Mitutoyo

Interface Unit EtherCAT for EJ Counter

User's Manual

- Instructions for use -

Read this document thoroughly before operating the product. After reading, retain it close at hand for future reference.
This English language version of the document contains the original instructions.

- For the related User's Manuals, see "■ Positioning of this document, document map" on page 1.

No. 99MBC158A1
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■ Product names and model numbers covered in this document

● Product name

Product name	Interface Unit EtherCAT for EJ Counter

■ Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the product, caused by its use not conforming to the procedure described in this document.
- In the event of loss or damage to this document, immediately contact the agent where you purchased the product or a Mitutoyo sales office.
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety Precautions" on page 6 and "Precautions for Use" on page 6.
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- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Contents

About This Document

■ Positioning of this document, document map

The position of this document and its relationship to other product documentation are as follows.

● Interface unit manual

Interface Unit Quick Start Guide	Explains setup, specifications and troubleshooting. This document is included in the product package together with the Interface Unit. (Common to all interface unit models)
Interface Unit EtherCAT User's Manual (This Document)	This is the User's Manual that explains the Interface Unit EtherCAT in detail.

● Counter manual

EJ Counter Quick Start Guide	Explains handling precautions, operating procedures, specifications, troubleshooting for EJ Counters to which the Interface Unit EtherCAT is connected for use. For details, see EJ Counter User's Manual. This document is included in the product package together with the EJ Counter.
EJ Counter User's Manual	This is the User's Manual that provides a detailed explanation of the EJ Counter that is connected to the Interface Unit EtherCAT. Not included with product. Please download the manual from Mitutoyo's web site (https://manual.mitutoyo.co.jp).

● Linear Gage manual

LG100 User's Manual	Explains installation procedures, specifications, maintenance and so forth for Linear Gages that can be connected to EJ Counters. Select and purchase Linear Gages according to your application.
LG200 User's Manual	
LGB User's Manual	

■ Intended readers and purpose of this document

● Intended readers

This manual is intended for customers who are installing or using the Interface Unit EtherCAT for EJ Counter for the first time.

● Purpose

The purpose of this document is to help you understand the product overview, functions of each part, procedures for use and care of the product.

Conventions Used in This Document

■ Safety reminder conventions warning against potential hazards

⚠CAUTION	Indicates a hazard with a low level of risk which, if not avoided, **could result in minor or moderate injury**.
NOTICE	Indicates a situation which, if not avoided, **may result in property damage**.

■ Conventions indicating prohibited and mandatory actions

	Indicates concrete information about prohibited actions.
	Indicates concrete information about mandatory actions.
	Indicates that grounding needs to be implemented.

■ Conventions indicating referential information or reference location

IMPORTANT	Indicates information that must be known when using the product.
Tips	Indicates further information and details relevant for the operating methods and procedures that are explained in that section.
	Indicates reference location if there is information that should be referred to in this document or an extraneous User's Manual. Example: For details about XX, see "1.1 Names of Parts" on page 5 in "1 Overview".

■ Other conventions

( ): Round brackets	Represent a paraphrase of an immediately preceding phrase or a supplementary explanation.
" ": Double quotation marks	Represent a highlighted phrase. They also indicate an index where information to be referenced is described.
[ ]: Square brackets	Indicates the name of an operation key.
1, **2**, **3** 1, 2, 3, ...	Indicates the order and the contents of tasks. (**1**: indicates main tasks, 1: indicates detailed tasks)
»	Indicates the action resulted from some operation(s).

■ Example of conventions use

2.1.2 Linking to EJ Counters

Link this product to EJ Counters.
Up to eight EJ Counters can be linked to this product.

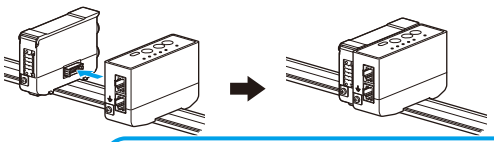
Tips
The interface unit is intended for use with the EJ-102N (Code No. 542-080) and EJ-102NE (Code No. 542-081) EJ Co[illegible]

1 **Remove the protective covers from the counter linkage connectors of this product and the EJ Counter.**

2 **Attach this product to the DIN rail on the side facing the EJ Counter's counter linkage connector (male).**

Tips
For details, see □□ "2.1.1 DIN Rail Attachment / Removal" on page 22.

3 **Link the product to the EJ Counter.**
Slide the product or EJ Counter along the DIN rail to fully mate the counter linkage connector on the product (female) with the counter linkage connector (male) on the EJ Counter.



NOTICE
Do not link more than eight EJ Counters together. Failure to observe this precaution may result in damage.

IMPORTANT
When sliding this product or EJ Counters along the DIN rail, move them slowly.

Indicates an operating procedure to be performed or its outline.

Indicates reference to some other document or section.

Indicates safety information.

Indicates important information that must be known when using the product.

Safety Precautions

Read these "Safety Precautions" thoroughly before operating the product to use it properly.

These safety precautions include such information as to prevent injury to the operator and other persons, damage to property and product defects. Be sure to observe these precautions carefully.

■ Precautions for this product

⚠CAUTION

	Do not disassemble or modify this product. Otherwise you may be subject to electric shock, and there is a risk of fire due to a short circuit caused by metallic powders that have gotten inside the product.

Precautions for Use

■ Use and handling of the product

● Use this product only by connecting to measuring instruments which supports this product.

Do not use this product for measuring instruments which does not support this product.

For measuring instruments supported by this product, contact the agent where you purchased the product or a Mitutoyo sales office.

● This product is a measuring instrument.

Do not use it for any purposes other than measuring.

● This product is for industrial usage.

Do not use this product for purposes other than for industrial usage.

● The product is a precision instrument.

Handle this product with care. Do not apply excessive shock or force to any of the parts during operation.

■ Environment for placement

This product is designed for indoor use. To ensure that the product is used in a suitable environment, take the following conditions into account when installing it.

- Vibration
  Install this product in an environment where it will be subject to minimal vibration. Using this product in a place with significant vibration for an extended period of time may result in malfunction of the precision components.
- Dust
  Dust in the installation site negatively affects the electrical components. Install this product in an environment where it will be subject to minimal dust.
- Sunlight
  If this product is exposed to direct sunlight, the heat will cause deformations in the main unit, negatively affecting its operation. If installing this product in an environment that is exposed to direct sunlight, such as near a window, is unavoidable, protect it from the sunlight by curtaining it off, etc.
- Ambient temperature and humidity
  Avoid using the product in any place that is subject to sudden changes in temperature or humidity.

When using this product in the following environments, take necessary shielding measures.

- Where noise is generated due to static electricity, etc.
- Where there is strong electrical field intensity
- Where power wires and motor lines pass nearby
- Where there is risk of direct contact with materials such as chips, cutting fluids or water
- Where there is risk of exposure to radiation
- Where there is the risk of exposure to corrosive gas

■ Maintenance

Do not use organic solvents such as thinner or benzine. Gently wipe dirt off of the product with a soft, tightly woven cloth.

■ Power supply

Be sure to connect this product to ground.

Provide a power supply with capacity sufficient to accommodate switch-on surge current.

Tips

This product is supplied with power by the connected EJ Counter.

Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive and the UK Electromagnetic Compatibility Regulations; however, if this receives electromagnetic interference that exceeds these requirements, it will be out of warranty and require appropriate measures.

This product is an industrial product, and is not intended to be used in residential environment. If this product is used in residential environment, this product may cause electromagnetic interference with other instruments. In such a case, it is required to take appropriate measures for preventing such electromagnetic interference.

Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of Export Trade Control Order or under Category 16 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country.

Also, if an option is added or modified to add a function to this product, this product may fall under the category of List-Control Goods, List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of Export Trade Control Order or under Category 1 - 15 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. In that case, if you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country. Please contact Mitutoyo in advance.

Notes on Export to European Countries

When you intend exporting of this product to any of the European countries, it may be required to provide User's Manual(s) in English and Declaration of Conformity in English (in some cases, the official language of the country to be exported). For detailed information, please contact Mitutoyo in advance.

Disposal of Products outside the European Countries

Please follow the official instruction in each community and country.

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Countries with Separate Collection Systems)

This symbol on the product or on its packaging is based on WEEE Directive (Directive on Waste Electrical and Electronic Equipment), and this symbol indicates that this product shall not be treated as household waste.

To reduce the environmental impact and minimize the volume of landfills, please cooperate in reuse and recycle.

For how to dispose of the product, please contact the agent where you purchased the product or a Mitutoyo sales office.

China RoHS Compliance Information

This product meets China RoHS requirements. See the table below.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
本体	×	○	○	○	○	○
配件	○	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

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电器电子产品只要按照安全及使用说明内容在正常使用情况下,从生产日期算起,在此期限内产品中含有的有毒有害物质不致发生外泄或突变,不致对环境造成严重污染或对其人身、财产造成严重损害。

产品使用后,要废弃在环保使用年限内或者刚到年限的产品,请根据国家标准采取适当的方法进行处置。

另外,此期限不同于质量/功能的保证期限。

Warranty

This product has been manufactured under strict quality management, but should it develop problems within one year of the date of purchase in normal use, repair shall be performed free of charge. Please contact the agent where you purchased the product or Mitutoyo sales representative ("SERVICE NETWORK" on page App-1). This warranty, however, shall not affect any provisions of the Mitutoyo Software End User License Agreement.

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

- Failure or damage owing to fair wear and tear
- Failure or damage owing to inappropriate handling, maintenance or repair, or to unauthorized modification
- Failure or damage owing to transport, dropping, or relocation of the product after purchase
- Failure or damage owing to fire, salt, gas, abnormal voltage, lightning surge, or natural disaster
- Failure or damage owing to use in combination with hardware or software other than those designated or permitted by Mitutoyo
- Failure or damage owing to use in ultra-hazardous activities

This warranty is effective only where the product is properly installed and operated in conformance with the instructions in this document within the original country of the installation.

EXCEPT AS SPECIFIED IN THIS WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES OF ANY NATURE WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OR WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE, ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT ALLOWED BY APPLICABLE LAW.

You assume responsibility for all results due to the selection of this product to achieve your intended results.

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1 Overview

This chapter describes the Interface Unit EtherCAT for EJ Counter product overview, name and functions of each part.

1.1 About EtherCAT

EtherCAT is a high-speed, high-efficiency Ethernet-based open network system that was developed for industrial use by Beckhoff Automation GmbH.

Because it uses standard Ethernet technology as its physical layer, it allows use of ordinary Ethernet cables.

While EtherCAT supports a variety of communication protocols, this product is designed to use the CANopen over EtherCAT (CoE) protocol.

CoE references an object dictionary to enable the following two types of communication.

- PDO communication: Transfer of process data between master and slave at a fixed interval using process data objects (cyclic communication).
- SDO communication: Asynchronous mailbox communication (messaging) using service data objects.

1.2 Main Functions and Features

This product is an interface unit for use with the EJ Counter.

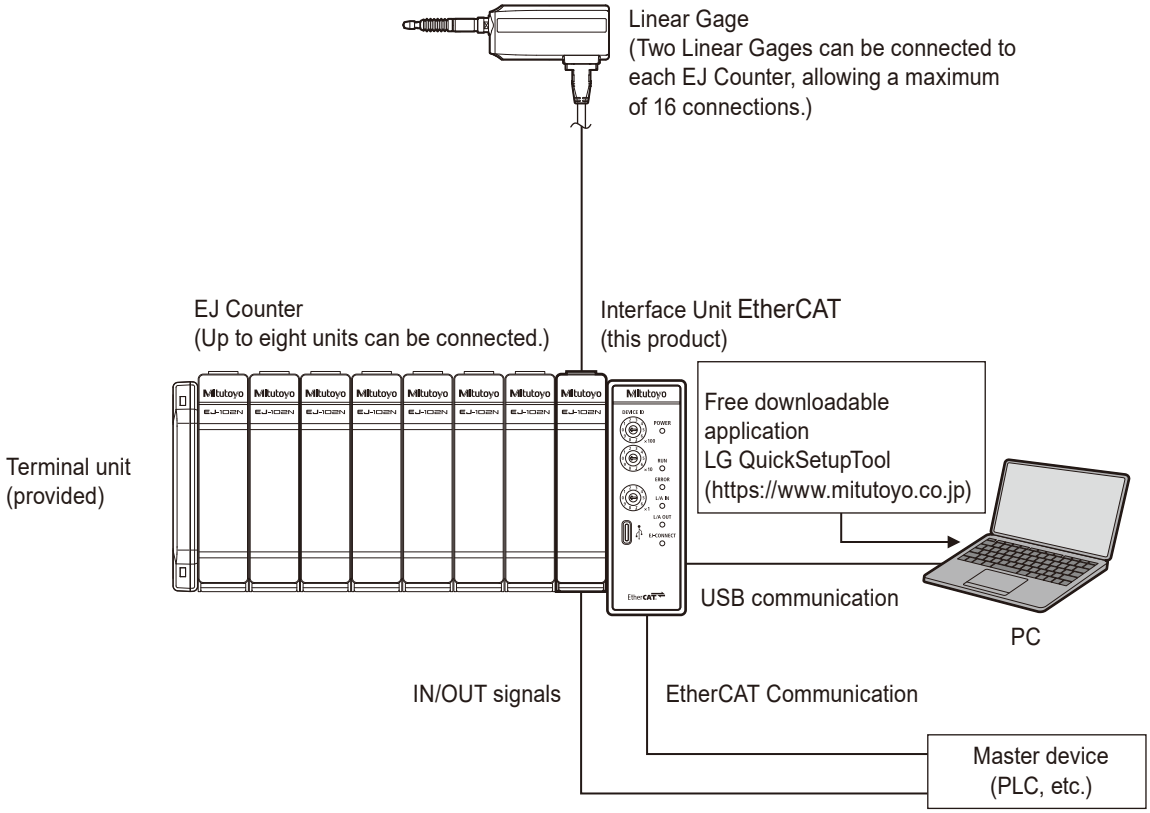
- This is a compact and space-saving interface unit, which is attached to a DIN rail to be used.
- It supports both USB communication and EtherCAT communication.
- Linear Gage measurements read by the EJ Counter can be output to external devices such as a PC and or PLC (programmable logic controller). Also, tolerance judgment results obtained by EJ Counters can be output.
- This product can be coupled to up to eight EJ Counters, allowing data output from up to 16 Linear Gages.
- EJ Counter parameter settings can be made via PC or PLC (programmable logic controller).
- The LG QuickSetupTool application software (freeware) is used to make EJ Counter settings and display measurements using USB communication.

Tips

Please download the LG QuickSetupTool application from Mitutoyo's web site (https://www.mitutoyo.co.jp).

The LG QuickSetupTool is compatible with the Windows 10 operating system. No assurance is provided of full operability in any given operating environment. While use of this application is free of charge, the customer must bear communication charges incurred during download of the software.

1.3 System Configuration



IMPORTANT

Be sure to attach the terminal unit.

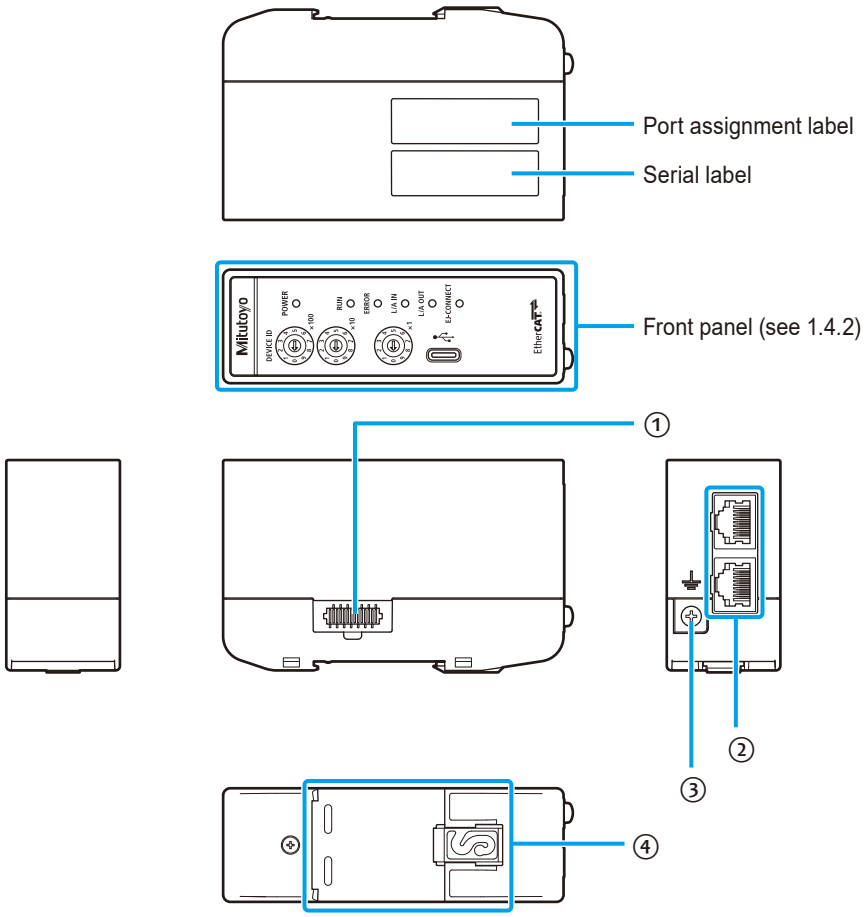
Normal communication between this product and EJ Counters requires attachment of the terminal unit.

Tips

- This product must be connected to an EJ Counter for use. It cannot be used by itself.
- For details on the EJ Counter, see the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".
- Select and purchase Linear Gages according to your application.
- A PC and master device (PLC, etc.) must be provided by the customer.

1.4 Part Names

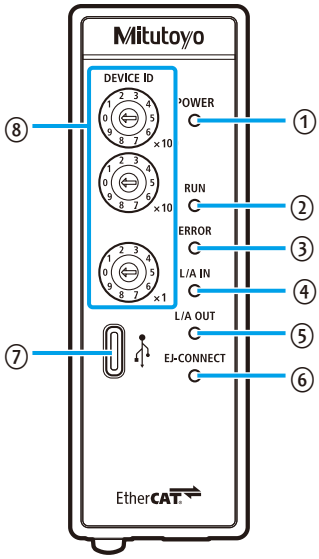
1.4.1 Main Unit



No.	Name	Description
①	Connector for linking counter	Connect to an EJ Counter.
②	EtherCAT communication connector (RJ45 connector)	Connect to an EtherCAT network using a commercially-available LAN cable (compatible with the EtherCAT communication standard). The connector on the DIN rail side (at the bottom of the illustration) is EtherCAT IN, and the one on the front side (at the top of the illustration) is EtherCAT OUT. **Tips** Use STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables.

No.	Name	Description
③	Grounding terminal	Connect to ground using the provided ground wire. **Tips** • The provided ground wire is to be used only for connecting the ground terminal on the interface unit to the ground terminal on the EJ Counter. • Overall grounding of coupled units is to be made using the ground wire provided with the EJ Counter. For details, see 📖 the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".
④	DIN rail attachment point	Used for attaching this product to a DIN rail.

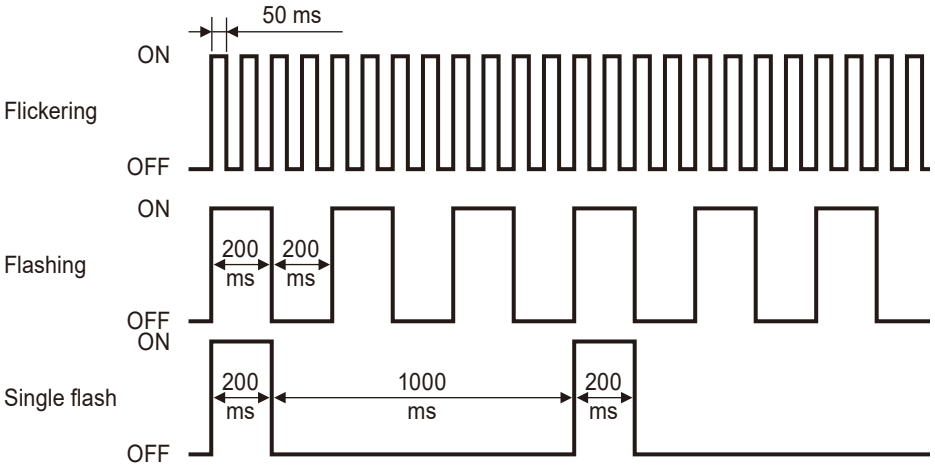
1.4.2 Front Panel

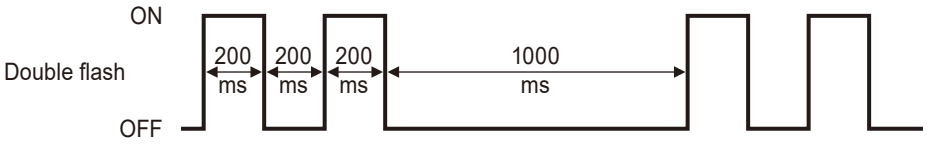


No.	Name	Description
①	[POWER] indicator	Lights when power is supplied to the unit.
②	[RUN] indicator	Indicates the EtherCAT communication status of the product. * Off Power is off or the product is in the initialized state. Lit The product is in the operational state. Flashing The product is in the pre-operational state. Single flash The product is in the safe-operational state. **Tips** For details on communication states, see 📖 "4.2 EtherCAT Communication Status Transition" on page 47.

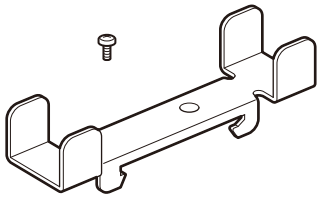
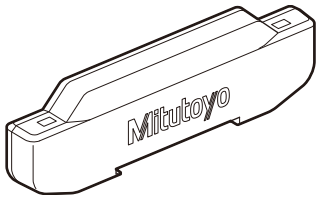
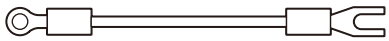
No.	Name	Description
③	[ERROR] indicator	Flashes in the event of an EtherCAT communication error. * Off No abnormality. Flashing Receipt of incorrect communication settings from the master device. Single flash Communication data abnormality. Double flash Communication timeout detected. Flickering Initialization error.
④	[L/A IN] indicator	Lights or flashes during communication through EtherCAT IN of the EtherCAT communication connector.
⑤	[L/A OUT] indicator	Lights or flashes during communication through EtherCAT OUT of the EtherCAT communication connector.
⑥	[EJ-CONNECT] indicator	Lights during communication between the unit and an EJ Counter. Lights off or flashes to indicate an error during communication with an EJ Counter. **Tips** For details about when the indicator is out or flashing (when an error occurs), see "6 Troubleshooting" on page 73.
⑦	USB connector (Type-C)	Allows USB connection to a PC.
⑧	[DEVICE ID] switch	Sets the Device ID of this product (0 to 999). When the Device ID is set to 0, the product is not used. Sets the hundreds place with [x100] switch, the tens place with the [x10] switch, and the ones place with the [x1] switch **Tips** For details about settings, see "4.3.2 Setting the Device ID" on page 49.

* The timings at which the [RUN] and [ERROR] indicators flash are as indicated below.




ON
Double flash
OFF
200 ms
200 ms
200 ms
1000 ms

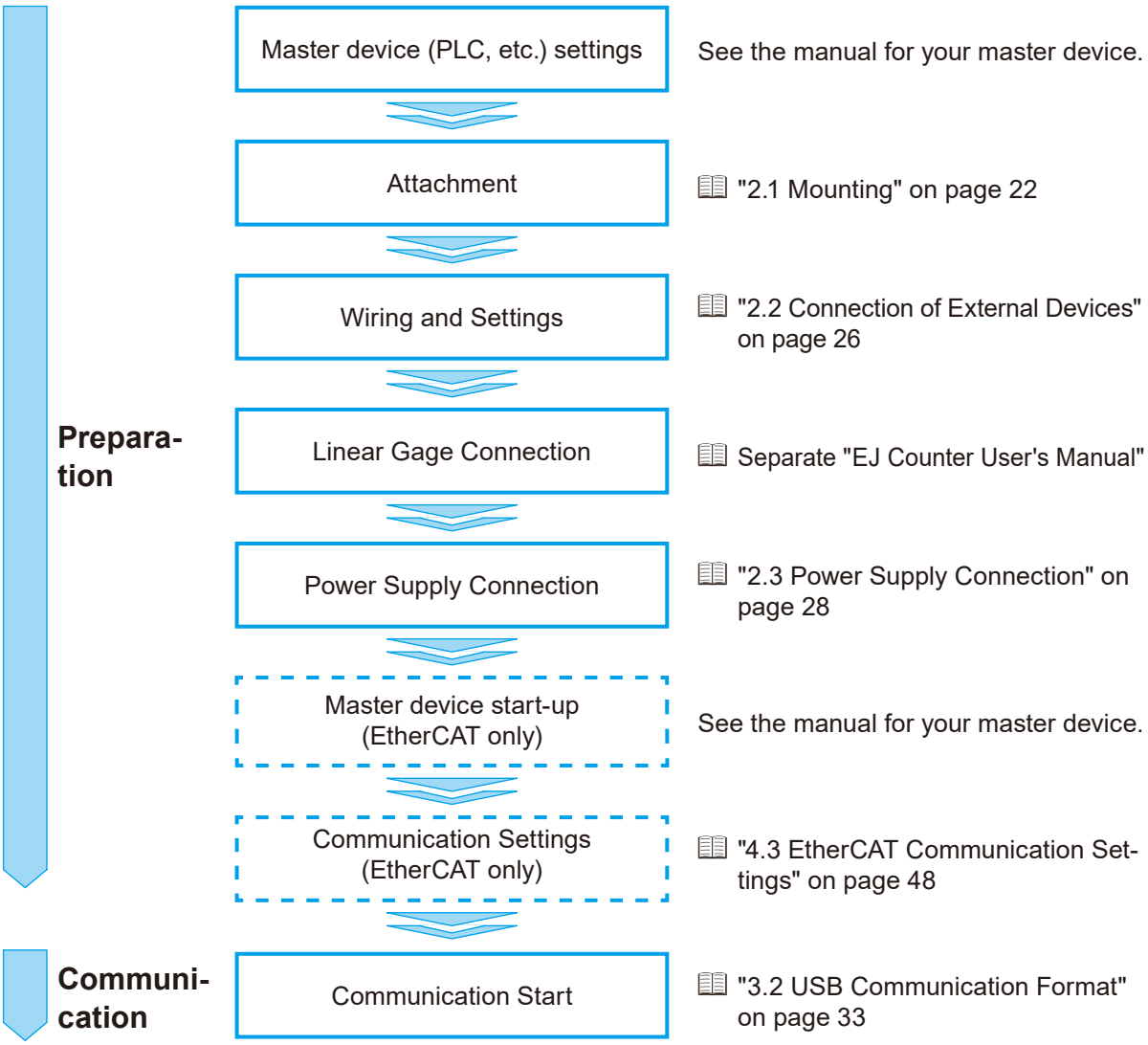
1.5 Standard Accessories

Name	Quantity	Description
DIN rail fixing bracket 	2	Used to fasten the unit and EJ Counter(s) to a DIN rail. Fasten the bracket to the DIN rail using an M4 screw. **Tips** The screw provided with the bracket is suitable for fastening to a TH35-7.5 rail. For details, see 📖 "2.1.3 Attaching the DIN Rail Fixing Bracket" on page 24.
Terminal unit 	1	The terminal unit is required for communication between this unit and EJ Counters. Attach it to the EJ Counter furthest from the interface unit. **IMPORTANT** Be sure to attach the terminal unit. Normal communication between this product and EJ Counters requires attachment of the terminal unit. **Tips** For details, see 📖 "2.1.2 Linking to EJ Counters" on page 23.
Ground wire 	1	Use this wire to connect the ground terminal on the interface unit to the ground terminal on the EJ Counter. **Tips** For details, see 📖 "2.3.1 Ground Connection" on page 28.
Quick Start Guide	1	99MBC146B
WEEE User's Manual	1	
Warranty	1	

1.6 Operation Flow

The basic flow of operation is explained below.

Be sure to perform operations enclosed by solid lines. Perform operations enclosed by dashed lines as necessary.



See the manual for your master device.

"2.1 Mounting" on page 22

"2.2 Connection of External Devices" on page 26

Separate "EJ Counter User's Manual"

"2.3 Power Supply Connection" on page 28

See the manual for your master device.

"4.3 EtherCAT Communication Settings" on page 48

"3.2 USB Communication Format" on page 33

"4.4 EtherCAT Communication Format" on page 50

MEMO

2 Setup

2.1 Mounting

2.1.1 DIN Rail Attachment / Removal

This product is attached to a DIN rail for use.

IMPORTANT

Attach this product to or remove it from the DIN rail a single unit at a time after first disconnecting USB cables and connector plugs.

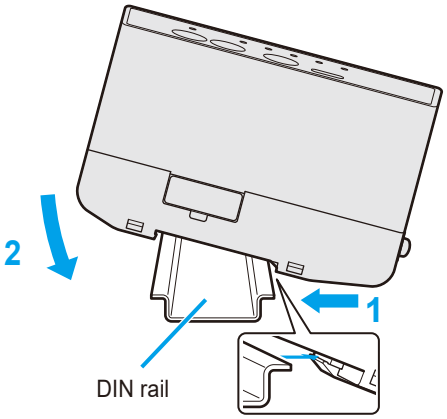
Tips

A DIN rail must be provided by the customer.

Suitable DIN rail type names (IEC 60715): TH35-7.5Al, TH35-7.5Fe, TH35-15Fe

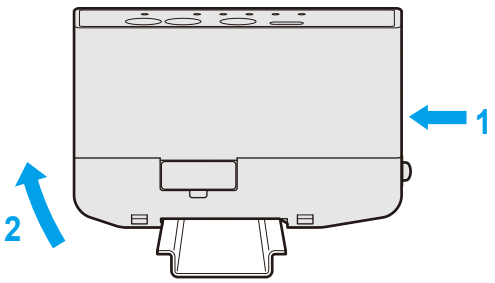
■ Attachment

Press the clip (gray) on the rear side of this product onto the DIN rail, and then hook the clip on the opposite side onto the DIN rail.



■ Removal

Pressing this product in the direction indicated by arrow 1, raise the clip on the opposite side so that it comes clear of the rail.



2.1.2 Linking to EJ Counters

Link this product to EJ Counters.
Up to eight EJ Counters can be linked to this product.

Tips
The interface unit is intended for use with the EJ-102N (Code No. 542-080) and EJ-102NE (Code No. 542-081) EJ Counters. These two types of EJ Counters can be used in mixed configurations.

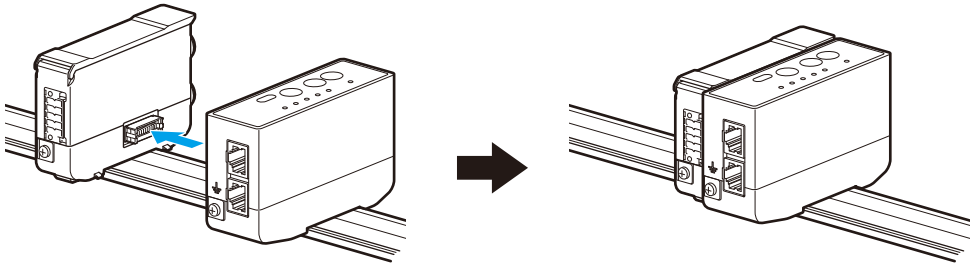
1 Remove the protective covers from the counter linkage connectors of this product and the EJ Counter.

2 Attach this product to the DIN rail on the side facing the EJ Counter's counter linkage connector (male).

Tips
For details, see "2.1.1 DIN Rail Attachment / Removal" on page 22.

3 Link the product to the EJ Counter.

Slide the product or EJ Counter along the DIN rail to fully mate the counter linkage connector on the product (female) with the counter linkage connector (male) on the EJ Counter.



NOTICE
Do not link more than eight EJ Counters together. Failure to observe this precaution may result in damage.

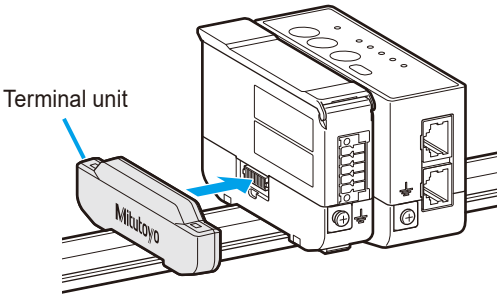
IMPORTANT
When sliding this product or EJ Counters along the DIN rail, move them slowly.

4 **Attach the provided terminal unit to the counter linkage connector (female) on the EJ Counter.**

Attach the terminal unit to the EJ Counter furthest from this product.

IMPORTANT

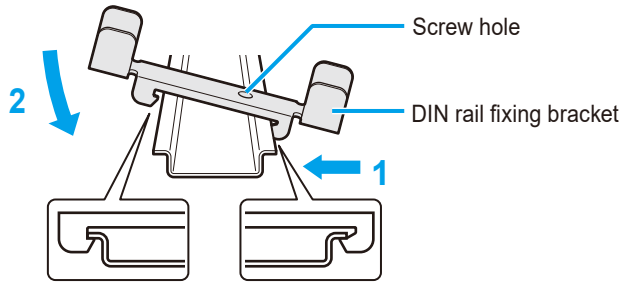
Be sure to attach the terminal unit. Normal communication between this product and EJ Counters requires attachment of the terminal unit.



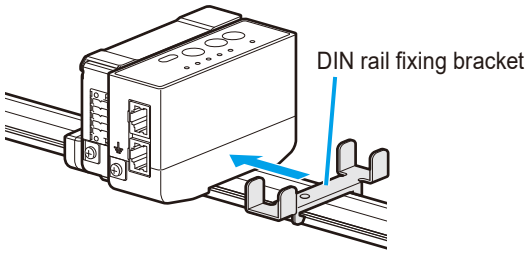
2.1.3 Attaching the DIN Rail Fixing Bracket

This product and EJ Counters are fastened to the DIN rail using the provided DIN rail fixing brackets.

1 **Hook the clip that is closer to the screw hole in the fixing bracket onto the DIN rail, then press toward the opposite side and hook the other clip onto the rail.**



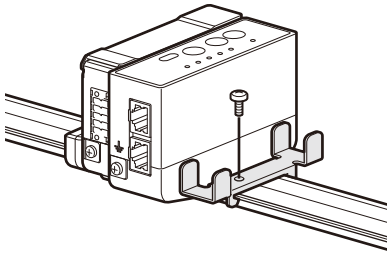
2 **Slide the fixing bracket along the DIN rail to where it comes in contact with this product.**



3 **Fasten the fixing bracket in place by threading the screw provided with the fixing bracket into the screw hole in the bracket, and then tightening the screw so that it presses against the DIN rail, immobilizing the fixing bracket.**

Tips

The screw provided with the bracket is suitable for fastening to a TH35-7.5 rail.
A different screw (M4) must be used for fastening to a TH35-15 rail.



4 **Repeat step 1 through 3 to attach the other fixing bracket also to the side with the terminal unit.**

2.2 Connection of External Devices

Connection between this product and external devices such as a PC or PLC (programmable logic controller) is made by USB or EtherCAT communication.

2.2.1 USB Connection

Use a USB cable to connect the USB connector (Type-C) on the front panel of this product to a USB connector on the PC.

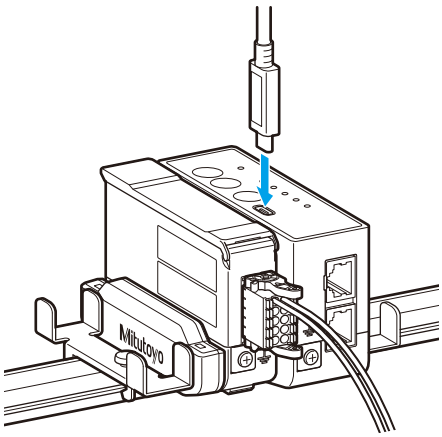
IMPORTANT

For permanent USB cable connection, fasten the cable so that it does not place any strain on the USB connectors.

NOTICE

This product requires a Type-C USB connector.

Note that connectors other than Type-C (such as miniB and microB) cannot be used.



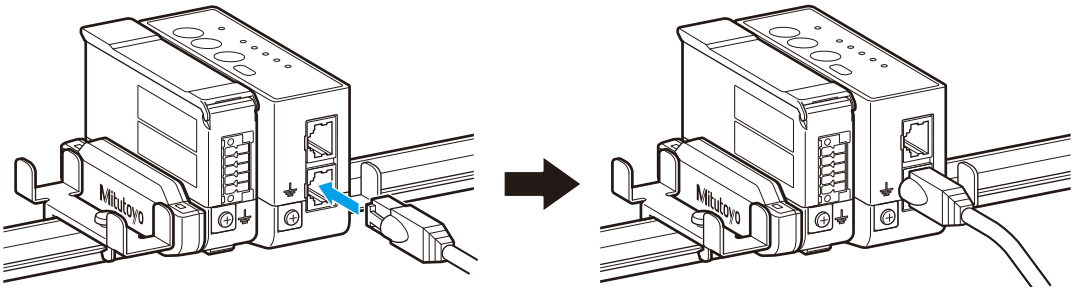
2.2.2 EtherCAT Connection

Connect the communication cable from the master device to the EtherCAT communication connector (EtherCAT IN) on this product.

When expanding the network, you can connect another device to the EtherCAT communication connector (EtherCAT OUT).

Tips

- Use STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables.
- This product does not support optical communication or single-pair Ethernet.
- Make sure that communication cable length does not exceed 30 m.
- Depending on the PLC, performing the following operations may prevent normal EtherCAT communication. When building your network, refer to your PLC manual.
  - Connection of a device that does not support EtherCAT communication to an EtherCAT communication connector
  - Connecting/disconnecting a communication cable while the PLC is in the RUN state
- If electrical noise causes EtherCAT communication errors, attach a clamp filter (TOKIN ESD-SR-250 or equivalent) with the two turns of the communication cable at a point adjacent to this product.



2.3 Power Supply Connection

This section describes the power supply connection procedure.

IMPORTANT

Provide a power supply with capacity sufficient to accommodate switch-on surge current.

Tips

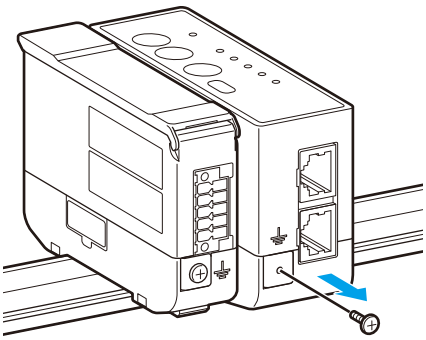
- Prepare for EtherCAT communication by making EtherCAT communication connections and settings. For details, see "4.3 EtherCAT Communication Settings" on page 48.
- This product is supplied with power by the connected EJ Counter.

2.3.1 Ground Connection

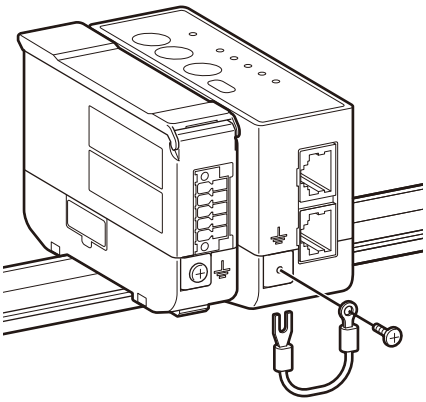
This product is grounded through the connected EJ Counter. Use the provided ground wire for connecting this product to the EJ Counter.

Be sure to connect this product to ground before connecting it to the power supply. Failure to ground the product will make it susceptible to electrical noise.

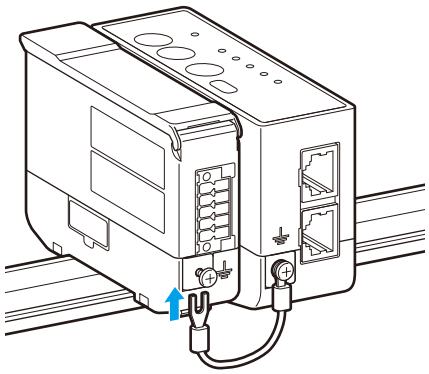
1 Remove the ground terminal screw.



2 Pass the removed terminal screw through the hole in the ground wire's ring lug, and then loosely fasten the lug to the ground terminal.



3 **Loosen the ground terminal screw on the adjacent EJ Counter, and then slip the ground wire's fork lug under the head of the screw.**



4 **Firmly tighten the ground terminal screws on this product and the EJ Counter.**

5 **Connect the EJ Counter's ground wire.**

Tips

For details on the EJ Counter's ground wire, see the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".

2.3.2 Power ON/OFF

This product is not equipped with a power switch. It is supplied with power by the connected EJ Counter.

To power the product ON/OFF, either switch the EJ Counter ON/OFF, or connect/disconnect the power cable.

When the power is turned on, an ID number is automatically assigned to the EJ Counter, and then it becomes ready for communication with this product.

Tips

- When using EtherCAT connection, turn on the power of the master device only after supplying power to this product.
- The ID number assigned to the EJ Counter differs for USB communication and EtherCAT communication. For details, see "3.2.1 ID Number Assignment During USB Communication" on page 33 and "4.4.1 EJ Counter ID Number Assignment During EtherCAT Communication" on page 50.

MEMO

3 USB Communication

3.1 USB Specifications

The USB interface provided with this product conforms to the USB 2.0 standard (with Full-speed communication).

It communicates using a virtual COM port on a PC.

Tips

- For details about USB communication contents, see "3.2.2 Send and Receive Data Format" on page 34 and "3.2.3 List of Commands" on page 36.
- This product cannot output data directly to a printer.
- USB communication can be performed when power is supplied to this product. Power cannot be supplied through the USB terminal.
- The LG QuickSetupTool application software (freeware) is provided to allow EJ Counter settings and display of measurement values to be done by USB communication.
  Please download the software from Mitutoyo's web site (https://www.mitutoyo.co.jp).
  Note that the software may not be usable in all environments. Further, Mitutoyo makes no assurance or representation of any kind regarding the fitness or usability of the software. While use of this application is free of charge, the customer must bear communication charges incurred during download of the software.

■ Compatible connector

Type-C connector

■ Compatible cable

Cable compatible with Type-C connector

Tips

- No USB cable is provided with this product. Use a commercially available cable.
- The software works with Windows 10 standard device drivers.

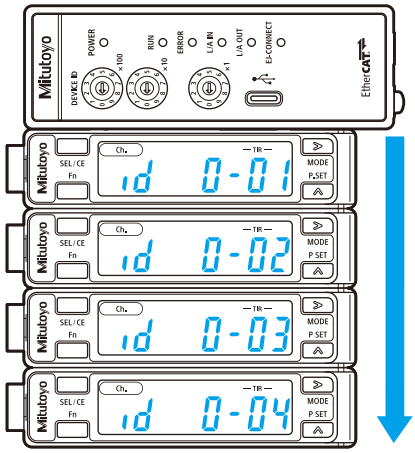
3.2 USB Communication Format

3.2.1 ID Number Assignment During USB Communication

During USB communication, ID numbers from 01 to 08 are automatically assigned to EJ Counters in sequence, starting with the device that is adjacent to this product. However, if arbitrary ID numbers (50 to 99) were set for Parameter Number 19 when the product was last powered on, those values are assigned instead.

Tips

For details about setting parameters, see "5 EJ Counter Parameter Settings" on page 67.



ID numbers are assigned sequentially (figure shows automatic ID number assignments).

3.2.2 Send and Receive Data Format

■ Send data format (from PC to this product)

Tips

Send data consists of ASCII codes.

● Commands

Commands are made up of three alphanumeric characters.

Example: The command for reading the current value is "GCJ".

● Counter ID and channel (Ch.) numbers

Counter ID and channel numbers are made up of four numeric characters.

The uppermost digit is always 0, followed by two digits indicating the EJ Counter ID, and then a single digit indicating the channel (Ch.).

Example: For an EJ Counter whose ID is 02 on Ch.1, specify "0021".

Tips

- Commands that do not specify an EJ Counter channel (Ch.) should always have "1" as the last digit.
- Use "0011" for commands that do not specify an EJ Counter.
  For details, see "3.2.3 List of Commands" on page 36.
- The content of individual channels are specified by parameter settings.
  For details about setting parameters, see "5 EJ Counter Parameter Settings" on page 67.

● Numeric values (only for commands requiring such values)

When setting preset and tolerance values, use the + or - sign together with 10-digit numbers. The least significant digit corresponds to a resolution of 10 nm (0.0000001 in).

Example 1: To set +10.5 mm, specify "+0001050000".

Example 2: To set -0.001 in, specify "-0000010000".

Tips

- Unit, without decimal point.
- Numeric values must be specified as 10 digits. Pad empty parts with zero (0).
- When setting the resolution of an EJ Counter, any fractional value below the set resolution is discarded.

● Delimiter

Commands are delimited by the 2-byte sequence CRLF ("0x0D 0x0A").

■ Receive data format (to PC from this product)

Tips

Receive data consists of ASCII codes.

● Commands

Commands are made up of three alphanumeric characters.

These are the same as for send commands (except for commands that are undefined).

● Counter ID and channel (Ch.) numbers

Counter ID and channel numbers are made up of four numeric characters.

ID and channel (Ch.) numbers are specified in the same manner as for send data.

However, "0000" is received for commands that do not specify an EJ Counter.

For details, see "3.2.3 List of Commands" on page 36.

● Numeric values (only for commands requiring such values)

When outputting preset and tolerance values, use the + or - sign together with 10-digit numbers. The least significant digit corresponds to a resolution of 10 nm (0.0000001 in). Values are rounded according to the EJ Counter's resolution setting.

Example 1: To set +10.5 mm, specify "+0001050000".

Example 2: To set -0.001 in, specify "-0000010000".

Tips

- Unit, without decimal point.
- Numeric values must be specified as 10 digits. Pad empty parts with zero (0).
- When setting the resolution of an EJ Counter, any fractional value below the set resolution is discarded.

● Delimiter

Commands are delimited by the 2-byte sequence CRLF ("0x0D 0x0A").

3.2.3 List of Commands

Commands sent from the PC and corresponding content output from this product are explained below.

■ View commands

These commands are used to verify the settings of EJ Counters. They do not affect the EJ Counter settings or display.

IMPORTANT

Do not send these commands during communication with the master device. Doing so might result in incorrect measurement.

Command format[*1]	Corresponding output[*1*2]	Description
GCJ,****(CRLF)	GCJ,****,(Err-1),+0123456789,(TJ-2),(DataER-2)(CRLF)	Read current values and tolerance judgments[*3*4]
GPR,****(CRLF)	GPR,****,(Err-1),+0123456789,(DataER-2)(CRLF)	Read preset values[*4]
GS1,****(CRLF)	GS1,****,(Err-1),+0123456789,(DataER-2)(CRLF)	Read tolerance value S1[*4]
GS2,****(CRLF)	GS2,****,(Err-1),+0123456789,(DataER-2)(CRLF)	Read tolerance value S2[*4]
GS3,****(CRLF)	GS3,****,(Err-1),+0123456789,(DataER-2)(CRLF)	Read tolerance value S3[*4]
GS4,****(CRLF)	GS4,****,(Err-1),+0123456789,(DataER-2)(CRLF)	Read tolerance value S4[*4]
GST,****(CRLF)	GST,****,(Err-1),(D-1)(D-2)(D-3)(D-4),(DataER-2)(CRLF)	Read the EJ Counter display state[*5]
GER,****(CRLF)	GER,****,(Err-1),(DataC-8),(DataER-2)(CRLF)	Read EJ Counter error flag details[*6]
GEH,****(CRLF)	GEH,****,(Err-1),(DataC-8),(DataER-2)(CRLF)	Read the EJ Counter error flag details history[*7]
GPM,****,(PMNum-2)(CRLF)	GPM,****,(Err-1),(PMNum-2),(PMData-2),(DataER-2)(CRLF)	Read EJ Counter parameter settings[*8]
FNM,0011(CRLF)	FNM,0000,(Err-1),(Data-1)(CRLF)	Read the number of connected EJ Counters[*9]
FCI,0011(CRLF)	FCI,0000,(Err-1),(Data-16)(CRLF)	Read EJ Counter IDs[*10]

*1 "****" indicates the counter ID and channel (Ch.) numbers.
For details, see 📖 "3.2.2 Send and Receive Data Format" on page 34.

*2 "Err-1" is the interface unit's communication error flag.
For details, see 📖 "3.3 List of USB Communication Errors" on page 40.

*3 "TJ-2" is the result of tolerance judgment.
When tolerance judgment is enabled, the result of tolerance judgment is output as a value from L1 to L5.
When tolerance judgment is disabled (when the EJ Counter produces as error), L0 is output.
For details about the tolerance judgment, see 📖 "3.4 Tolerance Judgment Result" on page 44.

*4 Output of data conforming to the settings of EJ Counter Parameter Numbers 03 (display mode selection) and 22 (unit setting).
For details on numeric data output, see 📖 "■ Receive data format (to PC from this product)" on page 35.

*5 "D-1" indicates the display state. "00" indicates standby, "01" indicates count display, and "02" indicates that a parameter preset or tolerance value is being set.
"D-2" indicates peak mode. "00" indicates the current value, "01" indicates MAX (the maximum value), "02" indicates MIN (the minimum value) and "03" indicates TIR (the value of MAX-MIN).
"D-3" indicates the HOLD state. "00" indicates no HOLD, and any other value indicates HOLD.
"D-4" indicates the unit. "00" indicates mm, and "01" indicates inch.

*6 For details, see "3.3.2 EJ Counter Error Flags" on page 41.

*7 The EJ Counter error history contains up to the last four errors, and errors are read out starting with the oldest. Note that the error history is deleted even if the error data is not received by the PC.
For details, see "3.3.2 EJ Counter Error Flags" on page 41.

*8 For the command's "PMNum-2" parameter, specify the Parameter Number. In the corresponding output, the setting of the specified Parameter Number is output for "PMData-2". For details about parameters, see "5 EJ Counter Parameter Settings" on page 67.

*9 "Data-1" is the number of connected EJ Counters (1 to 8).

*10 ID numbers of connected EJ Counters are output for "Data-16". "FF" is output if no EJ Counter is connected.
For example, if eight EJ Counters with ID numbers 1 to 8 are connected, "0102030405060708" is output, and if three EJ Counters with ID numbers 1, 2 and 51 are connected, "010251FFFFFFFFFF" is output.

■ Setting and control commands

These commands are used to change EJ Counter settings and control operation of EJ Counters.

IMPORTANT

Do not send these commands during communication with the master device. Doing so might result in incorrect measurement.

Command format*1	Corresponding output*1*2	Description
SPR,****,+0123456789 (CRLF)	SPR,****,(Err-1),+0123456789, (DataER-2)(CRLF)	Write preset values*3
SS1,****,+0123456789 (CRLF)	SS1,****,(Err-1),+0123456789, (DataER-2)(CRLF)	Write tolerance value S1*3*4
SS2,****,+0123456789 (CRLF)	SS2,****,(Err-1),+0123456789, (DataER-2)(CRLF)	Write tolerance value S2*3*4
SS3,****,+0123456789 (CRLF)	SS3,****,(Err-1),+0123456789, (DataER-2)(CRLF)	Write tolerance value S3*3*4
SS4,****,+0123456789 (CRLF)	SS4,****,(Err-1),+0123456789, (DataER-2)(CRLF)	Write tolerance value S4*3*4
SSU,****(CRLF)	SSU,****,(Err-1),(DataER-2)(CRLF)	Cancel the start-up standby state ("--------" display)
SPK,****,(D-2)(CRLF)	SPK,****,(Err-1),(DataC-8), (DataER-2)(CRLF)	Switch the peak mode*5
SEC,****(CRLF)	SEC,****,(Err-1),(DataER-2)(CRLF)	Clear the EJ Counter error history
PST,****(CRLF)	PST,****,(Err-1),(DataER-2)(CRLF)	Perform presets (set preset values set with the SPR command)
PZS,****(CRLF)	PZS,****,(Err-1),(DataER-2)(CRLF)	Zero current values
PCL,****(CRLF)	PCL,****,(Err-1),(DataER-2)(CRLF)	Clear preset values
PKC,****(CRLF)	PKC,****,(Err-1),(DataER-2)(CRLF)	Clear peak data (MAX and MIN data)
PEC,****(CRLF)	PEC,****,(Err-1),(DataER-2)(CRLF)	Clear errors*6
PSH,****(CRLF)	PSH,****,(Err-1),(DataER-2)(CRLF)	Hold current value*7
PCH,****(CRLF)	PCH,****,(Err-1),(DataER-2)(CRLF)	Cancel current value hold*8
PDA,****(CRLF)	PDA,****,(Err-1),(DataER-2)(CRLF)	Display EJ Counter ID (displays an EJ Counter's ID number for a preset interval)
PDB,****(CRLF)	PDB,****,(Err-1),(DataER-2)(CRLF)	Specify EJ Counter display axis (switches display axes of the current value on an EJ Counter)
PPM,****,(PMNum-2), (PMData-2)(CRLF)	PPM,****,(Err-1),(PMNum-2), (PMData-2),(DataER-2)(CRLF)	Write parameter settings*9
RST,0011,SRST (CRLF)	RST,0000,(Err-1)(CRLF)	System reset*10

*1 "****" indicates the counter ID and channel (Ch.) numbers.
For details, see "3.2.2 Send and Receive Data Format" on page 34.

*2 "Err-1" is the interface unit's communication error flag.
For details, see "3.3 List of USB Communication Errors" on page 40.

*3 Use the + or - sign and specify 10-digit numbers with no decimal point.
For details on specification of numeric data, see "■ Send data format (from PC to this product)" on page 34.

*4 For 3-step tolerance, set tolerance values S1 and S4. Setting of S2 and S3 and read-out are not possible. Attempting to set S2/S3 or perform read-out will result in setting of an error flag (bit 0 of DataER-2) and transmission of error output "+2147483647".
For 5-step tolerance, set tolerance values S1 through S4.
Set the tolerance values in sequence from S1 to S4 or from S4 to S1.

*5 For "D-2", specify the peak mode.
Specify "00" for the current value, "01" for MAX (the maximum value), "02" for MIN (the minimum value), or "03" for TIR (the value of MAX-MIN).
When the peak mode is set properly, "00000000" is output for "DataC-8".

*6 Clear the error state after first eliminating the cause of the error.

*7 The HOLD signal is shared by all linked EJ Counters, and all linked EJ Counters enter the HOLD state.
When canceling HOLD with the PCH command, cancellation is required for EJ Counters on which HOLD is set. Set HOLD against the ID number of the linked EJ Counter that is adjacent to the interface unit.

*8 The HOLD signal is shared by all linked EJ Counters, and HOLD is canceled for all linked EJ Counters.
Cancel HOLD on EJ Counters for which HOLD was set with the PSH command.

*9 Specify the Parameter Number for "PMNum-2" and the setting value for "PMData-2". For details about parameters, see "5 EJ Counter Parameter Settings" on page 67.

*10 A software reset is performed on this product and linked EJ Counters. Do not execute this command while measurement is in progress.

3.3 List of USB Communication Errors

3.3.1 Interface Unit Communication Error Flags

When a communication error is detected by this product, it outputs the communication error flag (Err-1).

■ Communication error flags (Err-1)

Err-1	Description
5	Commands cannot be executed in this state. EJ Counters are in the standby or error state.
4	This indicates an undefined command. The command sent is undefined or its format is incorrect (missing a comma).
3	The data length of the command is incorrect. The command is missing data or includes unneeded data.
2	The command content is incorrect. The command includes an incorrect ID number or channel specification (contains a character other than a numeral).
1	There was an error in communication between the interface unit and EJ Counters. The ID number specified in a command does not belong to a connected EJ Counter.
0	No error

In the event of a command abnormality (undefined command), the response takes the following format.

CER,****,(Err-1)(CRLF)

For example, if the undefined command "GGG" is sent, the response is as follows.

Send command: GGG,0000(CRLF)

Output data: CER,0000,4(CRLF)

3.3.2 EJ Counter Error Flags

These error flags are output when an EJ Counter detects an error.

■ Error flags (DataER-2)

This error flag (DataER-2) is made up of data in hexadecimal notation. Bits that are set to "1" indicate the location of the alarm or error.

Data ER-2	Judgment	Description
bit 0	0: Normal 1: Alarm or error state	Indicates an error in communication between the interface unit and EJ Counters. Whether or not the command was normally executed cannot be determined. Check the command and execute it again.
bit 1		The EJ Counter is in the Busy state. EJ Counter settings are being made by key operation. Commands cannot be executed. Execute the command after putting the EJ Counter in the counting state.
bit 2		The origin of the requested channel has not been detected. Commands cannot be executed. Execute the command again after performing gage origin detection or disabling origin detection.
bit 3		An alarm occurred on the requested channel or both channels. Commands cannot be executed. The flag is set if the EJ Counter is in the Busy state (DataER-2 bit1), its origin has not been detected (DataER-2 bit 2), or it is in the counter stand-by state.
bit 4		A hardware error occurred on the requested channel or both channels.
bit 5		An alarm or hardware error occurred on one of the channels. The flag is set even if the alarm or hardware error occurred on the channel that was not requested. The command is executed if there is no abnormality the requested channel.
bit 6		Fixed to 0
bit 7		Fixed to 0

■ Error flag details (DataC-8)

Error flag details (DataC-8) are made up of data in hexadecimal notation. Bits that are set to "1" indicate the location of the alarm or error.

Data C-8	Judgment	Description	
bit 0	0: Normal 1: Alarm or error state	Alarm	EJ Counter Busy state (EJ Counter settings are being made by key operation). Put the EJ Counter in the counting state.
bit 1			A-axis origin not detected. Go through A-axis origin detection.
bit 2			B-axis origin not detected. Go through B-axis origin detection.
bit 3			Counter stand-by state Cancel the counter standby state, putting the EJ Counter in the counting state.
bits 4 to 7			Fixed to 0
bit 8		Hardware error	A-axis peak detection error (with peak mode only). If this error occurs continuously, verify measurement conditions (such as plunger movement speed).
bit 9			B-axis peak detection error (with peak mode only). If this error occurs continuously, verify measurement conditions (such as plunger movement speed).
bit 10			Ch.1 counter value overflow. Verify preset values.
bit 11			Ch.2 counter value overflow. Verify preset values.
bit 12			A-axis excess speed error. Verify measurement conditions (such as plunger movement speed).
bit 13			B-axis excess speed error. Verify measurement conditions (such as plunger movement speed).
bit 14			No gage head on the A-axis or discontinuity detection error. Verify gage head connection.
bit 15			No gage head on the B-axis or discontinuity detection error. Verify gage head connection.
bit 16			Internal memory abnormality. If operation is not restored upon clearing the error, there may be an internal malfunction.
bit 17			Power supply voltage abnormality. Clear the error after verifying supply of correct voltage.
bit 18			A-axis counter IC reset error. Occurred because a Linear Gage was connected or removed during operation.
bit 19			B-axis counter IC reset error. Occurred because a Linear Gage was connected or removed during operation.
bit 20			A-axis counter IC overflow. Electrical noise could be a problem.
bit 21			B-axis counter IC overflow. Electrical noise could be a problem.

Data C-8	Judgment	Description	
bit 22	0: Normal 1: Alarm or error state	Hardware error	No A-axis origin signal. When using a Linear Gage with origin, check whether the origin signal is disconnected. When using a Linear Gage without origin, set Parameter Number 05 to 0.
bit 23			No B-axis origin signal. When using a Linear Gage with origin, check whether the origin signal is disconnected. When using a Linear Gage without origin, set Parameter Number 05 to 0.
bit 24			Internal memory access error. If operation is not restored upon clearing the error, there may be an internal malfunction.
bit 25			Wrong number of EJ Counters connected (nine or more devices). Turn the power on after reducing the number of connected EJ Counters to no more than eight.
bits 26 to 31			Fixed to 0

■ EJ Counter error history

If a hardware error occurs, error flag details are stored in the error history in the EJ Counter. Error details are not stored when alarms occur.

The EJ Counter error history holds up to the last four errors, and errors are read out starting with the oldest.

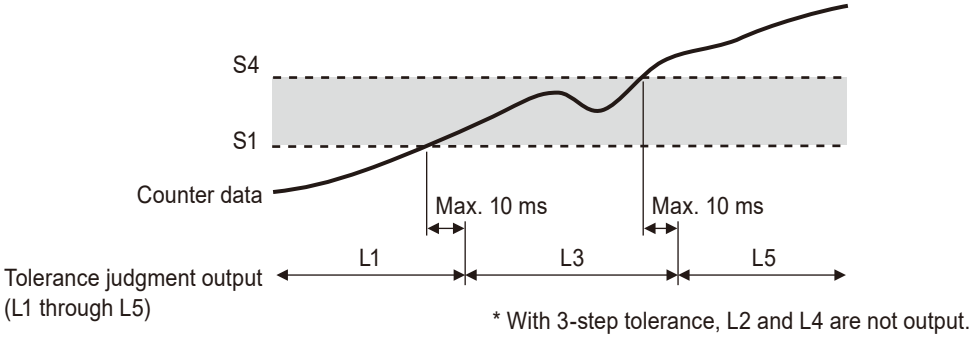
If a hardware error occurs when the error history already contains four errors, the oldest error is discarded.

If the error history is read when there are no errors in the EJ Counter error history, the value 0(0x00000000) is output.

3.4 Tolerance Judgment Result

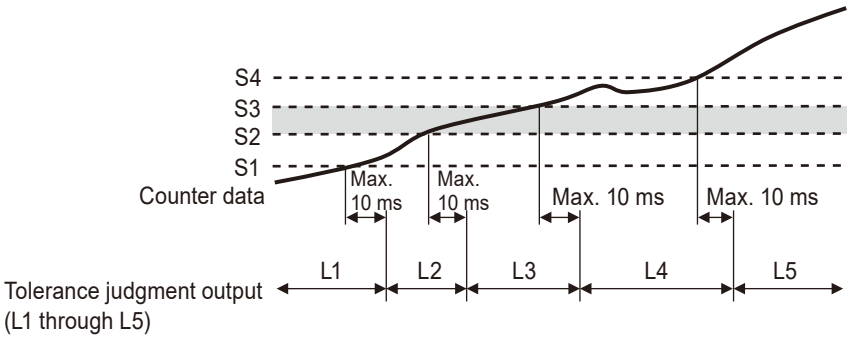
■ Tolerance judgment output

● 3-step tolerance



* With 3-step tolerance, L2 and L4 are not output.

● 5-step tolerance



4 EtherCAT Communication

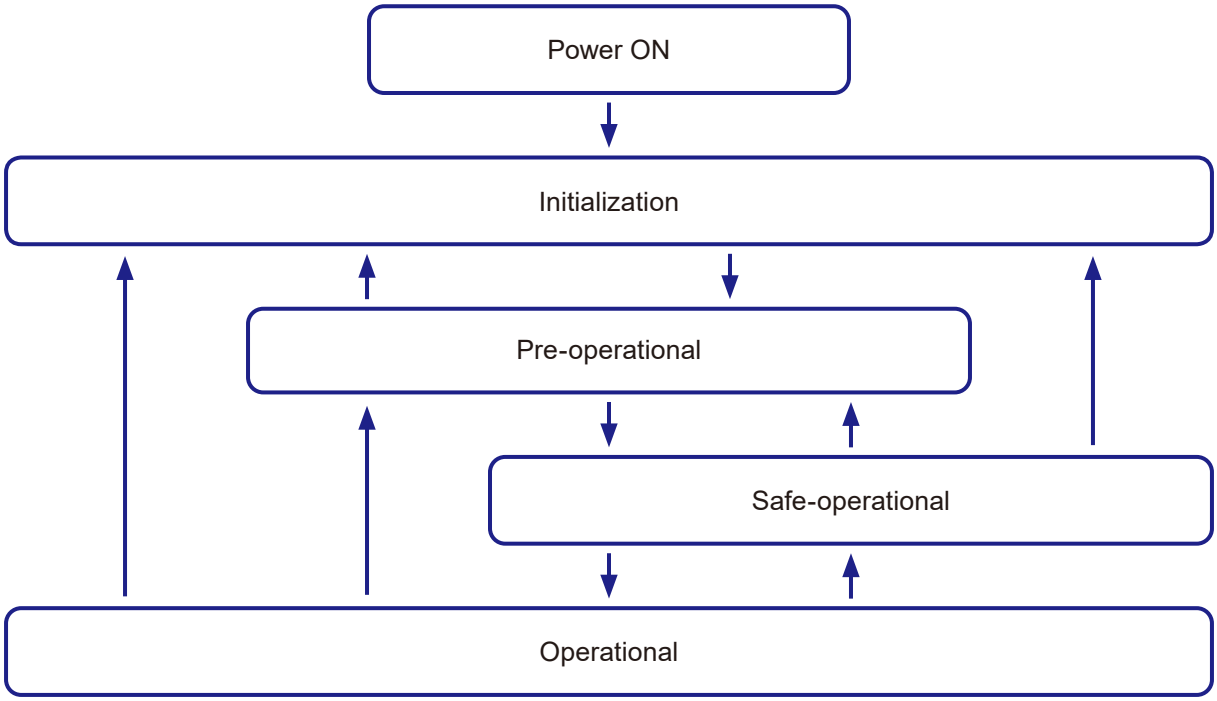
4.1 Outline of EtherCAT Communication

This product functions as a slave device. When connected to a master device (PLC, etc.), this product outputs the tolerance judgments and current value data of the connected EJ Counter(s) to the master device.

Item		Specifications
EtherCAT Communication	Communication port	RJ45×2 ports (IP20)
	Communication cable	STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables
	Baud rate	100 Mbps, full duplex
	Device ID	Bits 1 to 999 * When set to 0, the device ID is not used.
	Synchronization mode	Free Run mode

4.2 EtherCAT Communication Status Transition

Following power-on, communication status transition proceeds as follows in accordance with requests from the master device.



Status	SDO communication	PDO communication	Description
Initialization	–	–	Communication initializing.
Pre-operational	✓	–	Ready for SDO communication (messaging).
Safe-operational	✓	✓ (IN data only)	In addition to SDO communication, PDO communication (cyclic communication) is ready only for IN data.
Operational	✓	✓	This is the normal communication status.

4.3 EtherCAT Communication Settings

4.3.1 Communication Settings

This section explains the settings that are required before this product can communicate with a master device (PLC, etc.). Make sure that the master device being used and engineering tool are ready before making settings.

Tips

- For details on engineering tool operation, see the manual and other documentation provided by the distributor.
- This product's settings file (the ESI file) for import to the engineering tool can be downloaded from Mitutoyo's website (https://www.mitutoyo.co.jp).

1 Make connections between this product, the master device, and the PC on which the engineering tool is installed, and then supply the power source.

Tips

- For details on powering on the product, see "2.3.2 Power ON/OFF" on page 29.
- To connect this product to the master device, use STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables.
- Before making the settings for this product, select the master device to be connected in the engineering tool.

2 Install the ESI file for this product in the engineering tool and select this product.

Tips

- Selection by engineering tool can be done in either of two ways: by scanning the network and automatically selecting the device, or by manually selecting the device to be connected.
- The address setting of the slave device is set using the engineering tool.
  In principle, an address is automatically allocated to the slave device when it is registered in the master device, but it is also possible to change the address by means of the engineering tool. The address may be recorded as a node address or an EtherCAT address.

3 Designate the data area to be used for sending/receiving data to the master device.

Tips

For details, see "4.4.2 EtherCAT Cyclic Communication" on page 51.

4.3.2 Setting the Device ID

This product supports explicit device identification.

Use of explicit device identification makes it possible for the master device to explicitly identify a slave device, thereby preventing device misidentification due to cabling errors when the network includes multiple units of the product.

This also makes it easier to replace a defective slave device with another device to which the same device ID has been assigned as that of the defective device.

Set the hundreds place with [x100] switch, the tens place with the [x10] switch, and the ones place with the [x1] switch

Using a standard screwdriver, set the switches to the desired numeric value.

When not used, set the value to 0.

Tips

- The device ID setting becomes effective when the power is turned ON. When the mode setting is changed with the power ON, the change becomes effective when the power has been turned OFF and then ON again.
- For how to make the setting on the master side, see the manual provided with the engineering tool. There are situations in which usable device IDs differ and explicit device identification cannot be used.
- When using Omron's Sysmac Studio engineering tool, set the device ID to the node address.

4.3.3 Verifying Communication

Verify that all devices are properly connected and configured, and that I/O data can be properly read and written.

■ Verifying device status

With the master device connected, verify that indicators on the front panel of the product appear as follows.

Name	Status
[POWER] indicator	Lit
[RUN] indicator	Lit
[ERROR] indicator	Off
[EJ-CONNECT] indicator	Lit

■ Verifying data

Verify that IN data and OUT data is properly read and written by the master device.

4.4 EtherCAT Communication Format

4.4.1 EJ Counter ID Number Assignment During EtherCAT Communication

ID numbers used during EtherCAT communication are assigned according to the combination of axes connected to each of the EJ Counters being used.

ID numbers are assigned in sequence from COUNTER_1 to COUNTER_8, starting with the EJ Counter that is adjacent to this product. For the Linear Gage, channel number "A" is assigned to the A-axis, and "B" is assigned to the B-axis of each EJ Counter.

The ID number for the axes is formed of combinations of the above in the format "COUNTER_xx".

Example:

The ID number assigned to the B-axis of the second EJ Counter from this product will be "COUNTER_2B".

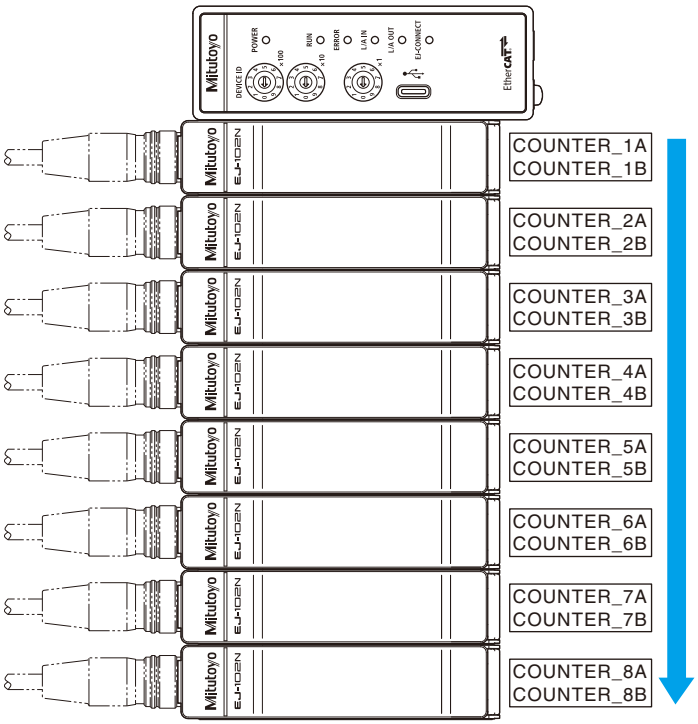
IMPORTANT

Do not change the ID number by setting EJ Counter parameters during EtherCAT communication (while the [RUN] indicator is lit or flashing). Changing the ID numbers will prevent normal communication with the EJ Counters.

Tips

Arbitrary ID numbers (50 to 99) set with EJ Counter Parameter Number 19 apply to USB communication.

EtherCAT communication ID numbers are automatically assigned in sequence beginning with the EJ Counter that is adjacent to this product.



4.4.2 EtherCAT Cyclic Communication

This section describes the data makeup of cyclic communication.

With EtherCAT communication, cyclic communication is performed using process data objects (PDOs).

Data content is defined by PDO mapping objects stored in the object dictionary in combination with ESI files.

Data is defined as indicated in the table below.

■ IN data (from this product to master device)

PDO assign objects: 0x1c13

PDO mapping objects: 0x1A00

Assignment of data items to be acquired is made by master device settings.

In the initial state, all data indicated in the table below is assigned to the master device, but data assignments that are not used can be deleted to reduce communication overhead.

Individual assignments can also be changed for COUNTER_xx data details.

Example:

When connecting a single EJ Counter without using the B-axis or tolerance judgment, assign only HOLD_COMPLETE, C_1A_CONNECT, C_1A_SENSOR_ERROR and C1A_CURRENT_DATA.

Tips

In the engineering tool, COUNTER_xx is displayed as Cxx.

Data type	Item	Description
1 Byte	ALL_GO	Tolerance judgment for all axes "1" results if tolerance judgment is OK for all axes (if each axis is available and its tolerance judgment is OK); if any result fails, "0" results.
1 Byte	HOLD_COMPLETE	HOLD update complete flag Becomes "1" following data update. These bits are restored to "0" when HOLD clear is returned from "1" to "0" (by external input or OUT data).
9 Byte	C1A (COUNTER_1A)	**Tips** For details about data content of the counters, see "● COUNTER_xx (Cxx) data details (from this product to the master device)" on page 52.
9 Byte	C1B (COUNTER_1B)	
9 Byte	C2A (COUNTER_2A)	
9 Byte	C2B (COUNTER_2B)	
…	…	
9 Byte	C8A (COUNTER_8A)	
9 Byte	C8B (COUNTER_8B)	

● COUNTER_xx (Cxx) data details (from this product to the master device)

Item	Bit	Description	
CONNECT	7:1	Reserved (fixed to "0")	
	0	Connection status flag 1: Axis enabled 0: Counter not connected, or axis not available	
RANGE_CHECK	7:0	Not used.	
RANGE_L	7:5	Reserved (fixed to "0")	
	4	L5	Tolerance judgment L1 through L5 1: In range 0: Out of range **Tips** For details about the tolerance judgment (L1 through L5), see "4.6 Tolerance Judgment Result" on page 65.
	3	L4	
	2	L3	
	1	L2	
	0	L1	
RANGE_LT	7:3	Reserved (fixed to "0")	
	2	LT3	Tolerance judgment LT1 through LT3 1: H 0: L **Tips** For details about the tolerance judgment (LT1 through LT3), see "4.6 Tolerance Judgment Result" on page 65.
	1	LT2	
	0	LT1	
SENSOR_ERROR	7:1	Reserved (fixed to "0")	
	0	Tolerance judgment/current value output flag 1: Output not possible 0: Output possible	
CURRENT_DATA	31:0	Current value data **Tips** • Output of data conforming to the setting of EJ Counter Parameter Numbers 03 (display mode selection) and 22 (unit setting). • Current value data is stored with the lowest order byte in the lower address. (Little endian) • Data is output in the following format as a sign (1 bit) and a numeric value (31 bits). – Minimum resolution: Fixed to 0.00001 mm (0.0000001 in with display in inches) – Unit/ decimal point: None – Sign: "0" when positive, "1" when negative (complement of 2)	

■ OUT data (from master device to this product)

PDO assign objects: 0x1c12

PDO mapping objects: 0x1600

Make data settings on the master device side.

Data type	Item	Description
1 Byte	HOLD_REQUEST	Current value data internal HOLD* 1: Internal HOLD set 0: Internal HOLD cleared

* When setting internal HOLD, verify the HOLD update complete flag before acquiring current value data.

4.4.3 Asynchronous Data Transfer

Settings and status of this product and connected EJ Counters can be read or written by this product using mailbox communication (SDO communication).

Mailbox messaging is a function for issuing messages defined in the object dictionary and communicating them at arbitrary timings.

Objects specified by mailbox messaging include common objects meeting the standard (index numbers 0x1000 through 0x1FFF) and objects unique to this product (index numbers 0x2000 through 0xFFFF). To read/write the settings and status of this product and connected EJ Counters, specify the message as follows.

Tips

- For details on how to make mailbox communication settings, see the manual provided with the engineering tool.
- Objects unique to this product which are not described in this manual cannot be used.

■ Acquisition of EJ Counter connection information

Index No.	Object name	Access*1	Sub-index No.	Response data size	Description
0x2016	COUNTER_COUNT	RO	0	USINT (1 byte)	Reading the number of connected EJ Counters detected at power-on (zero to eight counters)
0x201D	COUNTER_ID	RO	0	USINT (1 byte)	Number of entries The fixed value 0x08 is read out.
			N/A	USINT (1 byte)	Padding for size adjustment Fixed to 0x00.
			1	USINT (1 byte)	1st EJ Counter ID*2
			2	USINT (1 byte)	2nd EJ Counter ID*2
			3	USINT (1 byte)	3rd EJ Counter ID*2
			4	USINT (1 byte)	4th EJ Counter ID*2
			5	USINT (1 byte)	5th EJ Counter ID*2
			6	USINT (1 byte)	6th EJ Counter ID*2
			7	USINT (1 byte)	7th EJ Counter ID*2
			8	USINT (1 byte)	8th EJ Counter ID*2

*1 Measurement results and setting data can be read out from this product to the master device using the RO (Read) command.

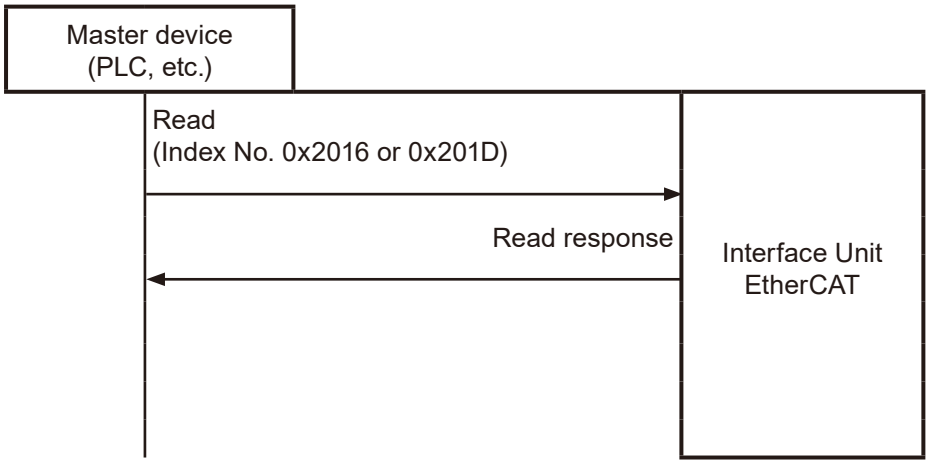
*2 The EJ Counter IDs are read out as they are detected at power-on time. Up to eight EJ Counters can be connected, but "0xFF" is read out if no EJ Counter is connected.

Tips

With objects that contain multiple sub-index definitions, the only value read or written is that of the specified sub-index number. If complete access is enabled at time of transmission, all sub-indexes beginning with the one specified can be read or written as a batch.

Example:

- Upon transmission of index number 0x201D and sub-index number 1 with complete access disabled, the ID of the first EJ Counter, such as "0x01", is returned in response.
- If two EJ Counters are connected to this product, and index number 0x201D and sub-index number 1 are transmitted with complete access enabled, the response includes IDs in the format for eight EJ Counters, such as "0x0102FFFFFFFFFFFF", starting with the EJ Counter closest to this product.



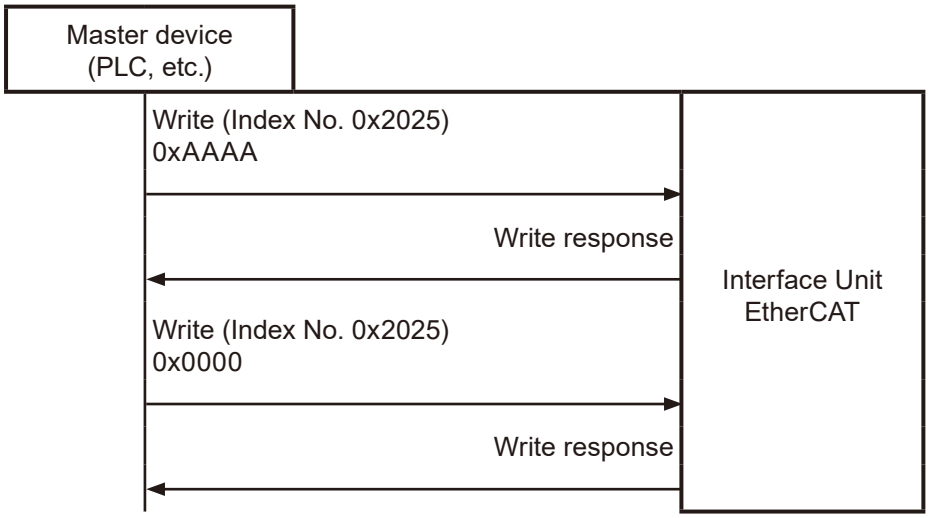
■ System reset

Index No.	Object name	Access*	Sub-index No.	Send data size	Description
0x2025	SYS_RESET	RW	0	UINT (2 byte)	Initiates system reset of this product and EJ Counters. System reset is performed upon setting "0xAAAA" (enable reset), followed by setting "0x0000" (execute reset). **Tips** If any other asynchronous data transfer is performed after setting enable reset, the enable reset state is canceled.

* Set by master device to this product using RW (Write command).

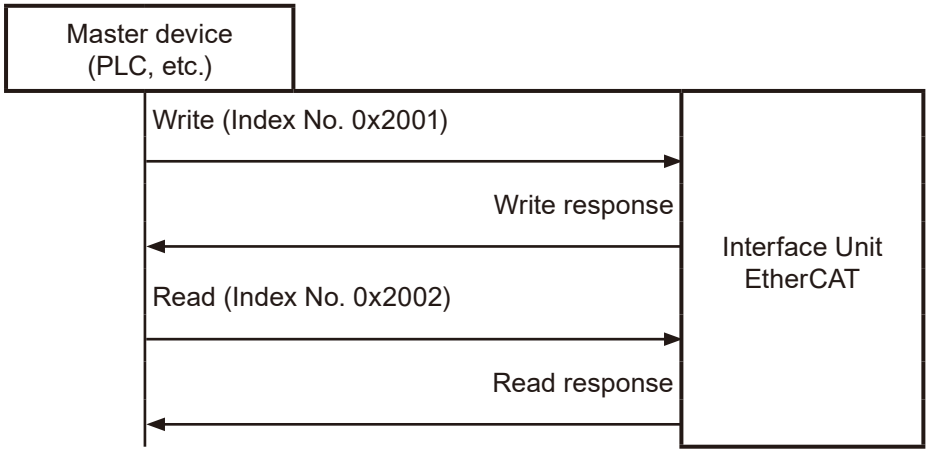
Tips

Executing a system reset will also interrupt EtherCAT communication with any device connected through EtherCAT OUT.



■ Read/Write various parameters

Data is transferred by executing the mailbox communication Write command, and then executing the Read command. Parameters are read/written using the following procedure.



1 Transfer Write command
2 Verify Write command response
3 Transfer Read command

● Write command transfer

Sets data for Index No. 0x2001 and then executes the Write command.

This product is notified of the parameter read/write request.

Index No.	Send data size	Send data			
		Sub-index No.	Data type	Item	Description
0x2001	11 Byte	0	USINT (1 byte)	Number of entries	Sets the fixed value 0x05.
		N/A	USINT (1 byte)	(PAD)	Padding for size adjustment Fixed to 0x00.
		1	USINT (1 byte)	Command code	For details, see "■ EJ Counter command code" on page 58.
		2	USINT (1 byte)	EJ Counter number	Specify a value from 0x01 through 0x08. ID numbers from 0x01 to 0x08 are assigned to EJ Counters in sequence, starting with the device adjacent to this product.
		3	USINT (1 byte)	Ch. specification	Specify a Linear Gage (Ch.) connected to the EJ Counter. (Data than bit 0 are invalid.) 0: Ch.1 1: Ch.2
		4	USINT (1 byte)	Reserve	Fixed to 0x00.
		5	USINT × 5 (5 bytes)	Data	Set data according to command code.

● Write command response verification

Verify that mailbox communication has taken place properly in response to the Write command from the master device.

Tips

If an error occurred, check for abnormalities in the command code and data and then sent the command again. For details about error message contents, see "4.5.1 Asynchronous Data Transfer (Mailbox) Errors" on page 64.

● Read command transfer

Executes the Index No. 0x2002 Read command.

The receive data contains the read results when parameters are read, and write success/failure when parameters are written.

The receive data format is as shown here.

Index No.	Receive data size	Receive data			
		Sub-index No.	Data type	Item	Description
0x2002	11 Byte	0	USINT (1 byte)	Number of entries	Returns the fixed value 0x05.
		N/A	USINT (1 byte)	(PAD)	Padding for size adjustment Returns 0x00.
		1	USINT (1 byte)	Command code	Returns the specified command code.
		2	USINT (1 byte)	EJ Counter number	Returns the specified EJ Counter number.
		3	USINT (1 byte)	Ch. specification	Returns the specified Linear Gage (Ch.). 0: Ch.1 1: Ch.2
		4	USINT (1 byte)	Reserve	N/A
		5	USINT×5 (5 byte)	Data	Returns response data according to command code.

Tips

Data read out by the Read command is held until the next time the Write command is executed against Index No. 2001.

■ EJ Counter command code

● Read command parameters

Commands	Command code	Data set to send data (Sub-index No. 5)				
		Data read out by receive data (Sub-index No. 5)*1				
Current value	0x10	0x00	0x00	0x00	0x00	0x00
		Current value (31:0)*2				Error flag*7
Preset value	0x20	0x00	0x00	0x00	0x00	0x00
		Preset value (31:0)*2				Error flag*7
Tolerance value S1	0x21	0x00	0x00	0x00	0x00	0x00
		Tolerance value S1 (31:0)*2				Error flag*7
Tolerance value S2	0x22	0x00	0x00	0x00	0x00	0x00
		Tolerance value S2 (31:0)*2				Error flag*7
Tolerance value S3	0x23	0x00	0x00	0x00	0x00	0x00
		Tolerance value S3 (31:0)*2				Error flag*7
Tolerance value S4	0x24	0x00	0x00	0x00	0x00	0x00
		Tolerance value S4 (31:0)*2				Error flag*7

Commands	Command code	Data set to send data (Sub-index No. 5)				
		Data read out by receive data (Sub-index No. 5)*1				
EJ Counter display status	0x30	0x00	0x00	0x00	0x00	0x00
		Display status*3	Peak mode*4	HOLD status*5	Unit*6	Error flag*7
Read EJ Counter parameter settings	0x40	0x00	Parameter number	0x00	0x00	0x00
		0x00	Parameter number	0x00	Parameter value	Error flag*7

*1 If the command cannot be executed, "0x7FFFFFFF" is output for bytes 4 to 7 of the receive data.

*2 The current value, preset value and tolerance data are output from the highest order data. (Big endian) The output data format consists of a sign (1 bit) + numeric value (31 bits).

– Minimum resolution: Fixed to 0.00001 mm (0.0000001 in with display in inches)

– Decimal point: None

– Sign: "0" when positive, "1" when negative (complement of 2)

Tips

The data sequence (endianness) is different than with cyclic communication.

*3 "0x00" indicates the standby state, "0x01" indicates counter display, and "0x02" indicates parameter display.

*4 "0x00" indicates current value display, "0x01" indicates MAX value display, "0x02" indicates MIN value display and "0x03" indicates TIR value display

*5 Bit 0 indicates the external HOLD state, bit 1 indicates the internal HOLD state, and bit 2 indicates the internal HOLD output state. Each is "1" when ON or during output. Bits 3 to 7 are fixed to "0".

*6 "0x00" indicates mm display, and "0x01" indicates inch display.

*7 For details about error flags, see "4.5.2 EJ Counter Error Flags" on page 64.

● Write command parameters (settings data)

Commands	Command code	Data set to send data (Sub-index No. 5)				
		Data read out by receive data (Sub-index No. 5)*1				
Write preset values	0x60	Preset value (31:0)*2				0x00
		Set preset value (31:0)*2				Error flag*4
Write tolerance value S1	0x61	Tolerance value S1 (31:0)*2				0x00
		Set tolerance value S1 (31:0)*2				Error flag*4
Write tolerance value S2	0x62	Tolerance value S2 (31:0)*2				0x00
		Set tolerance value S2 (31:0)*2				Error flag*4
Write tolerance value S3	0x63	Tolerance value S3 (31:0)*2				0x00
		Set tolerance value S3 (31:0)*2				Error flag*4
Write tolerance value S4	0x64	Tolerance value S4 (31:0)*2				0x00
		Set tolerance value S4 (31:0)*2				Error flag*4
Cancel the start-up standby state (cancel "-------" display)	0x70	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Switch peak mode	0x71	0x00	0x00	0x00	0x00	Peak mode*3
		0x00	0x00	0x00	Peak mode*3	Error flag*4

Commands	Command code	Data set to send data (Sub-index No. 5)				
		Data read out by receive data (Sub-index No. 5)*1				
Current value preset	0x72	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Zero current values	0x73	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Preset/zero set clear	0x74	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Clear peak data (MAX and MIN data)	0x75	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Clear the EJ Counter error state	0x76	0x00	0x00	0x00	0x00	0x00
		0x00	0x00	0x00	0x00	Error flag*4
Write EJ Counter parameter settings	0x80	0x00	Parameter number	0x00	Parameter value	0x00
		0x00	Parameter number	0x00	Parameter value	Error flag*4

*1 If the command cannot be executed, "0x7FFFFFFF" is output for bytes 4 to 7 of the receive data.

*2 The preset value and tolerance data are set or output from the highest order data. (Big endian)
The output data format consists of a sign (1 bit) + numeric value (31 bits).

– Minimum resolution: Fixed to 0.00001 mm (0.0000001 in with display in inches)

– Decimal point: None

- Sign: "0" when positive, "1" when negative (complement of 2)

Tips

The data sequence (endianness) is different than with cyclic communication.

*3 Specify "0x00" to switch peak mode to current value, "0x01" to switch to MAX value, "0x02" to switch to MIN value and "0x03" to switch to TIR value.

*4 For details about error flags, see "4.5.2 EJ Counter Error Flags" on page 64.

● Read/Write parameter examples

This example illustrates the procedure for setting the resolution of the Ch.2 Linear Gage (COUNTER_1B) connected to the first EJ Counter to 0.0001 mm.

1 Write the parameters.

1 Write command transfer

Sets the following data and then executes the Write command.

- Index No. 0x2001
- Sub-index No.: 1
- Complete access: Enabled

Tips

Specification to Sub-index No.1 makes it possible to omit the number of entries and PAD. When specifying 0 for Sub-index No. 1, set 11 bytes of send data.

Send data			
Byte	**Item**	**Data**	**Description**
0	Command code	0x80	Write EJ Counter parameter settings
1	EJ Counter number	0x01	Specify the 1st EJ Counter
2	Ch. specification	0x01	Specify Ch.2
3	N/A	0x00	N/A
4	N/A	0x00	N/A
5	Parameter number	0x04	Linear Gage resolution setting
6	N/A	0x00	N/A
7	Parameter value	0x03	Set to 0.0001 mm
8	N/A	0x00	N/A

2 Write command response verification

Verify that mailbox communication has taken place properly in response to the Write command from the master device.

3 Read command transfer

Sets the following data and then executes the Read command.

- Index No. 0x2002
- Sub-index No.: 1
- Complete access: Enabled

4 Verify result

Verify the response to writing of parameters executed by Read command transfer. Verify that all data match the contents of send data, and that the EJ Counter hasn't raised an abnormal error flag.

Receive data			
Byte	**Item**	**Data**	**Description**
0	Command code	0x80	Write EJ Counter parameter settings
1	EJ Counter number	0x01	Specify the 1st EJ Counter
2	Ch. specification	0x01	Specify Ch.2
3	N/A	0x00	N/A
4	N/A	0x00	N/A
5	Parameter number	0x04	Linear Gage resolution setting
6	N/A	0x00	N/A
7	Parameter value	0x03	Set to 0.0001 mm

Receive data			
Byte	**Item**	**Data**	**Description**
8	Error flag	0x00	(When there is no error or alarm)

2 Read the parameters.

Verify the parameters written by reading the parameters.

1 Write command transfer

Sets the following data and then executes the Write command.

- Index No. 0x2001
- Sub-index No.: 1
- Complete access: Enabled

Send data			
Byte	**Item**	**Data**	**Description**
0	Command code	0x40	Read EJ Counter parameter settings
1	EJ Counter number	0x01	Specify the 1st EJ Counter
2	Ch. specification	0x01	Specify Ch.2
3	N/A	0x00	N/A
4	N/A	0x00	N/A
5	Parameter number	0x04	Linear Gage resolution setting
6	N/A	0x00	N/A
7	N/A	0x00	N/A
8	N/A	0x00	N/A

2 Write command response verification

Verify that mailbox communication has taken place properly in response to the Write command from the master device.

3 Read command transfer

Sets the following data and then executes the Read command.

- Index No. 0x2002
- Sub-index No.: 1
- Complete access: Enabled

» The parameters are read and stored in data.

4 Verify result

Verify that all data match the contents of send data, that the value of parameter settings read is 0x03 (0.0001 mm resolution), and that the EJ Counter hasn't raised an abnormal error flag.

Receive data			
Byte	**Item**	**Data**	**Description**
0	Command code	0x40	Read EJ Counter parameter settings
1	EJ Counter number	0x01	Specify the 1st EJ Counter
2	Ch. specification	0x01	Specify Ch.2
3	N/A	0x00	N/A
4	N/A	0x00	N/A
5	Parameter number	0x04	Linear Gage resolution setting
6	N/A	0x00	N/A
7	Parameter value	0x03	Set to 0.0001 mm
8	Error flag	0x00	(When there is no error or alarm)

4.4.4 Emergency Message

If this product enters any abnormal state, an emergency message is automatically sent to the master device.

To handle such messages, see "6 Troubleshooting" on page 73.

Tips

For the emergency message verification procedure, see the manual provided with the engineering tool.

- Emergency message

Byte	0	1	2	3	4	5	6	7
Description	Emergency message error code		Error register	Not used (0x00000)				

- Emergency message error code

Emergency message error code	Description
0x3000	Abnormal power voltage
0xFF00	A momentary communication error occurred between this product and an EJ Counter or inside this product.

- Error register (Index No.: 0x1001)

Bit	Description
7	Maker-specific
6:3	Not used
2	Voltage error
1	Not used
0	1: Error occurred, 0: Error cleared

4.5 EtherCAT Communication Errors

4.5.1 Asynchronous Data Transfer (Mailbox) Errors

If mailbox communication is not successful, the following abort code is issued.

Tips

- Depending on the master device being used, errors other than those indicated below may be issued, or error codes may not be displayed at all.
- For the error verification procedure, see the manual provided with the engineering tool.

Abort Code	Description
0x6020000	Index No. is not correct.
0x6090011	Sub-index No. does not exist.
0x8000022	EJ Counter number is not correct.
0x6070013	The set Service Data size is too small.
0x6070012	The set Service Data size is too large.
0x6070002	Write command transferred against a read-only object.

4.5.2 EJ Counter Error Flags

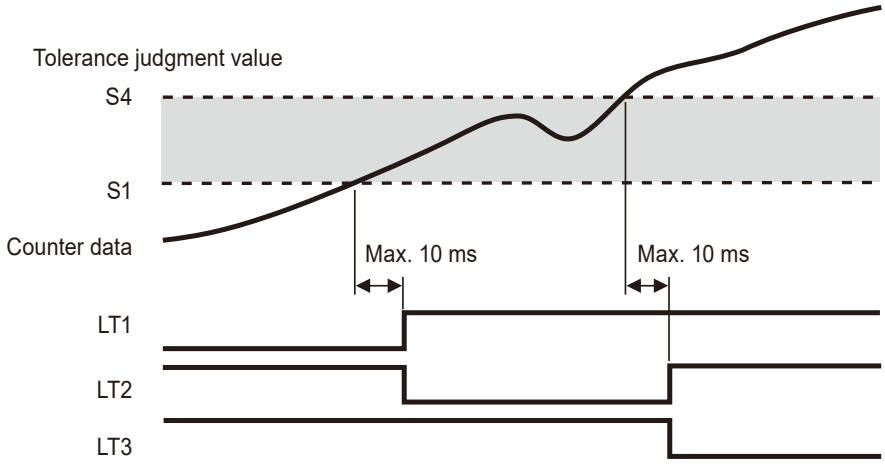
Error flags are made up of data in hexadecimal notation. Bits that are set to "1" indicate the location of the alarm or error.

bit	Judgment	Description
bit 0	0: Normal 1: Alarm or error state	Indicates an error in communication between the interface unit and EJ Counters. Whether or not the command was normally executed cannot be determined. Check the command and execute it again.
bit 1		The EJ Counter is in the Busy state. EJ Counter settings are being made by key operation. Commands cannot be executed. Execute the command after putting the EJ Counter in the counting state.
bit 2		The origin of the requested channel has not been detected. Commands cannot be executed. Execute the command again after performing gage origin detection or disabling origin detection.
bit 3		An alarm occurred on the requested channel or both channels. Commands cannot be executed. The flag is set if the EJ Counter is in the Busy state (DataER-2 bit1), its origin has not been detected (DataER-2 bit 2), or it is in the counter stand-by state.
bit 4		A hardware error occurred on the requested channel or both channels.
bit 5		An alarm or hardware error occurred on one of the channels. The flag is set even if the alarm or hardware error occurred on the channel that was not requested. The command is executed if there is no abnormality the requested channel.
bit 6		Fixed to 0
bit 7		Fixed to 0

4.6 Tolerance Judgment Result

■ Tolerance judgment output

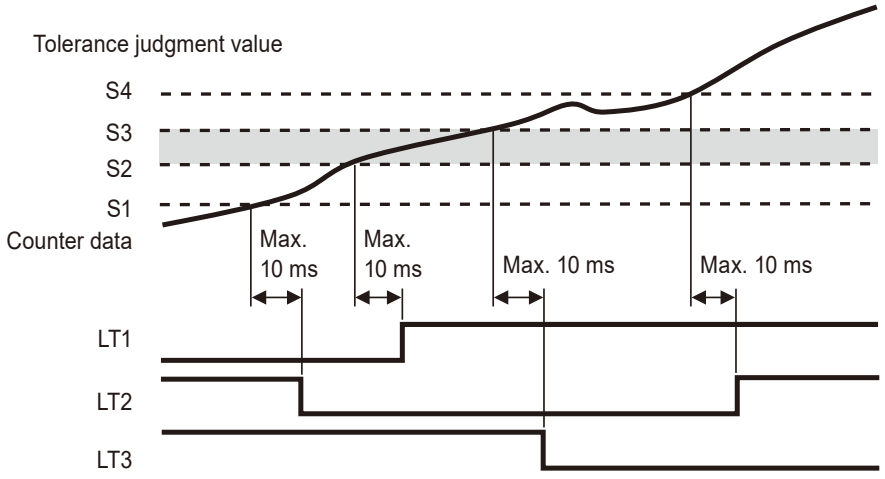
● 3-step tolerance



	x < S1 (L1)	S1 ≦ x ≦S4 (L3)	S4< x (L5)
LT1	L	H	H
LT2	H	L	H
LT3	H	H	L

* With 3-step tolerance judgment, L2 and L4 are not used. (Fixed to 0)

● 5-step tolerance



	x < S1 (L1)	S1 ≦ x < S2 (L2)	S2 ≦ x ≦ S3 (L3)	S3 < x ≦ S4 (L4)	S4 < x (L5)
LT1	L	L	H	H	H
LT2	H	L	L	L	H
LT3	H	H	H	L	L

4.7 Communication Response Time

The current value data of EJ Counter(s) connected to this product are sent to the master device by EtherCAT cyclic communication. The time required to update data at the master device is as follows.

Tips

The update times indicated below are for reference. The time fluctuates depending on the system used by the customer.

■ Conditions

Baud rate: 100 Mbps

Master device: BECKHOFF CX5120-0175

EtherCAT communication cyclic communication period: 1 ms

Number of EJ Counters	Update time (reference)
1 unit	Approx. 4 ms
8 units	Approx. 18 ms

- The update time is the same regardless of whether the number of Linear Gages connected to the EJ Counters is one or two.

5 EJ Counter Parameter Settings

<table>
<tr><th>No.</th><th>Set value</th><th>Per-axis setting</th><th>Set value: Operation</th><th>Default value</th><th>Description</th></tr>
<tr><td>01</td><td>Key protect</td><td>N/A</td><td>00: No key protect
01: Key protect</td><td>00</td><td>Operation of keys other than those used for setting parameters can be disabled to prevent operation errors.
Tips
Operation by external input cannot be disabled.</td></tr>
<tr><td>02</td><td>Origin initial-ization
(Origin clear)</td><td>N/A</td><td>00: Do not initialize.
01: Initialize.</td><td>00</td><td>When a Linear Gage with origin mark is connected, the origin can be initialized without cycling on the power.</td></tr>
<tr><td>03</td><td>Display mode selection</td><td>N/A</td><td><table><tr><th>Set value</th><th>Ch. 1</th><th>Ch. 2</th></tr><tr><td>00</td><td>A-axis counter</td><td>B-axis counter</td></tr><tr><td>01</td><td>Sum (A+B)</td><td>B-axis counter</td></tr><tr><td>02</td><td>Differ-ence (A-B)</td><td>B-axis counter</td></tr><tr><td>03</td><td>A-axis counter</td><td>Sum (A+B)</td></tr><tr><td>04</td><td>A-axis counter</td><td>Differ-ence (A-B)</td></tr><tr><td>05</td><td>A-axis speed</td><td>B-axis speed</td></tr><tr><td>06</td><td>A-axis counter</td><td>A-axis speed</td></tr><tr><td>07</td><td>B-axis counter</td><td>B-axis speed</td></tr></table></td><td>00</td><td>Selects the values to be displayed on Ch.1 and Ch.2.
Tips
• When using only the A-axis or the B-axis, set 06 or 07.
• If the displayed content is the same both before and after changing the setting, the tolerance value, preset value and preset state settings are maintained.
• In order to set the speed display, set the speed sampling cycle with Parameter Number 17.
• The speed display unit is mm/s (or in/s). Display of lower digits may be fixed depending on the speed sampling time.
• When the minimum value (MIN) is selected for Peak mode, the speed display indicates the maximum speed in the reverse direction.
• Because speed display is simpli-fied, it is not suitable for feedback control.</td></tr>
</table>

No.	Set value	Per-axis setting	Set value: Operation	Default value	Description
04	Linear Gage resolution (minimum reading)	✓	00: 0.005 mm (5 µm), 0.0002 in 01: 0.001 mm (1 µm), 0.00005 in 02: 0.0005 mm (0.5 µm), 0.00002 in 03: 0.0001 mm (0.1 µm), 0.000005 in	01	Sets the minimum reading according to the resolution of the connected Linear Gage. Make settings individually for the A-axis and B-axis. **Tips** • Correct values will not be displayed if the settings do not match the resolution of the connected Linear Gage. • The unit for minimum reading is "in" when Parameter Number 22 is set to "1".
05	Origin detection function	N/A	00: Disabled 01: Enabled	00	Selects whether the origin function is enabled or disabled when a Linear Gage with an origin point mark is connected.
06	Counter direction	✓	00: + direction 01: - direction	00	Sets the relationship between the direction in which the numeric value changes and the direction of movement of the Linear Gage plunger. When 00 is set, the numeric value increases as the plunger moves toward top dead center. When 01 is set, the numeric value increases as the plunger moves toward bottom dead center. Make settings individually for the A-axis and B-axis.
07	Origin detection direction	✓	00: + direction 01: - direction	00	When a Linear Gage with an origin mark is connected, selects the direction of the plunger of the Linear Gage for origin detection. Make settings individually for the A-axis and B-axis.

No.	Set value	Per-axis setting	Set value: Operation	Default value	Description
08	Tolerance judgment setting	N/A	00: 3-step tolerance judgment 01: 5-step tolerance judgment 02: No tolerance judgment	00	Selects whether or not the tolerance judgment function is used. When the tolerance judgment is used, selects the number of steps of tolerance judgment. **Tips** Changing the settings does not clear tolerance values S1 to S4, which are maintained. However, the following adjustments may be made in the event that the following inconsistencies occur. When the setting is changed from "3-step tolerance" or "No tolerance" to "5-step tolerance": When S2 < S1 or S4 < S2, S2 is replaced with the value of S1. When S3 < S1 or S4 < S3, S3 is replaced with the value of S4.
09	Display at startup	N/A	00: Counter stand-by 01: Counter displayed	00	Selects whether to display the standby state or the counter display at startup. **Tips** For details about screen display in the counter stand-by state, see 📖 the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".
10	ERR/ALLGO selection (I/O input/output setting)	N/A	00: Used as ERR 01: Used as ALLGO	00	Selects whether to use the ERR or ALLGO signal as the external output function. **Tips** When multiple EJ Counters are linked together, all of them must have the same setting. Correct output will not be obtained if any of the EJ Counters has a different setting.
11	Channel coupling selection (I/O input/output setting)	N/A	00: Do not couple channels 01: Couple channels	00	Selects whether to couple the 1 or 2 SEL external input signal to the EJ Counter's display channel. **Tips** The EJ Counter's [SEL/CE] key also works to couple the signal.

No.	Set value	Per-axis setting	Set value: Operation	Default value	Description
12	Origin re-detection (I/O input/output setting)	N/A	00: Disabled 01: Only effective for the axis that is dependent on the channel selected by 1/2 SEL. 02: Axis dependent on Ch.1 and axis dependent on Ch.2.	00	When setting is enabled, origin re-detection goes on stand-by when the HOLD signal (I/O input) rises. If the HOLD signal rises again while original detection is on stand-by, origin re-detection is canceled. **Tips** This setting affects all axes related to the specified channel. However, this does not include the axis whose channel is displaying speed. Example: • If the channel displaying the sum (A+B) and difference (A-B) is selected, the A-axis and B-axis are affected. • If the channel displaying the B-axis coordinates is selected, the B-axis is affected.
13	Preset by I/O input (I/O input setting)	N/A	00: Executed only for the channel selected by 1/2 SEL. 01: Executed for both channels.	00	Selects whether preset processing by external input is to be applied to just one channel or both channels.
14	Ch affected by the CLEAR signal (I/O input/output setting)	N/A	00: Executed only for the channel selected by 1/2 SEL. 01: Executed for both channels.	00	Selects whether peak clear and error clear are to be applied to just the specified channel or to both channels.
15	Peak value preset	N/A	00: Disabled 01: Enabled	00	Sets whether the peak value is to be set as the standard during peak mode maximum value display or minimum value display. **Tips** Peak value preset cannot be set during run-out display.
16	Smoothing	N/A	00: No smoothing (update at 5 ms intervals). 01: The average of 16 measurements is displayed (update at 80 ms intervals). 02: The average of 32 measurements is displayed (update at 160 ms intervals).	00	Counter values are averaged to minimize flicker of the lowest-order digit.

No.	Set value	Per-axis setting	Set value: Operation	Default value	Description
17	Speed sampling cycle	N/A	00: 10 ms 01: 50 ms 02: 100 ms	00	Selects the sampling interval for speed calculation.
18	Hide the lowest-order digit.	N/A	00: Display all digits. 01: Hide the lowest-order digit.	00	Hides the lowest-order digit. However, data output to the optional interface unit includes the lowest-order digit.
19	Arbitrary ID specification	N/A	00 to 49: ID numbers assigned automatically. 50 to 99: Arbitrary ID numbers assigned (ID numbers specified).	01	Set the ID number required when an optional interface unit is connected. When arbitrary ID numbers are set in the range 50 to 99, the ID numbers set are assigned the next time the power is turned on. **Tips** • After setting IDs, be sure to cycle the power off and on or perform a system reset. • When 00 to 49 is set, ID numbers 01 to 08 are automatically reassigned when the power is cycled off and on or after the system is reset. • If the same ID number is arbitrarily assigned to more than one EJ Counter, [EJ-CONNECT] will flash following power-on or system reset and the interface unit will not function properly. This will require checking ID settings at the EJ Counters themselves.
20	Power saving function	N/A	00: Display always lit 01 to 99: Display goes out after the specified interval passes (specify the interval length in minutes).	00	Turning off display minimizes power consumption. Specify the time that elapses between when the last key is pressed until the display goes out (01 to 99 minutes). When display is turned off, press any key to turn it on again. **Tips** Counter operation for the axes, I/O input and output, and data communication through the optional interface unit continue even when the display is off.

No.	Set value	Per-axis setting	Set value: Operation	Default value	Description
21	Parameter initialization	N/A	00: Do not initialize. 01: Initialize.	00	When this parameter is set to 01, the settings for all parameters other than number 19 (the arbitrary ID) and number 22 (the unit setting) are reset to their default values. Further, the tolerance and preset values are cleared.
22	Unit selection (EJ-102NE only)	N/A	00: mm (mm/s) 01: in (in/s)	00	The unit for displayed values can be set to "mm" or "in". **Tips** • Changing this setting clears the preset and tolerance values. • The default value is not restored even if the parameters are re-initialized. • The resolution of the Linear Gage is fixed to "in".

6 Troubleshooting

When this product does not operate as expected, refer to the cause of the trouble and the solutions shown below:

■ Overall

Problem	Cause	Solution
Power does not go on.	The interface unit is not connected to an EJ Counter.	The interface unit draws power from an EJ Counter. Connect it to an EJ Counter. **Tips** For details, see "2.1.2 Linking to EJ Counters" on page 23 and "2.3 Power Supply Connection" on page 28.
	Power is not supplied to the EJ Counter.	The interface unit draws power from an EJ Counter. Supply power to the EJ Counter.
	Power is not properly connected to the EJ Counter's connection plug.	Properly connect the power to the EJ Counter's connection plug. **Tips** For details, see the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".
	Power supply capacity is insufficient.	Connect a noise-free power supply with a capacity of 10 V DC–27 V DC (30 W).
	You are attempting to supply power via USB.	This product is not designed to receive power via USB bus. Power must be supplied by an EJ Counter. Supply power to the EJ Counter.
	The counter or interface unit linkage connector is defective.	Replace the defective counter or interface unit with a good one.
Unit from the middle of daisy chain does not power on.	One of the daisy chain is not properly connected.	Disconnect the first unit that won't power on from the last unit that does power on, and then reconnect the units.
	The linkage connector is defective on either the unit that will power on, the unit that won't power on, or both.	Replace the defective unit with a good one.
Only one unit in the daisy chain does not power on.	The unit in question is defective.	Replace the defective unit with a good one.

Problem	Cause	Solution
The [EJ-CONNECT] indicator does not light. (No communication with the EJ Counter.)	The terminal unit is not connected.	Normal communication requires connection of the terminal unit. Connect the terminal unit. **Tips** For details, see "2.1.2 Linking to EJ Counters" on page 23.
	The interface unit was connected to the EJ Counter while the EJ Counter's power was on.	The interface unit detects the EJ Counter when its power is turned on. Turn off the power, and then turn it back on again.
	Nine or more EJ Counters are linked together.	Turn off the power and then turn it back on after reducing the number of linked EJ Counters to no more than eight.
	The counter or interface unit linkage connector is defective.	Replace the defective counter or interface unit with a good one.
The [EJ-CONNECT] indicator flashes.	When setting arbitrary IDs, the same ID was assigned to more than one EJ Counter.	Make parameter settings by key operation, taking care to assign a unique ID to each EJ Counter.
The [ERROR] indicator flashes.	Master device setting or EtherCAT communication timeout detected.	Verify master device settings and connection of EtherCAT cables.
Connection lost between units.	DIN rail fixing bracket not installed.	Immobilize the interface unit and EJ Counter(s) using the DIN rail fixing bracket. **Tips** For details, see "2.1.3 Attaching the DIN Rail Fixing Bracket" on page 24.

■ USB communication

Problem	Cause	Solution
Unable to connect USB connector.	The USB connector is of the wrong type.	The interface unit uses a Type-C connector. Use a Type-C compatible cable. **Tips** For details, see "2.2.1 USB Connection" on page 26.
Unable to use USB communication.	Your device uses the wrong communication standard.	This product uses the USB 2.0 Full Speed communication standard and works with Windows 10 standard device drivers. Please verify that your device supports the USB 2.0 Full Speed standard.
	Your device has the wrong port setting.	With this interface unit, USB communication uses a virtual COM port. When making port settings on your device, check to make sure the settings work with the application use for communication.

Problem	Cause	Solution
Cannot retrieve current value data.	The EJ Counter has thrown an error, and is not counting.	Clear the error on the EJ Counter. **Tips** For details, see the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".

■ EtherCAT Communication

Problem	Cause	Solution
The cable cannot be connected.	You are attempting connection with optical communication or a single-pair Ethernet (SPE).	This product does not support optical communication and SPE. Use STP straight communication cables of type Cat.5e or higher, or EtherCAT-compatible cables.
	You are attempting to use other than an RJ45 connector.	The standard of this product's communication port is RJ45. Obtain a cable and plug connector that supports RJ45 connection.
Communication speed is slow. Communication doesn't work.	The cable used is the wrong category.	Use STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables.
Communication not working.	The communication cable from the master device is connected to EtherCAT OUT.	Connect the communication cable from the master device to EtherCAT IN.
	Device identification by master device ID is selected.	Change the device ID of this product to the ID specified on the master device.
The current value is not as expected.	You may be applying the wrong unit (mm/in).	This product transfers only numeric data, which does not include the unit of measurement. Check the unit setting on the EJ Counter. **Tips** For details, see the separate "Compact Display Unit for Linear Gage EJ Counter User's Manual".
	The number of digits is wrong.	This product uses a fixed minimum resolution for data transfer. (0.00001 mm or 0.0000001 in) No decimal point is included in send data. Take the above into consideration and convert data as needed.
	Negative numbers not properly converted.	This product handles negative numbers as the complement of 2. Use a suitable method for converting data.

Problem	Cause	Solution
The master device received an emergency message from this product.	Supplied power is outside of the specified range or the product is defective.	Verify EJ Counter connections and supplied power (10 V DC–27 V DC, 30 W). If operation is not restored after verification, the product may be defective and require replacement.
	A momentary communication error occurred between this product and an EJ Counter or inside this product.	The power supply or communication cable may be carrying electrical noise. Verify that the power supply is not carrying noise and that the product is grounded.

Tips

For details on handling output errors, see "3.3 List of USB Communication Errors" on page 40.

7 Specifications

7.1 Basic Specifications

Part No.		21HZA264
Product name		Interface Unit EtherCAT
Supported interfaces		EtherCAT
User interface	Display	POWER (green), RUN (green), ERROR (red), L/A IN (green), L/A OUT (green), EJ-CONNECT (green)
	Switch	Rotary switch × 3 (for device ID setting)
Functions		Common protocol for USB and EtherCAT Current value read-out, current value hold (software hold), EJ Counter parameter setting, tolerance evaluation setting, preset value setting, preset/zero set clear, peak clear, error clear
Power supply specifications	Input voltage	10 V–27 V DC (supplied from EJ Counter) Power cannot be supplied by USB.
	Maximum power consumption	Interface unit by itself: 3 W or less With maximum number of linked EJ Counters: 30 W or less (including 8 EJ Counters and 16 Linear Gages)
Operating temperature (humidity) range		0 °C–50 °C (20% RH–80% RH, without condensation)
Storage temperature (humidity) range		-10 °C–60 °C (20% RH–80% RH, without condensation)
CE marking/ UKCA marking		EMC Directive/Electromagnetic Compatibility Regulations: EN IEC 61326-1 Immunity test requirement: Clause 6.2 Table 2 Emission limit: Class A RoHS Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations: EN IEC 63000

7.2 Communication Specification

7.2.1 USB Communication

Item		Specifications
USB 2.0	Baud rate	Full Speed (12 Mbps)*1
	Port used	Virtual COM port
	Connector type	Type-C

*1 Communication time is 5 to 10 ms when acquiring current values, and 20 to 30 ms when setting EJ Counter parameters (reference values).
Actual times will vary depending on the computer operating environment and conditions of use.

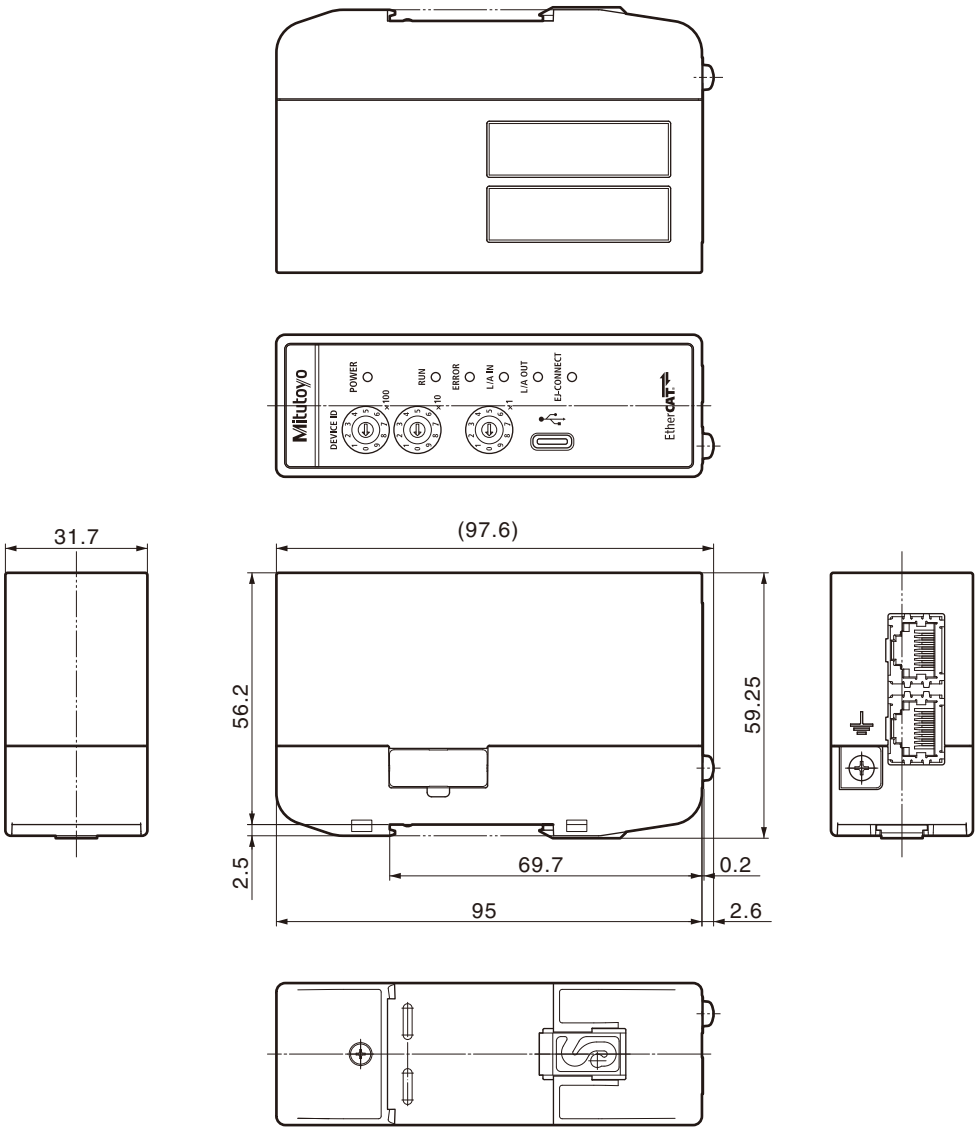
7.2.2 EtherCAT Communication

Item		Specifications
EtherCAT Communication	Communication port	RJ45×2 ports (IP20)
	Communication cable	STP communication cables of type Cat.5e or higher, or EtherCAT-compatible cables
	Baud rate	100 Mbps, full duplex
	Device ID	Bits 1 to 999 * When set to 0, the device ID is not used.
	Synchronization mode	Free Run mode

7.3 Outline Dimensional Drawing

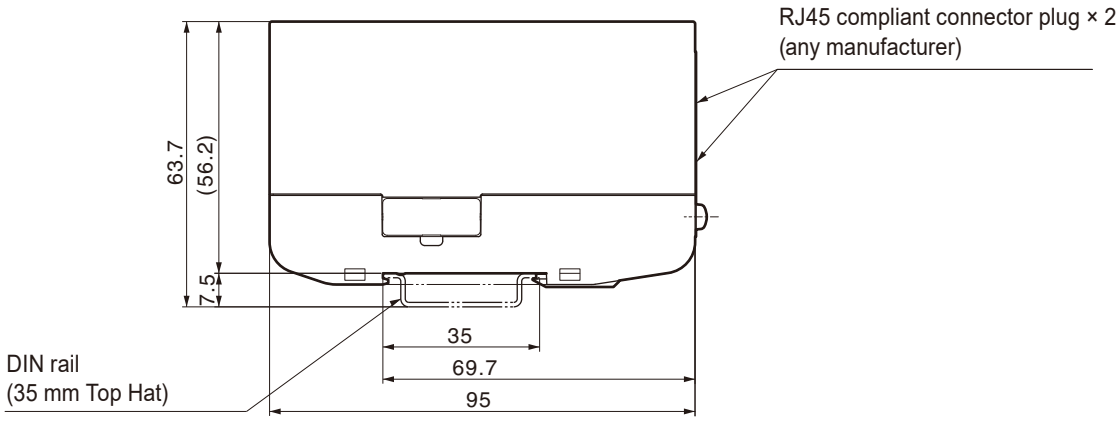
■ Main unit dimensions

Unit: mm



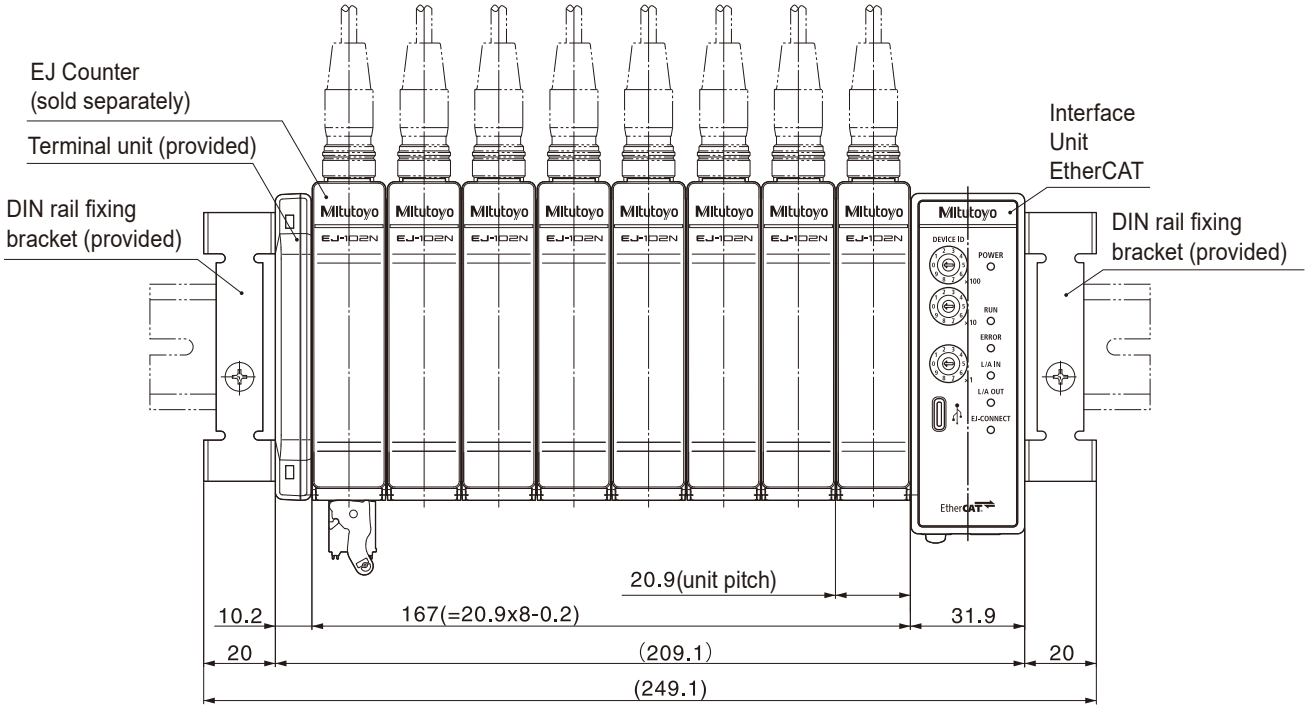
■ DIN rail and connector installation dimensional drawing

Unit: mm



■ Maximum configuration dimensional drawing

Unit: mm



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*As of June 2023

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