Machine Automation Controller NJ-series

EtherCAT
Connection Guide

OMRON Corporation

3G3RX-V1-Series Inverter
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1. Related Manuals

The table below lists the manuals related to this document. To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions, Precautions for Safe Use, and Precaution for Correct Use of manuals for each device which is used in the system.

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Model</th>
<th>Manual name</th>
</tr>
</thead>
<tbody>
<tr>
<td>W500</td>
<td>NJ501-[]-[]-[]-[]</td>
<td>NJ-series CPU Unit Hardware User's Manual</td>
</tr>
<tr>
<td></td>
<td>NJ301-[]-[]-[]-[]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NJ301-[]-[]-[]-[]</td>
<td></td>
</tr>
<tr>
<td>W505</td>
<td>NJ501-[]-[]-[]-[]</td>
<td>NJ-series CPU Unit Built-in EtherCAT Port User's Manual</td>
</tr>
<tr>
<td></td>
<td>NJ301-[]-[]-[]-[]</td>
<td></td>
</tr>
<tr>
<td>W504</td>
<td>SYSMAC-SE2[]-[]</td>
<td>Sysmac Studio Version 1 Operation Manual</td>
</tr>
<tr>
<td>I578</td>
<td>3G3RX-V1 series</td>
<td>High-function General-purpose Inverter 3G3RX-V1 User’s Manual</td>
</tr>
<tr>
<td>I574</td>
<td>3G3AX-MX2-ECT</td>
<td>MX2 series/RX-V1 series</td>
</tr>
<tr>
<td></td>
<td>3G3AX-RX-ECT</td>
<td>EtherCAT Communication Unit USER'S MANUAL</td>
</tr>
</tbody>
</table>
## 2. Terms and Definition

<table>
<thead>
<tr>
<th>Terms</th>
<th>Explanation and Definition</th>
</tr>
</thead>
</table>
| PDO Communications (Communications using Process Data objects) | This method is used for cyclic data exchange between the master unit and the slave units. PDO data (i.e., I/O data that is mapped to PDOs) that is allocated in advance is refreshed periodically each EtherCAT process data communications cycle (i.e., the period of primary periodic task). The NJ-series Machine Automation Controller uses process data communications for commands to refresh I/O data in a fixed control period, including I/O data for EtherCAT Slave Units, and the position control data for the Servomotors. It is accessed from the NJ-series Machine Automation Controller in the following ways:  
• With device variables for EtherCAT slave I/O  
• With Axis Variables for Servo Drive and encoder input slaves to which assigned as an axis |
| SDO Communications (Communications using Service Data objects) | This method is used to read and write the specified slave unit data from the master unit when required. The NJ-series Machine Automation Controller uses SDO communications for commands to read and write data, such as for parameter transfers, at specified times. The NJ-series Machine Automation Controller can read/write the specified slave data (parameters and error information, etc.) with the EC_CoESDORead (Read CoE SDO) instruction or the EC_CoESDOWrite (Write CoE SDO) instruction. |
| Slave Unit | There are various types of slaves such as Servo Drives that handle position data and I/O terminals that control the bit signals. The slave receives output data sent from the master, and transmits input data to the master. |
| Node address | An address to identify the unit connected to EtherCAT. |
| ESI file (EtherCAT Slave Information file) | The ESI files contain information unique to the EtherCAT slaves in XML format. Install an ESI file into the Sysmac Studio, to allocate slave process data and make other settings. |
3. Remarks

(1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing safety circuit in order to ensure safety and minimize risks of abnormal operation.

(2) To ensure system safety, always read and heed the information provided in all Safety Precautions, Precautions for Safe Use, and Precaution for Correct Use of manuals for each device used in the system.

(3) The users are encouraged to confirm the standards and regulations that the system must conform to.

(4) It is prohibited to copy, to reproduce, and to distribute a part of or whole of this document without the permission of OMRON Corporation.

(5) This document provides the latest information as of March 2013. The information contained in this document is subject to change for improvement without notice.

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Windows is a registered trademark of Microsoft Corporation in the USA and other countries.
EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
Company names and product names in this document are the trademarks or registered trademarks of their respective companies.
The following notation is used in this document.

**WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

**Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text.

This example shows a general precaution for something that you must do.

---

**Precautions for Safe Use**
Indicates precautions on what to do and what not to do to ensure using the product safely.

**Precautions for Correct Use**
Indicates precautions on what to do and what not to do to ensure proper operation and performance.

**Additional Information**
Provides useful information.
Additional information to increase understanding or make operation easier.
4. Overview

This document describes the procedure for connecting the Inverter (3G3RX-V1 series) of OMRON Corporation (hereinafter referred to as OMRON) to NJ-series Machine Automation Controller (hereinafter referred to as Controller) on EtherCAT and provides the procedure for checking their connection.

Refer to Section 7 Connection Procedure to understand the setting method and key points to connect the devices via EtherCAT.

5. Applicable Devices and Support Software

5.1. Applicable Devices

The following devices can be connected.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Name</th>
<th>Model</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMRON</td>
<td>NJ series CPU Unit</td>
<td>NJ501-[]</td>
<td>-</td>
</tr>
<tr>
<td>OMRON</td>
<td>Inverter</td>
<td>3G3RX-A[][]-V1</td>
<td>2.0</td>
</tr>
<tr>
<td>OMRON</td>
<td>EtherCAT Communications Unit</td>
<td>3G3AX-RX-ECT</td>
<td>-</td>
</tr>
</tbody>
</table>

Additional Information

As applicable devices above, the devices listed in Section 5.2. are actually used in this document to check the connection. When using devices not listed in Section 5.2, check the connection by referring to the procedure in this document.

Additional Information

This document describes the procedure to establish the network connection. It does not provide information about operation, installation nor wiring method of each device. For details on the products (other than communication connection procedures) listed above, refer to the manuals for the corresponding products or contact your OMRON representative.
5.2. Device Configuration

The hardware components to reproduce the connection procedure in this document are as follows.

![Diagram of hardware components]

**Manufacturer**  | **Name** | **Model** | **Version**
--- | --- | --- | ---
OMRON | CPU Unit (Built-in EtherCAT port) | NJ501-1500 | Ver.1.01
OMRON | Power Supply Unit | NJ1W-PA3001 | |
OMRON | Sysmac Studio | SYSMAC-SE2 | Ver.1.03
- | Personal computer (OS: Windows 7) | | |
- | USB cable (USB 2.0 type B connector) | | |
OMRON | Ethernet cable (with industrial Ethernet connector) | XS5W-T421-[M]-K | |
OMRON | Inverter | 3G3RX-A2055-V1 | V2.0
OMRON | EtherCAT Communications Unit | 3G3AX-RX-ECT | |

Precautions for Correct Use

The connection line of EtherCAT communication cannot be shared with other networks, such as Ethernet or EtherNet/IP.

The switching hub for Ethernet cannot be used for EtherCAT.

Please use the cable of Category 5 or higher, double-shielded with aluminum tape and braided shielding and the shielded connector of Category 5 or higher.

Connect the cable shield to the connector hood at both ends of the cable.

Additional Information

For information on the specifications of the Ethernet cable and network wiring, refer to Section 4 EtherCAT Network Wiring in the NJ-series CPU Unit Built-in EtherCAT Port User's Manual (Cat. No. W505).

Additional Information

The system configuration in this document uses USB for the connection between the personal computer and the NJ-series CPU Unit. For information on how to install a USB driver, refer to A-1 Driver Installation for Direct USB Cable Connection of the Sysmac Studio Operation Manual (Cat.No. W504).
6. EtherCAT Settings

This section describes the specifications such as communication parameters and variables that are set in this document.
Hereinafter, the Inverter is referred to as "destination device" in some descriptions.

6.1. EtherCAT Communications Settings

The setting required for EtherCAT communications is as follows.

<table>
<thead>
<tr>
<th>3G3RX-A2055-V1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node address</td>
</tr>
<tr>
<td>01</td>
</tr>
</tbody>
</table>

6.2. Assignment of EtherCAT Communications

The device variables of the destination device are allocated to the Controller's global variables.
The relationship between the device data and the global variables is shown below.

■ Output area (Controller → Destination device)

<table>
<thead>
<tr>
<th>Destination device data</th>
<th>Device variable name</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation command to Inverter</td>
<td>E001_Command</td>
<td>WORD</td>
</tr>
<tr>
<td>Output frequency</td>
<td>E001_Frequency_reference</td>
<td>INT</td>
</tr>
</tbody>
</table>

■ Input area (Controller ← Destination device)

<table>
<thead>
<tr>
<th>Destination device data</th>
<th>Global variable name</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>E001_Status</td>
<td>WORD</td>
</tr>
<tr>
<td>Output frequency monitor</td>
<td>E001_Output_frequency_monitor</td>
<td>INT</td>
</tr>
</tbody>
</table>

■ Details of the status allocation (Controller ← Destination device)

<table>
<thead>
<tr>
<th>Destination device data</th>
<th>Global variable name</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sysmac Error Status</td>
<td>E001_Sysmac_Error_Status</td>
<td>BYTE</td>
</tr>
<tr>
<td>Error information at observation level</td>
<td>E001_Observation</td>
<td>BOOL</td>
</tr>
<tr>
<td>Error information at minor fault level</td>
<td>E001_Minor_Fault</td>
<td>BOOL</td>
</tr>
</tbody>
</table>
7. Connection Procedure

This section describes how to connect the Controller via EtherCAT. This document explains the procedures for setting up the Controller and Inverter from the factory default setting. For the initialization, refer to Section 8 Initialization Method.

7.1. Work Flow

The following is the procedure for connecting to EtherCAT.

7.2. Setting Up the Inverter

- 7.2.1 Hardware Settings
- 7.2.2. Parameter Setting

7.3. Setting Up the Controller

- 7.3.1. Starting the Sysmac Studio and Setting the EtherCAT network configuration
- 7.3.2 Setting the Device Variables
- 7.3.3. Transferring the Project Data

7.4. Checking the Connection Status

- 7.4.1 Checking the Connection Status
- 7.4.2 Checking Data that are Sent and Received

Set up the Inverter.
Set the hardware switches on the Inverter.
Set the parameter of the Inverter.
Set up the Controller.
Start the Automation Software Sysmac Studio and set the EtherCAT network configuration.
Set the device variables used for the EtherCAT Slave Unit.
Transfer the project data from the Sysmac Studio to the Controller.
Check the EtherCAT network connection status.
Confirm that EtherCAT communications are performed normally.
Confirm that the correct data are sent and received.
7.2. Setting Up the Inverter

Set up the Inverter.

7.2.1. Hardware Setting

Set the hardware switches on the Inverter.

Precautions for Correct Use

Make sure that the power supply is OFF when you perform the settings.

1. Mount the EtherCAT Communications Unit on the Inverter.

   *For details on how to mount the EtherCAT Communications Unit, refer to 2-5 Mounting and Wiring for the EtherCAT Communication Unit in the 3G3AX-RX-ECT (RX-V1) EtherCAT Communication Unit User's Manual (Cat.No. I574)

   Remove the following parts from the RX-V1 Inverter.
   A. Digital operator
   B. Spacer cover
   C. Terminal cover
   D. Front cover

2. Remove the two break-outs from the front cover.

   Confirm that there are no burrs left.

3. Mount the conversion board onto the Inverter.
4. Mount the front cover as before and tighten the screws.

5. Connect the connector on the Inverter connection board of the EtherCAT Communication Unit to the conversion board mounted on the Inverter.

6. Mount the EtherCAT Communication Unit onto the Inverter. Insert the two lock pins (A) of the EtherCAT Communication Unit into the Inverter. Then insert the bottom part of the EtherCAT Communication Unit and mount it by pushing down.

(a) Insert the two tabs on the top of the EtherCAT Communications Unit in the hole and push it up.

(b) While pushing it up, insert the bottom part of the EtherCAT Communications Unit.

(c) Securely mount the EtherCAT Communications Unit by sliding it down.

7. Connect the grounding cable of the EtherCAT Communication Unit to the grounding terminal of the Inverter. Make sure that the grounding terminal is marked with a grounding symbol.
8. Mount the Digital Operator (C) and the terminal cover and secure the terminal cover by tightening the screws.

Mount the terminal cover below the EtherCAT Communication Unit to the Inverter (B). Tighten the two screws (A).

9. Refer to the right figure and check the hardware switches located on the front panel of the EtherCAT Communications Unit.

10. Set the node address setting switches to "01".

11. Connect the communication cable to the communication connector IN.

   In this document, OUT side is not used.
7.2.2. Parameter Setting

Set the parameters of the Inverter.

1. Turn ON the power supply to the Inverter.

*Set the parameters by using the digital operator that is on the front of the Inverter.

<table>
<thead>
<tr>
<th>8.8.8.8.</th>
<th>Data display</th>
<th>Displays relevant data, such as frequency reference, output current, and set values.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>RUN key</td>
<td>Activates the Inverter. Available only when operation via the Digital Operator is selected. (Confirm that the RUN command LED indicator is lit.)</td>
</tr>
<tr>
<td>STOP/RESET</td>
<td>STOP/RESET key</td>
<td>Decelerates and stops the Inverter. Functions as a reset key if an Inverter error occurs.</td>
</tr>
<tr>
<td>Mode key</td>
<td>Mode key</td>
<td>Switches between: the monitor mode (D[ ][ ][ ]), the basic function mode (F[ ][ ][ ]), and the extended function mode (A[ ][ ][ ][ ], B[ ][ ][ ], C[ ][ ][ ][ ], H[ ][ ][ ][ ]).</td>
</tr>
<tr>
<td>Enter key</td>
<td>Enter key</td>
<td>Enters the set value. (To change the set value, be sure to press the Enter key.)</td>
</tr>
<tr>
<td>Increment key</td>
<td>Increment key</td>
<td>Changes the mode. Also, increases the set value of each function.</td>
</tr>
<tr>
<td>Decrement key</td>
<td>Decrement key</td>
<td>Changes the mode. Also, decreases the set value of each function.</td>
</tr>
</tbody>
</table>
2 Turn ON the power supply. The display shows the monitor value. Set the parameters by following the procedure on the right.

[A001] Frequency Reference Selection 1: 05.
[A002] RUN Command Selection 1: 05

*Set "05" (Option 2).

*The d001 (Output frequency monitor) data is displayed during power ON.
( Default setting)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Press the Mode Key 3 times.</td>
</tr>
<tr>
<td>2.</td>
<td>A001 parameter is displayed. Press the Enter Key.</td>
</tr>
<tr>
<td>3.</td>
<td>The initial data is displayed. Press the Increment Key three times.</td>
</tr>
<tr>
<td>4.</td>
<td>Change the data to &quot;05&quot;. Press the Enter Key.</td>
</tr>
<tr>
<td>5.</td>
<td>The parameter is displayed again. Press the Increment Key once.</td>
</tr>
<tr>
<td>6.</td>
<td>A002 parameter is displayed. Press the Enter Key.</td>
</tr>
<tr>
<td>7.</td>
<td>The initial data is displayed. Press the Increment Key three times.</td>
</tr>
<tr>
<td>8.</td>
<td>Change the data to &quot;05&quot;. Press the Enter Key.</td>
</tr>
<tr>
<td>9.</td>
<td>The parameter is displayed again.</td>
</tr>
</tbody>
</table>
7. Connection Procedure

3 Use the procedure on the right to set the parameter.

[C102] Reset selection: 03
*Set "03" (Trip reset only).

1. Cycle the power supply to the Inverter.

2. **Press the Mode Key** twice.

3. **Press the Increment Key** to move to C102.

4. **Press the Enter Key**.

5. **Press the Increment Key** three times.

6. **Change the data to "03"**

7. **Press the Enter Key**.

8. The parameter is displayed again.

9. The parameter is displayed.
7. Connection Procedure

7.3. Setting Up the Controller

Set up the Controller.

7.3.1. Starting the Sysmac Studio and Setting the EtherCAT Network Configuration

Start the Automation Software Sysmac Studio and set the EtherCAT network configuration. Install the software and USB driver beforehand.

1. Start the Sysmac Studio. Click the **New Project** Button.

   *If a confirmation dialog for an access right is displayed at start, select to start.

2. The Project Properties Dialog Box is displayed.

   *In this document, New Project is set as the project name.

   Select **1.01** from the Version pull-down menu.

3. Click the **Create** Button.
4 The New Project is displayed. The left pane is called Multiview Explorer, the right pane is called Toolbox and the middle pane is called Edit Pane.

5 Select the **Communications Setup** from the Controller Menu.

6 The Communications Setup Dialog Box is displayed. Select **Direct Connection via USB** Option from Connection Type.

   Click the **OK** Button.

7 Select **Online** from the Controller Menu.

   A confirmation dialog is displayed. Click the **Yes** Button.

   *A displayed dialog depends on the status of the Controller used. Select the **Yes** Button or other button to proceed with the processing.*
### Additional Information

For details on the online connections to a Controller, refer to Section 5 Going Online with a Controller of the Sysmac Studio Version 1.0 Operation Manual (Cat. No. W504).

---

#### 7. Connection Procedure

8. When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.

9. Select **Mode - Program Mode** from the Controller Menu.

10. A confirmation dialog is displayed. Click the **Yes** Button. Confirm that the controller status on the Toolbox is changed to the PROGRAM mode.

11. Double-click **EtherCAT** under Configurations and Setup in the Multiview Explorer. Or, right-click **EtherCAT** under Configurations and Setup and select **Edit**.

12. The EtherCAT Tab Page is displayed in the Edit Pane.
7. Connection Procedure

13 Right-click **Master** on the EtherCAT Tab Page, and select **Compare and Merge with Actual Network Configuration**.

A screen is displayed stating "Get information is being executed".

14 The **Compare and Merge with Actual Network Configuration** Pane is displayed. Node address 1 and 3G3AX-RX-ECT Rev:1.0 are added to the Actual network configuration after the comparison. Click the **Apply actual network configuration** Button.

15 A confirmation dialog box is displayed. Click the **Apply** Button. Confirm that node address 1 and E001 3G3AX-RX-ECT Rev:1.0 are added to the Network configuration on Sysmac Studio. Click the **Close** Button.

16 Node address 1 and E001 3G3AX-RX-ECT Rev:1.0 are added to the EtherCAT Tab Page in the Edit Pane.
7. Connection Procedure

7.3.2. Setting the Device Variables
Set the device variables used for the EtherCAT Slave Unit.

1. Select **Offline** from the Controller Menu.

   The yellow bar on the top of the Edit Pane disappears.

2. Double-click **I/O Map** under Configurations and Setup on the Multiview Explorer. Or right-click **I/O Map** under Configurations and Setup and select **Edit**.

3. The I/O Map Tab is displayed on the Edit Pane.
   *In this document, create variable names automatically by following step 4. To enter variable names individually, click a column under Variable.*

4. Right-click the row for Node1 and 3G3AX-RX—ECT. Then, select **Create Device Variable**.
The Variable names and Variable Types are automatically set.

**Additional Information**

The device variable names are created automatically from a combination of the device names and the I/O port names. For slave units, the default device names start with an "E" followed by a sequential number starting from "001".

**Additional Information**

Although the device variable names are automatically created by slaves in the example above, they can be automatically created by I/O ports. Also, you can set any device variables.
### 7. Connection Procedure

#### 7.3.3. Transferring Project Data

Transfer the project data from the Sysmac Studio to the Controller.

---

**WARNING**

Always confirm safety at the destination node before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio. The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.

---

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select <strong>Online</strong> from the Controller Menu.</td>
</tr>
<tr>
<td>2</td>
<td>Select <strong>Synchronization</strong> from the Controller Menu.</td>
</tr>
<tr>
<td>3</td>
<td>The Synchronization Dialog Box is displayed. Confirm that the data to transfer (NJ501 in the right figure) is selected. Then, click the <strong>Transfer to Controller</strong> Button.</td>
</tr>
<tr>
<td>4</td>
<td>A confirmation dialog is displayed. Click the <strong>Yes</strong> Button. A screen stating “Synchronizing” is displayed.</td>
</tr>
</tbody>
</table>
5 Confirm that the synchronized data is displayed with the color specified by “Synchronized” and that a message is displayed stating “The synchronization process successfully finished”.

If there is no problem, click the Close Button.

*If the synchronization fails, check the wiring and repeat the procedure described in this section.
7. Connection Procedure

7.4. Connection Status Check

Check the EtherCAT network connection status.

7.4.1. Checking the Connection Status

Confirm that EtherCAT communications are performed normally.

Check the LED indicators on the Controller and confirm that the EtherCAT communications are performed normally.

LED indicators in normal status:
- [NET RUN]: Lit green
- [NET ERR]: Not lit
- [LINK/ACT]: Flashing yellow

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Color</th>
<th>Status</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherCAT NET RUN</td>
<td>RUN</td>
<td>Green</td>
<td>Lit</td>
<td>EtherCAT communications are in progress:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
<td>• I/O data is being input and output.</td>
</tr>
<tr>
<td>EtherCAT NET ERR</td>
<td>ERROR</td>
<td>Red</td>
<td>Lit</td>
<td>EtherCAT communications are stopped.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
<td>• Power is OFF or the link is being reset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not lit</td>
<td>• There is a MAC address error, communica-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>tions controller error, or other error.</td>
</tr>
<tr>
<td>EtherCAT LINK/ACT</td>
<td>Link/Activity</td>
<td>Yellow</td>
<td>Flashing</td>
<td>A link is established and data is being</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sent and received.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not lit</td>
<td>The indicator flashes whenever data is sent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or received.</td>
</tr>
</tbody>
</table>

**Built-in EtherNet/IP port 100Base-TX/10Base-T**

**Built-in EtherCAT port 100Base-TX**

**EtherCAT master indicators**

1
Check the LED indicators on the Inverter.

LED indicators in normal status:
- [L/A IN]: Flickering
- [RUN]: Lit green
- [ERR]: Not lit

The LED indicators flash at the same timing as those of the Controller.

### [PWR] indicator
Indicates the unit power supply status.

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>OFF</td>
<td>Unit power OFF state</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>The unit power (24 VDC) is supplied to the Slave Unit</td>
</tr>
</tbody>
</table>

### [L/A IN] indicator
Indicates the communication state (input side).

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>OFF</td>
<td>Link not established in electrical layer</td>
</tr>
<tr>
<td></td>
<td>Flickering</td>
<td>In operation after establishing link</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>Link established in physical layer</td>
</tr>
</tbody>
</table>

### [RUN] indicator
It indicates the operation state.

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>OFF</td>
<td>Init state</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Pre-Operational state</td>
</tr>
<tr>
<td></td>
<td>Single flash</td>
<td>Safe-Operational state</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>Operational state</td>
</tr>
</tbody>
</table>

### [ERR] indicator
It indicates the information of an error.

<table>
<thead>
<tr>
<th>Color</th>
<th>State</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>OFF</td>
<td>No error</td>
</tr>
<tr>
<td></td>
<td>Blinking</td>
<td>Communications setting error</td>
</tr>
<tr>
<td></td>
<td>Single flash</td>
<td>Synchronization error or communications data error</td>
</tr>
<tr>
<td></td>
<td>Double flash</td>
<td>Application WDT timeout</td>
</tr>
<tr>
<td></td>
<td>Flickering</td>
<td>Boot error</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>PDI WDT timeout</td>
</tr>
</tbody>
</table>
7. Connection Procedure

7.4.2. Checking Data That Are Sent and Received
Confirm that the correct data are sent and received.

⚠️ WARNING

The Inverter will run if you proceed to this section. Confirm safety before operation. If you cannot confirm safety, do not proceed to this section after completing until Section 7.4.1. If you proceed to this section, make sure to complete all the steps and place the Inverter in the safe state.

⚠️ Caution

Sufficiently confirm safety before you change the values of variables on a Watch Tab Page when the Sysmac Studio is online with the CPU Unit. Incorrect operation may cause the devices that are connected to Output Units to operate regardless of the operating mode of the Controller.

1. Select **Mode - RUN Mode** from the Controller Menu.

A confirmation dialog box is displayed. Click the **Yes** Button.

2. RUN mode is displayed on the Controller Status Pane.
3 Select Watch Tab Page from the View Menu.

4 The Watch Window (Controller) Tab Page is displayed in the lower section of the Edit Pane.

5 Click the column that says Input Name... under Name at the bottom of the Watch Window (Controller).

6 Now, characters can be entered. Enter the device variable name. Enter E001_Command (operation command to Inverter). Type the first character E. A list of device variables starting with E is displayed. Scroll the list and select E001_Command. Double-click E001_Command. E001_Command is entered in the Name Column.

7 In the same way, enter the following variables. Output frequency: E001_Frequency_reference Status: E001_Status Output frequency monitor: E001_Output_frequency_monitor

8 Check that the online value of E001_Status is 0200 (bit 9: Remote is 1).

*Status bit 9: Remote
  0:Local (Operations from EtherCAT are disabled)
  1:Remote (Operations from EtherCAT are enabled)
7. Connection Procedure

9. Enter "100" in (E001_Frequency_reference) Output frequency.

10. Check that the RUN LED indicator on the Inverter is unlit and the 7-segment display (Output frequency) shows "0.00"

11. Enter "1" in the E001_Command (Operation command to Inverter).

*Command bit 0: Forward/stop
0: Stop
1: Forward command

Command

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 0   | Forward/stop | 0: Stop
1: Forward command |
| 1   | Reverse/stop | 0: Stop
1: Reverse command |
| 7   | Fault reset  | Resets an error or trip for the unit or Inverter. |
| -   | (Reserved)   | The reserved area. Set 0.                         |

12. Check that E001_Status is "1201" and E001_Output_frequency_monitor (Output frequency monitor) is "100".

*Status bit 0: Forward Operation in progress
0: Stopped/during reverse operation
1: During forward operation
*Status bit 12: Frequency matching
0: During acceleration/deceleration
1: Frequency matched

Status

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 0   | Forward operation in progress 0: Stopped/during reverse operation
1: During forward operation |
| 1   | Reverse operation in progress 0: Stopped/during forward operation
1: During reverse operation |
| 3   | Fault                        0: No error or trip occurred for the unit or Inverter
1: Error or trip occurred for the unit or Inverter |
| 7   | Warning                      0: No warning occurred for the unit or Inverter
1: Warning occurred for the unit or Inverter |
| 9   | Remote                      0: Local (Operations from EtherCAT are disabled)
1: Remote (Operations from EtherCAT are enabled) |
| 12  | Frequency matching           0: During acceleration/deceleration
1: Frequency matching |
| 15  | Connection error between the Optional Unit and Inverter 0: Normal
1: Error (Cannot update data for the Inverter. To restore, turn the power OFF and then ON again.) |
| -   | (Reserved)                  | The reserved area.                                          |
7. Connection Procedure

13 Check that the RUN LED indicator on the Inverter is lit and the 7-segment LED indicator (Output frequency) shows "1.00".

14 Enter "0" in \textit{E001\_Frequency\_reference} (Output frequency).
   Enter "0" in \textit{E001\_Command} (Operation command to Inverter).

15 Check that the 7-segment LED display (Output frequency) on the Inverter returns to "0.00" and RUN LED indicator is unlit.
8. Initialization Method

This document explains the setting procedure from the factory default setting. If the device settings have been changed from the factory default setting, some settings may not be applicable as described in this procedure.

8.1. Controller

To initialize the settings of the Controller, select *Clear All Memory* from the Controller Menu of the Sysmac Studio.

![Clear All Memory](image)

8.2. Inverter

For information on how to initialize the Inverter, refer to 5-1-2 Parameter Initialization in the *High-function General-purpose Inverter 3G3RX-V1 User’s Manual* (Cat. No. I578).
# 9. Revision History

<table>
<thead>
<tr>
<th>Revision code</th>
<th>Date of revision</th>
<th>Revision reason and revision page</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Mar. 26, 2013</td>
<td>First edition</td>
</tr>
</tbody>
</table>