX100. ② Subnet Mask Set the subnet mask assigned for the NX100.

	Operation	Explanation
6	(Cont'd from previous page.) Select {ETHERNET}.	③ Default Gateway Set the IP address of a gateway in case of transmitting the data via the gateway (router). NOTE Set the value at "0.0.0.0" if the gateway (router) will not be used. ④ Server Address Set the IP address of the server in case of using the DCI function or the stand-alone function. NOTE Set the value at "0.0.0.0" if the DCI or stand-alone functions will not be used.
7	Select the communication parameter to be changed.	The value input state is ready.
8	Input the new communication parameter value.	Input all the values. Four decimal numbers of each communication parameter should be pointed off by periods: for example, enter "192.168.255.1" for an IP address.
9	Press [ENTER].	The confirmation dialog box appears. 
10	Select {YES}.	If the Ethernet communication settings are correct, select {YES}.
11	Turn ON the power supply again.	The normal operation mode starts.

3.4 Command Remote Settings

Since the Ethernet function applies the data transmission function, it is required to set the command remote available. Refer to "NX100 OPTIONS INSTRUCTIONS FOR DATA TRANSMISSION FUNCTION" for the details of command remote and the setting method to enable it.

4 Specifications

4.1 Ethernet Specifications

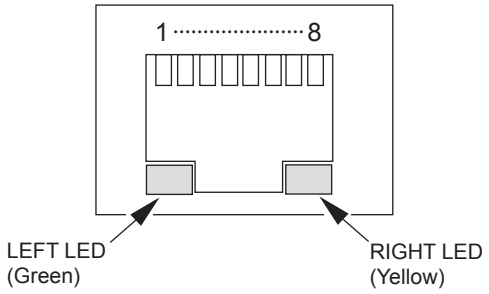
4.1.1 Communication Specifications

Applicable Standard	IEEE 802.3i 10Base-T
Baud Rate	10 Mbps (It is the transmission speed of signals, and not of the actual data. The actual data transfer rate is rather slow, since it depends on the processing speed and the transmission line status inside each communication station.)

4.1.2 Connector Specifications

LAN0 connector (RJ-45 8-pin modular jack)

■ External View of the Connector



■ Pin Assignment

PIN #	Signal Name	PIN #	Signal Name
1	TX	5	GND
2	TX	6	RX
3	RX	7	GND
4	GND	8	GND

■ LED Specifications

LED	Status	Meaning
LEFT (Green)	Lit	Link
	Blink	Active
RIGHT (Yellow)	Lit	100 MBps (Currently unsupported)
	Unlit	10 MBps

4.1.3 Cable Specifications

Use the following Ethernet cable:

Item	Description
Cable Type	Shielded, category 3 or more
Maximum Cable Length	100 m

4.2 Restrictions

4.2.1 Restrictions on the Data Transmission Function

NOTE Refer to "NX100 OPTIONS INSTRUCTIONS FOR DATA TRANSMISSION FUNCTION" for the details of the data transmission function.

■ Operation with the External Memory Devices

The external memory Devices and the data transmission function work exclusively. Therefore, data transmission function cannnot be executed when the external memory devices are in processing status, or external memory devices cannot process data when the data transmission function is being executed.

■ Remote Mode

With the remote mode, the data transmission function switches the external access wait state and the external access state. The host control function becomes available and the external access enters in a wait status when the remote is turned ON. When the remote is turned OFF, the external access is enabled and the DCI or stand-alone functions become available. The host control function and the DCI/stan-alone functions cannot be used simultaneously since the remote ON status and the remote OFF status work exclusively.

■ Concurrent Communication

Communication with more than one station is not available with the data transmission function.

4.2.2 Restrictions on Setting the IP Address

The Ethernet function does not support the local IP address "10.*.*.*".
Do not set it for the IP address.

4.2.3 Restrictions on Communication Port

The Ethernet function occupies 10000 to 10008 of the UDP ports. Therefore, do not transmit the packets that use the UDP ports occupied by the Ethernet function to the NX100 and the host computer which are executing the Ethernet communications.

5 Troubleshooting

In case of communication failure, try the following check items.

5.1 Cable Connection Check

- Check that the cable is securely connected to the LAN0 connector on the NCP01 board.
  - Check that the LED of the LAN0 (green LED on the left) is lit or blinks.

- Check that the cable connector of the hub side is properly connected.
  - Check that the power supply for the hub is ON.

- Check the cable type.
  - In case of connecting the cable to the hub which cannot auto-detect MDI/MDI-X connection, check if the cable used is a straight cable.
  - In case of directly connecting the NX100 and host computer, check if the cable used is a crossing cable.

- Check the baud rates of the hub and the host computer.
  - The baud rate of the NX100 is 10 Mbps.

5.2 Connection Check with Lower Protocol

In the TCP/IP network, it is possible to check if the IP packets are transmitted to the destinations using the host computer. Start the command prompt in the Windows 2000/XP, then input the IP address after entering "ping". If the communication is successfully done, the window displays as follows:

```
C:\>ping 192.168.255.1

Pinging 192.168.255.1 with 32 bytes of data:

Reply from 192.168.255.1: bytes=32 time<10ms TTL=255
Reply from 192.168.255.1: bytes=32 time<10ms TTL=255
Reply from 192.168.255.1: bytes=32 time<10ms TTL=255
Reply from 192.168.255.1: bytes=32 time<10ms TTL=255

Ping statistics for 192.168.255.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>
```

In case of a communication failure, the window displays as shown below. In this case, check the cable connections, network settings of the host computer, the Ethernet communication settings of the NX100 once again.

```
C:\>ping 192.168.255.1

Pinging 192.168.255.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.255.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>
```

5.3 Connection Check with MOTOCOM

The Ethernet communication settings are completed when the connection check with lower protocol is finished. For the further connection check, use the MOTOCOM referring to "NX100 OPTIONS INSTRUCTIONS FOR DATA TRANSMISSION FUNCTION" and "MOTOCOM32 OPERATION MANUAL".

6 Alarms

Alarm No.	Message	Cause/Status	Corrective Actions
1220	LAN COMMUNICATION PARAMETER ERROR [Decimal data]	Setting error of the LAN communication parameter. The decimal data denotes the error parameter. 1: IP address. 2: Subnet mask. 3: Default gateway.	• Set the correct values.
1221	ETHERNET INITIAL PROCESS ERROR [Decimal data]	An error occurred in the Ethernet initialization. Decimal data denotes the error parameter. 1: Ethernet device setting. 2: IP address setting. 3: Subnet mask setting. 4: Default gateway setting.	• Turn OFF the power then back ON. • If the error occurs again, contact your Yaskawa representative.
4130	NETWORK APPLICATION PROCESS ERROR [Decimal data]	An error occurred in the Ethernet process. Decimal data denotes the error parameter. 1: APP task reinitialization notification error. 2: Reinitialization reply reception error. 3: Reinitialization unfinished task abnormal termination. 4: Reinitialization synchronous semaphore reception error. 5: Reinitialization mail delivery error. 6: Exclusive control error in area management table. 50: Abnormal PCI written data size. 51: Received faulty PCI data write request. 52: Received undefined transmission request. 53: Transmission request reception error. 54: Received transmission request without data. 55: Received transmission request in abnormal data length.	• Turn OFF the remote then back ON. • If the system does not recover by turning OFF/ON the remote, turn OFF the power then back ON. • If the error occurs again, contact your Yaskawa representative.

Alarm No.	Message	Cause/Status	Corrective Actions
4131	UDP PROCESS ERROR [Decimal data]	An error occurred in the UDP process. Decimal data denotes the error parameter. 1: Receiving socket creation error. 2: Sending socket creation error. 3: Received faulty data. 4: Transmission error. 5: Abnormal termination of "select". 100: Abnormal reinitialization notification data length. 101: Abnormal reinitialization notification. 102: Abnormal termination of PCI write. 103: Transmission request in abnormal data length. 104: Transmission request data reception error.	• Turn OFF the remote then back ON. • If the system does not recover by turning OFF/ON the remote, turn OFF the power then back ON. • If the error occurs again, contact your Yaskawa representative.
4132	TCP PROCESS ERROR [Decimal data]	An error occurred in the TCP process. Decimal data denotes the error parameter. 1: Socket table creation error. 2: TCP server reinitialization error.	• Turn OFF the remote then back ON. • If the system cannot be recovered by turning OFF/ON the remote, turn OFF the power then back ON. • If the error occurs again, contact your Yaskawa representative.

NX100 OPTIONS
INSTRUCTIONS
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HW0482354