OMRON

Machine Automation Controller NX-series Load Cell Input Unit

User's Manual

NX-RS

Load Cell Input Unit



W565-E1-05



NOTE

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

Trademarks

- · Sysmac and SYSMAC are trademarks or registered trademarks of OMRON Corporation in Japan and other countries for OMRON factory automation products.
- Microsoft, Windows, Windows Vista, Excel, and Visual Basic are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.
- EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- Safety over EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- · ODVA, CIP, CompoNet, DeviceNet, and EtherNet/IP are trademarks of ODVA.
- The SD and SDHC logos are trademarks of SD-3C, LLC.

Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.

Copyrights

Microsoft product screen shots reprinted with permission from Microsoft Corporation.

Introduction

Thank you for purchasing an NX-series Load Cell Input Unit.

This manual contains information that is necessary to use the NX-series Load Cell Input Unit. Please read this manual and make sure you understand the functionality and performance of the NX-series Load Cell Input Unit before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- · Personnel in charge of designing FA systems.
- · Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B 3503.

Applicable Products

This manual covers the following product.

NX-series Load Cell Input Unit

NX-RS

CONTENTS

Introduction	1
Intended Audience	1
Applicable Products	1
Relevant Manuals	8
Manual Structure	9
Page Structure and Icons	9
Special Information	
Precaution on Terminology	11
Terms and Conditions Agreement	12
Warranty, Limitations of Liability	
Application Considerations	
Disclaimers	
Safety Precautions	14
Definition of Precautionary Information	
Symbols	
Warnings	
Cautions	
Precautions for Safe Use	
Precautions for Correct Use	
Regulations and Standards	24
Conformance to EU Directives	
Conformance Requirement to EU Directives	
Conformance to Shinbuilding Standards	
Conformance to KC Certification	
Software Licenses and Copyrights	
Unit Versions	27
Unit Versions	
Unit Versions and Support Software Versions	
Related Manuals	29
Related Manuals	29 33
Related Manuals Terminology Revision History	29 33 36
Related Manuals Terminology Revision History	29 33

Section 1 Features and System Configuration

1-1	Features of Load Cell Input Unit1		
1-2	Syste	m Configuration	1-4
	1-2-1	System Configuration in the Case of a CPU Unit	1-4
	1-2-2	System Configuration of Slave Terminals	1-5
	1-2-3	Configuration Examples of Weight Measurement System	1-7
	1-2-4	Configuration Examples of Force Measurement System	1-9

1-3	Unit N	Iodels, Functions and Support Software	1-10
	1-3-1	List of Unit Models	. 1-10
	1-3-2	List of Functions	. 1-10
	1-3-3	Support Software	. 1-12

Section 2 Specifications and Application Procedures

2-1	Specifications		2-2	
	2-1-1	General Specifications	2-2	
	2-1-2	Individual Specifications	2-3	
2-2	Opera	iting Procedures	2-7	

Section 3 Part Names and Functions

3-1	Part Names	3-2
3-2	Indicators	3-3
3-3	Terminal Blocks	3-5

Section 4 Installation and Wiring

4-1	Instal	lling NX Units	
4-2	Wiring	g the Power Supply and Ground	
4-3	Wiring	g the Terminals	
	4-3-1 4-3-2	Wiring the Screwless Clamping Terminal Blocks Checking the Wiring	
4-4	Wirin	g the Connected External Devices	
	4-4-1	Terminal Block Arrangement	
	4-4-2	Wiring Example with 6-wire Connection	
	4-4-3	Wiring Example with 4-wire Connection	
	4-4-4	Wiring Example of Parallel Connection	

Section 5 I/O Refreshing

5-1	I/O Re	freshing	
	5-1-1	I/O Refreshing from CPU Units to NX Units	5-2
	5-1-2	I/O Refreshing from CPU Units or Industrial PCs to Slave Terminal	5-3
	5-1-3	Calculating the I/O Response Times of NX Units	5-4
5-2	I/O Re	freshing Methods	5-5
	5-2-1	Types of I/O Refreshing Methods	5-5
	5-2-2	Setting the I/O Refreshing Methods	5-6
	5-2-3	Restrictions in Refresh Cycles	
	5-2-4	I/O Refreshing Method Operation	5-8
		- ·	

Section 6 Specifications of Input Conversion and I/O Data

6-1 Specifications of Input Conversion			
	- 6-1-1	General Properties of the Load Cell	
	6-1-2	Terms Used in Weight Measurement	
	6-1-3	Detailed Specifications of Input Conversion	6-5
6-2	6-2 Specifications of I/O Data		
	6-2-1	Data Items for Allocation to I/O	6-13

6-2-2	Data Details	. 6-	15	5
-------	--------------	------	----	---

Section 7 Calibration Methods

7-1 Overview and Precautions		7-2	
	7-1-1 7-1-2	Overview of Actual Load Calibration and Equivalent Input Calibration	7-2 7-3
7-2	Actua	I Load Calibration	
	7-2-1	Calibration Procedure	7-4
	7-2-2	Basic Parameter Settings	7-7
	7-2-3	Performing a Zero Calibration	7-9
	7-2-4	Performing a Span Calibration	7-10
	7-2-5	Correcting Errors by Calibration Site	7-10
7-3	Equiv	alent Input Calibration	
	7-3-1	Calibration Procedure	
	7-3-2	Basic Parameter Settings	
	7-3-3	Changing Calibration Modes	7-15
7-4	Calib	ation with the User Program	
	7-4-1	Performing an Actual Load Calibration	
	7-4-2	Performing an Equivalent Input Calibration	
7-5	Calib	ation Failures and Calibration Value Errors	
	7-5-1	Calibration Failures	
	7-5-2	Calibration Value Errors	

Section 8 Functions

8-1	Gravi	ty Acceleration Correction	
	8-1-1 8-1-2 8-1-3	Function Applications and Overview Details on the Function Setting Method	
8-2	Digita	al Filtering	
	8-2-1	Function Applications and Overview	
	8-2-2	Details on the Function	
	8-2-3		
8-3	Zero	Set/Zero Reset	
	8-3-1	Function Applications and Overview	
	8-3-2	Details on the Function	8-13
8-4	Zero	Tracking	8-16
	8-4-1	Function Applications and Overview	8-16
	8-4-2	Details on the Function	
	8-4-3	Setting Method	
8-5	Zero	Point Range Over Detection	
	8-5-1	Function Applications and Overview	
	8-5-2	Details on the Function	
	8-5-3	Setting Method	
8-6	Tare S	Subtraction	
	8-6-1	Function Applications and Overview	
	8-6-2	Calculating the Net Weight Value	
	8-6-3	One-touch Tare Subtraction	
	8-0-4		
8-7	Stable	e Detection	
	8-7-1	Function Applications and Overview	
	8-7-2	Details on the Function	
	8-7-3	Setting Method	

8-8	Over F	Range/Under Range Detection	8-31
	8-8-1 8-8-2	Function Applications and Overview	8-31
8-9	Senso	Details on the Function	8-32
	8-9-1 8-9-2	Function Applications and Overview Details on the Function	8-32 8-32
8-10	Input '	Value Refreshing Stop	8-35
	8-10-1 8-10-2	Function Applications and Overview Details on the Function	8-35 8-35
8-11	Peak I	Hold/Bottom Hold	8-37
	8-11-1 8-11-2	Function Applications and Overview Details on the Function	8-37 8-37
8-12	Data T	racing	8-41
	8-12-1 8-12-2 8-12-3 8-12-4	Function Applications and Overview Details on the Function How to Execute Data Tracing How to Check the Tracing Result	8-41 8-42 8-43 8-45
8-13	Decim	al Point Position Setting	8-47
	8-13-1 8-13-2 8-13-3	Function Applications and Overview Details on the Function Setting Method	8-47 8-47 8-48

Section 9 Troubleshooting

9-1	How to Check for Errors				
9-2	2 Checking for Errors with the Indicators				
9-3	Check	ing for Errors and Troubleshooting on the Support Software			
	9-3-1	Checking for Errors from the Sysmac Studio			
	9-3-2	Checking for Errors from Support Software Other Than the Sysmac Studio			
	9-3-3	Event Codes and Corrections for Errors	9-6		
	9-3-4	Meaning of Error			
9-4	Resett	ting Errors			
9-5	Unit-specific Troubleshooting9-				
9-6	Measurement Values Used When an Error Occurs				
9-7	Troubleshooting Flowchart9-31				

Section 10 Inspection and Maintenance

10-1 Cl	eani	ing and Inspection	10-2
10-	-1-1	Cleaning	. 10-2
10-	-1-2	Periodic Inspection	. 10-2
10-2 Ma	ainte	enance Procedures	10-5

Appendices

A-1	Dimen	sions	A-2
A-2	Digital	Filter Design That Utilizes Data Tracing	A-3
	A-2-1 A-2-2	System Configuration Examples of Digital Filter Design	A-3 A-4

A-3	List o	f NX Objects	A-7
	A-3-1	Format of NX Object Descriptions	A-7
	A-3-2	Unit Information Objects	A-7
	A-3-3	Objects That Accept I/O Allocations	A-8
	A-3-4	Other Objects	A-13
A-4	Versio	on Information with CPU Units	A-18
	A-4-1	Relationship between Unit Versions of Units	A-18
A-5	Versio	on Information with Communications Coupler Units	A-19
	A-5-1	Connection to the EtherCAT Coupler Unit	A-19
	A-5-2	Connection to the EtherNet/IP Coupler Unit	A-20
A-6	Displa	ay Methods for the Calibration View	A-21
	A-6-1	Connection to the CPU Unit	A-21
	A-6-2	Connection to the Communications Coupler Unit	A-22

Index

Relevant Manuals

The table below provides the relevant manuals for the NX-series Load Cell Input Unit.

Read all of the manuals that are relevant to your system configuration and application to make the most of the NX-series Load Cell Input Unit.

Other manuals, such as related product manuals, are necessary for specific system configurations and applications. Refer to *Related Manuals* on page 29 for the related manuals.

Manual name	Application		
NX-series Load Cell Input Unit	Learning how to use NX-series Load Cell Input Units		
User's Manual			
NX-series Data Reference Man-	Referencing lists of the data that is required to configure systems with		
ual	NX-series Units		

Manual Structure

Page Structure and Icons

The following page structure and icons are used in this manual.



Note This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.



Version Information

Information on differences in specifications and functionality for CPU Units, Industrial PCs, and Communications Coupler Units with different unit versions and for different versions of the Support Software is given.

Note References are provided to more detailed or related information.

Precaution on Terminology

- In this manual, "download" refers to transferring data from the Support Software to a physical device and "upload" refers to transferring data from a physical device to the Support Software.
- In this manual, the directions in relation to the Units are given in the following figure, which shows upright installation.



- This user's manual refers to the NY-series IPC Machine Controller Industrial Panel PCs and Industrial Box PCs as simply *Industrial PCs* or as *NY-series Industrial PCs*.
- This user's manual refers to the built-in EtherCAT port on an NJ/NX-series Controller or NY-series Industrial PC as simple a built-in EtherCAT port.
- This user's manual may omit manual names and manual numbers in places that refer to the user's manuals for CPU Units and Industrial PCs. The following table gives some examples. When necessary, refer to *Related Manuals* on page 29 to determine the appropriate manual based on the common text for the omitted contents.

Examples:

Manual name	Omitted contents	Common text	
NJ/NX-series CPU Unit Software	Software user's manual	Software User's Manual	
User's Manual	for the connected CPU		
NY-series	Unit or Industrial PC		
IPC Machine Controller Industrial			
Panel PC / Industrial Box PC			
Software User's Manual			
NJ/NX-series CPU Unit Built-in Ether-	User's manual for built-in	Built-in EtherCAT port	
CAT® Port User's Manual	EtherCAT port on the		
NY-series	connected CPU Unit or		
IPC Machine Controller Industrial	Industrial PC		
Panel PC / Industrial Box PC			
Built-in EtherCAT® Port			
User's Manual			

• This user's manual may omit manual names and manual numbers in places that refer to the user's manuals for Communications Coupler Units. If you use a Communications Coupler Unit, refer to *Related Manuals* on page 29 to identify the manual for your Unit.

Terms and Conditions Agreement

Warranty, Limitations of Liability

Warranties

Exclusive Warranty

Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

Limitations

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right.

Buyer Remedy

Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See http://www.omron.com/global/ or contact your Omron representative for published information.

Limitation on Liability; Etc

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CON-SEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Application Considerations

Suitability of Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIP-MENT OR SYSTEM.

Programmable Products

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Disclaimers

Performance Data

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an NX-series Load Cell Input Unit.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.



Symbols



The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.



The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.



The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.



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

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

NX-series Load Cell Input Unit User's Manual (W565)

Warnings

During Power Supply

Do not touch the terminal section while power is ON.

Electric shock may occur.

Do not attempt to take any Unit apart.

In particular, high-voltage parts are present in Units that supply power while power is supplied or immediately after power is turned OFF. Touching any of these parts may result in electric shock. There are sharp parts inside the Unit that may cause injury.

Fail-safe Measures

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, Industrial PCs, other Units, or slaves or due to other external factors affecting operation.

Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

The CPU Unit or Industrial PCs will turn OFF all outputs from Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.

- If a power supply error occurs.
- If the power supply connection becomes faulty.
- If a CPU watchdog timer error or CPU reset occurs.
- If a Controller error in the major fault level occurs.
- While the CPU Unit is on standby until RUN mode is entered after the power is turned ON

External safety measures must be provided to ensure safe operation of the system in such	
cases.	

The outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

If external power supplies for slaves or other devices are overloaded or short-circuited, the voltage will drop, outputs will turn OFF, and the system may be unable to read inputs. Provide external safety measures in control with monitoring of external power supply voltage as required so that the system operates safely in such a case.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.

Not doing so may result in serious accidents due to incorrect operation.











Voltage and Current Inputs

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.

Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

Transferring

Always confirm safety at the destination node before you transfer Unit configuration information, parameters, settings, or other data from tools such as the Sysmac Studio.

The devices or machines may operate unexpectedly, regardless of the operating mode of the Controller.

Cautions



Wiring

When you connect a computer or other peripheral device to a Communications Coupler Unit that has a non-isolated DC power supply, either ground the 0-V side of the external power supply (i.e. Unit power supply) or do not ground it at all.

If the peripheral devices are grounded incorrectly, the external power supply (i.e. Unit power supply) may be short-circuited.

Never ground the 24-V side of the power supply, as shown in the following figure.



Be sure that all terminal screws and cable connector screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction.



Online Editing

Execute online editing only after confirming that no adverse effects will be caused by deviations in the timing of I/O. If you perform online editing, the task execution time may exceed the task period, I/O may not be refreshed with external devices, input signals may not be read, and output timing may change.



Precautions for Safe Use

Transporting

- When transporting any Unit, use the special packing box for it. Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock. Doing so may result in Unit malfunction or burning.

Mounting

- · Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.

Installation

- Always turn OFF the power supply before installing the Unit. If the power supply is not OFF, the Unit may malfunction or may be damaged.
- Always turn OFF the Unit power supply and I/O power supply before you remove the NX Unit.
- Do not apply labels or tape to the Unit. When the Unit is installed or removed, adhesive or scraps may adhere to the pins in the NX bus connector, which may result in malfunctions.
- Do not touch the pins in the NX bus connector on the Unit. Dirt may adhere to the pins in the NX bus connector, which may result in malfunctions.



Example: NX Unit (12 mm width)

• Do not write on an NX Unit with ink within the restricted region that is shown in the following figure. Also do not get this area dirty. When the Unit is installed or removed, ink or dirt may adhere to the pins in the NX bus connector, which may result in malfunctions in the CPU Rack or the Slave Terminal.

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for the restricted region of CPU Unit and Communications Coupler Unit.



• For the installation orientations in the following figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured to the DIN Track, which may result in malfunctions.



Wiring

- Double-check all switches and other settings and double-check all wiring to make sure that they are correct before turning ON the power supply.
- Use the correct wiring parts and tools when you wire the system.
- Do not pull on the cables or bend the cables beyond their natural limit. Also, do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cable.
- When wiring or installing the Units, do not allow metal fragments to enter the Units.
- Do not press the flat-blade screwdriver straight into the release holes on a screwless clamping terminal block. Doing so may damage the terminal block.



- When you insert a flat-blade screwdriver into a release hole on a screwless clamping terminal block, press it down with a force of 30N or less. Applying excessive force may damage the terminal block.
- Do not incline or twist the flat-blade screwdriver while it is in a release hole on a screwless clamping terminal block. Doing so may damage the terminal block.



 Use crimp terminals for wiring the M3 screw terminal blocks. Do not connect bare stranded wires directly to the M3 screw terminal blocks.

Power Supply Design

- Use all Units within the I/O power supply ranges that are given in the specifications.
- The I/O power supply current for the CPU Rack with an NX-series CPU Unit should be within the range specified for the CPU Unit model. For example, use the NX1P2 CPU Unit with a current of 4 A or less. Using the currents that are outside of the specifications may cause failure or damage. Refer to the user's manual for the connected CPU Unit for the I/O power supply current for the CPU Unit model.
- Supply sufficient power according to the contents of this manual.
- · Use the power supply voltage that is specified in this manual.
- Do not apply voltages that exceed the rated value to any Input Unit.
- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum ratings.
- Inrush current occurs when the power supply is turned ON. When selecting fuses or breakers for
 external circuits, consider their fusing and detection characteristics as well as the above precautions
 and allow sufficient margin in shut-off performance.
- Install external breakers and take other safety measures against short-circuiting and overcurrents in external wiring.

Turning ON the Power Supply

• When you set the Operating Mode at Startup, confirm that no adverse effect will occur in the system.

Actual Operation

- Before you start operation, always register the NX Units that are connected to the Communications Coupler Unit in the host communications master as the Unit Configuration Information.
- Check the user program, data, and parameter settings for proper execution before you use them for actual operation.
- If you change the fail-soft operation setting, the output status when the error occurs may also change. Confirm safety before you change the fail-soft operation setting.
- If you use fail-soft operation, write programming to determine whether Unit I/O data is valid. Without such programming, the user program cannot distinguish between Units for which I/O refreshing is continued and Units for which I/O refreshing is stopped.

Turning OFF the Power Supply

- Do not disconnect the cable or turn OFF the power supply to the Controller or a Slave Terminal when downloading data or the user program from the Support Software.
- Always turn OFF the external power supply to the Units before attempting any of the following.

Mounting or removing an NX Unit, Communications Coupler Unit, CPU Unit, or Industrial PC Assembling Units

Setting DIP switches or rotary switches

Connecting or wiring cables

Attaching or removing terminal blocks or connectors

Units that supply power continue to supply power to the Units for up to several seconds after the power supply is turned OFF. The PWR indicator remains lit as long as power is supplied. Confirm that the PWR indicator is not lit before you perform any of the above.

Operation

 Confirm that the controlled system will not be adversely affected before you perform any of the following operations.

Changing the operating mode of the CPU Unit or the Industrial PC (including changing the setting of the Operating Mode at Startup)

Changing the user program or settings Changing set values or present values Forced refreshing

 Always sufficiently check the safety at the connected devices before you change the settings of a slave or Unit.

General Communications

- Do not exceed the ranges that are given in the specifications for the communications distance and number of connected Units.
- Refer to the user's manual for the Communications Coupler Unit for precautions for the safe use of communications with the connected Communications Coupler Unit.

Unit Replacement

• When you replace a Unit, start operation only after you transfer the settings and variables that are required for operation to the new Unit.

Disposal

• Dispose of the product according to local ordinances as they apply.

Precautions for Correct Use

Storage, Mounting, and Wiring

- · Follow the instructions in this manual to correctly perform installation and wiring.
- Do not operate or store the Units in the following locations. Doing so may result in malfunction, in operation stopping, or in burning.

Locations subject to direct sunlight Locations subject to temperatures or humidity outside the range specified in the specifications Locations subject to condensation as the result of severe changes in temperature Locations subject to corrosive or flammable gases Locations subject to dust (especially iron dust) or salts Locations subject to exposure to water, oil, or chemicals Locations subject to shock or vibration

• Take appropriate and sufficient countermeasures during installation in the following locations.

Locations subject to strong, high-frequency noise Locations subject to static electricity or other forms of noise Locations subject to strong electromagnetic fields Locations subject to possible exposure to radioactivity Locations close to power lines

- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Use the rated power supply voltage for the Units that supply power. Take appropriate measures to
 ensure that the specified power with the rated voltage and frequency is supplied in places where the
 power supply is unstable.
- Install the Units away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.

Actual Operation

• If you change the event level of an error, the output status when the error occurs may also change. Confirm safety before you change an event level.

Turning OFF the Power Supply

- Do not turn OFF the power supply while data is being transferred.
- Do not turn OFF the power supply while parameters are being written to the CPU Unit, the Communications Coupler Unit or NX Units.

General Communications

• Refer to the user's manual for the Communications Coupler Unit for precautions for the correct use of communications with the connected Communications Coupler Unit.

Regulations and Standards

Conformance to EU Directives

Applicable Directives

- EMC Directives
- Low Voltage Directive

Concepts

• EMC Directives

OMRON devices that comply with EU Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*1

Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EU Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

 *1. Applicable EMC (Electromagnetic Compatibility) standards are as follows: EMS (Electromagnetic Susceptibility): EN 61131-2 EMI (Electromagnetic Interference): EN 61131-2 (Radiated emission: 10-m regulations).

• Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61010-2-201.

Conformance to EU Directives

The NX-series Units comply with EU Directives. To ensure that the machine or device in which the NX-series Units are used complies with EU Directives, the following precautions must be observed.

- The NX-series Units must be installed within a control panel.
- You must use SELV power supply for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.
 EMC standard compliance was confirmed for the recommended Power Supplies. Refer to the user's manual for the connected CPU Unit for the recommended power supplies for the CPU Rack with an NX-series CPU Unit. Refer to the user's manual for the connected Communications Coupler Unit for the recommended power supplies for the Slave Terminal.
- NX-series Units that comply with EU Directives also conform to the Common Emission Standard (EN 61131-2). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.

You must therefore confirm that the overall machine or equipment in which the NX-series Units are used complies with EU Directives.

• You must use power supplies with an output hold time of 10 ms or longer for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.

• This is a Class A product (for industrial environments). In a residential environment, it may cause radio interference. If radio interference occurs, the user may be required to take appropriate measures.

Conformance Requirement to EU Directives

Immunity test conditions of the NX-series Load Cell Input Unit are as follows:

Model	Overall accuracy	Digital filter setting	
NX-RS1201	+5%/5%	Digital low-pass filter: 8 Hz	
	(full scale)	Moving average filter 1: 160 times	
		Moving average filter 2: 133 times	

For Load Cell Input Unit connections, the compatibility is confirmed in the following conditions.

- · Wired with a 6-wire connection
- 6-core shielded cables are used.
- · One end of the shield wire is grounded on the Unit side.

Conformance to UL and CSA Standards

Some NX-series products comply with UL and CSA standards. If you use an NX-series product that complies with UL or CSA standards and the machinery or system in which you use the NX-series product must also comply with the standards, refer to the *Instruction Sheet* that is provided with the product. The *Instruction Sheet* provides the application conditions for complying with the standards.

Conformance to Shipbuilding Standards

Some NX-series products comply with shipbuilding standards. If you use an NX-series product that complies with shipbuilding standards and the machinery or system in which you use the NX-series product must also comply with the standards, consult with your OMRON representative. Application conditions are defined according to the installation location. Application may not be possible for some installation locations.

For usage conditions for shipbuilding standards, refer to *Conformance to Shipping Standards* in the user's manual for the CPU Unit or Communications Coupler Unit to which NX Units are connected. Note that the usage conditions are provided in the relevant user's manuals for Units whose conformance to shipbuilding standards is confirmed.

Conformance to KC Certification

Observe the following precaution if you use NX-series Units in Korea.

A급 기기 (업무용 방송통신기자재) 이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Class A Device (Broadcasting Communications Device for Office Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes.

Sellers and/or users need to take note of this.

Software Licenses and Copyrights

This product incorporates certain third party software. The license and copyright information associated with this software is available at http://www.fa.omron.co.jp/nj_info_e/.

Unit Versions

This section describes the notation that is used for unit versions, the confirmation method for unit versions, and the relationship between unit versions and Support Software versions.

Unit Versions

A "unit version" has been introduced to manage the Units in the NX Series according to differences in functionality accompanying Unit upgrades.

An example is provided below for Communications Coupler Units and NX Units. For the notation that is used for the unit versions of CPU Units or Industrial PCs and the confirmation method for unit versions, refer to the user's manual for each Unit.

Notation of Unit Versions on Products

The unit version is given with the Unit specifications on the side of the Unit or in the notched area.



The following information is provided in the Unit specifications on the Unit.

Name	Function
Unit model number	Gives the model of the Unit.
Unit version	Gives the unit version of the Unit.
Lot number	Gives the lot number of the Unit.
	DDMYY⊡: Lot number, □: Used by OMRON.
	"M" gives the month (1 to 9: January to September, X: October, Y: November, Z: December)

The following information is provided in the notched area on the Unit.

Name	Function
Lot number and	Gives the lot number and unit version of the Unit.
unit version	 DDMYY^[]: Lot number, ^[]: Used by OMRON. "M" gives the month (1 to 9: January to September, X: October, Y: November, Z: December) 1^[]: Unit version The decimal portion of the unit version is omitted. (It is provided in the Unit specifications.)

Confirming Unit Versions with the Support Software

If your NX Unit is connected to a CPU Unit, refer to the user's manual of the connected CPU Unit for the confirmation method for the unit version of the NX Unit.

If your NX Unit is connected to a Communications Coupler Unit, refer to the user's manual of the connected Communications Coupler Unit for the confirmation method for the unit version of the Communications Coupler Unit and NX Unit.

Unit Versions and Support Software Versions

The functions that are supported depend on the unit version of the Unit. The version of Support Software that supports the functions that were added for an upgrade is also required to use those functions. Refer to *A-4 Version Information with CPU Units* on page A-18 or *A-5 Version Information with Communications Coupler Units* on page A-19 for the functions that are supported by each unit version.

Related Manuals

Manual name	Cat. No.	Model numbers	Application	Description
NX-series Load Cell Input Unit User's Manual	W565	NX-RS	Learning how to use an NX-series	The hardware, setup methods, and functions of the NX-series Load Cell
			Load Cell Input Unit	Input Unit are described.
NX-series Data Refer-	W525	NX-00000	Referencing lists of	Lists of the power consumptions,
ence Manual			the data that is	weights, and other NX Unit data that is
			required to config-	required to configure systems with
			ure systems with	NX-series Units are provided.
Svemac Studio Version	W504	SVSMAC	NX-series Units	Describes the operating procedures of
1 Operation Manual	VV00 -		operating proce-	the Sysmac Studio.
			dures and func-	
			tions of the	
			Sysmac Studio.	
NX-IO Configurator	W585		Learning about the	Describes the operating procedures of
Operation Manual		D-V4	operating proce-	the NX-IO Configurator.
			tions of the NX-IO	
			Configurator.	
NJ/NX-series Trouble-	W503	NX701-□□□□	Learning about the	Concepts on managing errors that may
shooting Manual		NJ501-□□□□	errors that may be	be detected in an NJ/NX-series Con-
		NJ301-□□□□	detected in an	troller and information on individual
		NJ101-□□□□	NJ/NX-series Con-	errors are described.
		NX102-000		
		NX1P2-000		
NY-series Troubleshoot-	W564	NY532-000	Learning about the	Concepts on managing errors that may
ing Manual		NY512-000	errors that may be	be detected in an NY-series Controller
			detected in an	and information on individual errors are
			INY-series indus-	described.
NX-series EtherCAT®	W519	NX-FCC20	Learning how to	The following items are described: the
Coupler Unit User's			use an NX-series	overall system and configuration meth-
Manual			EtherCAT Coupler	ods of an EtherCAT Slave Terminal
			Unit and Ether-	(which consists of an NX-series Ether-
			CAT Slave Termi-	CAT Coupler Unit and NX Units), and
			nais	Information on nardware, setup, and functions to set up, control, and monitor
				NX Units through EtherCAT.
NX-series Ether-	W536	NX-EIC202	Learning how to	The following items are described: the
Net/IP TM Coupler Unit			use an NX-series	overall system and configuration meth-
User's Manual			EtherNet/IP Cou-	ods of an EtherNet/IP Slave Terminal
			pier Unit and Eth-	(WHICH COUSISIS OF AN INX-SERIES ETHER-
			Terminals	information on hardware. setup. and
				functions to set up, control, and monitor
				NX Units.

The following table shows related manuals. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series CPU Unit Hardware User's Man- ual	W535	NX701-□□□	Learning the basic specifications of the NX-series NX701 CPU Units, including introduc- tory information, designing, installa- tion, and mainte- nance.	An introduction to the entire NX701 CPU Unit system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications
			Mainly hardware information is pro- vided.	Installation and wiringMaintenance and inspection
NX-series NX102 CPU Unit Hardware User's Manual	W593	NX102-□□□	Learning the basic specifications of the NX-series NX102 CPU Units, including introduc- tory information, designing, installa- tion, and mainte- nance. Mainly hardware informa- tion is provided.	An introduction to the entire NX102 CPU Unit system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection
NX-series NX1P2 CPU Unit Hardware User's Manual	W578	NX1P2-□□□	Learning the basic specifications of the NX-series NX1P2 CPU Units, including introduc- tory information, designing, installa- tion, and mainte- nance. Mainly hardware informa- tion is provided.	An introduction to the entire NX1P2 CPU Unit system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection
NJ-series CPU Unit Hardware User's Man- ual	W500	NJ501-□□□ NJ301-□□□ NJ101-□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory infor- mation, designing, installation, and maintenance. Mainly hardware information is pro- vided.	An introduction to the entire NJ-series system is provided along with the fol- lowing information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection

Manual name	Cat. No.	Model numbers	Application	Description
NY-series IPC Machine Controller Industrial Panel PC Hardware User's Manual	W557	NY532-□□□□	Learning the basic specifications of the NY-series Industrial Panel PCs, including introductory infor- mation, designing.	An introduction to the entire NY-series system is provided along with the fol- lowing information on the Industrial Panel PC. • Features and system configuration • Introduction
			installation, and maintenance. Mainly hardware information is pro- vided.	 Part names and functions General specifications Installation and wiring Maintenance and inspection
NY-series IPC Machine Controller Industrial Box PC Hardware User's Manual	W556	NY512-□□□	Learning the basic specifications of the NY-series Industrial Box PCs, including introduc- tory information, designing, installa- tion, and mainte- nance. Mainly hardware informa- tion is provided.	An introduction to the entire NY-series system is provided along with the fol- lowing information on the Industrial Box PC. • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection
NJ/NX-series CPU Unit Software User's Manual	W501	NX701-000 NJ501-000 NJ301-000 NJ101-000 NX102-000 NX1P2-000	Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is pro- vided.	 The following information is provided on an NJ/NX-series CPU Unit. CPU Unit operation CPU Unit features Initial settings Programming based on IEC 61131-3 language specifications
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Software User's Manual	W558	NY532-000	Learning how to program and set up the Controller functions of an NY-series Indus- trial PC	The following information is provided on NY-series Machine Automation Con- trol Software. • Controller operation • Controller features • Controller settings • Programming based on IEC 61131-3 language specifications
NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual	W505	NX701-UUUU NJ501-000 NJ301-000 NJ101-000 NX102-000 NX102-000	Using the built-in EtherCAT port on an NJ/NX-series CPU Unit.	Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the config- uration, features, and setup.
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Built-in EtherCAT® Port User's Manual	W562	NY532-0000	Using the built-in EtherCAT port on an NY-series Industrial PC	Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the config- uration, features, and setup.

Manual name	Cat. No.	Model numbers	Application	Description
NJ/NX-series Instruc-	W502	NX701-□□□□	Learning detailed	The instructions in the instruction set
tions Reference Manual		NJ501-□□□□	specifications on	(IEC 61131-3 specifications) are
		NJ301-□□□□	the basic instruc-	described.
		NJ101-□□□□	NJ/NX-series CPU	
		NX102-□□□□	Unit	
		NX1P2-000		
NY-series Instructions	W560	NY532-000	Learning detailed	The instructions in the instruction set
Reference Manual		NY512-000	specifications on	(IEC 61131-3 specifications) are
			the basic instruc-	described.
			tions of an	
			NY-series Indus-	
			trial PC	
Sysmac Library User's	W569	SYSMAC-XR010	Learning the func-	Information required to use the Weigh-
Manual for Weighing			tion block specifi-	ing Control Library is described.
Control Library			cations in the	
			Weighing Control	
			Library.	

Terminology

Term	Abbre- viation	Description
actual load calibration		One of the calibration methods of the Load Cell Input Unit. The actual
		weight or force is applied to the load cell to calibrate.
application layer status, AL status		Status for indicating information on errors that occur in an application on a slave.
CAN application protocol over Ether- CAT	CoE	A CAN application protocol service implemented on EtherCAT.
CAN in Automation	CiA	CiA is the international users' and manufacturers' group that develops and supports higher-layer protocols.
Communications Coupler Units		The generic name of an interface unit for remote I/O communications on a network between NX Units and a host network master.
CPU Rack		A rack to which a CPU Unit is mounted. For NX-series CPU Units to which NX Units can be connected, a CPU Rack has a CPU Unit with NX Units and an End Cover mounted to it.
DC time		In a CPU Rack of a NX-series CPU Unit to which NX Units can be con- nected, time indicated by the clock shared between the CPU Unit and the NX Units.
		EtherCAT slaves that support distributed clock synchronization have a clock that is shared by all slaves in the network. The time that is based on this distributed clock is called the DC time. The same clock is shared by a CPU Unit, NX Units connected to the CPU Unit, and applicable EtherCAT slaves.
device profile		A collection of device dependent information and functionality providing consistency between similar devices of the same device type.
device variable		A variable that is used to access a specific device through an I/O port by an NJ/NX-series CPU Unit or NY-series Industrial PC. Process data on an EtherCAT slave is allocated to this variable. For NX-series CPU Units to which NX Units can be connected, I/O data for the NX Units on a CPU Unit is allocated. A user application on a CPU Unit or Industrial PC accesses a device that can be connected, by directly reading and writing this device variable.
digital filter		A filter that performs signal processing for quantized values.
discharge weighing		A weighing method that controls the discharge amount based on the weight value that decreases when the material is discharged from the scale hopper.
distributed clock	DC	Clock distribution mechanism used to synchronize EtherCAT slaves and the EtherCAT master.
equivalent input calibration		One of the calibration methods of the Load Cell Input Unit. The electrical signal that is equal to the electrical signal change that occurs when an actual weight or force is applied to the load cell. This signal is input in numeric values to calibrate.
EtherCAT slave controller	ESC	A controller for EtherCAT slave communications.
EtherCAT slave information	ESI	An XML file that contains setting information for an EtherCAT slave.
EtherCAT state machine	ESM	An EtherCAT communications state machine.
EtherCAT Technology Group	ETG	The ETG is a global organization in which OEM, end users, and technol- ogy providers join forces to support and promote the further technology development.
feed weighing		A weighing method that controls the feed amount based on the weight value that increases when the material is fed into the scale hopper.
fixed tare		Tare of a scale or scale hopper fixed on top of the load cell that does not change permanently.

Term	Abbre- viation	Description
force		Force that is applied to the load cell. The unit is N or kN.
gain drift		Gain shift of AD conversion circuit that occurs for every 1°C ambient temperature change. The unit is ppm/°C.
gross weight		Total weight of tare and measured material. The unit is g, kg, or t.
I/O map settings		Settings that assign variables to I/O ports. Assignment information
		between I/O ports and variables.
I/O port		A logical interface that is used by the NJ/NX-series CPU Unit or NY-series Industrial PC to exchange data with an external device (slave or Unit).
I/O refreshing		Cyclic data exchange with external devices that is performed with prede- termined memory addresses.
index		Address of an object within an application process.
load cell		A sensor that converts the weight or force into an electrical signal to out- put. Generally, it refers to a sensor that uses a strain gauge.
load on the load cell		Weight or force that is applied to the load cell.
net weight		Weight of only the measured material that is acquired when you subtract the tare weight from the gross weight.
network configuration information		The EtherCAT network configuration information held by the EtherCAT master.
nonlinearity		The maximum measurement value error for the ideal line on the graph that shows the relationship between load on the load cell and the load cell output. This line connects the point where the load cell output 0 mV/V is input and the point where the full scale is input. It is expressed in percent of the full scale.
NX bus		The NX-series internal bus.
object		An abstract representation of a particular component within a device, which consists of data, parameters, and methods.
object dictionary	OD	Data structure that contains description of data type objects, communi- cation objects and application objects.
Operational		A state in which I/O refresh communications and NX message communi- cations are possible between the communications master and the Com- munications Coupler Unit or NX Units.
PDO communications		An acronym for process data communications.
Pre-Operational		A state in which NX message communications are possible between the communications master and the Communications Coupler Unit or NX Units, but I/O refresh communications are not possible.
primary periodic task		The task with the highest priority.
process data		Collection of application objects designated to be downloaded cyclically or acyclically for the purpose of measurement and control.
process data communications		One type of EtherCAT communications in which process data objects (PDOs) are used to exchange information cyclically and in realtime. This is also called PDO communications.
process data object	PDO	A structure that describes the mappings of parameters that have one or more process data entities.
rated capacity		The maximum load for which the load cell can measure within its design specifications. It is also called rated force. The load to measure must be less than the rated capacity.
rated output		Difference between the output with no load and the load cell output with the rated capacity. The unit is mV/V. The output for 1 V load cell excitation voltage is expressed in mV.
receive PDO	RxPDO	A process data object received by an EtherCAT slave.
Safe-Operational		A state in which input refresh communications and NX message commu- nications are possible between the communications master and the Communications Coupler Unit or NX Units, but output refresh communi- cations are not possible.
Term	Abbre- viation	Description
-----------------------------	-------------------	--
SDO communications		One type of EtherCAT communications in which service data objects
		(SDOs) are used to transmit information whenever required.
service data object	SDO	CoE asynchronous mailbox communications where all objects in the
		object dictionary can be read and written.
Slave Information Interface	SII	Slave information that is stored in non-volatile memory in the slave.
Slave Terminal		A building-block remote I/O terminal, which consists of a Communica-
		tions Coupler Unit connected with NX Units.
span calibration		One of the calibration types. The gross weight value or force measure-
		ment value with a load on the load cell is defined to calibrate.
strain gauge		Element that converts the strain magnitude into electrical resistance.
subindex		Sub-address of an object within the object dictionary.
summing box		A device that is used to connect one or more load cells in parallel. When
		one or more load cells are connected in parallel to output only one sig-
		nal, they are considered to be one load cell.
Sync0		A signal that gives the interrupt timing based on the distributed clock
		(DC) in EtherCAT communications. The slaves execute controls accord-
		ing to this interrupt timing.
Sync Manager	SM	Collection of control elements to coordinate access to concurrently used
		objects.
tare		A container or a bag in which the measured material is placed when the
		weight is measured.
task period		The interval at which the primary periodic task or a periodic task is exe-
		cuted.
transmit PDO	TxPDO	A process data object sent from an EtherCAT slave.
zero balance		Load cell output with no load. It is 0 V/V in theory, but in reality, the load
		cell outputs minute voltage to the excited voltage due to an error in the
		internal circuit even when no load is applied to the load cell.
zero calibration		One of the calibration types. The load on the load cell with which the
		gross weight value or force measurement value becomes 0 is defined to
		calibrate.
zero drift		Zero point shift that occurs for every 1°C ambient temperature change.
		The unit is $\mu V/^{\circ}C$.
zero point		Point on the straight line where the gross weight value or force measure-
		ment value becomes 0 during calibration. The straight line indicates the
		relationship between the gross weight value or force measurement value
		and the load on the load cell.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	April 2016	Original production
02	October 2016	 Made changes accompanying the addition of NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC.
		 Made changes accompanying the addition of the NX-series NX1P2 CPU Unit.
		Corrected mistakes.
03	June 2017	 Made changes accompanying the upgrade of the NX-ECC203 unit ver- sion to version 1.5.
		 Made changes accompanying the upgrade of the NX-EIC202 unit ver- sion to version 1.2.
		Corrected mistakes.
04	April 2018	 Made changes accompanying the addition of the NX-series NX102 CPU Unit.
		Corrected mistakes.
05	October 2018	Made revisions accompanying the appearance change of the indica-
		tors.
		Corrected mistakes.

Sections in this Manual



Features and System Configuration

This section provides overviews of the features, system configurations, Unit models, functions of the Load Cell Input Unit, and support software.

1-1	Featu	res of Load Cell Input Unit	1-2
1-2	Syste	m Configuration	1-4
	1-2-1	System Configuration in the Case of a CPU Unit	1-4
	1-2-2	System Configuration of Slave Terminals	1-5
	1-2-3	Configuration Examples of Weight Measurement System	1-7
	1-2-4	Configuration Examples of Force Measurement System	1-9
1-3	Unit N	lodels, Functions and Support Software	1-10
	1-3-1	List of Unit Models	1-10
	1-3-2	List of Functions	1-10
	1-3-3	Support Software	1-12

1-1 Features of Load Cell Input Unit

The Load Cell Input Unit performs input processing of the output signal from a load cell to measure the weight or force. The Load Cell Input Unit performs an AD conversion to convert the output signal from a load cell into physical units such as weight or force and output it to the CPU Unit or communications master.



The NX-series Load Cell Input Unit has the following features.

Can be Connected to a CPU Unit or Communications Coupler Unit

NX Unit NX-series Load Cell Input Unit can be connected to the following Units.*1

- NX-series CPU Unit
- NX-series Communications Coupler Unit

When a CPU Unit and a Communications Coupler Unit are used together, you can unify the methods for installing, wiring, and setting up NX Units, and eventually reduce design costs.

Example:

NX-series NX1P2 CPU Unit



NX Units: NX-series Load Cell Input Unit



NX-series EtherCAT Coupler Unit

*1. For whether NX Units can be connected to the CPU Unit or Communications Coupler Unit to be used, refer to the user's manual for the CPU Unit or Communications Coupler Unit to be used.

Synchronous I/O with Refresh Cycle of the NX Bus

When the NX-series CPU Unit or EtherCAT Coupler Unit is used together with NX Units that support synchronous I/O refreshing, the I/O control of multiple NX Units can be synchronized at the time to synchronize with the refresh cycle of the NX bus.

This provides an accurate I/O control because it suppresses jitter in the I/O timing of multiple NX Units.

Simple I/O Wiring with a Screwless Clamping Terminal Block

The terminal block is a screwless clamping terminal block.

You can connect the wires simply by pushing the ferrules into the terminals. The amount of wiring work is reduced without requiring the use of screws.

Accuracy That is Applicable to High-precision Load Cells

The Load Cell Input Unit can measure output signals from load cells with the following accuracies.

Therefore, it is applicable to load cells with high measurement resolution.

- Nonlinearity: ±0.01% (full scale)
- Zero drift: ±0.1 µV/°C RTI
- Gain drift: ±10 ppm/°C

Stable Measurements with Digital Filtering

You can use digital filtering to suppress fluctuations of measurement values that are caused by electrical noise and mechanical noise, and provide stable measurements. You can freely combine the following three digital filters to use digital filtering.

- · Digital low-pass filter
- · Moving average filter 1
- · Moving average filter 2

Optimum Digital Filter Design

You can use data tracing to sample measurement values before and after digital filtering, and record the data.

You can refer to the recorded results to easily identify the noise frequency band and confirm the noise removal effect to achieve the optimum digital filter design.

Cable Disconnection Check

You can use sensor disconnection test to check if the cable that connects the load cell and Load Cell Input Unit is disconnected.

This allows you to easily check if the connection cable is disconnected when starting up, operating, and maintaining devices.

1-2 System Configuration

NX Unit NX-series Load Cell Input Units can be connected to the following Units.

• NX-series CPU Unit

(D) Support Software

• NX-series Communications Coupler Unit

The following explains the system configuration for each NX Unit connection destination. Then, configuration examples of weight measurement and force measurement systems that use a Load Cell Input Unit are described.

1-2-1 System Configuration in the Case of a CPU Unit

The following figure shows a system configuration when a group of NX Units is connected to an NX-series NX1P2 CPU Unit.

You can connect the EtherCAT Slave Terminal to the built-in EtherCAT port on the CPU Unit. Refer to 1-2-2 System Configuration of Slave Terminals on page 1-5 for details on the system configuration of a Slave Terminal.

Refer to the user's manual for the connected CPU Unit for details on how to configure the system if the connected CPU Unit is not an NX1P2 CPU Unit.



Letter	Item	Description
(A)	NX-series CPU Unit	The Unit that serves as the center of control for a Machine Automation Con-
		troller. It executes tasks, refreshes I/O for other Units and slaves, etc. NX Units
		can be connected to an NX1P2 CPU Unit.

Letter	Item	Description
(B)	NX Units ^{*1}	The NX Units perform I/O processing with connected external devices. The NX Units exchange data with the CPU Unit through I/O refreshing. A maximum of eight NX Units can be connected to an NX1P2 CPU Unit.
(C)	End Cover	The End Cover is attached to the end of a CPU Rack.
(D)	Support Software (Sysmac Studio)	A computer software application for setting, programming, debugging, and troubleshooting NJ/NX/NY-series Controllers.
		For an NX1P2 CPU Unit, this application performs setting operation by making a connection to a built-in EtherNet/IP port.

*1. For whether an NX Unit can be connected to the CPU Unit, refer to the version information in the user's manual for the NX Unit.

1-2-2 System Configuration of Slave Terminals

A building-block remote I/O slave provided with a group of NX Units connected to a Communications Coupler Unit is generically called a Slave Terminal.

The NX Units can be flexibly combined with a Communications Coupler Unit to achieve the optimum remote I/O slave for the application with less wiring, less work, and less space.

The following figure shows an example of the system configuration when an EtherCAT Coupler Unit is used as a Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to configure the system when any other type of Communications Coupler Unit is used.



*1. The connection method for the Support Software depends on the model of the CPU Unit or Industrial PC.

Letter	ltem	Description
(A)	EtherCAT master *1	The EtherCAT master manages the network, monitors the status of slaves, and exchanges I/O data with slaves.
(B)	EtherCAT Coupler Unit	The EtherCAT Coupler Unit serves as an interface for process data com- munications on the EtherCAT network between the NX Units and the Eth- erCAT master.
		The I/O data for the NX Units is accumulated in the EtherCAT Coupler Unit and then all of the data is exchanged with the EtherCAT master at the same time.
		The EtherCAT Coupler Unit can also perform message communications (SDO communications) with the EtherCAT master.
(C)	NX Units ^{*2}	The NX Units perform I/O processing with connected external devices.
		The NX Units perform process data communications with the EtherCAT master through the EtherCAT Coupler Unit. The Load Cell Input Unit is one of the NX Units.
(D)	End Cover	The End Cover is attached to the end of the Slave Terminal.
(E)	Support Software *3 *4	The Sysmac Studio runs on a personal computer and it is used to config- ure the EtherCAT network and EtherCAT Slave Terminal, and to program, monitor, and troubleshoot the Controllers.
(F)	ESI (EtherCAT Slave Information) file	The ESI file contains information that is unique to the EtherCAT Slave Ter- minal in XML format. You can load the ESI file into the Support Software to easily allocate Slave Terminal process data and configure other settings.
		The ESI files for OMRON EtherCAT slaves are already installed in the Support Software. You can update the Support Software to get the ESI files for the most recent models.
(G)	Communications cable	Use a double-shielded cable with aluminum tape and braiding of Ethernet category 5 (100Base-TX) or higher, and use straight wiring.

*1. An EtherCAT Slave Terminal cannot be connected to any of the OMRON CJ1W-NC 81/82 Position Control Units even though they can operate as EtherCAT masters.

*2. For whether an NX Unit can be connected to the Communications Coupler Unit, refer to the version information in the user's manual for the NX Unit.

*3. The term Support Software indicates software that is provided by OMRON. If you connect to a master from another company, use the software tool corresponding to that master.

*4. Refer to 1-3-3 Support Software on page 1-12 for information on Support Software.

1-2-3 Configuration Examples of Weight Measurement System

Here, examples of system configuration that uses a Load Cell Input Unit to measure weights^{*1} are provided.

You can connect a load cell to the Load Cell Input Unit and perform calibration to configure a weight measurement system. These configuration examples are for EtherCAT Slave Terminals. *1. The unit is kg or t.

Scaling System

This is a system that measures the weight of measured material that is placed on the scale.

It converts the load cell output that is input to the Load Cell Input Unit into a weight value and measures the weight of the measured material.

The weight value that is converted by the Load Cell Input Unit is transmitted to the CPU Unit. The weight of the measured material can be measured as a gross weight value.



Quantitative Discharging Control System

This is a system that measures the weight of the material that is fed into the scale hopper and discharges the material into a container.

It controls the feed valve in the following order while measuring the weight of the material in the scale hopper.

- Large feed \rightarrow Medium feed \rightarrow Small feed \rightarrow Close

When the weight of the material in the scale hopper reaches the fixed quantity, the discharge valve is opened and the material is discharged into the container.



1-2-4 Configuration Examples of Force Measurement System

Here, examples of system configuration that uses a Load Cell Input Unit to measure forces^{*1} are provided.

You can connect a load cell to the Load Cell Input Unit and perform calibration to configure a force measurement system. These configuration examples are for EtherCAT Slave Terminals.

*1. The unit is N or kN.

Press Fitting System

This system is used to press fit two objects together in order to produce a processed product.

The Servo Drive applies a force to the objects to press fit them. Measure the force with the Load Cell Input Unit to check that the force is appropriate in order to determine if the processed product meets the standards.



1-3 Unit Models, Functions and Support Software

This section gives the Unit models, functions, and support software of the Load Cell Input Unit.

1-3-1 List of Unit Models

The following table lists the model of the Load Cell Input Unit.

Model	Number of points	Conver- sion cycle	I/O refreshing method	Load cell excitation voltage	Input range
NX-RS1201	1 point	125 µs	Free-Run refreshing	5 VDC ± 10%	–5.0 to
			Synchronous I/O refreshing		5.0 mV/V
			Task period prioritized refreshing		

1-3-2 List of Functions

The following table lists the functions of the Load Cell Input Unit.

Supported: Functions that are used in target applications

-: Functions that are not used in target applications

	Application			
Function	Weight measure- ment ^{*1}	Force mea- surement ^{*2}	Description	Reference
I/O refreshing method setting * ³	Supported.	Supported.	Sets Free-Run refreshing, synchronous I/O refreshing, or task period prioritized refreshing for the I/O refreshing method.	5-2-2 Setting the I/O Refreshing Methods on page 5-6
Actual load calibra- tion	Supported.	Supported.	This is a user calibration function that is performed by placing an actual load on the load cell.	7-2 Actual Load Calibration on page 7-4
Equivalent input calibration	Supported.	Supported.	This is a user calibration function that is performed by inputting the rated output, rated capacity, and zero balance values of the load cell.	7-3 Equivalent Input Calibration on page 7-11
Gravity accelera- tion correction	Supported.	-	This function corrects errors in the gross weight values that occur due to the dif- ference of gravity acceleration at each site when the site where the actual load calibration of the device is executed and the installation site are different.	8-1 Gravity Accel- eration Correction on page 8-3
Digital filtering	Supported.	Supported.	This function uses the digital filter to remove noise components that are con- tained in input signals to suppress fluctu- ations of measurement values. You can use the digital low-pass filter and moving average filter.	8-2 Digital Filtering on page 8-5

Application					
Fu	Inction	Weight measure- ment ^{*1}	Force mea- surement ^{*2}	Description	Reference
Zero se	et/zero reset	Supported.	Supported.	The zero set function corrects the gross weight value/force measurement value to be the zero point within the set range at a desired time. The zero reset function resets the zero point correction that is performed with the zero set function.	8-3 Zero Set/Zero Reset on page 8-13
Zero tra	acking	Supported.	-	This function automatically corrects the zero point within the set range.	<i>8-4 Zero Tracking</i> on page 8-16
Zero po over de	pint range etection	Supported.	Supported.	This function detects when the gross weight value/force measurement value exceeds the set zero point range.	8-5 Zero Point Range Over Detec- tion on page 8-20
Tare su	btraction	Supported.	-	This function subtracts the tare weight value from the gross weight value to acquire the net weight value. There are two types of this function: one-touch tare subtraction and digital tare subtraction.	8-6 Tare Subtrac- tion on page 8-23
	One-touch tare sub- traction	Supported.	-	This function stores the gross weight value at the specified timing as the tare value and subtracts it from a given gross weight value to acquire the net weight value.	8-6-3 One-touch Tare Subtraction on page 8-23
	Digital tare subtrac- tion	Supported.	-	This function subtracts the preset digital tare value from the gross weight value to acquire the net weight value.	8-6-4 Digital Tare Subtraction on page 8-25
Stable	detection	Supported.	-	This function detects whether the gross weight value is stable.	8-7 Stable Detec- tion on page 8-27
Over ra range d	inge/under letection	Supported.	Supported.	This function detects when the input sig- nal exceeds the input conversion range.	8-8 Over Range/Under Range Detection on page 8-31
Sensor tion tes	disconnec- t	Supported.	Supported.	This function tests if the cable that con- nects the Load Cell Input Unit and load cell is disconnected. During the sensor disconnection test, you cannot measure the weight or force.	8-9 Sensor Discon- nection Test on page 8-32
Input va ing stop	alue refresh-)	Supported.	Supported.	This function stops refreshing the input value in a specified period.	8-10 Input Value Refreshing Stop on page 8-35
Peak he	old/bottom	-	Supported.	This function continues holding the peak value or the bottom value of the force measurement value in a specified period.	8-11 Peak Hold/Bottom Hold on page 8-37
Data tra	acing	Supported.	Supported.	This function records the values in REAL data in the buffer of the Load Cell Input Unit and exports the data to a CSV file. These values indicate the gross weight values/force measurement values before and after the digital filtering for a speci- fied period.	8-12 Data Tracing on page 8-41
Decima tion set	I point posi- ting	Supported.	Supported.	This function sets the number of digits which is displayed after the decimal point for each DINT data.	8-13 Decimal Point Position Setting on page 8-47

- *1. It is used to measure the weight in the unit of kg or t.
- *2. It is used to measure the force in the unit of N or kN.
- *3. Refer to 5-2-2 Setting the I/O Refreshing Methods on page 5-6 for details on the setting method.

1-3-3 Support Software

The Support Software that is used depends on the system configuration.

Support Software for a System Configured with a CPU Unit

If your system is configured by connecting an NX Unit to a CPU Unit, the Sysmac Studio is used as the Support Software.

• Support Software for a System Configured with a Slave Terminal

If your system is configured by connecting an NX Unit to a Communications Coupler Unit, refer to the user's manual for the Communications Coupler Unit for information on the Support Software.

Refer to A-4 Version Information with CPU Units on page A-18 or A-5 Version Information with Communications Coupler Units on page A-19 for information on the Support Software versions.

2

Specifications and Application Procedures

This section provides the specifications of the Load Cell Input Unit and describes how to use the Load Cell Input Unit.

2-1	Specifications 2-				
	2-1-1	General Specifications	. 2-2		
	2-1-2	Individual Specifications	. 2-3		
2-2	Opera	ting Procedures	2-7		

2-1 Specifications

This section provides the specifications of the Load Cell Input Unit.

2-1-1 General Specifications

	ltem	Specification
Enclosure	<u> </u>	Mounted in a panel
Groundin	n methods	Ground of 100 Q or less
	Ambient operating tem- perature	0 to 55°C
	Ambient operating humidity	10 to 95% RH (with no icing or condensation)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage tem- perature	-25 to 70°C (with no icing or condensation)
	Altitude	2,000 m max.
Oneret	Pollution degree	Pollution degree 2 or less: Conforms to JIS B 3502 and IEC 61131-2.
operat-	Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power supply line)
ronment	Overvoltage category	Category II: Conforms to JIS B 3502 and IEC 61131-2.
ronnioni	EMC immunity level	Zone B
		Conforms to IEC 60068-2-6.
		5 to 8.4 Hz with amplitude of 3.5 mm,
	Vibration resistance	8.4 to 150 Hz, acceleration of 9.8 m/s ²
		100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance	Conforms to IEC 60068-2-27, 147 m/s ² , 3 times each in X, Y, and Z directions
Applicable standards ^{*1}		cULus: Listed (UL61010-2-201), ANSI/ISA 12.12.01, EU: EN 61131-2, RCM, KC: KC Registration

*1. Refer to the OMRON website (www.ia.omron.com) or ask your OMRON representative for the most recent applicable standards for each model.

2-1-2 Individual Specifications

Item Descriptions

The meanings of each item of the Load Cell Input Unit are described in the table below.

ltem	Description		
Unit name	The name of the Unit.		
Model	The model of the Unit.		
Number of points	The number of load cell input points provided by the Unit.		
External connection ter-	The type of terminal block and connector that is used for connecting the Unit. The		
minals	number of terminals on the screwless clamping terminal block is also listed.		
I/O refreshing method	The I/O refreshing methods that are used by the Unit. The following refreshing methods are supported: Free-Run refreshing, synchronous I/O refreshing, and task period prioritized refreshing.		
Indicators	The type of indicators on the Unit and the layout of those indicators. ^{*1}		
Input range	The input range of the Unit.		
Input conversion range	The conversion range of converted values for the full scale of the Unit. Input mea- surement values range is fixed to the conversion limit value.		
Load cell excitation volt-	The excitation voltage that is supplied from the Unit to the load cell. The output cur-		
age	rent of the load cell excitation voltage that the Unit can supply is also listed.		
Zero point adjustment	The range of input values you can set as the zero point of the Unit.		
range			
Gain adjustment range	The range of input values you can set as the span point of the Unit.		
Nonlinearity	The nonlinearity of the Unit. It is defined at an ambient temperature of 25°C.		
Zero drift	The zero drift of the Unit.		
Gain drift	The gain drift of the Unit.		
A/D converter resolution	The resolution of the A/D converter that is used by the Unit.		
Warm-up period	The warm-up period of the Unit. If the Unit is warmed up, the temperature inside the Unit is stable. Thus, the measurement value is stable. When the Unit is calibrated or operated before the Unit is warmed up, accuracy values such as nonlinearity, zero drift, and gain drift do not deliver performance that is given in the specifications.		
Conversion cycle	The time required to convert load cell input signals of the Unit to measurement values.		
Dimensions	The dimensions of the Unit. They are described as W × H × D. The unit is "mm".		
Isolation method	The isolation method between the input circuit and internal circuit of the Unit.		
Insulation resistance	The insulation resistance between the input circuit and internal circuit of the Unit.		
Dielectric strength	The dielectric strength between the input circuit and internal circuit of the Unit.		
I/O power supply method	The method for supplying I/O power for the Unit. The supply method is determined for each Unit. I/O power is not supplied from the Unit to external devices.		
Current capacity of I/O power supply terminal	The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying I/O power to the connected external devices.		
NX Unit power con- sumption	The power consumption of the NX Unit power supply of the Unit. The power con- sumption when NX Units are connected to a CPU Unit and the power consumption when NX Units are connected to a Communications Coupler Unit.		
Current consumption	The current consumption from I/O power supply of the Unit. The current consump-		
from I/O power supply	tion of any connected external devices is excluded.		
Weight	The weight of the Unit.		
Circuit layout	The input circuit layout of the Unit.		
Installation orientation and restrictions	The installation orientation of a CPU Unit containing the Unit and the installation ori- entation of a Slave Terminal containing the Unit. Any restrictions to specifications that result from the installation orientation are also given.		

Item	Description
	A diagram of the connection between the Unit and connected external devices.
Terminal connection dia-	When an I/O Power Supply Connection Unit or a Shield Connection Unit is required
gram	to be connected to the connected external devices, the description for such is
	included.

^{*1.} The layout of the indicators after the appearance change is shown for models released in or before September 2018. For details on the applicable models and the changes, refer to *Appearance Change of the Indicators* on page 3-4.

Individual Specifications

Unit name	Load Cell Input Unit	Model		NX-RS1201
Number of points	1 point	External connection ter- minals		Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing, synchronous I/O ref	reshing,	or task period priori	tized refreshing
Indicators	TS indicator	Input r	ange	–5.0 to 5.0 mV/V
	BS1201	Input o	conversion range	–5.5 to 5.5 mV/V
	DTS	Load of voltag	cell excitation e	5 VDC ± 10%, Output current: 60 mA max.
		Zero p range	oint adjustment	-5.0 to 5.0 mV/V
		Gain p range	oint adjustment	-5.0 to 5.0 mV/V
		Accu Nonlinearity		±0.01% (full scale) ^{*2}
	rad		Zero drift	±0.1 µV/°C RTI
		-1	Gain drift	±10 ppm/°C
		A/D co	nverter resolu-	24 bits
		tion		
Warm-up period	30 minutes	Conve	rsion cycle	125 µs
Dimensions	12 (W) × 100 (H) × 71 (D)	Isolati	on method	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator
Insulation resistance	$20 \text{ M}\Omega$ min. between isolated circuits (at 100 VDC)	Dielec	tric strength	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	Currer power	nt capacity of I/O supply terminal	Without I/O power supply terminals
NX Unit power con- sumption	 Connected to a CPU Unit 2.05 W max. 	Current consumption from I/O power supply		No consumption
	Connected to a Communications Coupler Unit 1.70 W max.			
Weight	70 g max.			





*1. Accuracy for when the load cell and the Load Cell Input Unit are connected with the 6-wire connection.

 *2. The value for when the Load Cell Unit is used under the following conditions. Full scale: 0.0 to 5.0 mV/V or -5.0 to 0.0 mV/V Ambient temperature: 25°C Setting of digital filtering: Default

2-2 Operating Procedures

This section describes the operating procedures for the Load Cell Input Unit. Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on the operating procedures and how to download the settings of the CPU Unit or Slave Terminal to which the Load Cell Input Unit is connected.

Procedure	Item	Description	Reference
1	Making the Unit Settings	Register the Load Cell Input Unit with the Sup- port Software. Set the I/O allocations, basic parameters of the calibration, and functions to use for the Load Cell Input Unit offline.	 Section 6 Specifications of Input Conversion and I/O Data Section 7 Calibration Methodo
			Section 8 Func- tions
2	Creating the User Pro- gram	Create the user program for the CPU Unit or Industrial PC. For an NJ/NX-series CPU Unit or NY-series Industrial PC, create the user program with the Support Software. You can use the Weighing Control Library that is provided for the Load Cell Input Unit in the user program. In the Weighing Control Library, the function blocks, such as quantitative discharging control and other controls that can be used in the weight measurement system, are provided.	 Software user's manual for the connected CPU Unit or Industrial PC Sysmac Library User's Manual for Weighing Control Library (Cat. No. W569)
3	Installing the Unit	Install the Load Cell Input Unit on the CPU Unit or the Communication Couple Unit.	Section 4 Installa- tion and Wiring
4	Wiring the Unit	Wire the Load Cell Input Unit.	Section 4 Installa- tion and Wiring
5	Downloading the Unit Set- tings and the User Pro- gram	Download the Unit settings that are made with the Support Software to the Load Cell Input Unit. For an NJ/NX-series CPU Unit or NY-series Industrial PC, also download the user program.	 Software user's manual for the connected CPU Unit User's manual for the con- nected Commu- nications Coupler Unit
6	Calibrating the Unit	Calibrate the Load Cell Input Unit. Calibration is performed with actual load calibra- tion or equivalent input calibration.	Section 7 Calibra- tion Methods
7	Checking Operation	Confirm that gross weight values/force mea- surement values that are appropriate for the load on the load cell are acquired from the I/O Map or Watch Tab Page of the Support Soft- ware. Confirm that the Unit settings and the user pro- gram operate correctly.	<i>4-3-2 Checking the Wiring</i> on page 4-19

2 Specifications and Application Procedures

3

Part Names and Functions

This section describes the names and functions of the Load Cell Input Unit parts.

3-1	Part Names	3-2
3-2	Indicators	3-3
3-3	Terminal Blocks	3-5

3-1 Part Names

This section describes the names and functions of the Load Cell Input Unit parts.



Letter	Name	Description
(A)	Marker attachment loca-	This is where the markers are attached. OMRON markers are pre-installed at
	tion	the factory. You can also install commercially available markers.
(B)	NX bus connector	This connector is used to connect each Unit.
(C)	Unit hookup guides	These guides are used to connect two Units.
(D)	DIN Track mounting	These hooks are used to mount the NX Unit to a DIN Track.
	hooks	
(E)	Protrusions for remov-	These protrusions are to hold onto when you need to pull out the Unit.
	ing the Unit	
(F)	Indicators	The indicators show the current operating status of the Unit.
		Refer to 3-2 Indicators on page 3-3.
(G)	Terminal block	This terminal block is used to connect the load cell of the external device.
(H)	Unit specifications	The specifications of the Unit are given here.
(I)	DIN Track contact plate	This plate is connected internally to the functional ground terminal on the ter-
		minal block.

Indicators 3-2

There are indicators to show the current operating status of the Unit on the Load Cell Input Unit.

This section describes the names and functions of the indicator parts.

The appearance of the indicators has been changed for models released in or before September 2018 with lot numbers that represent the date of or after September 20, 2018. In this manual, those models are shown with the indicators after the change. For details on the applicable models and the changes, refer to Appearance Change of the Indicators on page 3-4.



Letter	Name	Function
(A)	Model number indication	Gives the model number of the Unit, without the prefix.
		For example, "RS1201" in the case of NX-RS1201.
		The text is orange.
(B)	TS indicator	This indicator shows the current status of the Load Cell Input Unit and its communications status with the CPU Unit or the Communications Coupler Unit.

The mear	The meanings of TS indicator light statuses are described as follows:			
Color		Status	Description	
Green		Lit	 The Unit is operating normally. 	
			 The Unit is ready for I/O refreshing. 	
			 I/O checking is operating.^{*1} 	
		Flashing at 2-s	Initializing	
		intervals.	 Restarting is in progress for the Unit. 	

Downloading

all I/O Units occurred.

to all I/O Units occurred.

· No Unit power supply

· Restarting is in progress for the Unit.

			Waiting for initialization to start
*1. Refer t	o the user's	s manual for the Comn	nunications Coupler Unit for the status of the indicator on the Commu-
niantia	na Countar	Linite when I/O sheek	ing in in program

A hardware failure, WDT error, or other fatal error that is common to

A communications error or other NX bus-related error that is common

nications Coupler Units when I/O checking is in progress.

Lit

/

Flashing at 1-s

intervals.

Not lit

3

Red

Appearance Change of the Indicators

The appearance of the indicators has been changed for models released in or before September 2018 with lot numbers that represent the date of or after September 20, 2018. See below for details on the applicable models and the changes. Models that are not listed here have the appearance after the change.

• Applicable Models

NX-RS1201

• Change Details

The shape of the light emitting part of the TS indicator has been changed from a square to a pentagon.

See below.



3-3 Terminal Blocks

Load Cell Input Unit uses screwless clamping terminal blocks for easy wiring and removal. The model number of the terminal block on the Load Cell Input Unit is NX-TBC162.



Letter	Name	Description
(A)	Terminal number indica- tion	The terminal numbers are given by column letters A and B, and row numbers 1 to 8.
		The combination of the column and row gives the terminal numbers from A1 to A8 and B1 to B8.
(B)	Release hole	Insert a flat-blade screwdriver into this hole to connect and remove the wire.
(C)	Terminal hole	The wire is inserted into this hole.
(D)	Ground terminal mark	This mark indicates the ground terminals.

4

Installation and Wiring

This section describes how to install and wire the Load Cell Input Unit.

4-1	Install	Installing NX Units 4-2			
4-2	Wiring	g the Power Supply and Ground4	-3		
4-3	Wiring	g the Terminals	-4		
	4-3-1	Wiring the Screwless Clamping Terminal Blocks	1-4		
	4-3-2	Checking the Wiring 4-	19		
4-4	Wiring	g the Connected External Devices	20		
	4-4-1	Terminal Block Arrangement 4-	21		
	4-4-2	Wiring Example with 6-wire Connection 4-	22		
	4-4-3	Wiring Example with 4-wire Connection 4-	22		
	4-4-4	Wiring Example of Parallel Connection 4-	23		

4-1 Installing NX Units

Refer to *Installation* in the hardware user's manual for the connected CPU Unit or the user's manual for the connected Communications Coupler Unit for information on installing NX Units, including Load Cell Input Units.

4-2 Wiring the Power Supply and Ground

There is the following one type of power supply that supplies power to the Load Cell Input Unit.

• NX Unit power supply

The method for supplying power to the Load Cell Input Unit and the wiring and grounding methods depend on the specifications for the CPU Unit or Slave Terminal to which NX Units are connected. Refer to *Designing the Power Supply System* and *Wiring* in the hardware user's manual for the connected CPU Unit and the user's manual for the Communications Coupler Unit for details on the method for supplying power to the Load Cell Input Unit and the wiring and grounding methods.

Refer to 4-4 Wiring the Connected External Devices on page 4-20 for information on connecting the shield wire when you connect the Load Cell Input Unit to an external device.

Precautions for Safe Use

The I/O power supply current for the CPU Rack with an NX-series CPU Unit should be within the range specified for the CPU Unit model. For example, use the NX1P2 CPU Unit with a current of 4 A or less. Using the currents that are outside of the specifications may cause failure or damage. Refer to the user's manual for the connected CPU Unit for the I/O power supply current for the CPU Unit model.



Additional Information

- It is not necessary to supply I/O power to the Load Cell Input Unit. The Load Cell Input Unit operates with the NX Unit power supply and supplies excitation voltage to the load cell.
- The terminal block on a Load Cell Input Unit has a functional ground terminal and you must ground it. However, if the DIN Track on which the CPU Rack and Slave Terminal are installed is made of steel and the surface is not treated using an insulating material, you can omit grounding the functional ground terminal on the Load Cell Input Unit. This is because the functional ground terminal on the Load Cell Input Unit is electrically connected to the DIN Track through the DIN Track contact plate.

Refer to *Wiring* in the hardware user's manual for the connected CPU Unit for details on grounding the CPU Rack. Refer to *Wiring* in the user's manual for the connected Communications Coupler Unit for details on grounding the Slave Terminal.

4-3 Wiring the Terminals

This section describes how to wire the terminals on the Load Cell Input Unit.

🕂 WARNING



Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.

Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

4-3-1 Wiring the Screwless Clamping Terminal Blocks

This section describes how to connect wires to the screwless clamping terminal block, the installation and removing methods, and functions for preventing incorrect attachment.

You can connect ferrules that are attached to the twisted wires to the screwless clamping terminal block. You can also connect the twisted wires or the solid wires to the screwless clamping terminal block. If you connect the ferrules, all you need to do to connect the wires is to insert the ferrules into the terminal holes.

Wiring Terminals

The terminals to be wired are as follows.

• I/O terminals

Applicable Wires

The wires that you can connect to the screwless clamping terminal block are twisted wires, solid wires, and ferrules that are attached to the twisted wires. The following section describes the dimensions and processed methods for applicable wires.

• Recommended Wires

The following table gives the recommended wires.

Wiring part	Specification	
Wires	Shielded cable	
	Size: AWG28 to 16 (0.08 to 1.5 mm ²)	

• Dimensions of Wires Connected to the Terminal Block

The dimensions of wires that you can connect into the terminal holes of the screwless clamping terminal block are as in the figure below.

Process the applicable wires that are specified in the following description to apply the dimensions.



• Using Ferrules

If you use ferrules, attach the twisted wires to them.

Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.

Always use plated one-pin ferrules. Do not use unplated ferrules or two-pin ferrules.

The applicable ferrules, wires, and crimping tools are listed in the following table.

Terminal types	Manufac- turer	Ferrule model	Applica- ble wire (mm ² (AWG))	Crimping tool
Terminals	Phoenix	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the
other than	Contact	AI0,5-8	0.5 (#20)	applicable wire size.)
ground ter-		AI0,5-10		CRIMPFOX 6 (0.25 to 6 mm ² , AWG24 to 10)
minals		AI0,75-8	0.75 (#18)	
		AI0,75-10		
		AI1,0-8	1.0 (#18)	
		AI1,0-10		
		AI1,5-8	1.5 (#16)	
		AI1,5-10		
Ground ter- minals		AI2,5-10	2.0 *1	
Terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmuller (The figure in parentheses is the appli-
other than		H0.25/12	0.25 (#24)	cable wire size.)
ground ter-		H0.34/12	0.34 (#22)	PZ6 Roto (0.14 to 6 mm ² , AWG26 to 10)
minals		H0.5/14	0.5 (#20)	
		H0.5/16		_
		H0.75/14	0.75 (#18)	
		H0.75/16		
		H1.0/14	1.0 (#18)	
		H1.0/16		
		H1.5/14	1.5 (#16)	1
		H1.5/16		

*1. Some AWG14 wires exceed 2.0 mm² and cannot be used in the screwless clamping terminal block.

When you use any ferrules other than those in the above table, crimp them to the twisted wires so that the following processed dimensions are achieved.



• Using Twisted Wires/Solid Wires

If you use twisted wires or solid wires, use the following table to determine the correct wire specifications.

Terminals		Wire type					Conductor
Classifica-	Current	Twisted wires		Solid wire		Wire size	length (strip-
tion	capacity	Plated	Unplated	Plated	Unplated		ping length)
All terminals	2 A max.	Possible	Possible	Possible	Possible	0.08 to 1.5	8 to 10 mm
except	Greater		Not pos-	Possible	Not possi-	mm ² (AWG	
ground	than 2 A		sible	*1	ble	28 to 16)	
terminals	and 4 A or						
	less						
	Greater	Possible *1		Not pos-			
	than 4 A			sible			
Ground		Possible	Possible	Possible	Possible ^{*2}	2.0 mm ²	9 to 10 mm
terminals				*2			

*1. Secure wires to the screwless clamping terminal block. Refer to *Securing Wires* on page 4-11 for how to secure wires.

*2. With the NX-TB 1 Terminal Block, use twisted wires to connect the ground terminal. Do not use a solid wire.

Conductor length (stripping length)


Precautions for Correct Use

- Use cables with suitable wire sizes for the carrying current. There are also restrictions on the current due to the ambient temperature. Refer to the manuals for the cables and use the cables correctly for the operating environment.
- For twisted wires, strip the sheath and twist the conductor portion. Do not unravel or bend the conductor portion of twisted wires or solid wires.



Unravel wires

Bend wires

Additional Information

If more than 2 A will flow on the wires, use plated wires or use ferrules.

Connecting/Removing Wires

This section describes how to connect and remove wires.

Terminal Block Parts and Names



Required Tools

Use a flat-blade screwdriver to connect and remove wires. Use the following flat-blade screwdriver.



Recommended screwdriver

Model	Manufacturer
SZF 0-0,4×2,5	Phoenix Contact

• Connecting Ferrules

Insert the ferrule straight into the terminal hole.

It is not necessary to press a flat-blade screwdriver into the release hole.



After you make a connection, make sure that the ferrule is securely connected to the terminal block.

• Connecting Twisted Wires/Solid Wires

Use the following procedure to connect the twisted wires or solid wires to the terminal block.

1 Press a flat-blade screwdriver diagonally into the release hole.

Press at an angle of 10° to 15°.

If you press in the screwdriver correctly, you will feel the spring in the release hole.



2 Leave the flat-blade screwdriver pressed into the release hole and insert the twisted wire or the solid wire into the terminal hole.

Insert the twisted wire or the solid wire until the stripped portion is no longer visible to prevent shorting.



3 Remove the flat-blade screwdriver from the release hole.



After you make a connection, make sure that the twisted wire or the solid wire is securely connected to the terminal block.

Precautions for Safe Use

• Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.



- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- · Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.



- · Make sure that all wiring is correct.
- · Do not bend the cable forcibly. Doing so may sever the cable.

Securing Wires

It is necessary to secure wires to the screwless clamping terminal block depending on the wire types that are used or the current flows on the wires.

The following table gives the necessity for securing wires.

Terminals		Wire type				
Terminais			Twisted wires		Solid wire	
Classifica- tion	Current capacity	Ferrule	Plated	Unplated	Plated	Unplated
Allterminals	2 A max.	No	No	No	No	No
except	Greater than			Not Possible	Yes	Not Possible
ground	2 A and 4 A or					
terminals	less					
	Greater than		Yes		Not Possible	
	4 A					
Ground			No	No	No	No
terminals						

Use the following procedure to secure the wires.

1 Prepare a cable tie.

A cable tie can be used with a width of 4 mm or less and a thickness of 1.5 mm or less. Select a cable tie correctly for the operating environment.



2 Pass a cable tie through the hole for securing wires on the bottom of the screwless clamping terminal block.



3 Bundle the wires with a cable tie and secure them to the screwless clamping terminal block.



Secure wires within the range of 30 mm from the screwless clamping terminal block.



Removing Wires

1

Use the following procedure to remove the wires from the terminal block. The removal method is the same for ferrules, twisted wires, and solid wires.

If wires are secured firmly to the terminal block, release them first.

Press the flat-blade screwdriver diagonally into the release hole. Press at an angle of 10° to 15°. If you press in the screwdriver correctly, you will feel the spring in the release hole.



2 Leave the flat-blade screwdriver pressed into the release hole and pull out the wire.



3 Remove the flat-blade screwdriver from the release hole.



Precautions for Safe Use

• Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.



- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.



- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

Removing a Terminal Block

1 Press the lock lever on the terminal block and pull out the top of the terminal block to remove it.



Attaching a Terminal Block

1 Mount the terminal block hook on the guide at the bottom of the NX Unit, lift up the terminal block, and press in on the top of the terminal block until you hear it engage.

The terminal block will click into place on the Unit.

After you mount the terminal block, make sure that it is locked to the Unit.



Mount a terminal block that is applicable to each Unit model.

Refer to 3-3 Terminal Blocks on page 3-5 for the applicable terminal blocks to the Load Cell Input Unit.

Preventing Incorrect Attachment of Terminal Blocks

In order to prevent unintentionally installing the wrong terminal block, you can limit the combination of a Unit and a terminal block.

Insert three Coding Pins (NX-AUX02) into three of the six incorrect attachment prevention holes on the Unit and on the terminal block. Insert these pins into positions so that they do not interfere with each other when the Unit and terminal block are connected to each other.

You can use these pins to create a combination in which the wrong terminal block cannot be attached because the pin patterns do not match.



• Types of Coding Pins

There are two types of Coding Pins, both with their own unique shape: one for terminal blocks and one for Units.

Three pins come with each runner.



Coding Pins (Use this part.)

Use the following Coding Pins.

Name	Model	Specification
Coding Pin	NX-AUX02	For 10 Units
		(Terminal block: 30 pins, Unit: 30 pins)

Insertion Locations and Patterns of Coding Pins

Insert three Coding Pins of each on the terminal block and on the Unit at the positions designated by the numbers 1 through 6 in the figure below.

As shown in the following table, there are 20 unique pin patterns that can be used.



To make the maximum of 20 patterns, purchase two sets of NX-AUX02 Pins. (One set for 10 Units.)



Precautions for Correct Use

- OMRON uses the holes other than No. 1 to 6 in the figure on the previous page. If you insert a Coding Pin into one of the holes used by OMRON on the terminal block side, this makes it impossible to mount the terminal block on a Unit.
- Do not use Coding Pins that have been attached and removed.

Inserting the Coding Pins

1 Hold the pins by the runner and insert a pin into one of the incorrect attachment prevention holes on the terminal block or on the Unit.

Terminal block

Unit





2 Rotate the runner to break off the Coding Pins.

Terminal block



Unit



4-3-2 Checking the Wiring

Check the wiring by reading input data or writing output data from Slave Terminals using the Watch Tab Page of the Support Software.

For Input Units, you can turn ON/OFF the inputs from external devices that are connected to the target Units and monitor the results.

For Output Units, you can execute the I/O outputs of the target Units and check the operation of the connected external devices.

For details on monitoring and I/O output operations using the Support Software, refer to the operation manual for the Support Software that you are using.



Additional Information

- In the Sysmac Studio, you can check the wiring from the I/O Map or Watch Tab Page. If you use the I/O Map, you can also monitor and perform forced refreshing even if the variables are not defined or the algorithms are not created. Therefore, you can easily check the wiring. Refer to the Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for details on monitoring and forced refreshing operations.
- Some Communications Coupler Units support I/O checking that allows you to check wiring with only the Slave Terminal. Refer to the user's manual of the Communications Coupler Unit for detailed information on the support and functionality of I/O checking for your Communications Coupler Unit.

4-4 Wiring the Connected External Devices

This section provides information on wiring the Load Cell Input Unit to the connected external devices.

You can connect the Load Cell Input Unit to the load cell with a 6-wire or 4-wire connection. We recommend that you use a 6-wire connection for connecting the load cell with the Load Cell Input Unit to achieve high-precision measurements.

Precautions for Safe Use

- Use a shielded cable to connect to the load cell. Connect the shield wire to the SHLD terminal on the Load Cell Input Unit.
- Ground the functional ground terminal on the Load Cell Input Unit to 100 Ω or less.



Precautions for Correct Use

- We recommend that you use a 6-wire connection for connecting the load cell with the Load Cell Input Unit to achieve high-precision measurements. When you use a 4-wire connection, the measurement resolution of wiring resistance is deteriorated due to temperature changes.
- Keep the wiring resistance from the load cell to the Load Cell Input Unit to 5 Ω or less while in use.
- Wire the cable that connects the load cell and the Load Cell Input Unit separately from AC power supply lines or power lines in order to avoid the effects of the noise. Do not place such lines in the same duct.
- Insert a noise filter into the power supply input section if noise may overlap from power supply lines when using the same power supply to power an electrical welder or an electric discharge machine, or there is a high-frequency source nearby.

4-4-1 Terminal Block Arrangement

The table below shows the terminal block arrangement of the Load Cell Input Unit.

Pin No.	Symbol	I/O	Name
A1	SIG+	I	Load cell input (+)
A2	SIG-	I	Load cell input (-)
A3	EXC+	0	Load cell excitation voltage 5 V
A4	EXC-	0	Load cell excitation voltage 0 V
A5	NC		Not used.
A6	NC		Not used.
A7	SHLD		Shield terminal
A8	¢		Functional ground terminal

Pin No.	Symbol	I/O	Name
B1	S+	I	Load cell excitation voltage measure-
			ment input (+)
B2	S–	I	Load cell excitation voltage measure-
			ment input (–)
B3	EXC+	0	Load cell excitation voltage 5 V
B4	EXC-	0	Load cell excitation voltage 0 V
B5	NC		Not used.
B6	NC		Not used.
B7	SHLD		Shield terminal
B8	¢		Functional ground terminal



4-4-2 Wiring Example with 6-wire Connection

This section provides a wiring example for connecting the Load Cell Input Unit to the load cell with a 6-wire connection. We recommend that you use a 6-wire connection for connecting the load cell with the Load Cell Input Unit to achieve high-precision measurements.



4-4-3 Wiring Example with 4-wire Connection

This section provides a wiring example for connecting the Load Cell Input Unit to the load cell with a 4-wire connection.



When you use the Load Cell Input Unit with a 4-wire connection, always connect S+ terminal with EXC+ terminal, and S– terminal with EXC– terminal on the terminal block. If they are not connected, the Load Cell Input Unit does not operate normally.

4-4-4 Wiring Example of Parallel Connection

This section provides a wiring example for connecting load cells in parallel.

When multiple load cells with the same specifications are connected to a summing box in parallel, they function as a single load cell that has the following specifications.

- Rated capacity: Rated capacity per load cell × Number of load cells connected in parallel
- Rated output: The same as each load cell connected in parallel

Connect the Load Cell Input Unit to the summing box in the same way that a single load cell is connected to the Load Cell Input Unit.

When you connect load cells in parallel, observe the following precautions when you wire them.

- Use a summing box.
- We recommend that you use a 6-wire connection for connecting the summing box and the Load Cell Input Unit.
- Place the summing box near the load cell.
- Keep the output current of the load cell excitation voltage to 60 mA max. while in use.
- Use load cells that have the same rated capacity and rated output. Also, adjust the output of each load cell as necessary. Confirm the appropriate adjustment methods with the load cell manufacturer.



5

I/O Refreshing

This section describes the types and functions of I/O refreshing for the Load Cell Input Unit.

5-1	I/O Re	freshing	5-2
	5-1-1	I/O Refreshing from CPU Units to NX Units	5-2
	5-1-2	I/O Refreshing from CPU Units or Industrial PCs to Slave Terminal	5-3
	5-1-3	Calculating the I/O Response Times of NX Units	5-4
5-2	I/O Re	freshing Methods	5-5
	5-2-1	Types of I/O Refreshing Methods	5-5
	5-2-2	Setting the I/O Refreshing Methods	5-6
	5-2-3	Restrictions in Refresh Cycles	5-7
	5-2-4	I/O Refreshing Method Operation	5-8

5-1 I/O Refreshing

This section describes I/O refreshing for NX Units.

5-1-1 I/O Refreshing from CPU Units to NX Units

An NX-series CPU Unit cyclically performs I/O refreshing with the NX Units.

The following period and two cycles affect operation of the I/O refreshing between the CPU Unit and the NX Units.

- (a) CPU Unit primary period
- (b) Refresh cycle of the NX bus
- (c) Refresh cycle of each NX Unit



The following operation occurs.

- The refresh cycle of the NX bus in item (b) is automatically synchronized with the primary period of the CPU Unit in item (a).
- The refresh cycle of each NX Unit in item (c) depends on the I/O refreshing method which is given below.

Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for detailed information on I/O refreshing between the CPU Unit and the NX Units.

Refer to 5-1-3 Calculating the I/O Response Times of NX Units on page 5-4 for the I/O response times of NX Units in the CPU Rack of the CPU Unit.

5-1-2 I/O Refreshing from CPU Units or Industrial PCs to Slave Terminal

The CPU Unit or Industrial PC performs I/O refreshing cyclically with the Slave Terminals through the Communications Master Unit and the Communications Coupler Unit.

The following four cycles affect operation of the I/O refreshing between the CPU Unit or Industrial PC and the NX Units in a Slave Terminal:

- (a) Cycle time of the CPU Unit or Industrial PC
- (b) Communications cycle of the host network
- (c) Refresh cycle of the NX bus
- (d) Refresh cycle of each NX Unit



The cycle time of the CPU Unit or Industrial PC, the communications cycle of the host network, and the NX bus I/O refresh cycle are determined by the type of the CPU Unit or Industrial PC and the type of communications.

The following explains operations when the built-in EtherCAT port on the NJ/NX-series CPU Unit or NY-series Industrial PC is used for communications with an EtherCAT Slave Terminal, with symbols in the figure.

Refer to the user's manual for the connected Communications Coupler Unit for details on the operation of I/O refreshing on Slave Terminals other than EtherCAT Slave Terminals.

Operation of I/O Refreshing with NX-series CPU Units

The operation of I/O refreshing is as follows when the built-in EtherCAT port on the NX-series CPU Unit is used for communications with an EtherCAT Slave Terminal.

- The process data communications cycle in item (b) and the refresh cycle of the NX bus in item (c) are automatically synchronized with the primary period or the task period of the priority-5 periodic task of the CPU Unit in item (a) when the distributed clock is enabled in the EtherCAT Coupler Unit.
- The refresh cycle of each NX Unit in item (d) depends on the I/O refreshing method which is given below.

The priority-5 periodic task must be supported by the connected CPU Unit model. Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for the periodic tasks supported by each model of NX-series CPU Unit.

Operation of I/O Refreshing with NJ-series CPU Units or NY-series Industrial PCs

The operation of I/O refreshing is as follows when the built-in EtherCAT port on the NJ-series CPU Unit or NY-series Industrial PC is used for communications with an EtherCAT Slave Terminal.

- The process data communications cycle in item (b) and the refresh cycle of the NX bus in item (c) are automatically synchronized with the primary period of the CPU Unit or Industrial PC in item (a) when the distributed clock is enabled in the EtherCAT Coupler Unit.^{*1}
- The refresh cycle of each NX Unit in item (d) depends on the I/O refreshing method which is given below.
- *1. It applies when the task period of a periodic task is set to a value that is longer than the NX bus refresh cycle that was automatically calculated by the Support Software.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for detailed information on I/O refreshing between the built-in EtherCAT port and EtherCAT Slave Terminals.

Refer to 5-1-3 Calculating the I/O Response Times of NX Units on page 5-4 for the I/O response times of NX Units on Slave Terminals.

5-1-3 Calculating the I/O Response Times of NX Units

Depending on where the NX Unit is connected, refer to the following manuals to calculate the I/O response times of an NX unit.

Connected to a CPU Unit

Manual to reference	Description
Software user's manual for the con-	The method for calculating the I/O response times of NX Units in the
nected CPU Unit	CPU Rack with a CPU Unit is described.
NX-series Data Reference Manual	The NX Unit parameter values used for calculating the I/O response
	times of NX Units are described.

Connected to a Communications Coupler Unit

Manual to reference	Description
User's manual for the connected Com-	The method for calculating the I/O response times of NX Units on
munications Coupler Unit	Slave Terminals is described.
NX-series Data Reference Manual	The NX Unit parameter values used for calculating the I/O response
	times of NX Units are described.

5-2 I/O Refreshing Methods

This section describes I/O refreshing for Load Cell Input Unit.

5-2-1 Types of I/O Refreshing Methods

Methods of I/O Refreshing between the CPU Unit and NX Units

The I/O refreshing methods that you can use between the CPU Unit and the NX Units depend on the connected CPU Unit.

Refer to the software user's manual for the connected CPU Unit for information on the I/O refreshing methods that you can use between the CPU Unit and the NX Units.

As an example, the I/O refreshing methods that you can use between the NX-series NX1P2 CPU Unit and the NX Units are shown below.

For the Load Cell Input Unit, synchronous I/O refreshing is always used.

I/O refreshing method ^{*1}	Outline of operation
Free-Run refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh
	cycles of the NX Units are asynchronous.
Synchronous I/O refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is syn- chronized on a fixed interval between more than one NX Unit connected to a CPU Unit.

*1. Task period prioritized refreshing cannot be used for the NX1P2 CPU Unit.

Since the NX1P2 CPU Unit can execute all of the above I/O refreshing methods at the same time, you can use NX Units with different I/O refreshing methods together.

Methods of I/O Refreshing between the Communications Coupler Unit and NX Units

The I/O refreshing methods that you can use between the Communications Coupler Unit and the NX Units depend on the Communications Coupler Unit that is used.

Refer to the user's manual for the connected Communications Coupler Unit for information on the I/O refreshing methods that you can use between the Communications Coupler Unit and the NX Units.

As an example, when an EtherCAT Coupler Unit is connected to the built-in EtherCAT port on an NJ/NX-series CPU Unit or NY-series Industrial PC, the I/O refreshing methods that you can use between the EtherCAT Coupler Unit and the NX Units are shown below.

I/O refreshing method	Outline of operation
Free-Run refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O
	refresh cycles of the NX Units are asynchronous.
Synchronous I/O refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs
	is synchronized on a fixed interval between more than one NX Unit on more
	than one Slave Terminal.
Task period prioritized refresh-	With this I/O refreshing method, shortening the task period is given priority
ing ^{*1}	over synchronizing the I/O timing with other NX Units. With this I/O refreshing
C .	method, the timing of I/O is not consistent with the timing of I/O for NX Units
	that use simultaneous I/O refreshing.

*1. An NX-ECC203 EtherCAT Coupler Unit is required to use task period prioritized refreshing.

Since the EtherCAT Coupler Unit can execute all I/O refreshing methods at the same time, you can use NX Units with different I/O refreshing methods together in the EtherCAT Slave Terminal.

Additional Information

The EtherCAT Slave Terminals with enabled distributed clocks and all EtherCAT slaves that support DC synchronization execute I/O processing based on Sync0, which is shared on the EtherCAT network. However, because the specifications and performance for the timing to read inputs or to refresh outputs for EtherCAT slaves and NX Units are different, the timing to read inputs or to refresh outputs is not simultaneous.

Refer to the user's manual for the EtherCAT slaves for information on the timing to read inputs or to refresh outputs in EtherCAT slaves.

5-2-2 Setting the I/O Refreshing Methods

Setting Methods between the CPU Unit and the NX Units

How to set an I/O refreshing method between the CPU Unit and the NX Units is determined by the connected CPU Unit.

Refer to the software user's manual for the connected CPU Unit for information on how to set an I/O refreshing method between the CPU Unit and the NX Units.

An example of the setting operation for the NX-series NX1P2 CPU Unit is shown below. For the NX-series NX1P2 CPU Unit, no setting operation is required, and the method is determined according to the following table.

NX Units that support only Free-Run refreshing	NX Units that support both Free-Run refreshing and synchronous I/O refreshing	NX Units that support Free-Run refreshing, synchro- nous I/O refreshing, and task period prioritized refreshing
Free-Run refreshing	Synchronous I/O refreshing	

Because the Load Cell Input Unit supports the synchronous I/O refreshing method, synchronous I/O refreshing is always used.

Setting Methods between the Communications Coupler Unit and the NX Units

How to set an I/O refreshing method between the Communications Coupler Unit and the NX Units is determined by the connected Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for information on how to set an I/O refreshing method between the Communications Coupler Unit and the NX Units.

An example when the EtherCAT Coupler Unit is connected to the built-in EtherCAT port on an NJ/NX-series CPU or NY-series Industrial PC is shown below.

The I/O refreshing method between the EtherCAT Coupler Unit and the NX Units depends on whether the DC is enabled in the EtherCAT Coupler Unit.

DC enable setting in the EtherCAT Coupler Unit	Load Cell Input Unit
Enabled (DC for synchronization)	Operates with synchronous I/O refreshing
Enabled (DC with priority in cycle time)	Operates with task period prioritized refreshing ^{*1}
Disabled (FreeRun)	Operates with Free-Run refreshing

*1. A Load Cell Input Unit and an NX-ECC203 EtherCAT Coupler Unit are required to use task period prioritized refreshing.

5-2-3 Restrictions in Refresh Cycles

The following table lists the restrictions in the refresh cycles for Free-Run refreshing, synchronous I/O refreshing, and task period prioritized refreshing for the Load Cell Input Unit.

I/O refreshing method	Refresh cycle
Free-Run refreshing	No restrictions
Synchronous I/O refreshing*1	250 μs to 10 ms ^{*2}
Task period prioritized refreshing*1*3	125 µs to 10 ms

*1. The refresh cycle depends on the specifications of the EtherCAT master and EtherCAT Coupler Unit. It also depends on the Unit configuration.

- *2. When it is combined with the NX-ECC201 or NX-ECC202, the refresh cycle is 250 μs to 4 ms.
- *3. A Load Cell Input Unit and an NX-ECC203 EtherCAT Coupler Unit are required.

Precautions for Correct Use

If you use synchronous I/O refreshing or task period prioritized refreshing, set the task periods of the periodic tasks as follows.

- · Less than or equal to the refresh cycle of the Load Cell Input Unit
- A value longer than the NX bus refresh cycle that is automatically calculated by the Support Software

Also refer to the user's manual for the connected CPU Unit or EtherCAT Coupler Unit for information on setting the task periods of periodic tasks.

5-2-4 I/O Refreshing Method Operation

This section describes the operation of the following I/O refreshing methods: Free-Run refreshing, synchronous I/O refreshing, and task period prioritized refreshing.

Operation of Free-Run Refreshing

With Free-Run refreshing, the refresh cycle of the NX bus and the I/O refresh cycle of the NX Units operate asynchronously. For the Load Cell Input Unit, this refreshing method is applicable when the Unit is connected to the Slave Terminal.

Free-Run refreshing for a Load Cell Input Unit operates as follows:

- The Communications Coupler Unit performs I/O refreshing for NX Units. (Refer to (a) in the figure below.)
- The Load Cell Input Unit is not synchronized with I/O refreshing of the NX bus and refreshes input values in a conversion cycle of 125 µs. It reads the most recent input values at the time of I/O refreshing. (Refer to (b) and (c) in the figure below.)
- When the I/O is refreshed, the Communications Coupler Unit reads the most recent input values and the NX Units control the outputs with the most recent output values. However, the timing to read inputs or to refresh outputs for each NX Unit in the Slave Terminal does not occur at the same time. (Refer to (d) in the figure below.)
- The I/O refreshing interval changes according to the processing conditions of the Communications Coupler Unit and host communications master. Therefore, the interval of the timing to read inputs or to refresh outputs for NX Unit is not always the same. (Refer to (e) in the figure below.)

(a) I/O refreshing for NX Units			(e) The interval for reading inputs is not constant.									
I/O refreshing on NX bus					\downarrow							L
	Input refreshing	Out	put refres	hing			Input	values	that an	e read	d at the	Э
	(b)) Input rea timing	d	t			uming		iaing in			
Load Cell Input Unit A												
(c) Conv	version cycle: 125 μ	S		1	<u>.</u>						<u>t</u>	
Load Cell Input Unit B												
(c) Conv	مصحياً version cycle: 125 µ	S										
	1				1						1	
Unit A												
	111											

(d) The inputs are not read at the same time for all of the Units.

Operation of Synchronous I/O Refreshing

The I/O refreshing method is described below. For the Load Cell Input Unit, this refreshing method is applicable when the Unit is connected to a CPU Unit or in an EtherCAT Slave Terminal.

- The timing to read inputs or to refresh outputs is synchronized on a fixed interval between more than one NX Unit connected to a CPU Unit.
- The timing to read inputs or to refresh outputs is synchronized on a fixed interval between more than one NX Unit on more than one Slave Terminal.

The operation of I/O refreshing in the CPU Unit and that in the Slave Terminal are given below.

• CPU Unit Operation

The following describes the operation of synchronous I/O refreshing between the NX-series CPU Unit and the NX Units.

- All NX Units that are connected to the CPU Unit and operate with synchronous input refreshing read their inputs at the same time at a fixed interval based on the synchronization timing. (Refer to (a) in the figure below.)^{*1}
- The Load Cell Input Unit performs conversions in order to obtain input values at the timing to read inputs.
- The CPU Unit reads the input values, which are read by the Unit at the timing of reading inputs, at immediate I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the CPU Unit. (Refer to (c) in the figure below.) The timing to read inputs will be at a fixed interval. (Refer to (d) and (e) in the figure below.)
- The timing of reading inputs, the synchronization timing, and the maximum NX bus I/O refresh cycle are automatically calculated by the Support Software according to the input refresh cycles of the NX Units on the CPU Unit when a Unit configuration in the CPU Unit is created and set up.
- *1. Regardless of the synchronization interval, the input values are refreshed in a conversion cycle of 125 μs and digital filtering, peak hold, and bottom hold are performed in the Unit.



(a) All Input Units that operate with synchronous input refreshing read their inputs at the same time.

• Slave Terminal Operation

The following describes the operation of synchronous I/O refreshing of an EtherCAT Slave Terminal.

- The NX Units that operate with synchronous input refreshing in a Slave Terminal read inputs at a fixed interval based on Sync0. (Refer to (a) in the figure below.)^{*1 *2}
- The Load Cell Input Unit performs conversions in order to obtain input values at the timing to read inputs.
- The Communications Coupler Unit reads the input values, which are read by the Unit at the timing of reading inputs, at immediate I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. (Refer to (c) in the figure below.) The timing to read inputs will be at a fixed interval. (Refer to (d) and (e) in the figure below.)
- The Sync0, the timing to read inputs and the maximum NX bus I/O refresh cycle of the Slave Terminals are automatically calculated by the Sysmac Studio according to the input refresh cycle of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- *1. Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for information on the Slave Terminals that operate with the same timing when more than one Slave Terminal is placed on the same Ether-CAT network.
- *2. Regardless of the Sync0 cycle, the input values are refreshed in a conversion cycle of 125 μs and digital filtering, peak hold, and bottom hold are performed in the Unit.



(a) All Input Units that support synchronous input refreshing read their inputs simultaneously.

Operation for Task Period Prioritized Refreshing

With task period prioritized refreshing, shortening the task period is given priority over synchronizing the I/O timing with other NX Units that use synchronous I/O refreshing. For the Load Cell Input Unit, this refreshing method is applicable when Unit is connected in an EtherCAT Slave Terminal.

Task period prioritized refreshing for a Load Cell Input Unit operates as follows:

- The Load Cell Input Unit performs input processing with priority over the output processing so that the Communications Coupler Unit can read the input values of the Load Cell Input Unit during the next I/O refresh. (Refer to (a) in the figure below.)^{*1}
- The I/O refreshing interval changes according to the processing conditions of the Communications Coupler Unit and host communications master (refer to (c) in the figure below), so the inputs are read at the next I/O refresh. (Refer to (b) in the figure below.)
- Sync0, the timing of reading inputs, and the maximum NX bus I/O refresh cycle for more than one Slave Terminal are automatically calculated by the Support Software according to the input refresh cycles of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- Because input processing is given priority, output processing is performed after input processing is completed. (Refer to (d) in the figure below.)^{*2}
- *1. Regardless of the Sync0 cycle, the input values are refreshed in a conversion cycle of 125 μs and digital filtering, peak hold, and bottom hold are performed in the Unit.
- *2. Output processing for the Load Cell Input Unit means processing output data such as operation commands.



6

Specifications of Input Conversion and I/O Data

This section describes the specifications of input conversion and I/O data for the Load Cell Input Unit.

6-1	Specifications of Input Conversion				
	6-1-1	General Properties of the Load Cell	6-2		
	6-1-2	Terms Used in Weight Measurement	6-4		
	6-1-3	Detailed Specifications of Input Conversion	6-5		
6-2	Speci	fications of I/O Data	6-13		
	6-2-1	Data Items for Allocation to I/O	6-13		
	6-2-2	Data Details	6-15		

6-1 Specifications of Input Conversion

This section describes the specifications of input conversion in which output signals from the load cell are entered and converted into measurement values on the Load Cell Input Unit. This section first describes the general properties of the load cell and the terms used in weight measurement that are required in order to understand the specifications of input conversion. It then describes the detailed specifications of input conversion.

6-1-1 General Properties of the Load Cell

Overview of the Load Cell

A load cell is a sensor that converts loads, such as weight and force, into electrical signals to output. The inside of a load cell consists of a Wheatstone bridge circuit with a strain gauge. The output voltage changes when the resistance values of the strain gauge change according to the load applied to the load cell.

The following is an example of a circuit layout of a load cell. This is an example of a load cell that consists of four resistance bridges, one of which is a strain gauge. Some load cells consist of four resistance bridges, of which two or four are strain gauges.



Output Characteristics of the Load Cell

The output characteristics of a load cell are determined by the rated capacity, load cell excitation voltage, and the rated output of the load cell.

There is a maximum load that is measured for a load cell with its specifications maintained, and it is defined as the rated capacity. When a constant voltage is applied to the load cell, the output voltage is proportional to the load applied to the load cell. The specific voltage applied to the load cell is defined as the load cell excitation voltage. The value given by subtracting an output without load from an output with load in the rated capacity is defined as the rated output.

When a constant load is applied to the load cell, the output voltage is proportional to the load cell excitation voltage. To express the rated output in a certain standard, it is expressed in output voltage [mV] when the rated capacity is applied in the case of the load cell excitation voltage is 1 V. The unit is [mV/V].

The load cell excitation voltage supplied from the Load Cell Input Unit is 5 V. For example, if a load of rated capacity is applied to the load cell with the rated output of 5 mV/V, the output voltage will be as follows.

Output voltage of the load cell = Rated output of the load cell × Load cell excitation voltage

The following shows the output characteristics of the load cell when the load cell excitation voltage is 5 V. $\!\!\!\!$



(a): Output characteristics for when the load cell with the rated output of 5 mV/V is used. (b): Output characteristics for when the load cell with the rated output of 1 mV/V is used.

6-1-2 Terms Used in Weight Measurement

The following is an example of a platform scale. The terms that are used in weight measurement are described using this example.

	Container: Tare
	Contents: Measured material
	Scale: Fixed tare
Load cell	Load cell
Term	Description
Fixed tare	This is an area of the scale or the scale hopper fixed on top of the load cell that does not change permanently.
	In this example, it is the scale where the container and the material are placed.
Tare	This is the container, such as a bag or a bottle, in which the measured material is placed.
	In this example, it is the container that is placed on the scale.
Gross weight value	This is a combined weight value of the tare and the measured material. ^{*1}
	Gross weight value = Weight value of the tare + Weight value of the measured material
	In this example, it is the sum of the weight values of the container and the material.
Net weight value	This weight value is given by subtracting the weight of the tare from the gross weight value.
	Net weight value = Gross weight value – Weight value of the tare
	= Weight value of the measured material
	In this example, it is the weight value of the material

*1. In this definition, the weight of the fixed tare is not included in the calculation. To exclude the weight value of the fixed tare in the gross weight value, perform a zero calibration for an actual load calibration with only the fixed tare placed on the load cell. Refer to 7-2 Actual Load Calibration on page 7-4 for details of an actual load calibration.
6-1-3 Detailed Specifications of Input Conversion

The detailed specifications of input conversion on the Unit are described by using the following parameters.

- · Load on the load cell
- · Load cell output
- · Gross weight value/force measurement value

Load on the load cell (weight or force)



The Load Cell Input Unit can properly convert the input into gross weight value/force measurement value according to the load on the load cell when a calibration is performed.

Precautions for Correct Use

Be sure to perform a calibration before you use the Load Cell Input Unit to perform a measurement. If you do not perform a calibration, the gross weight value/force measurement value will not be correct.

On the Load Cell Input Unit, an actual load calibration or an equivalent input calibration is performed. Refer to *Section 7 Calibration Methods* for details of each calibration method.

The following sections describe the specifications of input conversion for each calibration method.

Specifications of Input Conversion Used for an Actual Load Calibration

Specifications and a specific example of input conversion when the Load Cell Input Unit is used with an actual load calibration are provided below. Refer to 7-2 Actual Load Calibration on page 7-4 for details of an actual load calibration.

• Specifications of Input Conversion

Here, we describes the relationship among the load on the load cell, the load cell output [mV/V], and the gross weight value/force measurement value when the Load Cell Input Unit is used with an actual load calibration.

- By applying an actual load to the load cell and performing a zero calibration or a span calibration, the calibration straight line that connects the zero point and the span point is acquired. The gross weight value/force measurement value is converted according to the load that is applied to the load cell from this calibration straight line. (Refer to (a) in the figure below.)
- For an actual load calibration, a zero calibration is performed with no load or by placing a fixed tare only.^{* 1} A span calibration is performed by additionally applying a standard load, such as a weight. (Refer to (b) in the figure below.)
- The input range of the Load Cell Input Unit is from -5.0 to 5.0 mV/V. The rated output of the connected load cell must be within the range from -5.0 to 5.0 mV/V. (Refer to (c) in the figure below.)
- If the output exceeds the upper limit (5.5 mV/V) of the input conversion range, an over range occurs and the gross weight value/force measurement value is fixed to the upper limit. If the output reaches below the lower limit (-5.5 mV/V) of the input conversion range, an under range occurs and the gross weight value/force measurement value is fixed to the lower limit. (Refer to (d) in the figure below.)

- Do not apply a load that exceeds the load cell rated capacity. If such a load is applied, the specifications of the load cell are not guaranteed. (Refer to (e) in the figure below.)
- *1. On a system with no fixed tare, perform a zero calibration without applying a load to the load cell.



• Specific Example of an Input Conversion

The following is a specific example of an input conversion when an actual load calibration is performed.

The conditions are as follows: If a setting is specified for an item, the set value is indicated.

ltem	Condition	Set value	Remarks
Standard weight	50.0 kg	50.0	Set this in Standard Weight in the Unit operation
			on page 7-7 for the detailed settings of standard
			weight.
Weight of the fixed tare	20.0 kg		
Load cell rated capac-	100.0 kg		
ity			
Load cell rated output	3.0 mV/V		
Display of digits after	× 10 ⁰	0	This is the default setting of Decimal Point Posi-
the decimal point			tion in the Unit operation settings ^{*1} . Refer to 8-13
			Decimal Point Position Setting on page 8-47 for
			the detailed settings of the decimal point position.
Weight of the mea-	10.0 kg		
sured material			
Measurement display	Gross Weight		This is allocated to the Load Cell Input Unit by
	Value/Force Measure-		default. Refer to 6-2-1 Data Items for Allocation to
	ment Value DINT		I/O on page 6-13 for details on I/O data.

*1. This is the setting of the display of the digits after the decimal point for Gross Weight Value/Force Measurement Value DINT.

The Gross Weight Value/Force Measurement Value DINT that an input conversion is performed is as follows:

- When the load applied to the load cell after the calibration is from 20.0 to 70.0 kg, the Gross Weight Value/Force Measurement Value DINT will be from 0 to 50. (Refer to (a) in the figure below.)
- When a measured material of 10.0 kg is placed on the fixed tare, the measurement load will be 30.0 kg, and 10 is indicated for the Gross Weight Value/Force Measurement Value DINT. (Refer to (b) in the figure below.)
- When the load cell rated capacity of 100 kg is applied, 80 is indicated for the Gross Weight Value/Force Measurement Value DINT. (Refer to (c) in the figure below.)
- When an over range occurs, the Gross Weight Value/Force Measurement Value DINT will be a
 measurement value for which an error occurs, and is fixed to 2147483647. When an under range
 occurs, the Gross Weight Value/Force Measurement Value DINT will be a measurement value for
 which an error occurs, and is fixed to -2147483648. (Refer to (d) in the figure below.) Refer to 9-6
 Measurement Values Used When an Error Occurs on page 9-30 for the details of the measurement
 when an error occurs.



Specifications of Input Conversion Used for an Equivalent Input Calibration

Specifications and a specific example of input conversion when the Load Cell Input Unit is used with an equivalent input calibration are provided below. Refer to 7-3 *Equivalent Input Calibration* on page 7-11 for details of an equivalent input calibration.

• Specifications of Input Conversion

Here, we describes the relationship among the load cell output [mV/V], the load cell load, and the gross weight value/force measurement value when the Load Cell Input Unit is used with an equivalent input calibration.

- By setting numeric values for the zero point and the span point without applying an actual load to the load cell, the calibration straight line that connects the two points is acquired. The gross weight value/force measurement value is converted according to the load that is applied to the load cell from this calibration straight line. (Refer to (a) in the figure below.)
- For an equivalent input calibration, Load Cell Zero Balance is set for the zero point. Load Cell Rated Output and Load Cell Rated Capacity are set for the span point. (Refer to (b) in the figure below.)
- The input range of the Load Cell Input Unit is from -5.0 to 5.0 mV/V. The rated output of the connected load cell must be within the range from -5.0 to 5.0 mV/V. (Refer to (c) in the figure below.)
- If the output exceeds the upper limit (5.5 mV/V) of the input conversion range, an over range occurs and the gross weight value/force measurement value is fixed to the upper limit. If the output reaches below the lower limit (-5.5 mV/V) of the input conversion range, an under range occurs and the gross weight value/force measurement value is fixed to the lower limit. (Refer to (d) in the figure below.)
- Do not apply a load that exceeds the load cell rated capacity. If such a load is applied, the specifications of the load cell are not guaranteed. (Refer to (e) in the figure below.)



• Specific Example of an Input Conversion

The following is a specific example of an input conversion when an equivalent input calibration is performed.

The conditions are as follows: If a setting is specified for an item, the set value is indicated.

Item	Condition	Set value	Remarks
Load cell zero balance	1.0 μV/V	1.0	Set this in Load Cell Zero Balance in the Unit operation settings. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the detailed settings of load cell zero balance.
Load cell rated capac- ity	100.0 N	100.0	Set this in Load Cell Rated Capacity in the Unit operation settings. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the detailed settings of load cell rated capacity.
Load cell rated output	3.0 mV/V	3.0	Set this in Load Cell Rated Output in the Unit operation settings. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the detailed settings of load cell rated output.
Display of digits after the decimal point	× 10 ⁰	0	This is the default setting of Decimal Point Posi- tion in the Unit operation settings ^{*1} . Refer to 8-13 <i>Decimal Point Position Setting</i> on page 8-47 for the detailed settings of decimal point position.
Measurement force	30.0 N		
Measurement display	Gross Weight Value/Force Measure- ment Value DINT		This is allocated to the Load Cell Input Unit by default. Refer to 6-2-1 Data Items for Allocation to I/O on page 6-13 for details on I/O data.

*1. This is the setting of the display of the digits after the decimal point for Gross Weight Value/Force Measurement Value DINT.

The Gross Weight Value/Force Measurement Value DINT that an input conversion is performed is as follows:

- When the load applied to the load cell after the calibration is from 0.0 to 100.0 N, the Gross Weight Value/Force Measurement Value DINT will be from 0 to 100. (Refer to (a) in the figure below.)
- When a force of 30.0 N is applied to the load cell, 30 is indicated for the Gross Weight Value/Force Measurement Value DINT. (Refer to (b) in the figure below.)
- When the load cell rated capacity of 100.0 N is applied, 100 is indicated for the Gross Weight Value/Force Measurement Value DINT. (Refer to (c) in the figure below.)
- When an over range occurs, the Gross Weight Value/Force Measurement Value DINT will be a
 measurement value for which an error occurs, and is fixed to 2147483647. When an under range
 occurs, the gross weight value/force measurement value will be a measurement value for which
 an error occurs, and is fixed to -2147483648. (Refer to (d) in the figure below.) Refer to 9-6 Measurement Values Used When an Error Occurs on page 9-30 for the details of the measurement
 value when an error occurs.



6-2 Specifications of I/O Data

This section describes I/O data for the Load Cell Input Unit.

6-2-1 Data Items for Allocation to I/O

Two I/O entry mappings for input and output are assigned to the I/O allocation settings for the Load Cell Input Unit. A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. The allocation of I/O entry mappings is fixed. However, you can add or delete I/O entries.

An I/O entry means the I/O data described in this section. An I/O entry mapping means a collection of I/O entries.

To assign the I/O allocation information of the NX Unit or Slave Terminal to an NJ/NX-series CPU Unit or NY-series Industrial PC, use the I/O ports for the allocated I/O data.

However, for Slave Terminals, I/O ports may not be used depending on the type of communications master or Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to use I/O data for Slave Terminals.

The following table shows the allocable I/O data in the Load Cell Input Unit. The I/O port name, index number and subindex number are described in the following section.

Area	Data name	Size (Byte)	Data type	Default ^{*1}	Reference
Input	Ch1 Detection Status ^{*2}	2	WORD	Yes	Detection Status on page 6-15
	Ch1 Executing Status ^{*2}	2	WORD	Yes	Executing Status on page 6-16
	Ch1 Gross Weight Value/Force Measurement Value DINT	4	DINT	Yes	Gross Weight Value/Force Measurement Value DINT on page 6-17
	Ch1 Gross Weight Value/Force Measurement Value REAL	4	REAL		Gross Weight Value/Force Measurement Value REAL on page 6-18
	Ch1 Net Weight Value DINT	4	DINT		<i>Net Weight Value DINT</i> on page 6-18
	Ch1 Net Weight Value REAL	4	REAL		<i>Net Weight Value REAL</i> on page 6-18
	Ch1 Peak Hold Value DINT	4	DINT		Peak Hold Value DINT on page 6-19
	Ch1 Peak Hold Value REAL	4	REAL		Peak Hold Value REAL on page 6-19
	Ch1 Bottom Hold Value DINT	4	DINT		<i>Bottom Hold Value DINT</i> on page 6-19
	Ch1 Bottom Hold Value REAL	4	REAL		<i>Bottom Hold Value REAL</i> on page 6-20
	Ch1 Calibration Command Response SID ^{*3}	2	UINT		<i>Calibration Command</i> <i>Response SID</i> on page 6-20
	Ch1 Calibration Command Response ^{*3}	2	WORD		Calibration Command Response on page 6-21

Area	Data name	Size (Byte)	Data type	Default ^{*1}	Reference
Output	Ch1 Operation Command ^{*2}	2	WORD	Yes	<i>Operation Command</i> on page 6-22
	Ch1 Calibration Command SID ^{*3}	2	UINT		Calibration Command SID on page 6-23
	Ch1 Calibration Command ^{*3}	2	WORD		Calibration Command on page 6-23
	Ch1 Calibration Data ^{*3}	4	REAL		Calibration Data on page 6-24

*1. The *Default* column shows the data items that are assigned when the Unit is shipped from the factory. You can allocate other data items.

- *2. The option to clear the selection of Detection Status, Executing Status and Operation Command will not be available after I/O allocation.
- *3. Add and allocate the data items if you perform a calibration in the user program.

Additional Information

To access data not assigned to I/O, access the relevant NX object using a message such as an instruction. How to access an NX object by a message such as an instruction differs depending on the NX Unit connection destination. To connect an NX Unit to a CPU Unit, access the relevant NX object using the Read NX Unit Object and Write NX Unit Object instructions of the NJ/NX-series Controllers. To connect an NX Unit to a Communications Coupler Unit, how to access an NX object differs depending on the connected Communications Coupler Unit or communications master.

Refer to the user's manual for the connected Communications Coupler Unit for how to access a Slave Terminal NX object using a message. For the index number and subindex numbers of an NX object, refer to *A-3 List of NX Objects* on page A-7.

6-2-2 Data Details

This section describes the data for each of the data items for I/O allocation and their configurations.

Detection Status

This is an aggregated data of the statuses for Sensor Disconnected Error, Under Range and other items which the Load Cell Input Unit detects.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Detection Status	WORD	0000 hex	Ch1 Detection Status	6000	01

The bit configuration and the description of each bit for the Detection Status are given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	(RSV)	(RSV)	SST1	ZPR01	ADCE1	OR1	UR1	SDE1
+1	(RSV)							

Abbrevia- tion	Data name	Description ^{*1}	Data type	I/O port name
SDE1	Ch1 Sensor	1: A sensor disconnection was detected.	BOOL	Ch1 Sensor Discon-
	Disconnected Error	0: A sensor disconnection was not detected.		nected Error
		It is fixed to 0 unless during the sensor disconnection test.		
UR1	Ch1 Under	1: An under range was detected.	BOOL	Ch1 Under Range
	Range	0: An under range was not detected.		
		During the sensor disconnection test, it is fixed to 0.		
OR1	Ch1 Over	1: An over range was detected.	BOOL	Ch1 Over Range
	Range	0: An over range was not detected.		
		During the sensor disconnection test, it is fixed to 0.		
ADCE1	Ch1 AD Con-	1: An AD conversion error was detected.	BOOL	Ch1 AD Convertion
	version Error	0: An AD conversion error was not detected.		Error
ZPR01	Ch1 Zero Point	1: A zero point range over was detected.	BOOL	Ch1 Zero Point Range
	Range Over	0: A zero point range over was not detected.		Over
		During the sensor disconnection test, it is fixed to 0.		
SST1	Ch1 Stable Sta- tus	1: A gross weight value/force measure- ment value was detected to be stable.	BOOL	Ch1 Stable Status
		0: A gross weight value/force measure- ment value was not detected to be sta- ble.		
		During the sensor disconnection test, it is fixed to 0.		
(RSV)	Reserved	Cannot be used. It is fixed to 0.		

*1. 1 is TRUE and 0 is FALSE.

Executing Status

This is an aggregated data of the function statuses for sensor disconnection test, data tracing and other items which the Load Cell Input Unit executes.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Executing Status	WORD	0000 hex	Ch1 Executing Status	6001	01

The bit configuration and the description of each bit for the Executing Status are given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	OTTS-	ZSEXC1	HEXC1	MAF2DIS	MAF1DIS	DLPF-	IRSEXC1	SDTEXC1
	EXC1			1	1	DIS1		
+1	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	DTEXC1

Abbrevia- tion	Data name	Description ^{*1}	Data type	I/O port name
SDTEXC1	Ch1 Sensor Disconnection	1: The sensor disconnection test is in progress.	BOOL	Ch1 Sensor Discon- nection Test Executing
	Test Executing	0: The sensor disconnection test is not in progress.		
IRSEXC1	Ch1 Input Value Refresh- ing Stopping	 The input value refreshing stop is in progress. The input value refreshing stop is not in progress. 	BOOL	Ch1 Input Value Refreshing Stopping
		During the sensor disconnection test, it is fixed to 0.		
DLPFDIS1	Ch1 Digital Low-pass Filter Disabled	 The digital low-pass filter is disabled. The digital low-pass filter is enabled. During the sensor disconnection test, it is fixed to 0. 	BOOL	Ch1 Digital Low-pass Filter Disabled
MAF1DIS1	Ch1 Moving Average Filter 1 Disabled	 The moving average filter 1 is disabled. The moving average filter 1 is enabled. During the sensor disconnection test, it is finally a sensor disconnection test. 	BOOL	Ch1 Moving Average Filter 1 Disabled
MAF2DIS1	Ch1 Moving Average Filter 2 Disabled	1: The moving average filter 2 is dis- abled. 0: The moving average filter 2 is enabled. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Moving Average Filter 2 Disabled
HEXC1	Ch1 Hold Exe- cuting	 The peak hold or bottom hold is in progress. The peak hold or bottom hold is not in progress. During the sensor disconnection test, it is fixed to 0. 	BOOL	Ch1 Hold Executing

Abbrevia- tion	Data name	Description ^{*1}	Data type	I/O port name
ZSEXC1	Ch1 Zero Set	1: The zero set is in progress.	BOOL	Ch1 Zero Set Execut-
	Executing	0: The zero set is not in progress.		ing
		During the sensor disconnection test, it is fixed to 0.		
OTTSEXC1	Ch1 One-touch	1: One-touch tare subtraction is in prog-	BOOL	Ch1 One-touch Tare
	Tare Subtrac-	ress.		Subtraction Executing
	tion Executing	0: One-touch tare subtraction is not in		
		progress.		
		During the sensor disconnection test, it is fixed to 0.		
DTEXC1	Ch1 Data Trace	1: The data tracing is in progress.	BOOL	Ch1 Data Trace Exe-
	Executing	0: The data tracing is not in progress.		cuting
		During the sensor disconnection test, it is fixed to 0.		
(RSV)	Reserved	Cannot be used. It is fixed to 0.		

*1. 1 is TRUE and 0 is FALSE.

Gross Weight Value/Force Measurement Value DINT

This is the DINT gross weight value/force measurement value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Gross Weight	DINT	0	Ch1 Gross Weight	6002	01
Value/Force Measure-			Value/Force Measure-		
ment Value DINT			ment Value DINT		

The bit configuration of the Gross Weight Value/Force Measurement Value DINT is given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0	Ch1 Gross	Ch1 Gross Weight Value/Force Measurement Value DINT LL							
+1	Ch1 Gross	Ch1 Gross Weight Value/Force Measurement Value DINT LH							
+2	Ch1 Gross	Ch1 Gross Weight Value/Force Measurement Value DINT HL							
+3	Ch1 Gross	Weight Value	e/Force Meas	surement Val	ue DINT HH				

Gross Weight Value/Force Measurement Value REAL

This is the REAL gross weight value/force measurement value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Gross Weight	REAL	0.0	Ch1 Gross Weight	6003	01
Value/Force Measure-			Value/Force Measure-		
ment Value REAL			ment Value REAL		

The bit configuration of the Gross Weight Value/Force Measurement Value REAL is given in the following table. The data format conforms to IEEE754.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Mantissa							
+1	Mantissa							
+2	Exponent	Mantissa						
+3	Sign	Exponent						

Net Weight Value DINT

This is the DINT net weight value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Net Weight Value	DINT	0	Ch1 Net Weight Value	6004	01
DINT			DINT		

The bit configuration of the Net Weight Value DINT is given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch1 Net Weight Value DINT LL							
+1	Ch1 Net We	Ch1 Net Weight Value DINT LH						
+2	Ch1 Net We	Ch1 Net Weight Value DINT HL						
+3	Ch1 Net We	eight Value D	INT HH					

Net Weight Value REAL

This is the REAL net weight value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Net Weight Value	REAL	0.0	Ch1 Net Weight Value	6005	01
REAL			REAL		

The bit configuration of the Net Weight Value REAL is given in the following table. The data format conforms to IEEE754.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Mantissa							
+1	Mantissa							
+2	Exponent	Mantissa						
+3	Sign	Exponent						

Peak Hold Value DINT

This is the DINT peak hold value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Peak Hold Value DINT	DINT	0	Ch1 Peak Hold Value DINT	6006	01

The bit configuration of the Peak Hold Value DINT is given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch1 Peak Hold Value DINT LL							
+1	Ch1 Peak H	Ch1 Peak Hold Value DINT LH						
+2	Ch1 Peak Hold Value DINT HL							
+3	Ch1 Peak H	lold Value DI	NT HH					

Peak Hold Value REAL

This is the REAL peak hold value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Peak Hold Value	REAL	0.0	Ch1 Peak Hold Value	6007	01
REAL			REAL		

The bit configuration of the Peak Hold Value REAL is given in the following table. The data format conforms to IEEE754.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Mantissa							
+1	Mantissa							
+2	Exponent	Mantissa						
+3	Sign	Exponent						

Bottom Hold Value DINT

This is the DINT bottom hold value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Bottom Hold Value DINT	DINT	0	Ch1 Bottom Hold Value DINT	6008	01

The bit configuration of the Bottom Hold Value DINT is given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch1 Bottom	n Hold Value	DINT LL					
+1	Ch1 Bottom	Ch1 Bottom Hold Value DINT LH						
+2	Ch1 Bottom	n Hold Value	DINT HL					
+3	Ch1 Bottom	n Hold Value	DINT HH					

Bottom Hold Value REAL

This is the REAL bottom hold value.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Bottom Hold Value	REAL	0.0	Ch1 Bottom Hold Value	6009	01
REAL			REAL		

The bit configuration of the Bottom Hold Value REAL is given in the following table. The data format conforms to IEEE754.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Mantissa							
+1	Mantissa							
+2	Exponent	Mantissa						
+3	Sign	Exponent						

Calibration Command Response SID

This is a response to the calibration command SID. After the calibration command is executed, the SID of the calibration command that was executed is stored.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Calibration Com-	UINT	0	Ch1 Calibration Com-	600A	01
mand Response SID			mand Response SID		

Compare the calibration command response SID with the calibration command SID that was sent. If they match, consider it as the response for the calibration command that was sent. If they do not match, it is not the response for the calibration command that was sent. Ignore it. If they do not match for even more than 1 second, send the calibration command SID by 0. The calibration command response SID is reset to 0. Then, send the calibration command SID and calibration command again.

Calibration Command Response

This response shows the execution results of the calibration command.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Calibration Com- mand Response	WORD	0000 hex	Ch1 Calibration Com- mand Response	600B	01

The meaning of the calibration command response and how to correct it are given in the following table.

Response	Meaning	Correction
0000 hex	Ended normally.	
0001 hex	An incorrect calibration command was received which was not among the calibra- tion commands listed below.	Send the correct calibration command.
	0090 hex, 0091 hex, 0092 hex, 0093 hex, 0020 hex, 0030 hex, 0040 hex	
0002 hex	An incorrect calibration data outside of the specified range was received.	Send the calibration data that is within the specified range.
0003 hex	Reception of calibration commands is not possible because of one of the following reasons.	How to correct each reason is listed below.
	 The sensor disconnection test is in progress. 	After the sensor disconnection test, send the calibration command again.
	The calibration processing is executed.	Send the calibration command again.
	An AD conversion error is detected.	Send the calibration command while there is no AD conversion error.
0004 hex	The execution of calibration commands failed because of one of the following reasons.	How to correct each reason is listed below.
	 An AD conversion error was detected during calibration. 	Send the calibration command while there is no AD conversion error.
	 An over range or under range was detected during calibration. 	Remove the error, and send the calibration command after checking that over range and under range is not detected.
	Failed to write calibration data to non-vola- tile memory.	Send the calibration command again. If the 0004 hex response code is received again, replace the Unit.

Operation Command

This is an aggregated data for the Operation Command which the Load Cell Input Unit uses to execute functions such as sensor disconnection test and data tracing.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Operation Com- mand	WORD	0000 hex	Ch1 Operation Command	7000	01

The bit configuration and the meaning of each bit for the Operation Command are given in the following table.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	OTTSE1	ZSE1	HE1	MAF2D1	MAF1D1	DLPFD1	IRSE1	SDTE1
+1	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	HVC1	DTE1

Abbrevia- tion	Data name	Meaning ^{*1}	Data type	I/O port name
SDTE1	Ch1 Sensor	1: Executes the sensor disconnection	BOOL	Ch1 Sensor Discon-
	Disconnection	test.		nection Test Execution
	Test Execution	0: Ends the sensor disconnection test.		
IRSE1	Ch1 Input	1: Executes the input value refreshing	BOOL	Ch1 Input Value
	value Refresh-	stop.		Refreshing Stop
		0: Ends the input value refreshing stop.	DOOL	
DLPFD1	Ch1 Digital	1: Disables the digital low-pass filter.	BOOL	Ch1 Digital Low-pass
	Disable	0: Enables the digital low-pass filter.		
	Diodolo	If the Digital Low-pass Filter Cutoff Fre-		
		quency ^{*2} is set to 0, the digital low-pass		
		filter will not enable even if you set this		
	Ch1 Moving	Dit to U.	ROOL	Ch1 Maying Average
WAFIDI	Average Filter 1		BOOL	Filter 1 Disable
	Disable	U: Enables the moving average filter 1.		
		If the Filter 1 Moving Average Count ^{*2} is		
		set to 0, the moving average filter 1 will		
	Ch1 Moving	not enable even if you set this bit to 0.	ROOL	Ch1 Moving Average
IVIAF2D I	Average Filter 2		BUUL	Filter 2 Disable
	Disable	U: Enables the moving average filter 2.		
		If the Filter 2 Moving Average Count ^{*2} is		
		set to 0, the moving average filter 2 will		
	Obd Llaid Eve	not enable even if you set this bit to 0.	DOOL	Chilled Execution
HEI	Criticon	1: Executes the hold.	BOOL	Chi Hold Execution
7054		0: Ends the hold.		Ohd Zana Oat Europu
ZSET	Execution	1: Executes the zero set.	BOOL	tion
		0: Executes the zero reset.		
OTISE1	Ch1 One-touch	1: Executes the one-touch tare subtrac-	BOOL	Ch1 One-touch lare
	tion Execution			
	Ch1 Data Traca	U: Ends the one-touch tare subtraction.	POOL	Ch1 Data Traca Eva
DIEI	Execution		BUUL	cution
		U: Ends the data tracing.		

Abbrevia- tion	Data name	Meaning ^{*1}	Data type	I/O port name
HVC1	Ch1 Hold Value Clear	1: Clears the held peak value/bottom value.	BOOL	Ch1 Hold Value Clear
		0: Do not clear the held peak value/bot- tom value.		
(RSV)	Reserved	Cannot be used. Fix it to 0.		

*1. 1 is TRUE and 0 is FALSE.

*2. Set in the Unit operation settings for the Load Cell Input Unit.

Calibration Command SID

With this ID, the Load Cell Input Unit identifies calibration command requests.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Calibration Com- mand SID	UINT	0	Ch1 Calibration Com- mand SID	7001	01

 If 0 or a value of 256 or more is sent, the calibration command response SID is reset to 0. If the calibration command SID and calibration command response SID do not match, set the calibration command SID to 0 and send it.

• If 1 to 255 is sent, the calibration command request is identified. In the user program, send the calibration command and calibration command SID together. The calibration command SID is a value that adds 1 to the previous value of the calibration command SID. If the calibration command SID is changed as above, a new calibration command request is determined and the calibration command is accepted. If the calibration command SID is not changed, a new calibration command request is not determined.

Also, if the calibration command SID is changed in an incorrect sequential order such as adding 2 to its previous value, the calibration command is not accepted and ignored.

If 255 is reached, return it to 1 the next time you send it.

Calibration Command

Set the command code for the calibration command. The calibration command lets you select setting items, execute calibration and change calibration modes.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Calibration Com- mand	WORD	0000 hex	Ch1 Calibration Com- mand	7002	01

The meanings of the command codes for the calibration command are given in the following table.

Command code	Meaning
0090 hex	Sets the Load Cell Rated Capacity.
0091 hex	Sets the Load Cell Rated Output.
0092 hex	Sets the Load Cell Zero Balance.
0093 hex	Sets the Standard Weight.
0020 hex	Executes the zero calibration.
0030 hex	Executes the span calibration.
0040 hex	Changes the actual load calibration mode to the equivalent input calibration mode.

Calibration Data

Set the calibration data. Set the values of the calibration data according to the command codes for the calibration command.

Data name	Data type	Default	I/O port name	Index number (hex)	Subindex number (hex)
Ch1 Calibration Data	REAL	0.0	Ch1 Calibration Data	7003	01

The bit configuration of the calibration data is given in the following table. The data format conforms to IEEE754.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Mantissa	<i>I</i> antissa						
+1	Mantissa	Vantissa						
+2	Exponent	Mantissa						
+3	Sign	Exponent						

Calibration Methods

This section describes the methods of calibrating the Load Cell Input Unit.

7-1	Overv	iew and Precautions	2
	7-1-1	Overview of Actual Load Calibration and Equivalent Input Calibration 7-	-2
	7-1-2	Precautions for Calibration	.3
7-2	Actua	I Load Calibration	4
	7-2-1	Calibration Procedure	-4
	7-2-2	Basic Parameter Settings 7-	-7
	7-2-3	Performing a Zero Calibration	.9
	7-2-4	Performing a Span Calibration 7-1	0
	7-2-5	Correcting Errors by Calibration Site 7-1	0
7-3	Equiv	alent Input Calibration	1
	7-3-1	Calibration Procedure	1
	7-3-2	Basic Parameter Settings	3
	7-3-3	Changing Calibration Modes 7-1	5
7-4	Calibr	ation with the User Program	6
	7-4-1	Performing an Actual Load Calibration	6
	7-4-2	Performing an Equivalent Input Calibration	2
7-5	Calibr	ation Failures and Calibration Value Errors	5
	7-5-1	Calibration Failures	-5
	7-5-2	Calibration Value Errors	.8

7-1 Overview and Precautions

This section provides an overview of and precautions for calibration.



Precautions for Correct Use

You must perform a calibration before you use the Load Cell Input Unit to measure a weight and force.

7-1-1 Overview of Actual Load Calibration and Equivalent Input Calibration

The Load Cell Input Unit can properly convert the input into measurement values according to the load on the load cell when a calibration is performed. For example, when a load of 10 kg is applied to the load cell, perform a calibration in order for the Load Cell Input Unit to convert the measurement value to 10 kg.

On the Load Cell Input Unit, use the actual load calibration method or the equivalent input calibration method for a calibration.

Overview of Actual Load Calibration

This is a calibration method that applies an actual load to the load cell that is connected to the Load Cell Input Unit, and registers the actual load value on the Load Cell Input Unit as calibration data. Because the margin of error is small during calibration, highly accurate measurement is achieved.

For an actual load calibration, a zero calibration and a span calibration are performed with an actual load. A zero calibration is performed when no load is applied to the load cell, or when only the fixed tare is placed on the load cell. A span calibration is performed by placing the fixed tare and a standard load, such as a weight, on the load cell.



Zero calibration

Span calibration

Overview of Equivalent Input Calibration

This is a calibration method that sets the rated capacity, the rated output and the zero balance that are listed on the data sheet for the load cell by entering numeric values, and registers the values on the Load Cell Input Unit as calibration data.

Compared to an actual load calibration, the measurement resolution is lower because the margin of error is greater with this calibration. An equivalent input calibration is performed in the following cases:

- When measuring a force
- When measuring a material of a weight for which preparation of a standard weight is not possible
- When spatial limitation makes it difficult to apply an actual load, such as when the load cell and the filling machine are integrated.

When a zero balance is not listed on the data sheet for the load cell, perform one of the following:

- Contact the manufacturer of the load cell to obtain the zero balance value.
- Set the set value of the load cell zero balance to 0. To eliminate any impact of the zero balance, use the zero set to correct the zero point before you perform a measurement.

7-1-2 Precautions for Calibration

Precautions when performing a calibration are provided as follows:

- Perform an actual load calibration in the actual equipment system.
- Before you perform an actual load calibration, turn ON the power supply and warm-up the system for at least 30 minutes. If the system is not warmed up, the error by a zero drift or a gain drift after the calibration becomes greater than that of when the system is warmed up and the error of measurement values becomes larger.
- When you perform an actual load calibration for the first time, be sure to perform both a zero calibration and a span calibration. If only one of them is performed, the measurement values are not converted properly.
- · Check that there are no errors before you perform a calibration.
- The measurement values continue to be refreshed even during a calibration as they are during a normal operation. The measurement values during a calibration are not accurately displayed until the calibration is completed.
- If a calibration fails, the calibration values are not recorded to the non-volatile memory of the Load Cell Input Unit. Remove the cause of the failure and perform the calibration again. Refer to 7-5 Calibration Failures and Calibration Value Errors on page 7-45 for details of calibration failure.

7

7-2 Actual Load Calibration

This section describes an actual load calibration of the Load Cell Input Unit.

7-2-1 Calibration Procedure

The calibration procedure varies depending on the following situations:

- · When performing an actual load calibration for the first time
- When performing an actual load calibration again

The procedure of an actual load calibration for each situation is described.

When Performing an Actual Load Calibration for the First Time

The following is a procedure to perform an actual load calibration for the first time.



- *1. Place the fixed tare on the load cell if you use it during the measurement. If you do not use a fixed tare, do not apply any load to the load cell.
- *2. It can take time for the measurement values to become stable after the fixed tare or a weight is placed on the load cell. The amount of time until the measurement values become stable varies depending on the environment in which the actual load calibration is performed, the load cell that you use, the response characteristics of the digital filter, and the mechanical characteristics of the equipment. Determine the appropriate amount of time according to the operating environment and the response characteristics of the digital filter. Refer to 8-2 Digital Filtering on page 8-5 for the response characteristics of the digital filter.



- *1. This function detects whether the gross weight values are stable. Refer to *8-7 Stable Detection* on page 8-27 for details of the stable detection. When an actual load calibration is performed for the first time, the stable detection cannot be used with the calibration operation.
- *2. Place the fixed tare on the load cell if you use it during the measurement. If you do not use a fixed tare, do not apply any load to the load cell.
- *3. It can take time for the measurement values to become stable after the fixed tare or a weight is placed on the load cell. The amount of time until the measurement values become stable varies depending on the environment in which the actual load calibration is performed, the load cell that you use, the response characteristics of the digital filter, and the mechanical characteristics of the equipment. Determine the appropriate amount of time according to the operating environment and the response characteristics of the digital filter. Refer to 8-2 *Digital Filtering* on page 8-5 for the response characteristics of the digital filter.

7-2-2 Basic Parameter Settings

Parameters

When performing an actual load calibration, set the following as the basic parameters.

ltem	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Stan-	Sets the value of	5.0	1.175495e-38 to		Set the value that matches the unit
dard	the standard		3.402823e+38		of the gross weight value/force
Weight	weight placed on				measurement value to measure.
	the load cell to per-				For example, if the value of the
	form a span cali-				standard weight is 100 kg and the
	bration.				unit of the measurement is kg, set
					100 as the set value. For the mea-
					surement in the unit of t, set 0.1 as
					the set value because 100 kg
					equals 0.1 t.

Additional Information

If you clear all memory on the Support Software after an actual load calibration is performed, the value of the Ch1 Standard Weight is reset to the default and the measurement value is not converted correctly.

Perform the actual load calibration again or set the value of the Ch1 Standard Weight to the value before you clear all memory to convert the measurement value correctly. If the standard weight is already set, you do not need to perform the actual load calibration again because the calibration value is saved in the Load Cell Input Unit when an actual load calibration is performed even if you clear all memory.

7

Setting Method

The method for setting the basic parameters of the actual load calibration with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. When you are using Support Software other than the Sysmac Studio, in the Edit Unit Operation Settings Tab Page, set the parameters described in the procedure and transfer the settings to the target NX Unit.

The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

For details on how to display the Edit Unit Operation Settings Tab Page and to transfer settings to an NX Unit with Support Software other than the Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×		-
All parameters		
Item name	Value	
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter Cutoff Frequency	80	×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count	160	times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count	133	times
Standard Weight/Ch1 Standard Weight	5	
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity	5	
Load Cell Rated Output/Ch1 Load Cell Rated Output	5	mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance	0	uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of Calibration Site	9.80665	m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of Installation Site	9.80665	m/s2
Digital Tare Value/Ch1 Digital Tare Value	0	
Zero Point Range/Ch1 Zero Point Range	0	
Zero Tracking Range/Ch1 Zero Tracking Range	0	
Zero Tracking Period/Ch1 Zero Tracking Period	0	x0.1s
Stable Status Range/Ch1 Stable Status Range	0	
Stable Status Period/Ch1 Stable Status Period	0	x0.1s
Decimal Point Position/Ch1 Decimal Point Position	x1	•
Event Level Setting/Event 1	Unit Over Range	T
Event Level Setting/Event 1 Level	Observation	•
Event Level Setting/Event 2	Unit Under Range	T
Event Level Setting/Event 2 Level	Observation	▼
	Retur	n to Default Value
_ Help		
Data type: REAL Valid range: 1.175495E-38 - 3.402823E+38 Comment: Sets the value of the standard weight to place on the load cell before	performing a span calibrati	on.
Transfer to Unit	Transfer from Unit	Compare

Set the Ch1 Standard Weight.

2

3

Click the Transfer to Unit Button.

The settings are transferred from the Sysmac Studio to the NX Unit.

The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

7-2-3 Performing a Zero Calibration

The method for performing a zero calibration with the Support Software is given below.

This section describes how to perform a zero calibration with the Sysmac Studio. For details on how to perform the operation with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Display the calibration view.

For the display methods, refer to A-6 Display Methods for the Calibration View on page A-21.

N	Calibration		
\sim	Actual Load Calibration -	Stable status: ON	Execute Zero Calibration Execute Span Calibration
	Equivalent Input Calibra Click this button if you Change fro	tion — u want to execute the equivalent input calibr m Actual Load Calibration Mode to Equivale	ation after the actual load calibration. Int Input Calibration Mode

2 Check Stable status in Actual Load Calibration is ON if the stability of the gross weight value is being checked using the stable detection. A check of Stable status is not required if the stability of the gross weight value is not being checked.

CActual Load Calibration		
	Stable status: ON	Execute Zero Calibration Execute Span Calibration

The gross weight value is not stable if Stable status is OFF. Refer to *9-5 Unit-specific Trouble-shooting* on page 9-27 for assumed causes of instability in a gross weight value and the correction for the causes.

3 Click the **Execute Zero Calibration** Button in Actual Load Calibration.

An execution confirmation dialog box is displayed.

Zero Calibrati	on
A	Confirm that no load or only the fixed tare is placed on the load cell. Do you want to continue?
	<u>Y</u> es <u>N</u> o

4 Click the **Yes** Button.

A zero calibration is performed.

7

7-2-4 Performing a Span Calibration

The method for performing a span calibration with the Support Software is given below. You can omit procedure 1 when a span calibration is performed after a zero calibration.

This section describes how to perform a span calibration with the Sysmac Studio. For details on how to perform the operation with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Display the calibration view.

For the display methods, refer to A-6 Display Methods for the Calibration View on page A-21.

1	Calibration		
	Actual Load Calibration		
$\sim\!\!\!\!\sim$		Stable status: ON	Execute Zero Calibration
			Execute Span Calibration
	Equivalent Input Calibra Click this button if you	tion	ration after the actual load calibration.
	Change fro	m Actual Load Calibration Mode to Equivale	ent Input Calibration Mode

2 Check Stable status in Actual Load Calibration is ON if the stability of the gross weight value is being checked using the stable detection. A check of Stable status is not required if the stability of the gross weight value is not being checked.

CActual Load Calibratio	on	
		Execute Zero Calibration
	Stable status: ON	Execute Span Calibration
L		

The gross weight value is not stable if Stable status is OFF. Refer to 9-5 Unit-specific Troubleshooting on page 9-27 for assumed causes of instability in a gross weight value and the correction for the causes.

3 Click the **Execute Span Calibration** Button in Actual Load Calibration.

An execution confirmation dialog box is displayed.

Span Calibrati	on
A	Confirm that the weight is placed on the load cell. Do you want to continue?
	<u>Y</u> es <u>N</u> o

4 Click the Yes Button.

A span calibration is performed.

7-2-5 Correcting Errors by Calibration Site

If the actual load calibration site of equipment is different from the installation site, the gross weight values that are converted by the Load Cell Input Unit will be different between those at the calibration site and the installation site due to the difference in the gravity acceleration of each site. Use the gravity acceleration correction to correct this error. Refer to *8-1 Gravity Acceleration Correction* on page 8-3 for details of the gravity acceleration correction.

7-3 Equivalent Input Calibration

This section describes an equivalent input calibration of the Load Cell Input Unit.

7-3-1 Calibration Procedure

The equivalent input calibration procedure varies depending on the following situations:

- When performing an equivalent input calibration in the factory setting or when performing the calibration again
- · When performing an equivalent input calibration after performing an actual load calibration

The procedure of an equivalent input calibration for each situation is described.

When Performing an Equivalent Input Calibration in the Factory Setting or When Performing the Calibration Again



When you use the Unit after an equivalent input calibration is performed, the gross weight value/force measurement value with no load may change to a value other than 0 due to the installation method of the load cell. To change the gross weight value/force measurement value with no load to 0 without changing the installation method of the load cell, use the zero set. Refer to *8-3 Zero Set/Zero Reset* on page 8-13 for details on the zero set.

7

When Performing an Equivalent Input Calibration After Performing an Actual Load Calibration



When you use the Unit after an equivalent input calibration is performed, the gross weight value/force measurement value with no load may change to a value other than 0 due to the installation method of the load cell. To change the gross weight value/force measurement value with no load to 0 without changing the installation method of the load cell, use the zero set. Refer to *8-3 Zero Set/Zero Reset* on page 8-13 for details on the zero set.

7-3-2 Basic Parameter Settings

Parameters

When performing an equivalent input calibration, set the following as the basic parameters.

For the set value of each item, refer to the data sheet for the load cell to set the values.

Item	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Load Cell Rated Capacity	Sets the rated capacity of the load cell.	5.0	1.175495e–38 to 3.402823e+38		 When more than one load cell is connected in parallel, set a value calculated from Rated capacity per load cell × Number of load cell connected in parallel. Set the value that matches the unit that is listed on the data sheet for the load cell. To measure gross weight value/force measurement value in a unit that is different from the unit on the data sheet, set a value that matches that unit. For example, to measure a value in unit of t by using a load cell with a rated capacity of 100 kg, set 0.1 as the set value because 100 kg equals 0.1 t.
Ch1 Load Cell Rated Output	Sets the rated out- put of the load cell.	5.0	1.175495e-38 to 3.402823e+38	mV/V	To use a load cell whose sign of the rated output is defined with a ±, set an absolute value as the set value.
Ch1 Load Cell Zero Balance	Sets the zero bal- ance of the load cell.	0.0	-3.402823e+38 to 3.402823e+38	μν/ν	 To connect more than one load cell in parallel, set an average value of each load cell. If the value is not listed on the data sheet for the load cell, set 0 as the set value. After an equivalent input calibration is performed, if the input signal is equal to the set value of the Load Cell Zero Balance, the gross weight value/force measurement value changes to 0. To change the gross weight value/force measurement value to 0 with a fixed tare that is placed on the load cell, execute the zero set with only a fixed tare that is placed. Refer to <i>8-3 Zero Set/Zero Reset</i> on page 8-13 for details on the zero set.

Setting Method

The method for setting the basic parameters of the equivalent input calibration with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. When you are using Support Software other than the Sysmac Studio, in the Edit Unit Operation Settings Tab Page, set the parameters described in the procedure and transfer the settings to the target NX Unit.

The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

For details on how to display the Edit Unit Operation Settings Tab Page and to transfer settings to an NX Unit with Support Software other than the Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×		-			
All parameters					
Item name	Value	Value			
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter Cutoff Frequen	icy 80	×0.1Hz			
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count	160	times			
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count	133	times			
Standard Weight/Ch1 Standard Weight	5				
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity	5				
Load Cell Rated Output/Ch1 Load Cell Rated Output	5	mV/V			
Load Cell Zero Balance/Ch1 Load Cell Zero Balance	0	uV/V			
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of Calibration Site	9.80665	m/s2			
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of Installation Site	9.80665	m/s2			
Digital Tare Value/Ch1 Digital Tare Value	0				
Zero Point Range/Ch1 Zero Point Range	0				
Zero Tracking Range/Ch1 Zero Tracking Range	0				
Zero Tracking Period/Ch1 Zero Tracking Period	0	x0.1s			
Stable Status Range/Ch1 Stable Status Range	0				
Stable Status Period/Ch1 Stable Status Period	0	x0.1s			
Decimal Point Position/Ch1 Decimal Point Position	x1	▼			
Event Level Setting/Event 1	Unit Over Range	T			
Event Level Setting/Event 1 Level	Observation	▼.			
Event Level Setting/Event 2	Unit Under Range	$\overline{\mathbf{v}}$			
Event Level Setting/Event 2 Level	Observation	▼			
	Return	to Default Value			
_ Help					
Data type: REAL					
Valid range: 1.1/5495E-38 - 3.402823E+38					
Comment: Sets the rated capacity of the load cell.					
Transfer to U	Unit Transfer from Unit	Compare			

2 Set the Ch1 Load Cell Rated Capacity, Ch1 Load Cell Rated Output, and Ch1 Load Cell Zero Balance.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

7-3-3 Changing Calibration Modes

If you perform an equivalent input calibration after an actual load calibration is performed, it is necessary to change the actual load calibration mode to the equivalent input calibration mode after the basic parameters are set. The procedure for changing the actual load calibration mode to the equivalent input calibration mode with the Support Software is given below.

This section describes how to change the calibration mode with the Sysmac Studio. For details on how to perform the operation with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Display the calibration view.

For the display methods, refer to A-6 Display Methods for the Calibration View on page A-21.

2	Calibration			
\sim	- Actual Load Calibration -	Stable status: ON	Execute Zero Calibration Execute Span Calibration	
	Equivalent Input Calibration — Click this button if you want to execute the equivalent input calibration after the actual load calibration. Change from Actual Load Calibration Mode to Equivalent Input Calibration Mode			

2 Click the Change from Actual Load Calibration Mode to Equivalent Input Calibration Mode Button in Equivalent Input Calibration.

An execution confirmation dialog box is displayed.

1	Mode Change	and had been a
		The mode is changed from actual load calibration mode to equivalent input calibration mode. Do you want to continue?
		<u>Y</u> es <u>N</u> o

3 Click the **Yes** Button.

The actual load calibration mode is changed to the equivalent input calibration mode.

7

7-4 Calibration with the User Program

This section describes the sample programming that is used to perform a calibration in the user program.

Descriptions of the following two types of sample programming are provided.

- · Performing an actual load calibration
- · Performing an equivalent input calibration

These sample programs assume that an EtherCAT Coupler Unit and an NJ/NX-series CPU Unit are connected to each other.

7-4-1 Performing an Actual Load Calibration

This section describes the sample programming that is used to perform an actual load calibration in the user program.

System Configuration

The system configuration is given below.

Item	Specification
Communications master	NJ501-1500
Communications Coupler Unit	NX-ECC203
Node address of the Communications Coupler	1
Unit	
Load Cell Input Unit	NX-RS1201
NX Unit number of the Load Cell Input Unit	1



Refer to *When Connecting to the CPU Unit* on page 7-29 for an application example when the Load Cell Input Unit is connected to an NX-series CPU Unit.
Unit Operation Settings for the Load Cell Input Unit

The set values of the Unit operation settings for the Load Cell Input Unit are all default values.

I/O Allocation

To perform a calibration with the user program, use the I/O allocation settings to assign the following I/O data. Use I/O allocations as the default values for I/O data that are not given in the following table.

Unit	Data name	Remarks		
NX-ECC203	NX Unit I/O Data Active Status 63	It is assigned by default.		
	NX Unit Error Status 63	It is not assigned by default. Be sure to		
NX-RS1201	Ch1 Calibration Command Response SID	assign in the I/O allocation settings.		
	Ch1 Calibration Command Response			
	Ch1 Calibration Command SID			
	Ch1 Calibration Command			
	Ch1 Calibration Data			

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for details on I/O data for the NX-ECC203. Refer to 6-2-1 Data Items for Allocation to I/O on page 6-13 for details on I/O data for the NX-RS1201.

Processing Contents

Processing that are performed in the sample programming and execution conditions are given in the following table. For some processing, the user needs to set internal variables.

	Processing	Execution conditions
Checking the process	data communications status	There are no execution conditions. This processing is always performed.
Resetting Ch1 Calibra	tion Command SID to 0	When the user sets the following internal variable to TRUE, this processing is per-
Setting Ch1 Stan- dard Weight	Sending Ch1 Calibration Command SID, Ch1 Calibration Command, and Ch1 Cali- bration Data Checking whether Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID are matched Checking Ch1 Calibration Command Response	formed. ^{*1} • Actual_Load_Calibration_Start
Performing a zero calibration	Sending Ch1 Calibration Command SID and Ch1 Calibration Command Checking whether Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID are matched Checking Ch1 Calibration Command Response	 When the user sets the following internal variable to TRUE, this processing is performed.^{*1} Zero_Calibration_Start
Performing a span calibration	Sending Ch1 Calibration Command SID and Ch1 Calibration Command Checking whether Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID are matched Checking Ch1 Calibration Command Response	 When the user sets the following internal variable to TRUE, this processing is performed.^{*1} Span_Calibration_Start

Processing	Execution conditions
Adding 1 to the previous value of Ch1 Calibration Command SID	When one of the following processing is completed normally, this processing is per- formed.
	Resetting Ch1 Calibration Command SID to 0
	Setting Ch1 Standard Weight
	Performing a zero calibration
	Performing a span calibration
Notifying the completion of actual load calibration	When all of the following processing are completed normally, this processing is per- formed.
	Setting Ch Standard Weight
	Performing a zero calibration
	Performing a span calibration

*1. Refer to Internal Variables on page 7-19 for details on internal variables.

I/O Map

The following table shows the settings of variables that are assigned to the I/O Map on the Support Software.

Unit	Port	Meaning	Data type	Variable name	Variable type
NX-ECC203	NX Unit I/O Data	This status is given	ARRAY	E001_NX_Unit_I_O_	Global vari-
	Active Status 63	as an array of BOOL	[063] OF	Data_Active_Status_63	able
		data. TRUE indicates	BOOL		
		that the I/O data in			
		the NX Unit can be			
		used for control.			
	NX Unit Error	This status is given	ARRAY	E001_NX_Unit_Er-	Global vari-
	Status 63	as an array of BOOL	[063] OF	ror_Status_63	able
		data. TRUE indicates	BOOL		
		that an error occurs			
		in the NX Unit.			
NX-RS1201	Ch1 Calibration	Ch1 Calibration	UINT	N1_Ch1_Calibra-	Global vari-
	Command	Command Response		tion_Command_Re-	able
	Response SID	SID		sponse_SID	
	Ch1 Calibration	Ch1 Calibration	WORD	N1_Ch1_Calibra-	Global vari-
Command		Command Response		tion_Command_Re-	able
	Response			sponse	
	Ch1 Calibration	Ch1 Calibration	UINT	N1_Ch1_Calibra-	Global vari-
	Command SID	Command SID		tion_Command_SID	able
	Ch1 Calibration	Ch1 Calibration	WORD	N1_Ch1_Calibra-	Global vari-
	Command	Command		tion_Command	able
	Ch1 Calibration	Ch1 Calibration Data	REAL	N1_Ch1_Calibration_	Global vari-
	Data			Data	able

Variable Table

External variables and internal variables that are used in the sample programming are given below.

• External Variables

Use global variables that are assigned to the I/O Map on the Support Software as external variables. Refer to *I/O Map* on page 7-18 for details on global variables that are assigned to the I/O Map.

Internal Variables

Internal variables that are used in the sample programming are given below for each of the aforementioned processing. Whether the user needs to set internal variables for the program execution is also given.

Yes: Setting by the user is required.

-: Setting by the user is not required.

Processing	Variable name	Data type	Default	Comment	Setting by the user
Checking the pro- cess data commu- nications status	Process_Data_Chec k	BOOL	FALSE	When this variable is TRUE, it indi- cates that EtherCAT process data communications are active and normal.	-
Resetting Ch1 Calibration Com- mand SID to 0	Actual_Load_Calibr ation_Start	BOOL	FALSE	This variable is used to start an actual load calibration. Set it to TRUE when you set Ch1 Standard Weight.	Yes
				When this variable is TRUE and EtherCAT process data communi- cations are active and normal, Ch1 Calibration Command SID is reset to 0 and Ch1 Standard Weight is set.	
	Initial_State_Setting _Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibration Command SID is reset to 0.	-
	Initial_State_SID_C heck	BOOL	FALSE	When this variable changes to TRUE, whether Ch1 Calibration Command SID and Ch1 Calibra- tion Command Response SID are reset to 0 is checked.	-

7

Processing	Variable name	Data type	Default	Comment	Setting by the user
Setting Ch1 Stan- dard Weight	Standard_Weight_S etting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Standard Weight is set.	-
	Standard_Weight_C ommand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Standard Weight. Before you perform the sample program- ming, set this variable to 0093 hex.	Yes
	Standard_Weight_V alue	REAL	0.0	This variable is used to set Ch1 Calibration Command for Ch1 Standard Weight. Before you per- form the sample programming, set a value according to the standard weight to use.	Yes
	Standard_Weight_SI D_Error_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID do not match in the setting of Ch1 Stan- dard Weight.	-
	Standard_Weight_S etting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand Response is abnormal in the setting of Ch1 Standard Weight.	-
	Standard_Weight_E rror_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the set- ting of Ch1 Standard Weight, Ch1 Calibration Command Response is stored in this variable.	-
	Standard_Weight_S etting_Finish	BOOL	FALSE	When this variable is TRUE, it indi- cates that the setting of Ch1 Stan- dard Weight was completed normally.	-
	Standard_Weight_C heck_instance	Send_Res ponse_Ch eck_FB		This instance is used to set Ch1 Standard Weight. Use the Send_Response_Check_FB func- tion block. ^{*1}	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Performing a zero calibration	Zero_Calibration_St art	BOOL	FALSE	This variable is used to start a zero calibration. Set it to TRUE when you perform a zero calibra- tion. When this variable is TRUE and EtherCAT process data communi- cations are active and normal, a zero calibration is performed.	Yes
	Zero_Calibration_C ommand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to perform a zero calibration. Before you perform the sample program- ming, set this variable to 0020 hex.	Yes
	Zero_Calibration_SI D_Error_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID do not match in the execution of a zero calibration.	-
	Zero_Calibration_Er ror_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand Response is abnormal in the execution of a zero calibration.	-
	Zero_Calibration_Er ror_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the exe- cution of a zero calibration, Ch1 Calibration Command Response is stored in this variable.	-
	Zero_Calibration_Fi nish	BOOL	FALSE	When this variable is TRUE, it indi- cates that the zero calibration was completed normally.	-
	Zero_Calibration_C heck_instance	Send_Res ponse_Ch eck_FB		This instance is used to perform a zero calibration. Use the Send_Response_Check_FB func-tion block.*1	-

7

Processing	Variable name	Data type	Default	Comment	Setting by the user
Performing a span calibration	Span_Calibration_St art	BOOL	FALSE	This variable is used to start a span calibration. Set it to TRUE when you perform a span calibra- tion. When this variable is TRUE and EtherCAT process data communi- cations are active and normal, a	Yes
	Span_Calibration_C ommand	WORD	0000 hex	span calibration is performed. This variable is used to set Ch1 Calibration Command for which to perform a span calibration. Before you perform the sample program- ming, set this variable to 0030 hex.	Yes
	Span_Calibration_SI D_Error_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand SID and Ch1 Calibration Command Response SID do not match in the execution of a span calibration.	-
	Span_Calibration_Er ror_flg	BOOL	FALSE	When this variable is TRUE, it indi- cates that Ch1 Calibration Com- mand Response is abnormal in the execution of a span calibra- tion.	-
	Span_Calibration_Er ror_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the exe- cution of a span calibration, Ch1 Calibration Command Response is stored in this variable.	-
	Span_Calibration_Finish	BOOL	FALSE	When this variable is TRUE, it indi- cates that the span calibration was completed normally.	-
	Span_Calibration_C heck_instance	Send_Res ponse_Ch eck_FB		This instance is used to perform a span calibration. Use the Send_Response_Check_FB function block. ^{*1}	-
Adding 1 to the previous value of Ch1 Calibration Command SID	Calibration_Comma nd_SID	UINT	0	 This variable is used to set Ch1 Calibration Command SID. It is also used in the following processing. Resetting Ch1 Calibration Command SID to 0 Setting Ch1 Standard Weight Performing a zero calibration Performing a span calibration 	-
Notifying the com- pletion of actual load calibration	Actual_Load_Calibr ation_Finish	BOOL	FALSE	 When this variable is TRUE, it indicates that all of the following processing was completed normally. Setting Ch1 Standard Weight Performing a zero calibration Performing a span calibration 	-

*1. Refer to *Function Block* on page 7-25 for details on the Send_Response_Check_FB function block.

Precautions Before Performing Sample Programming

Internal variables you need to set before you perform an actual load calibration in the sample programming and precautions in regard to the timing to set internal variables are given below.

• Setting Internal Variables Beforehand

Internal variables you need to set beforehand and their values are given below. If they are not set, an actual load calibration is not performed correctly.

Variable name	Data type	Set value
Standard_Weight_Command	WORD	0093 hex
Standard_Weight_Value	REAL	Set a value according to the standard weight to use.
Zero_Calibration_Command	WORD	0020 hex
Span_Calibration_Command	WORD	0030 hex

Refer to Internal Variables on page 7-19 for details on these internal variables.

• Timing to Set Internal Variables

Set the following internal variables at the timing according to the calibration procedure for an actual load calibration. Also, do not set the variables to TRUE.

- Actual_Load_Calibration_Start
- Zero_Calibration_Start
- Span_Calibration_Start

If you do not set internal variables according to the calibration procedure, an actual load calibration is not performed correctly. Also, if you set the variables to TRUE, the program does not operate normally.

The timing for setting internal variables is given below.

Variable name	Data type	Timing for setting internal variables
Actual_Load_Calibration_Start	BOOL	Set it to TRUE when you set Ch1 Standard Weight.
Zero_Calibration_Start	BOOL	Set it to TRUE when you perform a zero calibration.
		Perform a zero calibration after a sufficient time elapses since no load is applied on or only the fixed tare is placed on the load cell.
Span_Calibration_Start	BOOL	Set it to TRUE when you perform a span calibration.
		Perform a span calibration after a sufficient time elapses since the standard weight is placed on the load cell.

Refer to 7-2-1 Calibration Procedure on page 7-4 for details on calibration procedure.

Refer to Internal Variables on page 7-19 for details on these internal variables.

Sample Programming That Performs An Actual Load Calibration

A sample programming that performs an actual load calibration is given below. Before you perform programs, refer to the aforementioned precautions for performing sample programming.

The status of process data communications is always monitored to see if communications are active and normal.

If Process_Data_Check is FALSE, subsequent programs are not performed.

_EC_PDSIa	vTbl[1] _EC_CommErr [*]	Tbl[1] E001_NX_Unit_I_O_Da	ata	Active_Status_63[1]	E001_NX_Unit_I	Error_Status_63[1]	Process_Da	ta_Check
			1				$ \frown $	\
	1/ [-	1			1			

When Actual_Load_Calibration_Start changes to TRUE, an actual load calibration is started.

	Actual_Load_Calibration_Start Process_Data_Check	Initial_State_Setting_Start
ſ		\bigcirc

Ch1 Calibration Command SID is sent by 0 and Ch1 Calibration Command SID is reset to 0.



Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are compared. If they match, 1 is added to the previous value of Ch1 Calibration Command SID.



When *Standard_Weight_Setting_Start* changes to TRUE, Ch1 Standard Weight is set by *Standard_Weight_Check_instance*. The operation of *Standard_Weight_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

Standard_Weight_Setting_Start_Process_Data_Check	Standard_Weight_Check_instanc Send_Response_Check_FB In Out	2	EN ENO
Calibration_Command_SID—	SID SID_Error	—Standard_Weight_SID_Error_flg	BOOL#FALSE-In Out-Standard_Weight_Setting_Start
Standard_Weight_Command—	Command Setting_Error	—Standard_Weight_Setting_Error_flg	
Standard_Weight_Value—	Command_Data Error_Code	—Standard_Weight_Error_Code	
	Setting_Finish	— Standard_Weight_Setting_Finish	

When Zero_Calibration_Start changes to TRUE, a zero calibration is performed by Zero_Calibration_ Check_instance. Perform a zero calibration with no load applied or only the fixed tare placed on the load cell. The operation of Zero_Calibration_Check_instance is defined in the Send_Response_ Check_FB function block^{*1}.

I		Zero_Calibration_Ch	neck_instance			
I	Zero_Calibration_Start Process_Data_Check	Send Response	Check FB		MOVE	7
ł		In	Out		EN ENC)
	Calibration_Command_SID—	SID	SID_Error	-Zero_Calibration_SID_Error_flg	BOOL#FALSE-In Ou	t Zero_Calibration_Start
I	Zero_Calibration_Command—	Command S	Setting_Error	—Zero_Calibration_Error_flg		
	Enter Variable—	Command_Data	Error_Code	-Zero_Calibration_Error_Code		
		Se	etting_Finish	—Zero_Calibration_Finish		
I						

When *Span_Calibration_Start* changes to TRUE, a span calibration is performed by *Span_Calibration_Check_instance*. Perform a span calibration with the standard weight placed on the load cell. The operation of *Span_Calibration_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

Span_Calibration_Start Process_Data_Check Span_	n_Calibration_Check_instance Send_Response_Check_FB		
Calibration Commond CID		Const Colliburation CID Force for	
Calibration_Command_SID	SID_Error	- Span_Calibration_SLD_Error_fig	BOOL#FALSE IN Out Span_Calibration_start
Span_Calibration_Command— Com	mmand Setting_Error	—Span_Calibration_Error_flg	
Enter Variable— Com	mmand_Data Error_Code	-Span_Calibration_Error_Code	
	Setting_Finish	-Span_Calibration_Finish	

When the Ch1 Standard Weight setting, a zero calibration, or a span calibration is completed normally, 1 is added to the previous value of Ch1 Calibration Command SID.^{* 2}

Standard_Weight_Setting_Start	EN EN	Inc ENO		E	= N	MOVE EN ENO
Zero_Calibration_Start	Calibration_Command_SID— InOut	InOut	-Calibration_Command_SID	Calibration_Command_SID-In	n1 UINT#1—	In Out—Calibration_Command_SID
Span Calibration Start			—Enter Variable	UINT#256—In	n2	
				_		

When the Ch1 Standard Weight setting, a zero calibration and a span calibration are all completed normally, *Actual_Load_Calibration_Finish* changes to TRUE and it is notified that an actual load calibration was completed normally.

Standard_Weight_Setting_Finish Zero_Calibration_Finish Span_Calibratio	n_Finish Actual_Load_Calibration_Finish
	O

- *1. Refer to *Function Block* on page 7-25 for details on the Send_Response_Check_FB function block.
- *2. In this sample programming, when Ch1 Calibration Command SID reaches 255, the next Ch1 Calibration Command SID returns to 1.

Function Block

In the sample programming that performs an actual load calibration and equivalent input calibration, a function block with the following name is used.

Send_Response_Check_FB

This function block (hereinafter Send_Response_Check_FB) is not registered in the Support Software. The user must create this function block and register in the Support Software. Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for details on how to create a function block. For details on how to register the function block, refer to the operation manual for the Support Software that you are using.

Functions of the Send_Response_Check_FB are as follows.

Sample program- ming	Function	Description
Performing an actual	Setting basic parame-	Sets Ch1 Standard Weight.
load calibration	ters	
	Calibration	Performs a zero calibration and a span calibration.
Performing an equiv-	Setting basic parame-	Sets Ch1 Load Cell Rated Capacity, Ch1 Load Cell Rated Out-
alent input calibra-	ters	put, and Ch1 Load Cell Zero Balance.
tion	Calibration	Changes the actual load calibration mode to the equivalent input
		calibration mode.

Details on the Send_Response_Check_FB are given in the following pages.

• Processing Contents

Processing performed by the Send_Response_Check_FB is described below.

The Send_Response_Check_FB performs the following three processes to set the basic parameters and execute calibration operations.

- Sending Ch1 Calibration Command SID, Ch1 Calibration Command, and Ch1 Calibration Data
- Checking whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched
- Checking Ch1 Calibration Command Response

• Variable Table

Internal variables and I/Os that are used in the Send_Response_Check_FB are given below.

(a) Internal variables

Internal variables that are used in the Send_Response_Check_FB are given below. Whether the user needs to set internal variables for the program execution is also given.

Yes: Setting by the user is required.

-: Setting by the user is not required.

Variable name	Data type	Default	Comment	Setting by the user
SID_Check	BOOL	FALSE	When this variable changes to TRUE, the match of Ch1 Calibration Command SID and Ch1 Calibra- tion Command Response SID is checked.	-
Next_Step	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibra- tion Command Response is checked.	-
SID_Check_Timer	TON		This is an instance of the timer that monitors whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched.	-
Set_Time	TIME	T#0 ms	This variable is used to set the time to monitor whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched. Before you perform a sample programming, set a desired value. We recommend a value around 1000 ms.	Yes
			When Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match after the time elapses, it is considered that they do not match.	
Elapsed_time	TIME	T#0 ms	This variable indicates the time elapsed from moni- toring the match of Ch1 Calibration Command SID and Ch1 Calibration Command Response SID.	-

(b) I/O

I/Os that are used in the Send_Response_Check_FB are given below.

Variable name	I/O	Data type	Default	Comment
In	Input	BOOL	FALSE	This is an input of the function block. When it is TRUE, the
				processing in the function block is performed.
SID	Input	UINT	0	This variable is used to set Ch1 Calibration Command SID.
				The input data is set to Ch1 Calibration Command SID.
Command	Input	WORD	0000	This variable is used to set Ch1 Calibration Command. The
			hex	input data is set to Ch1 Calibration Command.

Variable name	I/O	Data type	Default	Comment
Command_Data	Input	REAL	0.0	This variable is used to set Ch1 Calibration Data. The input data is set to Ch1 Calibration Data.
Out	Output	BOOL		This is an output of the function block. When it is TRUE, it indicates that the processing in the function block is completed.
SID_Error	Output	BOOL		When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match.
Setting_Error	Output	BOOL		When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal.
Error_Code	Output	WORD		If Ch1 Calibration Command Response is abnormal, Ch1 Calibration Command Response is stored in this variable.
Setting_Finish	Output	BOOL		When this variable is TRUE, it indicates that the processing in the function block was completed normally.

• Precautions Before Performing Sample Programming

Internal variables you need to set before you perform an actual load calibration and equivalent input calibration in the sample programming of the function block and their values are given below. If they are not set, an actual load calibration and equivalent input calibration are not performed correctly.

Variable name	Data type	Set value
Set_Time	TIME	Set a desired value. We recommend a value around 1000 ms.

Refer to Variable Table on page 7-26 for details on internal variables.

• Sample Programming of the Function Block

A sample programming of the Send_Response_Check_FB is given below. Before you perform programs, refer to the aforementioned precautions for performing sample programming.



Ch1 Calibration Command SID, Ch1 Calibration Command, and Ch1 Calibration Data are sent.

The match of Ch1 Calibration Command SID and Ch1 Calibration Command Response SID is checked.



If Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match even after the time that was set by *Set_time* elapses, *SID_Error* changes to TRUE and it is notified that they do not match.



Ch1 Calibration Command Response is checked and the execution result is notified.

If the execution is completed normally, *Setting_Finish* changes to TRUE and it is notified that the execution was completed normally.

If the execution is not completed normally, Ch1 Calibration Command Response is stored in *Error_Code*, *Setting_Error* changes to TRUE, and it is notified that an error occurs.



When Connecting to the CPU Unit

The following is an application example when the Load Cell Input Unit shown in the above configuration examples is connected to an NX-series NX1P2 CPU Unit. Here, only the differences from the examples for EtherCAT Slave Terminals are shown.

Refer to the above examples for EtherCAT Slave Terminals in consideration of these differences.

• System Configuration

The system configuration is given below.

ltem	Specification
CPU Unit	NX1P2-1140DT1
Load Cell Input Unit	NX-RS1201
NX Unit number of the Load	1
Cell Input Unit	



• Unit Operation Settings for the Load Cell Input Unit

The Unit operation settings are the same as those given in the examples for EtherCAT Slave Terminals.

• I/O Allocation

As opposed to the examples for EtherCAT Slave Terminals, the following I/O data is not assigned.

- NX Unit I/O Data Active Status 63
- NX Unit Error Status 63

Processing Contents

As opposed to the examples for EtherCAT Slave Terminals, the following processing is not performed.

Checking the process data communications status

The following processing is performed.

Processing	Execution conditions
Checking the I/O data com-	There are no execution conditions.
munications status	This processing is always performed.

• I/O Map

As opposed to the examples for EtherCAT Slave Terminals, the following variables are not assigned to the I/O Map.

- E001_NX_Unit_I_O_Data_Active_Status_63
- E001_NX_Unit_Error_Status_63

You assign the following variables to the I/O Map.

Unit	Port	Meaning	Data type	Variable name	Variable type
NX-RS1201	N1 NX Unit I/O	TRUE indicates that the I/O	BOOL	NXBus_N1_NX_Uni	Global
	Data Active	data in the NX Unit can be		t_I_O_Data_Active_	variable
	Status	used for control.		Status	
	N1 NX Unit	TRUE indicates that an	BOOL	NXBus_N1_NX_Uni	Global
	Error Status	error occurs in the NX Unit.		t_Error_Status	variable

• Variable Table

a) External Variables

They are the same as those given in the examples for EtherCAT Slave Terminals.

b) Internal Variables

As opposed to the examples for EtherCAT Slave Terminals, the *Process_Data_Check* variable is not used.

The following variable is used.

Yes: Setting by the user is required.

-: Setting by the user is not required.

Processing	Variable name	Data type	Default	Comment	Setting by the user
Checking the I/O data com-	I_O_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that I/O data commu-	-
munications status				nications with the NX Units are active and normal.	

Processing	Variable name	Data type	Default	Comment	Setting by the user
Resetting Ch1 Calibration Command SID to 0	Actual_Load_Cali- bration_Start	BOOL	FALSE	This variable is used to start an actual load calibration. Set it to TRUE when you set Ch1 Standard Weight.	Yes
				When this variable is TRUE and I/O data communications with the NX Units are active and normal, Ch1 Calibration Command SID is reset to 0 and Ch1 Standard Weight is set.	
Performing a zero calibration	Zero_Calibra- tion_Start	BOOL	FALSE	This variable is used to start a zero calibration. Set it to TRUE when you perform a zero calibration.	Yes
				When this variable is TRUE and I/O data communications with the NX Units are active and normal, a zero calibration is performed.	
Performing a span calibra-tion	Span_Calibra- tion_Start	BOOL	FALSE	This variable is used to start a span calibration. Set it to TRUE when you perform a span calibration.	Yes
				When this variable is TRUE and I/O data communications with the NX Units are active and normal, a span calibra- tion is performed.	

In addition, the comments for the *Actual_Load_Calibration_Start*, *Zero_Calibration_Start*, and *Span_Calibration_Start* variables are replaced as follows.

• Precautions Before Performing Sample Programming

They are the same as those given in the examples for EtherCAT Slave Terminals.

• Sample Programming That Performs An Actual Load Calibration

Change the following inputs in the ladder diagram program for EtherCAT Slave Terminals.

Input to change	Change description
_EC_PDSlavTbl[1]	Delete.
_EC_CommErrTbl[1]	Delete.
E001_NX_Unit_I_O_Data_Active_Status_63[1]	Change to the following variable.
	NXBus_N1_NX_Unit_I_O_Data_Active_Status
E001_NX_Unit_Error_Status_63[1]	Change to the following variable.
	NXBus_N1_NX_Unit_Error_Status
Process_Data_Check	Change to the following variable.
	I O Data Check

In addition, replace "process data communications" in program comments with "I/O data communications with the NX Units."

• Function Block

They are the same as those given in the examples for EtherCAT Slave Terminals.

7-4-2 Performing an Equivalent Input Calibration

This section describes the sample programming that is used to perform an equivalent input calibration in the user program.

System Configuration

The system configuration is given below.

Item	Specification
Communications master	NJ501-1500
Communications Coupler Unit	NX-ECC203
Node address of the Communications Coupler Unit	1
Load Cell Input Unit	NX-RS1201
NX Unit number of the Load Cell Input Unit	1



Refer to *When Connecting to the CPU Unit* on page 7-42 for an application example when the Load Cell Input Unit is connected to an NX-series CPU Unit.

Unit Operation Settings for the Load Cell Input Unit

The set values of the Unit operation settings for the Load Cell Input Unit are all default values.

I/O Allocation

I/O allocation is the same as one for an actual load calibration. Refer to I/O Allocation on page 7-17 for details on I/O allocation for an actual load calibration.

Processing Contents

Processing that are performed in the sample programming and execution conditions are given in the following table. For some processing, the user needs to set internal variables.

	Processing	Execution conditions
Checking the process data	communications status	There are no execution conditions. This
		processing is always performed.
Resetting Ch1 Calibration C	Command SID to 0	When the user sets the following internal
Setting Ch1 Load Cell	Sending Ch1 Calibration Command SID,	variable to TRUE, this processing is per-
Rated Capacity	Ch1 Calibration Command, and Ch1	formed. ¹
	Calibration Data	 Equivalent_Input_Calibration_Start
	Checking whether Ch1 Calibration Com-	
	mand SID and Chi Calibration Com-	
	Checking Ch1 Calibration Command	
	Response	
Setting Ch1 Load Cell	Sending Ch1 Calibration Command SID	+
Rated Output	Ch1 Calibration Command. and Ch1	
	Calibration Data	
	Checking whether Ch1 Calibration Com-	
	mand SID and Ch1 Calibration Com-	
	mand Response SID are matched	
	Checking Ch1 Calibration Command	
	Response	
Setting Ch1 Load Cell	Sending Ch1 Calibration Command SID,	
Zero Balance	Ch1 Calibration Command, and Ch1	
	Calibration Data	
	Checking whether Ch1 Calibration Com-	
	mand SID and Ch1 Calibration Com-	
	mand Response SID are matched	-
	Checking Ch1 Calibration Command	
Changing the actual load	Sending Ch1 Calibration Command SID	-
calibration mode to the	and Ch1 Calibration Command	
equivalent input calibration	Checking whether Ch1 Calibration Com-	
mode	mand SID and Ch1 Calibration Com-	
	mand Response SID are matched	
	Checking Ch1 Calibration Command	
	Response	
Adding 1 to the previous va	lue of Ch1 Calibration Command SID	When one of the following processing is
		completed, this processing is performed.
		Resetting Ch1 Calibration Command SID to 0
		Setting Ch1 Load Cell Rated Capacity
		Setting Ch1 Load Cell Rated Output
		Setting Ch1 Load Cell Zero Balance
Notifying the completion of	equivalent input calibration	When all of the following processing are
		completed normally, this processing is performed.
		Setting Ch1 Load Cell Rated Capacity
		Setting Ch1 Load Cell Rated Output
		Setting Ch1 Load Cell Zero Balance
		Changing the actual load calibration
		mode to the equivalent input calibra- tion mode

*1. Refer to Variable Table on page 7-34 for details on internal variables.

I/O Map

The settings of variables that are assigned to the I/O Map on the Support Software are the same as those for an actual load calibration. Refer to I/O Map on page 7-18 for details on the I/O Map for the actual load calibration.

Variable Table

External variables and internal variables that are used in the sample programming are given below.

• External Variables

Extremal variables are the same as those for an actual load calibration. Refer to *External Variables* on page 7-19 for details on external valuables for an actual load calibration.

Internal Variables

Internal variables that are used in the sample programming are given below for each of the aforementioned processing. Internal variables are given for each processing that uses them. Whether the user needs to set internal variables for the program execution is also given.

Yes: Setting by the user is required.

-: Setting by the user is not required.

Processing	Variable name	Data type	Default	Comment	Setting by the user
Checking the process data communica- tions status	Process_Data_Che ck	BOOL	FALSE	When this variable is TRUE, it indicates that EtherCAT pro- cess data communications are active and normal.	-
Resetting Ch1 Calibration Command SID to 0	Equivalent_Input_C alibration_Start	BOOL	FALSE	This variable is used to start an equivalent input calibration. Set it to TRUE when you per- form an equivalent input cali- bration. When this variable is TRUE and EtherCAT process data communications are active and normal, Ch1 Calibration Command SID is reset to 0 and an equivalent input cali- bration is performed.	Yes
	Initial_State_Setting _Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibration Com- mand SID is reset to 0.	-
	Initial_State_SID_C heck	BOOL	FALSE	When this variable changes to TRUE, whether Ch1 Calibra- tion Command SID and Ch1 Calibration Command Response SID are reset to 0 is checked.	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Setting Ch1 Load Cell Rated Capacity	Rated_Capacity_Se tting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Load Cell Rated Capacity is set.	-
	Rated_Capacity_Co mmand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Load Cell Rated Capacity. Before you perform sample program- ming, set this variable to 0090 hex.	Yes
	Rated_Capacity_Val ue	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Rated Capacity. Before you perform the sam- ple programming, set a value according to the rated capacity of the load cell to use.	Yes
	Rated_Capacity_SI D_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Cali- bration Command Response SID do not match in the setting of Ch1 Load Cell Rated Capacity.	-
	Rated_Capacity_Se tting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnor- mal in the setting of Ch1 Load Cell Rated Capacity.	-
	Rated_Capacity_Err or_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the setting of Ch1 Load Cell Rated Capacity, Ch1 Calibration Command Response is stored in this variable.	-
	Rated_Capacity_Se tting_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Rated Capacity was completed normally.	-
	Rated_Capacity_Ch eck_instance	Send_Respo nse_Check_ FB		This instance is used to set Ch1 Load Cell Rated Capac- ity. Use the Send_Response_ Check_FB function block.	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Load Cell Rated Output	Rated_Output_Com mand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Load Cell Rated Output. Before you per- form the sample program- ming, set this variable to 0091 hex.	Yes
	Rated_Output_Valu e	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Rated Output. Before you perform the sam- ple programming, input a value according to the rated output of the load cell to use.	Yes
	Rated_Output_SID_ Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Cali- bration Command Response SID do not match in the setting of Ch1 Load Cell Rated Out- put.	-
	Rated_Output_Setti ng_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnor- mal in the setting of Ch1 Load Cell Rated Output.	-
	Rated_Output_Error _Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the setting of Ch1 Load Cell Rated Output, Ch1 Calibration Com- mand Response is stored in this variable.	-
	Rated_Output_Setti ng_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Rated Output was completed normally.	-
	Rated_Output_Che ck_instance	Send_Respo nse_Check_ FB		This instance is used to set the Ch1 Load Cell Rated Output. Use the Send_ Response_Check_FB function block.*1	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Setting Ch1 Load Cell Zero Balance	Zero_Balance_Com mand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Load Cell Zero Balance. Before you per- form the sample program- ming, set this variable to 0092 hex.	Yes
	Zero_Balance_Valu e	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Zero Balance. Before you perform the sam- ple programming, input a value according to the zero balance of the load cell to use.	Yes
	Zero_Balance_SID_ Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Cali- bration Command Response SID do not match in the setting of Ch1 Load Cell Zero Bal- ance.	-
	Zero_Balance_Setti ng_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnor- mal in the setting of Ch1 Load Cell Zero Balance.	-
	Zero_Balance_Error _Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the setting of Ch1 Load Cell Zero Balance, Ch1 Calibration Command Response is stored in this variable.	-
	Zero_Balance_Setti ng_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Zero Balance was completed normally.	-
	Zero_Balance_Che ck_instance	Send_Respo nse_Check_ FB		This instance is used to set Ch1 Load Cell Zero Balance. Use the Send_Response_ Check_FB function block. ^{*1}	-

I

Processing	Variable name	Data type	Default	Comment	Setting by the user
Changing the actual load cali- bration mode to the equivalent input calibra- tion mode	Mode_Switch_Com mand	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to change the actual load calibration mode to the equivalent input calibration mode. Before you perform the sample programming, set this variable to 0040 hex.	Yes
	Mode_Switch_SID_ Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Cali- bration Command Response SID do not match when the actual load calibration mode is changed to the equivalent input calibration mode.	-
	Mode_Switch_Setti ng_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 calibration Command Response is abnor- mal when the actual load cali- bration mode is changed to the equivalent input calibration mode.	-
	Mode_Switch_Error _Code	WORD	0000 hex	If Ch1 calibration Command Response is abnormal when the actual load calibration mode is changed to the equiv- alent input calibration mode, Ch1 Calibration Command Response is stored in this variable.	-
	Mode_Switch_Setti ng_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the changing from the actual load calibration mode to the equivalent input calibration mode was com- pleted normally.	_
	Mode_Switch_Chec k_instance	Send_Respo nse_Check_ FB		This instance is used to change the actual load calibra- tion mode to the equivalent input calibration mode. Use the Send_Response_ Check_FB function block. ^{*1}	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Adding 1 to the previous value of Ch1 Calibra- tion Command	Calibration_Comma nd_SID	UINT	0	This variable is used to set Ch1 Calibration Command SID. It is also used in the fol- lowing processing.	-
SID				 Resetting Ch1 Calibration Command SID to 0 	
				 Setting Ch1 Load Cell Rated Capacity 	
				 Setting Ch1 Load Cell Rated Output 	
				 Setting Ch1 Load Cell Zero Balance 	
	Calibration_Comma nd_SID_Inc	BOOL	FALSE	When this variable is TRUE, it indicates that 1 is added to the previous value of Calibration Command SID.	-
Notifying the completion of equivalent input calibra- tion	Equivalent_Input_C alibration_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that an equivalent input calibration was completed normally.	-

*1. Refer to *Function Block* on page 7-25 for details on the Send_Response_Check_FB function block.

Precautions Before Performing Sample Programming

Internal variables you need to set before you perform an equivalent input calibration in the sample programming and precautions in regard to the timing to set internal variables are given below.

• Setting Internal Variables Beforehand

Internal variables you need to set beforehand and their values are given below. If they are not set, an equivalent input calibration is not performed correctly.

Variable name	Data type	Set value
Rated_Capacity_Command	WORD	0090 hex
Rated_Capacity_Value	REAL	Set a value according to the rated capacity of the load cell to use.
Rated_Output_Command	WORD	0091 hex
Rated_Output_Value	REAL	Set a value according to the rated output of the load cell to use.
Zero_Balance_Command	WORD	0092 hex
Zero_Balance_Value	REAL	Set a value according to the zero balance of the load cell to use.
Mode_Switch_Command	WORD	0040 hex

Refer to Internal Variables on page 7-34 for details on these internal variables.

Timing to Set Internal Variables

Set the following internal variable to TRUE when you perform an equivalent input calibration.

Equivalent_Input_Calibration_Start

If you do not set this internal variable, an equivalent input calibration is not performed.

Refer to Internal Variables on page 7-34 for details on internal variables.

7

A Sample Programming That Performs an Equivalent Input Calibration

A sample programming that performs an equivalent input calibration is given below. Before you perform programs, refer to the aforementioned precautions for performing sample programming.

The status of process data communications is always monitored to see if communications are active and normal.

If *Process_Data_Check* is FALSE, subsequent programs are not performed.

_EC_PDSlavTbl[1] _EC_CommErrTbl[1]	E001_NX_Unit_I_O_Data_Active_Status_63[1]	E001_NX_Unit_Error_Status_63[1]	Process_Data_Check
			\frown
	1 [17 [-

When Equivalent_Input_Calibration_Start changes to TRUE, an equivalent input calibration is started.

Equivalent_Input_Calibration_Start Process_Da	ta_Check	Initial_State_Setting_Start

Ch1 Calibration Command SID is sent by 0 and Ch1 Calibration Command SID is reset to 0.



Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are compared. If they match, 1 is added to the previous value of Ch1 Calibration Command SID.



When *Rated_Capacity_Setting_Start* changes to TRUE, Ch1 Load Cell Rated Capacity is set by *Rated_Capacity_Check_instance*. The operation of *Rated_Capacity_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

Rated Capacity Setting Start Process Data Check	Rated_Capacity_C	Check_instance	I		MOVE	1	
	-In	Out			EN ENO		
Calibration_Command_SID-	SID	SID_Error	 Rated_Capacity_SID_Error_flg 	BOOL#FALSE-	In Out	—Rated_Capacity_Setting_Start	
Rated_Capacity_Command-	Command	Setting_Error	Rated_Capacity_Setting_Error_flg				
Rated_Capacity_Value-	Command_Data	Error_Code	Rated_Capacity_Error_Code				
		Setting_Finish	—Rated_Capacity_Setting_Finish				

When the setting of Ch1 Load Cell Rated Capacity is completed normally, Ch1 Load Cell Rated Output is set by *Rated_Output_Check_instance*. The operation of *Rated_Output_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

_flg
h

When the setting of Ch1 Load Cell Rated Output is completed normally, Ch1 Load Cell Zero Balance is set by *Zero_Balance_Check_instance*. The operation of *Zero_Balance_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

Rated_Output_Setting_Finish Calibration_Command_SID_Inc Process_Di	ata_Check Zero_Ba	alance_Check_instance _Response_Check_FB _Out	
	Calibration_Command_SID—SID	SID_Error	—Zero_Balance_SID_Error_flg
	Zero_Balance_Command—Commar	nd Setting_Error	—Zero_Balance_Setting_Error_flg
	Zero_Balance_Value— Commar	nd_Data Error_Code	-Zero_Balance_Error_Code
		Setting_Finish	—Zero_Balance_Setting_Finish

When the setting of Ch1 Load Cell Zero Balance is completed normally, the actual load calibration mode is changed to the equivalent input calibration mode by *Mode_Switch_Check_instance*. The operation of *Mode_Switch_Check_instance* is defined in the Send_Response_Check_FB function block^{*1}.

		Mode_Switch_C	heck_instance	
Zero_Balance_Setting_Finish Calibration_Command_SID_Inc Process_Data_Check		Send_Respon	se_Check_FB	
		In	Out	
	Calibration_Command_SID—	SID	SID_Error	—Mode_Switch_SID_Error_flg
	Mode_Switch_Command—	Command	Setting_Error	—Mode_Switch_Setting_Error_flg
	Enter Variable—	Command_Data	Error_Code	—Mode_Switch_Error_Code
			Setting_Finish	—Mode_Switch_Setting_Finish

When the Ch1 Load Cell Rated Capacity setting, Ch1 Load Cell Rated Output setting, or Ch1 Load Cell Zero Balance setting is completed normally, 1 is added to the previous value of Ch1 Calibration Command SID.

	Rated_Capacity_Setting_Finish		FN	Inc]	Calibration_Command_SID_Inc
l	Rated Output Setting Finish	Calibration Command SID—	InOut —	InOut	Calibration Command SID	\bigcirc
$\left \right $		canoradon_connana_oro	mout	mout	- Enter Variable	
l	Zero_Balance_Setting_Finish					
ľ	l↑ '					

When the Ch1 Load Cell Rated Capacity setting, Ch1 Load Cell Rated Output setting, Ch1 Load Cell Zero Balance setting, and the changing from the actual load calibration mode to the equivalent input calibration mode are all completed normally, *Equivalent_Input_Calibration_Finish* changes to TRUE and it is notified that an equivalent input calibration was completed normally.

I	Rated Capacity Setting Finish	Rated Output Setting Finish	Zero Balance Setting Finish	Mode Switch Setting Finish	Equivalent_Input_Calibration_Finish
L					\sim
Γ	1 [1	1 [1 Г	$\overline{\mathbf{O}}$
L					

*1. Refer to *Function Block* on page 7-42 for details on the Send_Response_Check_FB function block.

7

Function Block

The function block is the same as one for an actual load calibration. Refer to *Function Block* on page 7-25 for details on the function block that is used in the sample programming that performs an actual load calibration.

When Connecting to the CPU Unit

The following is an application example when the Load Cell Input Unit shown in the above configuration examples is connected to an NX-series NX1P2 CPU Unit. Here, only the differences from the examples for EtherCAT Slave Terminals are shown.

Refer to the above examples for EtherCAT Slave Terminals in consideration of these differences.

• System Configuration

The system configuration is given below.

Item	Specification
CPU Unit	NX1P2-1140DT1
Load Cell Input Unit	NX-RS1201
NX Unit number of the Load	1
Cell Input Unit	



Load cell

• Unit Operation Settings for the Load Cell Input Unit

The Unit operation settings are the same as those given in the examples for EtherCAT Slave Terminals.

• I/O Allocation

The differences in I/O allocation are the same as those for an actual load calibration. Refer to I/O *Allocation* on page 7-29 for details on the differences in the I/O allocation for an actual load calibration.

Processing Contents

The differences in the processing contents are the same as those for an actual load calibration. Refer to *Processing Contents* on page 7-29 for details on the differences in the processing contents for an actual load calibration.

I/O Map

The differences in the I/O Map are the same as those for an actual load calibration. Refer to I/O Map on page 7-30 for details on the differences in the I/O Map for an actual load calibration.

Variable Table

a) External Variables

They are the same as those given in the examples for EtherCAT Slave Terminals.

b) Internal Variables

As opposed to the examples for EtherCAT Slave Terminals, the *Process_Data_Check* variable is not used.

The following variable is used.

Yes: Setting by the user is required. -: Setting by the user is not required.

Processing	Variable name	Data type	Default	Comment	Setting by the user
Checking the I/O data com- munications status	I_O_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that I/O data commu- nications with the NX Units are active and normal.	-

In addition, the comment for the *Equivalent_Input_Calibration_Start* variable is replaced as follows.

Processing	Variable name	Data type	Default	Comment	Setting by the user
Resetting Ch1 Calibration Command SID to 0	Equivalent_Input Calibration_Start	BOOL	FALSE	This variable is used to start an equivalent input calibration. Set it to TRUE when you per- form an equivalent input cali- bration. When this variable is TRUE and I/O data communications with the NX Units are active and normal, Ch1 Calibration Command SID is reset to 0 and an equivalent input cali- bration is performed.	Yes

• Precautions Before Performing Sample Programming

They are the same as those given in the examples for EtherCAT Slave Terminals.

• A Sample Programming That Performs an Equivalent Input Calibration

The differences in the sample programming are the same as those for an actual load calibration. Refer to *Sample Programming That Performs An Actual Load Calibration* on page 7-31 for details on the differences in the sample programming for an actual load calibration.

7

• Function Block

They are the same as those given in the examples for EtherCAT Slave Terminals.

7-5 Calibration Failures and Calibration Value Errors

This section describes calibration failures and calibration value errors.

7-5-1 Calibration Failures

Calibration failures are described below.

- · Errors and corrections when the calibration fails
- · Conversion of gross weight value/force measurement value when the calibration fails

_

Errors and Corrections When the Calibration Fails Errors and corrections when the calibration fails are provided for each execution method.

Errors are different depends on the execution methods.

• When Executing a Calibration with the Support Software

The following table shows the errors, assumed causes, and corrections when the calibration fails.

Error	Assumed cause	Correction	
 The following error message is displayed when a calibration is executed. An error occurred. After removing the error causes, to varian 	A calibration was executed while the sensor disconnection test was in progress.	Execute the calibration again after the sensor disconnection test is completed. Refer to 8-9 Sensor Dis- connection Test on page 8-32 for details on the sensor disconnection test.	
	 A calibration was executed when an A/D Conversion Error occurred. One of the following errors was detected while the calibration was in progress. A/D Conversion Error Over Range Under Range 	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to <i>Sec-</i> <i>tion 9 Troubleshooting</i> for details on errors.	
	A failure to write calibration data to non-volatile memory occurred while the calibration was in progress.	Execute the calibration again. If the calibration execution is failed again, replace the Unit.	
 The following error message is displayed when a calibration is executed. A communications error occurred. After removing the error causes, try again. 	 One of the following errors was detected while the calibration was in progress. NX Unit Processing Error NX Message Communications Error 	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to Sec- tion 9 Troubleshooting for details on errors.	

Error	Assumed cause	Correction	
The following error message is dis-	One of the following errors	Remove the cause of the error and	
played when the calibration view is	occurred.	reset the error. Close the calibration	
opened or you open the calibration	 NX Unit Processing Error 	view and open it again. And then,	
view.	Non-volatile Memory Hardware	execute the calibration again. Refer	
An error occurred.	Error	to Section 9 Troubleshooting for	
After removing the error causes,	Control Parameter Error in Master		
open the view again.	NX Unit I/O Communications		
	Error		
	NX Unit Clock Not Synchronized		
	Error		

• When Executing a Calibration with the User Program

The following table shows the errors, assumed causes, and corrections when the calibration fails.

Error	Assumed cause	Correction		
When a calibration is executed,	An incorrect calibration command	Send the correct calibration com-		
0001 hex is returned in the Ch1 Cal-	was sent.	mand.		
ibration Command Response of I/O				
data.				
When a calibration is executed,	An incorrect calibration data outside	Send the calibration data that is		
0002 hex is returned in the Ch1 Cal-	of the specified range was sent.	within the specified range.		
ibration Command Response of I/O				
data.				
When a calibration is executed,	A calibration was executed while	Execute the calibration again after		
0003 hex is returned in the Ch1 Cal-	the sensor disconnection test was in	the sensor disconnection test. Refer		
ibration Command Response of I/O	progress.	to 8-9 Sensor Disconnection Test		
data.		on page 8-32 for details on the sen-		
		sor disconnection test.		
	A new calibration command was	Send a new command after pro-		
	sent when the calibration command	cessing of the current calibration		
	is processed by the Unit.	command is completed.		
	A calibration was executed when an	Remove the cause of the error,		
	A/D Conversion Error occurred.	reset the error, and then execute		
When a calibration is executed,	One of the following errors was	the calibration again. Refer to Sec-		
0004 hex is returned in the Ch1 Cal-	detected while the calibration was in	tion 9 Troubleshooting for details on		
ibration Command Response of I/O	progress.	errors.		
data.	A/D Conversion Error			
	Over Range			
	Under Range			
	A failure to write calibration data to	Execute the calibration again. If the		
	non-volatile memory occurred while	calibration execution is failed again,		
	the calibration was in progress.	replace the Unit.		

Error	Assumed cause	Correction
The Ch1 Calibration Command Response of I/O data is not returned even if a calibration com- mand is sent. ^{*1}	 A calibration was executed when one of the following errors occurred. NX Unit Processing Error Non-volatile Memory Hardware Error Control Parameter Error in Master NX Unit I/O Communications Error NX Unit Clock Not Synchronized 	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to <i>Sec-</i> <i>tion 9 Troubleshooting</i> for details on errors.
	 NX Onit Clock Not Synchronized Error One of the following errors was detected while the calibration was in progress. NX Unit Processing Error NX Unit I/O Communications Error NX Unit I/O Communications Error NX Unit Clock Not Synchronized Error 	

*1. There is no response even if the maximum I/O response time elapses. Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on the maximum I/O response time.

Conversion of Gross Weight Value/Force Measurement Value When the Calibration Fails

If a calibration fails, the gross weight value/force measurement value is converted based on the calibration values of a past successful calibration.

For example, if a zero calibration is completed successfully, while a span calibration fails, the gross weight value/force measurement value is converted based on the calibration values of the refreshed zero point and the calibration values of the old span point.



7-5-2 Calibration Value Errors

The Load Cell Input Unit checks whether the correct calibration values are stored in the non-volatile memory inside the Unit when the power is turned ON. If the checked calibration values are not correct, one or both of the following events occur:

- Actual Load Calibration Value Error
- Unit Calibration Value Error

Refer to 9-3-3 Event Codes and Corrections for Errors on page 9-6 for event details.

8

Functions

This section describes the functions of the Load Cell Input Unit.

8-1	Gravit	ty Acceleration Correction	. 8-3
	8-1-1	Function Applications and Overview	8-3
	8-1-2	Details on the Function	8-3
	8-1-3	Setting Method	8-4
8-2	Digita	I Filtering	. 8-5
	8-2-1	Function Applications and Overview	8-5
	8-2-2	Details on the Function	8-5
	8-2-3	Setting Method	8-11
8-3	Zero S	Set/Zero Reset	8-13
	8-3-1	Function Applications and Overview	. 8-13
	8-3-2	Details on the Function	. 8-13
8-4	Zero 1	Fracking	8-16
	8-4-1	Function Applications and Overview	. 8-16
	8-4-2	Details on the Function	. 8-16
	8-4-3	Setting Method	. 8-19
8-5	Zero F	Point Range Over Detection	8-20
	8-5-1	Function Applications and Overview	. 8-20
	8-5-2	Details on the Function	. 8-20
	8-5-3	Setting Method	. 8-22
8-6	Tare S	Subtraction	8-23
	8-6-1	Function Applications and Overview	. 8-23
	8-6-2	Calculating the Net Weight Value	. 8-23
	8-6-3	One-touch Tare Subtraction	. 8-23
	8-6-4	Digital Tare Subtraction	. 8-25
8-7	Stable	e Detection	8-27
	8-7-1	Function Applications and Overview	. 8-27
	8-7-2	Details on the Function	. 8-27
	8-7-3	Setting Method	. 8-30
8-8	Over I	Range/Under Range Detection	8-31
	8-8-1	Function Applications and Overview	. 8-31
	8-8-2	Details on the Function	. 8-31

8 Functions

8-9	Senso	r Disconnection Test8-	-32
	8-9-1	Function Applications and Overview	-32
	8-9-2	Details on the Function	-32
8-10	Input	/alue Refreshing Stop8-	-35
	8-10-1	Function Applications and Overview	-35
	8-10-2	Details on the Function	-35
8-11	Peak H	lold/Bottom Hold8-	-37
	8-11-1	Function Applications and Overview	-37
	8-11-2	Details on the Function	-37
8-12	Data T	racing	-41
8-12	Data T 8-12-1	racing 8- Function Applications and Overview 8-	-41 -41
8-12	Data T 8-12-1 8-12-2	Function Applications and Overview 8 Details on the Function 8	-41 -41 -42
8-12	Data T 8-12-1 8-12-2 8-12-3	racing 8 Function Applications and Overview 8 Details on the Function 8 How to Execute Data Tracing 8	-41 -41 -42 -43
8-12	Data T 8-12-1 8-12-2 8-12-3 8-12-4	Fracing 8- Function Applications and Overview 8 Details on the Function 8 How to Execute Data Tracing 8 How to Check the Tracing Result 8	-41 -41 -42 -43 -45
8-12 8-13	Data T 8-12-1 8-12-2 8-12-3 8-12-3 8-12-4 Decim	Tracing 8- Function Applications and Overview 8 Details on the Function 8 How to Execute Data Tracing 8 How to Check the Tracing Result 8 al Point Position Setting 8	- 41 -41 -42 -43 -45 -45
8-12 8-13	Data T 8-12-1 8-12-2 8-12-3 8-12-4 Decim 8-13-1	Fracing 8- Function Applications and Overview 8 Details on the Function 8 How to Execute Data Tracing 8 How to Check the Tracing Result 8 al Point Position Setting 8- Function Applications and Overview 8	- 41 -42 -43 -45 - 45 - 47
8-12 8-13	Data T 8-12-1 8-12-2 8-12-3 8-12-4 Decim 8-13-1 8-13-2	Fracing 8- Function Applications and Overview 8 Details on the Function 8 How to Execute Data Tracing 8 How to Check the Tracing Result 8 al Point Position Setting 8 Function Applications and Overview 8 Details on the Function 8	- 41 -42 -43 -45 - 45 - 47 -47

8-1 Gravity Acceleration Correction

8-1-1 Function Applications and Overview

This function corrects errors in the gross weight values that occur due to the difference of gravity acceleration at each site when the site where the actual load calibration of the device is executed and the installation site are different. This function is used in the weight measurement system.

This function is not required in the following cases.

- The site where the actual load calibration is executed and the installation site are the same.
- For the force measurement system.
- · A Load Cell Input Unit is calibrated with the equivalent input calibration.

8-1-2 Details on the Function

Gross weight values are corrected based on the gravity acceleration of the calibration site and installation site of the device, which are set with this function.

A correction calculation formula is given below.

Gross weight value after correction = Gross weight value before correction ×

Gravity acceleration of calibration site Gravity acceleration of installation site

Set the gravity acceleration in the Unit operation settings. The settings are shown in the following table.

ltem	Setting description	Default	Setting range	Unit	Remarks
Ch1 Gravity Accel-	Sets the gravity	9.80665	9.70000 to	m/s ²	Set values are applied when the power supply to the NX
tion Site	the calibration site.		0.00000		Unit is turned ON or the NX
Ch1 Gravity Accel- eration of Installa- tion Site	Sets the gravity acceleration value of the installation site.	9.80665	9.70000 to 9.99999	m/s ²	Unit is restarted.

Precautions for Correct Use

When actual load calibration and gravity acceleration correction are executed for a Load Cell Input Unit and then the Load Cell Input Unit is used for the force measurement system or calibrated with the equivalent input calibration, always reset Ch1 Gravity Acceleration of Calibration Site and Ch1 Gravity Acceleration of Installation Site to the same value. If they are not set to the same value, measurement values will be incorrect.

Additional Information

For the gravity accelerations in Japan, refer to the following GSI website.

http://www.gsi.go.jp/kizyunten.html

For the gravity accelerations outside of Japan, refer to the following Physikalisch-Technische Bundesanstalt website.

http://www.ptb.de/cartoweb3/SISproject.php

8

8-1-3 Setting Method

The method for setting the gravity acceleration with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×			.
All parameters			
Item name		Val	ue
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter	r Cutoff Frequency	80	×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count		160	times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count		133	times
Standard Weight/Ch1 Standard Weight		5	
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity		5	
Load Cell Rated Output/Ch1 Load Cell Rated Output		5	mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance		0	uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of	Calibration Site	9.80665	m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of	Installation Site	9.80665	m/s2
Digital Tare Value/Ch1 Digital Tare Value		0	
Zero Point Range/Ch1 Zero Point Range		0	
Zero Tracking Range/Ch1 Zero Tracking Range		0	
Zero Tracking Period/Ch1 Zero Tracking Period		0	x0.1s
Stable Status Range/Ch1 Stable Status Range		0	
Stable Status Period/Ch1 Stable Status Period		0	x0.1s
Decimal Point Position/Ch1 Decimal Point Position		x1	▼
Event Level Setting/Event 1		Unit Over Range	T
Event Level Setting/Event 1 Level		Observation	▼
Event Level Setting/Event 2		Unit Under Range	T
Event Level Setting/Event 2 Level		Observation	▼
		Re	turn to Default Value
Holo			
Data type: REAL			
Valid range: 9.7 - 9.99999			
Comment: Sets the gravity acceleration value of the calibrati	on site.		
Restart is required to reflect the settings.			
	Transfor to Linit	Transfor from Unit	Compare
	transfer to Unit	Transfer from Unit	Compare

- 2 Set the Ch1 Gravity Acceleration of Calibration Site and Ch1 Gravity Acceleration of Installation Site.
- **3** Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.
8-2 Digital Filtering

8-2-1 Function Applications and Overview

This function uses the digital filter to remove noise components that are contained in input signals to suppress fluctuations of measurement values.

A digital filter can remove electrical noise and mechanical vibration noise that are contained in input signals to provide stable measurements.

This function is used in the weight measurement and force measurement systems.

8-2-2 Details on the Function

You can freely combine the following three digital filters to use this function in the Load Cell Input Unit.

- Digital low-pass filter
- Moving average filter 1
- Moving average filter 2



The digital low-pass filter and moving average filters are enabled by default.

When the digital low-pass filter and moving average filters are not used, you can set the relevant bit in the Unit operation settings the Ch1 Operation Command of I/O data to disable the digital low-pass filter and moving average filters.

For details on digital filter functions and the procedure to enable/disable filters, refer to the following function descriptions for each digital filter.

The measurement values that the digital filtering is performed are stored in separate buffers for each digital filter.

In the following cases, the past measurement values that are stored in buffers are cleared and the measurement values at the recovery are stored.

- When the power supply is turned ON.
- When the NX Unit is restarted.
- When the system recovers from the sensor disconnection test mode and returns to normal operation.

If the digital filter is disabled with the relevant bit in the Ch1 Operation Command, the past measurement values that are stored in the buffer for the disabled digital filter are cleared. If it is enabled, the measurement values are stored.

The Load Cell Input Unit has a data tracing to achieve the optimum digital filter design. Refer to 8-12 *Data Tracing* on page 8-41 for details on data tracing. Refer to A-2 *Digital Filter Design That Utilizes Data Tracing* on page A-3 for examples of digital filter design that utilizes data tracing.

Digital Low-pass Filter

The digital low-pass filter attenuates input signals by -3dB with the set cutoff frequency.

• Cutoff Frequency Setting

Set the cutoff frequency in the Unit operation settings. The settings are shown in the following table.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Digital	Sets the digital	80	0 to 20000	× 0.1 Hz	 Set this parameter to 0 to
Low-pass Filter	low-pass filter cutoff				disable the digital
Cutoff Frequency	frequency.				low-pass filter.
					 Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted.

Refer to 8-2-3 Setting Method on page 8-11 for details on the setting method.

• Digital Low-pass Filter Enable/Disable Setting

The digital low-pass filter is enabled by default.

Set the cutoff frequency in the Unit operation settings to a value other than 0 to enable the digital low-pass filter.

Set the cutoff frequency in the Unit operation settings to 0 to disable the digital low-pass filter.

You can enable/disable the digital low-pass filter with the relevant bit in the Ch1 Operation Command of the I/O data.

To enable/disable the digital low-pass filter with the relevant bit, set the cutoff frequency in the Unit operation settings to a value other than 0. If the cutoff frequency is set to 0, the digital low-pass filter will not be enabled even if the relevant bit is set to enable.

The relevant bit is Ch1 Digital Low-pass Filter Disable. Refer to *Operation Command* on page 6-22 for details on the Ch1 Operation Command.

Attenuation Characteristics and Step Response Characteristics

a) Attenuation characteristics

The attenuation characteristics of digital low-pass filter for typical cutoff frequencies are shown below. Input signals are attenuated by -3 dB with the cutoff frequency.



b) Step response characteristics

The step response characteristics if the cutoff frequency is set to 8 Hz are shown below. The step response time of the digital low-pass filter is 45.703 ms if the cutoff frequency is set to 8 Hz. The step response time is the time until the output of the digital filter reaches 90% from 0% when the step signal is input to the digital low-pass filter.



The step response times for typical cutoff frequencies are shown below.

Cutoff frequency [Hz]	Step response time [ms]
0.1	3656.269
1	365.627
8	45.703
125	2.922
2000	0.122

8

The smaller the cutoff frequency, the wider range of noise you can remove. This stabilizes the measurement values, but causes the step response time to increase. When you use the digital low-pass filter, the values are measured with a delay in response to the input as shown in the step response characteristics. When the NX bus I/O refreshing is executed in the middle of digital low-pass filtering, the measurement values in the middle of digital low-pass filtering are sent to the CPU Unit or communications master. Set the cutoff frequency that is most suitable for the measurement.

Moving Average Filter

This function calculates the average of the input signals for the set moving average count and uses it as the measurement value.

You can use the moving average filter to significantly attenuate the signals in the specific frequency and the frequencies that are integer multiples of that frequency.

To attenuate two frequencies, combine the moving average filter 1 and moving average filter 2.

Description of Operation

The moving average processing of the Unit is shown below using the moving average count of 4 as an example.

The Load Cell Input Unit converts input signals in a conversion cycle of 125 µs. At the initial calculation, the initial data is stored in moving average buffers to perform the moving average processing.



Moving Average Count Setting

Set the moving average count in the Unit operation settings. The settings are shown in the following table.

ltem	Setting description	Default	Setting range	Unit	Remarks
Ch1 Filter 1 Mov- ing Average Count	Sets the moving average count for the moving average	160	0 to 80000	times	 Set this parameter to 0 to disable the moving aver- age filter.
Ch1 Filter 2 Mov- ing Average Count	filter 1. Sets the moving average count for the moving average filter 2.	133	0 to 80000	times	 Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted.

Refer to 8-2-3 Setting Method on page 8-11 for details on the setting method.

Moving Average Filter Enable/Disable Setting

The moving average filters are enabled by default.

Set the moving average count for the filter to enable in the Unit operation settings to a value other than 0 to enable the moving average filter.

Set the moving average count for the filter to disable in the Unit operation settings to 0 to disable the moving average filter.

You can also enable/disable the moving average filter with the relevant bit in the Ch1 Operation Command of I/O data. To enable/disable the moving average filter with the relevant bit, set the moving average count for the filter to enable in the Unit operation settings to a value other than 0. If the moving average is set to 0, the moving average filter will not be enabled even if the relevant bit is set to enable. The relevant bit is Ch1 Moving Average Filter 1 Disable or Ch1 Moving Average Filter 2 Disable. Refer to *Operation Command* on page 6-22 for details on the Ch1 Operation Command.

• Attenuation Characteristics and Step Response Characteristics

a) Attenuation characteristics

You can use the moving average filter to significantly attenuate the signals in the specific frequency and the frequencies that are integer multiples of that frequency.

A calculation formula that shows the relationship between the frequency f_N that is significantly attenuated and the moving average count.

Moving average count = $\frac{\text{Sampling frequency}^{*1}}{f_{N} [\text{Hz}]} = \frac{8000 [\text{Hz}]}{f_{N} [\text{Hz}]}$

*1. The sampling frequency of the moving average filter. It is 8000 Hz for a Load Cell Input Unit.

Set the moving average count based on the above formula.

The following shows an example of attenuation characteristics for when only the moving average filter 1 is used and the moving average count is set to 160 times.

As shown in the attenuation characteristics below, you can significantly attenuate the signals in the frequencies of 50 Hz and the frequencies that are integer multiples of 50 Hz.



b) Step response characteristics

The following shows step response characteristics for when only the moving average filter 1 is used and the moving average count is set to 160 times. The delay time of the moving average filter when the moving average count is set to 160 times is 19.875 ms. The delay time is the time until the output of the moving average filter reaches 100% from 0% when the step signal is input for one moving average filter.



You can calculate the delay time shown for the step response characteristics using the calculation formula below. However, the value for the moving average count using the calculation formula below is 1 or higher.

Delay time [ms] = (Moving average count -1) \times 125 \times 10⁻³

The larger the moving average count, the wider range of noise you can remove. This stabilizes the measurement values, but causes the delay time to increase. When you use the moving average filter, the values are measured with a delay in response to the input as shown in the step response characteristics. When the NX bus I/O refreshing is executed in the middle of moving average filtering, the measurement values in the middle of moving average filtering are sent to the communications master. Set the moving average count that is most suitable for the measurement.

8-2-3 Setting Method

The method for setting the cutoff frequency and moving average count with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

Unit 1[Node1]:NX-RS1...r… 🗙 All parameters Value Item name Digital Low- pass Filter Cutoff Freq ncy/Ch1 Digital Low-pass Filter Cutoff Frequ 0.1H Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count 133 Standard Weight/Ch1 Standard Weight Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity Load Cell Rated Output/Ch1 Load Cell Rated Output Load Cell Zero Balance/Ch1 Load Cell Zero Balance uV/\ Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of Calibration Site Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of Installation Site 9.8066 m/s2 9.80665 m/s. Digital Tare Value/Ch1 Digital Tare Value Zero Point Range/Ch1 Zero Point Range Zero Tracking Range/Ch1 Zero Tracking Range x0.1s Zero Tracking Period/Ch1 Zero Tracking Period Stable Status Range/Ch1 Stable Status Range x0.1s Stable Status Period/Ch1 Stable Status Period Decimal Point Position/Ch1 Decimal Point Position Event Level Setting/Event 1 Event Level Setting/Event 1 Level Event Level Setting/Event 2 Event Level Setting/Event 2 Level . Return to Default Value Help Data type: UINT Valid range: 0 - 20000 Comment: Sets the digital low-pass filter cutoff frequency. Restart is required to reflect the settings. Transfer to Unit Transfer from Unit Compare

The following tab page is displayed.

- 2
 - Set the Ch1 Digital Low-pass Filter Cutoff Frequency, Ch1 Filter 1 Moving Average Count, and Ch1 Filter 2 Moving Average Count.
- **3** Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

8



Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

8-3 Zero Set/Zero Reset

8-3-1 Function Applications and Overview

The zero set function corrects the gross weight value/force measurement value to be the zero point within the set range at a desired time. The zero reset function resets the correction that is performed with the zero set function.

Use this function to execute zero point correction in the following cases.

- · The zero point is changed due to dust being adhered to the weighing machine
- To eliminate the fixed tare weight value from the gross weight value/force measurement value when you use the Unit after an equivalent input calibration is performed
- If the gross weight value/force measurement value with no load changes to a value other than 0 due to the installation method of the load cell when you use the Unit after an equivalent input calibration is performed

This function is used in the weight measurement and force measurement systems.

8-3-2 Details on the Function

When the zero set is executed with the gross weight value/force measurement value within the zero point range, the gross weight value/force measurement value at the point of execution is corrected to be the zero point.

When the zero reset is executed, the zero point correction is reset and returns to the zero point at the point of calibration.

How to Execute the Function and Check the Execution Status

Use the Unit operation settings and I/O data to execute the zero set or the zero reset.

Use I/O data to check the execution status.

Refer to 6-2-1 Data Items for Allocation to I/O on page 6-13 for details on I/O data.

How to Execute the Function

Set the zero point range in the Unit operation settings. Set the zero point range to a value other than 0 to use the zero set or the zero reset. The zero set or the zero reset does not operate if the zero point range is set to 0.

After the zero point range is set, set the Ch1 Zero Set Execution bit in the Ch1 Operation Command of I/O data to execute the zero set or the zero reset.

Execution Status Check

You can check the zero set or the zero reset execution status with the Ch1 Zero Set Executing bit in the Ch1 Executing Status of I/O data.

You can also check if the zero point range is exceeded with the Ch1 Zero Point Range Over bit in the Ch1 Detection Status of I/O data.

Description of Operation

The operations of zero set and zero reset are described below. The Ch1 designation of I/O data is omitted.

 When the Zero Set Execution bit is changed from 0 to 1, the Zero Set Executing bit changes from 0 to 1 and the zero set is executed.
 When the zero set is executed, the grass weight value/force measurement value is corrected to be

When the zero set is executed, the gross weight value/force measurement value is corrected to be the zero point. (Refer to (a) in the figure below.)

When the Zero Set Execution bit is changed from 1 to 0, the Zero Set Executing bit changes from 1 to 0 and the zero reset is executed.
 When the zero reset is executed, the correction is reset and returns to the zero point at the point of calibration.

At this time, the gross weight value/force measurement value returns to the original gross weight value/force measurement value. (Refer to (b) in the figure below.)

• The zero set is not executed if the gross weight value/force measurement value exceeds the zero point range. If the gross weight value/force measurement value exceeds the zero point range, when the Zero Set Execution bit is changed from 0 to 1, the Zero Point Range Over bit changes from 0 to 1 and a zero point range over is detected. (Refer to (c) in the figure below.)

Refer to 8-5 Zero Point Range Over Detection on page 8-20 for details on the zero point range over.

 To reset the status of the zero point range over, execute the zero reset. (Refer to (d) in the figure below.)



Additional Information

If the zero calibration is performed during the zero set execution, the zero set is stopped, the zero point correction amount is cleared, and then a new zero point is set with the zero calibration. If the Zero Set Execution bit is set to 1 even the zero set is stopped, the Zero Set Executing bit remains 1. When the Zero Set Execution bit is changed from 0 to 1 after the calibration, the zero set is executed again.

Parameters

Set the zero point range in the Unit operation settings. Refer to 8-5 Zero Point Range Over Detection on page 8-20 for the setting of zero point range.

8

8-4 Zero Tracking

8-4-1 Function Applications and Overview

This function automatically corrects the zero point within the set range.

If the zero point is changed due to a change in the ambient operating temperature after calibration or dust being adhered to the weighing machine, this function is used to correct the zero point. This function is used in the weight measurement system.

8-4-2 Details on the Function

If the zero tracking period elapses while the fluctuation of the gross weight value is kept within the zero point range and $0 \pm$ zero tracking range, the gross weight value is automatically corrected to 0.

How to Execute the Function

You can use this function by setting the following items in the Unit operation settings.

- · Zero point range
- · Zero tracking range
- · Zero tracking period

Set the above items to a value other than 0 to use the zero tracking.

The zero tracking does not operate when any of the above items is set to 0.

Description of Operation

The operation of zero tracking is described below.

- If the zero tracking period elapses while the fluctuation of the gross weight value is kept within the zero point range and 0 ± zero tracking range, the gross weight value is automatically corrected to 0. (Refer to (a) in the figure below.) After the gross weight value is corrected to 0, the above operation (hereinafter zero tracking operation) is repeated and the gross weight value is corrected repeatedly.
- While the gross weight value after the correction exceeds the 0 ± zero tracking range, the zero tracking operation is stopped. (Refer to period between (b) and (c) in the figure below.)
 When the gross weight value fluctuates again within the 0 ± zero tracking range, the zero tracking operation is resumed.
- While the original gross weight value exceeds the zero point range, the zero tracking operation is stopped. (Refer to period between (d) and (e) in the figure below.)



Additional Information

- If the gross weight value does not change to 0 even the zero tracking is used without a measured material, remove any adhered materials from the weighing machine or perform the zero calibration again.
- If the zero calibration is performed during the zero tracking operation, the zero tracking operation is paused and a new zero point is set with the zero calibration. When the calibration is completed, the zero tracking operation is resumed.

8

Parameters

Set the zero tracking in the Unit operation settings. The settings are shown in the following table. Refer to *8-5 Zero Point Range Over Detection* on page 8-20 for the setting of zero point range.

ltem	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Zero Tracking	Sets the zero	0.0	0.0 to		 The zero tracking does not
Range ^{*1}	tracking range.		3.402823e+		operate when the value is set to
			38		0.
					 Set values are applied when
					the power supply to the NX Unit
					is turned ON or the NX Unit is restarted.
					 To perform an actual load cali- bration and use the Load Cell
					Input Unit, set in the unit of the
					as you would when setting the
					standard weight.*2
					 To perform an equivalent input calibration and use the Load
					Cell Input Unit, set in the unit of
					the gross weight value to mea-
					sure as you would when setting
					the load cell rated capacity.*3
Ch1 Zero Tracking	Sets the zero	0	0 to 100	× 0.1 s	Set values are applied when
Period	tracking period.				the power supply to the NX Unit
					restarted.
					 The zero tracking does not
					operate when the value is set to 0.

*1. With the zero tracking, the gross weight value is checked whether it is within the 0 ± zero tracking range. For example, if the zero tracking range is set to 10 and the gross weight value is within the range of 0±10, you can execute zero point correction with the zero tracking.

*2. Refer to 7-2-2 Basic Parameter Settings on page 7-7 for the setting of standard weight.

*3. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the setting of load cell rated capacity.

8-4-3 Setting Method

The method for setting the zero tracking range and zero tracking period with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×			•
All parameters			
Item name		Va	lue
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter	Cutoff Frequency	80	×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count		160	times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count		133	times
Standard Weight/Ch1 Standard Weight		5	
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity		5	
Load Cell Rated Output/Ch1 Load Cell Rated Output		5	mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance		0	uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of C	alibration Site	9.80665	m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of In	nstallation Site	9.80665	m/s2
Digital Tare Value/Ch1 Digital Tare Value		0	
Zero Point Range/Ch1 Zero Point Range		0	
Zero Tracking Range/Ch1 Zero Tracking Range		0	
Zero Tracking Period/Ch1 Zero Tracking Period		0	x0.1s
Stable Status Range/Ch1 Stable Status Range		0	
Stable Status Period/Ch1 Stable Status Period		0	x0.1s
Decimal Point Position/Ch1 Decimal Point Position		x1	▼
Event Level Setting/Event 1		Unit Over Range	×
Event Level Setting/Event 1 Level		Observation	×
Event Level Setting/Event 2		Unit Under Range	× .
Event Level Setting/Event 2 Level		Observation	
		Re	eturn to Default Value
Valid range: 0 - 3.402823E+38			
Comment: Sets the zero tracking range.			
Restart is required to reflect the settings.			
	Transfer to Unit	Transfer from Unit	Compare

2 Set the Ch1 Zero Tracking Range and Ch1 Zero Tracking Period.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

8

8-5 Zero Point Range Over Detection

8-5-1 Function Applications and Overview

This function detects when the gross weight value/force measurement value exceeds the set zero point range.

You need to set this function to use the zero set, zero reset, and zero tracking.

This function is used in the weight measurement and force measurement systems.

8-5-2 Details on the Function

How to Check If the Zero Point Range Is Exceeded

You can check if the zero point range is exceeded with the Ch1 Zero Point Range Over bit in the Ch1 Detection Status of I/O data.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

The operation varies between the zero set, zero reset, and zero tracking. Operations of each function are provided below.

• Bit Operations for Zero Set and Zero Reset

Refer to the description of operation in 8-3 Zero Set/Zero Reset on page 8-13 for details on operations of the Ch1 Zero Point Range Over bit.

• Bit Operations for Zero Tracking

The zero point range over is not detected even if the gross weight value/force measurement value exceeds the set zero point range. Therefore, the Ch1 Zero Point Range Over bit remains 0. The zero point range is used only to execute and stop the zero tracking operations.

Zero Point Range Setting

Set the zero point range over detection in the Unit operation settings. The settings are shown in the following table.

ltem	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Zero Point Range ^{*1}	Sets the range for zero point correc- tion in the zero set, zero reset, and zero tracking.	0.0	0.0 to 3.402823e+ 38	 The zero set, zero reset, zero tracking do not ope when the value is set to Set values are applied w the power supply to the N is turned ON or the NX U restarted. To perform an actual loa bration and use the Load Input Unit, set in the unit gross weight value/force 	 The zero set, zero reset, and zero tracking do not operate when the value is set to 0. Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted. To perform an actual load calibration and use the Load Cell Input Unit, set in the unit of the gross weight value/force mea-
					surement value to measure as you would when setting the standard weight. ^{*2}
					 To perform an equivalent input calibration and use the Load Cell Input Unit, set in the unit of the gross weight value/force measurement value to measure as you would when setting the load cell rated capacity.^{*3}

*1. With the zero set and zero tracking, the original gross weight value/force measurement value is checked whether it is within the 0 ± zero point range. For example, if the zero point range is set to 10 and the original gross weight value/force measurement value is within the range of 0±10, you can execute zero point correction with the zero set or the zero tracking.

- *2. Refer to 7-2-2 Basic Parameter Settings on page 7-7 for the setting of standard weight.
- *3. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the setting of load cell rated capacity.

8-5-3 Setting Method

The method for setting the zero point range with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×			-
All parameters			
Item name		Val	ue
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filte	r Cutoff Frequency	80	×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count		160	times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count		133	times
Standard Weight/Ch1 Standard Weight		5	
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity		5	
Load Cell Rated Output/Ch1 Load Cell Rated Output		5	mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance		0	uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of	Calibration Site	9.80665	m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of	Installation Site	9.80665	m/s2
Digital Tare Value/Ch1 Digital Tare Value		0	
Zero Point Range/Ch1 Zero Point Range		0	
Zero Tracking Range/Ch1 Zero Tracking Range		0	
Zero Tracking Period/Ch1 Zero Tracking Period		0	x0.1s
Stable Status Range/Ch1 Stable Status Range		0	
Stable Status Period/Ch1 Stable Status Period		0	x0.1s
Decimal Point Position/Ch1 Decimal Point Position		x1	▼
Event Level Setting/Event 1		Unit Over Range	
Event Level Setting/Event 1 Level		Observation	▼
Event Level Setting/Event 2		Unit Under Range	v
Event Level Setting/Event 2 Level		Observation	▼
		Re	turn to Default Value
- Help			
Valid range: 0 - 3.402823E+38			
Comment: Sets the range for zero point correction in the zero	ro set, zero reset, and	zero tracking.	
Restart is required to reflect the settings.			
	Transfer to Unit	Transfer from Unit	Compare

2 Set the Ch1 Zero Point Range.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

8-6 Tare Subtraction

8-6-1 Function Applications and Overview

This function subtracts the tare weight value from the gross weight value to acquire the net weight value. Use this function if you want to measure only the weight of the measured material which is stored inside a tare.



Refer to 6-1-2 Terms Used in Weight Measurement on page 6-4 for the terms of weight measurement such as tare and net weight value.

The Load Cell Input Unit provides two types of tare subtraction functions as listed below.

- One-touch tare subtraction
- Digital tare subtraction

This function is used in the weight measurement system.

8-6-2 Calculating the Net Weight Value

The Load Cell Input Unit calculates the net weight value using the calculation formula below.

Net weight value = Gross weight value - One-touch tare value - Digital tare value

8-6-3 One-touch Tare Subtraction

This function stores the gross weight value at the specified timing as the tare value and subtracts it from a given gross weight value to acquire the net weight value.

You can use this function to calculate the net weight value even if the weight of the tare is not constant. The function is described in detail below.

How to Execute the Function and Check the Execution Status and Net Weight Value

Use I/O data to execute one-touch tare subtraction and check the execution status and net weight value.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

How to Execute the Function

Operate the Ch1 One-touch Tare Subtraction Execution bit in the Ch1 Operation Command of I/O data to execute one-touch tare subtraction.

Execute the function when the measured material is not stored in the tare.

How to Check the Execution Status

You can use the Ch1 One-touch Tare Subtraction Executing bit in the Ch1 Executing Status of I/O data to check the execution status.

How to Check the Net Weight Value

You can use the Ch1 Net Weight Value DINT or Ch1 Net Weight Value REAL of I/O data to check the net weight value.

Precautions for Correct Use

The net weight value is not assigned to I/O data by default. To use this function, be sure to assign the net weight value in I/O allocation settings.

Description of Operation

The gross weight value at the start of execution of one-touch tare subtraction is stored as the one-touch tare value. During the execution of one-touch tare subtraction, the net weight value is calculated based on the calculation formula mentioned above. The calculation stops when the one-touch tare subtraction execution is finished.

The operation of the one-touch tare subtraction is described below. The description assumes that the digital tare subtraction is not used. The Ch1 designation of I/O data is omitted.

- When the One-touch Tare Subtraction Execution bit in the Operation Command is changed from 0 to
 1, the One-touch Tare Subtraction Executing bit changes from 0 to 1 and one-touch tare subtraction
 is executed. The gross weight value at the start of execution of one-touch tare subtraction is stored
 as the one-touch tare value, and the net weight value is calculated based on the calculation formula
 mentioned above. The net weight value will be 0. (Refer to (a) in the figure below.)
- During the execution of one-touch tare subtraction, the value that the gross weight value subtracts the one-touch tare value will be the net weight value. (Refer to period (a) and (b) in the figure below.)
- When the One-touch Tare Subtraction Execution bit is changed from 1 to 0, the One-touch Tare Subtraction Executing bit changes from 1 to 0 and one-touch tare subtraction stops. The one-touch tare value is cleared and the net weight value will be equal to the gross weight value. (Refer to (b) in the figure below.)



8-6-4 Digital Tare Subtraction

This function subtracts the preset digital tare value from the gross weight value to acquire the net weight value.

Details on the Function

The preset digital tare value is subtracted from the gross weight value based on the calculation formula mentioned above to calculate the net weight value. Set the digital tare value in the Unit operation settings. The settings are shown in the following table.

ltem	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Digital Tare Value	Sets the weight of the tare.	0.0	0.0 to 3.402823e+ 38		 Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted. To perform an actual load cali- bration and use the Load Cell Input Unit, set in the unit of the gross weight value to measure as you would when setting the standard weight.^{*1} To perform an equivalent input calibration and use the Load Cell Input Unit, set in the unit of the gross weight value to mea- sure as you would when setting the load cell rated capacity.^{*2}

*1. Refer to 7-2-2 Basic Parameter Settings on page 7-7 for the setting of standard weight.

*2. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the setting of load cell rated capacity.

You can use the Ch1 Net Weight Value DINT or Ch1 Net Weight Value REAL of I/O data to check the net weight value.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

Precautions for Correct Use

The net weight value is not assigned to I/O data by default. To use this function, be sure to assign the net weight value in I/O allocation settings.

Setting Method

The method for setting the digital tare value with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×	
All parameters	
Item name	Value
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter Cutoff Frequency	80 ×0.1H
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count	160 time
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count	133 time
Standard Weight/Ch1 Standard Weight	5
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity	5
Load Cell Rated Output/Ch1 Load Cell Rated Output	5 mV/\
Load Cell Zero Balance/Ch1 Load Cell Zero Balance	0 uV/\
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of Calibration Site	9.80665 m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of Installation Site	9.80665 m/s2
Digital Tare Value/Ch1 Digital Tare Value	0
Zero Point Range/Ch1 Zero Point Range	0
Zero Tracking Range/Ch1 Zero Tracking Range	0
Zero Tracking Period/Ch1 Zero Tracking Period	0 x0.1
Stable Status Range/Ch1 Stable Status Range	0
Stable Status Period/Ch1 Stable Status Period	0 x0.1
Decimal Point Position/Ch1 Decimal Point Position	x1. 🔻
Event Level Setting/Event 1	Unit Over Range 🔍
Event Level Setting/Event 1 Level	Observation 🔻
Event Level Setting/Event 2	Unit Under Range 🔍
Event Level Setting/Event 2 Level	Observation 🔻
	Return to Default Value
_ Help	
Data type: REAL	
Valid range: 0 - 3.402823E+38	
Comment: Sets the weight of the tare.	
Restart is required to reflect the settings.	
Transfer to Unit	Transfer from Unit Compare

2 Set the Ch1 Digital Tare Value.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

8-7 Stable Detection

8-7-1 Function Applications and Overview

This function detects whether the gross weight value is stable. Use it for stability check before and after weight measurement.

This function is used in the weight measurement system.

8-7-2 Details on the Function

Stability is detected if the stable status period elapses while the fluctuation of the gross weight value is kept within the range of gross weight value \pm stable status range.

How to Execute the Function and Check the Execution Status

Use the Unit operation settings to execute the stable detection.

Use I/O data to check the execution status. Refer to 6-2-1 Data Items for Allocation to I/O on page 6-13 for details on I/O data.

• How to Execute the Function

You can use this function by setting the stable status range and stable status period in the Unit operation settings.

To use the stable detection, set the stable status range and stable status period to a value other than 0. The stable detection does not operate when either the stable status range or the stable status period is set to 0.

• How to Check the Execution Status

You can use Ch1 Stable Status bit in the Ch1 Detection Status of I/O data to check the execution status of the stable detection.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

Description of Operation

The operation of the stable detection is described below. The Ch1 designation of I/O data is omitted.

- When the stable status period and stable status range are set to a value other than 0, the stable detection is executed. If the stable status period elapses while the fluctuation of the gross weight value is kept within the range of gross weight value ± stable status range, the gross weight value is determined to be stable and the Stable Status bit changes to 1. (Refer to (a) in the figure below.)
- If the gross weight value exceeds the range of gross weight value ± stable status range and fluctuates before the stable status period elapses, the Stable Status bit changes to 0. (Refer to (b) in the figure below.)



Parameters

Set the stable detection in the Unit operation settings. The settings are shown in the following table.

ltem	Setting descrip- tion	Default	Setting range	Unit	Remarks
Ch1 Stable Status Range ^{*1}	Sets the range of change for which the gross weight value is deter- mined to be stable.	0.0	0.0 to 3.402823e+ 38		 The stable detection does not operate when the value is set to 0. Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted. To perform an actual load calibration and use the Load Cell Input Unit, set in the unit of the gross weight value to measure as you would when setting the standard weight.^{*2}
					 To perform an equivalent input calibration and use the Load Cell Input Unit, set in the unit of the gross weight value to mea- sure as you would when setting the load cell rated capacity.^{*3}
Ch1 Stable Status Period	Sets the period for which the gross weight value is determined to be stable.	0	0 to 100	× 0.1 s	 The stable detection does not operate when the value is set to 0. Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted

*1. With the stable detection, the gross weight value is checked whether it is within the gross weight value ± stable status range. For example, if the stable status range is set to 10 and gross weight value is within the range of gross weight value ±10, the gross weight value is determined to be stable.

*2. Refer to 7-2-2 Basic Parameter Settings on page 7-7 for the setting of standard weight.

*3. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for the setting of load cell rated capacity.

8

8-7-3 Setting Method

The method for setting the stable status range and stable status period with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×			-
All parameters			
Item name		Valu	Je
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Fil	er Cutoff Frequency	80	×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Court		160	times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Court	t	133	times
Standard Weight/Ch1 Standard Weight		5	
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity		5	
Load Cell Rated Output/Ch1 Load Cell Rated Output		5	mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance		0	uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of	f Calibration Site	9.80665	m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of	f Installation Site	9.80665	m/s2
Digital Tare Value/Ch1 Digital Tare Value		0	
Zero Point Range/Ch1 Zero Point Range		0	
Zero Tracking Range/Ch1 Zero Tracking Range		0	
Zero Tracking Period/Ch1 Zero Tracking Period		0	x0.1s
Stable Status Range/Ch1 Stable Status Range		0	
Stable Status Period/Ch1 Stable Status Period		0	x0.1s
Decimal Point Position/Ch1 Decimal Point Position		x1	▼
Event Level Setting/Event 1		Unit Over Range	T
Event Level Setting/Event 1 Level		Observation	▼
Event Level Setting/Event 2		Unit Under Range	$\mathbf{\nabla}$
Event Level Setting/Event 2 Level		Observation	▼
		Re	turn to Default Value
- Heln			
Data type: REAL			
Valid range: 0 - 3.402823E+38			
Comment: Sets the range of change for which the gross w	eight value is determine	d to stable.	
Restart is required to reflect the settings.			
	Transfer to Unit	Transfer from Unit	Compare

2 Set the Ch1 Stable Status Range and Ch1 Stable Status Period.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

8-8 Over Range/Under Range Detection

8-8-1 Function Applications and Overview

This function detects when the input signal exceeds the input conversion range.

This function is used in the weight measurement and force measurement systems.

8-8-2 Details on the Function

How to Check the Detection Result

You can use the Ch1 Over Range bit in the Ch1 Detection Status of I/O data to check if an over range is detected.

You can use the Ch1 Under Range bit in the Ch1 Detection Status of I/O data to check if an under range is detected.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

When an over range is detected, an Over Range event occurs. When an under range is detected, an Under Range event occurs. Refer to *9-3-3 Event Codes and Corrections for Errors* on page 9-6 for event details.

Description of Operation

The operations of the over range/under range detection are described below. The Ch1 designation of I/O data is omitted.

- If the input signal exceeds the upper limit (5.5 mV/V) of the input conversion range, the measurement values are fixed to the measurement values when an error occurs. At this time, the Over Range bit changes to 1 and an Over Range event occurs. Refer to 9-6 Measurement Values Used When an Error Occurs on page 9-30 for information on measurement values when an error occurs.
- If the input signal is below the lower limit (-5.5 mV/V) of the input conversion range, the measurement values are fixed to the measurement values when an error occurs. At this time, the Under Range bit changes to 1 and an Under Range event occurs. Refer to 9-6 Measurement Values Used When an Error Occurs on page 9-30 for information on measurement values when an error occurs.
- When the input signal returns to the input conversion range, the fixing is canceled and the values become the normal measurement values.
- When the cause of the error is removed and the error is reset, the Over Range bit or Under Range bit changes to 0. The Over Range bit or Under Range bit remains 1 until the error is reset.

Setting Method

No setting is required.

8-9 Sensor Disconnection Test

8-9-1 Function Applications and Overview

This function tests if the cable that connects the Load Cell Input Unit and load cell is disconnected. You can check if the connection cable is disconnected when starting up, operating, and maintaining devices.

This function is used in the weight measurement and force measurement systems.



Precautions for Correct Use

Observe the following precautions when you use the sensor disconnection test.

- · Use 6-wire connections.
- During the sensor disconnection test, you cannot measure the gross weight value or force measurement value.

8-9-2 Details on the Function

How to Execute the Function and Check the Execution Status and Test Result

Use I/O data to execute the sensor disconnection test and check the execution status. Refer to 6-2 *Specifications of I/O Data* on page 6-13 for details on I/O data.

Use I/O data and event codes to check the test results. Refer to 9-3-3 *Event Codes and Corrections for Errors* on page 9-6 for event code details.

• How to Execute the Function

Operate the Ch1 Sensor Disconnection Test Execution bit in the Ch1 Operation Command of I/O data to execute the sensor disconnection test.

• How to Check the Execution Status

You can use the Ch1 Sensor Disconnection Test Executing bit in the Ch1 Executing Status of I/O data to check the execution status.

• How to Check the Test Result

You can use the Ch1 Sensor Disconnected Error bit in the Ch1 Detection Status of I/O data to check if the cable is disconnected.

When a disconnection is detected, a Sensor Disconnected Error event occurs.

Description of Operation

The operation of the sensor disconnection test is described below. The Ch1 designation of I/O data is omitted.

- When the Sensor Disconnection Test Execution bit is changed from 0 to 1, the Sensor Disconnection Test Executing bit changes from 0 to 1. At this time, the Load Cell Input Unit enters the sensor disconnection test mode and the sensor disconnection test starts. (Refer to (a) in the figure below.) During the sensor disconnection test, you cannot measure the gross weight value or force measurement value. (Refer to period (a) and (d) in the following figure.)
- When an error exists, the Sensor Disconnected Error bit changes to 1 and a Sensor Disconnected Error event occurs. (Refer to (b) in the figure below.)
- t1 time is required for a disconnection to be detected after the Sensor Disconnection Test Execution bit is changed from 0 to 1. (Refer to (b) in the figure below.)
- During the sensor disconnection test, the sensor disconnection test is executed repeatedly.
- After t2 elapses since the Sensor Disconnection Test Execution bit is changed from 1 to 0, the Sensor Disconnection Test Executing bit changes from 1 to 0 and the system changes to normal operation. (Refer to (c) and (d) in the figure below.)
- The Sensor Disconnected Error bit remains 1 until the error is reset. When the cause of the error is removed and the error is reset, the Sensor Disconnected Error bit changes from 1 to 0. (Refer to (e) in the figure below.)



- t1: Time required from the sensor disconnection test is executed until the disconnection is detected. Maximum 260 ms + Maximum I/O response time^{*1} is required.
- t2: Time required from the Sensor Disconnection Test Execution bit changes from 1 to 0 until the system changes to the normal operation mode. Maximum 300 ms + Maximum I/O response time^{*1} is required.
- *1. Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on the maximum I/O response time.

Precautions for Correct Use

Change the Sensor Disconnection Test Execution bit from 1 to 0 after the Sensor Disconnection Test Executing bit changes from 0 to 1. Otherwise, the sensor disconnection test may not execute.

I/O Data Status while in the Sensor Disconnection Test Mode

The status of I/O data while in the sensor disconnection test mode is shown in the following table. During the sensor disconnection test, regardless of whether a Sensor Disconnected Error occurs, the I/O data is as follows.

Area	Data name	Status
Input	Ch1 Detection Status	Only the Ch1 Sensor Disconnected Error bit and Ch1 AD
		Conversion Error bit are enabled. Other bits are fixed to 0.
	Ch1 Executing Status	Only the Ch1 Sensor Disconnection Test Executing bit is
		enabled. Other bits are fixed to 0.
	Ch1 Gross Weight Value/Force Mea-	Fixed to 2147483647.
	surement Value DINT	
	Ch1 Gross Weight Value/Force Mea-	Fixed to 3.402823e+38.
	surement Value REAL	
	Ch1 Net Weight Value DINT	Fixed to 2147483647.
	Ch1 Net Weight Value REAL	Fixed to 3.402823e+38.
	Ch1 Peak Hold Value DINT	Fixed to 2147483647.
	Ch1 Peak Hold Value REAL	Fixed to 3.402823e+38.
	Ch1 Bottom Hold Value DINT	Fixed to -2147483648.
	Ch1 Bottom Hold Value REAL	Fixed to -3.402823e+38.
	Ch1 Calibration Command Response	An error response is returned if a calibration command is
	SID	sent.
	Ch1 Calibration Command Response	
Output	Ch1 Operation Command	Only the Ch1 Sensor Disconnection Test Execution bit is
		enabled. Other bits are disabled and any operation is not
		accepted.
	Ch1 Calibration Command SID	Any of the commands are not accepted. An error response
	Ch1 Calibration Command	is returned if a calibration command is sent.
	Ch1 Calibration Data]

8-10 Input Value Refreshing Stop

8-10-1 Function Applications and Overview

This function stops refreshing the input value in a specified period.

Use this function in the following cases.

- · To avoid overshooting and undershooting due to mechanical vibrations occurred at a fixed timing
- · To avoid overshooting and undershooting when filling is started

This function is used in the weight measurement and force measurement systems.

8-10-2 Details on the Function

How to Execute the Function and Check the Execution Status

Use I/O data to execute the input value refreshing stop and check the execution status. Refer to 6-2 *Specifications of I/O Data* on page 6-13 for details on I/O data.

• How to Execute the Function

Operate the Ch1 Input Value Refreshing Stop bit in the Ch1 Operation Command of I/O data to execute the input value refreshing stop.

• How to Check the Execution Status

You can use the Ch1 Input Value Refreshing Stopping bit in the Ch1 Executing Status of I/O data to check the execution status.

Description of Operation

The operation of input value refreshing stop is described below. The Ch1 designation of I/O data is omitted.

- When the Input Value Refreshing Stop bit is changed from 0 to 1, the Input Value Refreshing Stopping bit changes from 0 to 1 and refreshing of the input values from the load cell is stopped. Execute this function when overshooting occurs to avoid overshooting of measurement values. (Refer to (a) in the figure below.)
- While refreshing of the input values is stopped, the previous measurement values are retained. (Refer to period (a) and (b) in the figure below.)
- When the Input Value Refreshing Stop bit is changed from 1 to 0, the Input Value Refreshing Stopping bit changes from 1 to 0 and refreshing of the input values from the load cell is resumed. (Refer to (b) in the figure below.)



8-11 Peak Hold/Bottom Hold

8-11-1 Function Applications and Overview

This function continues holding the peak value or the bottom value of the force measurement value in a specified period.

This function is used in the force measurement system.

8-11-2 Details on the Function

How to Execute and Cancel the Function and Check the Execution Status and Hold Values

Use I/O data to execute the peak hold or bottom hold, check the execution status, and check the peak hold value or bottom hold value.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

• How to Execute and Cancel the Function

Operate the Ch1 Hold Execution bit in the Ch1 Operation Command of I/O data to execute the peak hold or bottom hold.

Operate the Ch1 Hold Value Clear bit in the Ch1 Operation Command of I/O data to cancel the peak hold or bottom hold.

How to Check the Execution Status

You can use the Ch1 Hold Executing bit in the Ch1 Executing Status of I/O data to check the execution status.

• How to Check the Hold Values

You can use the Ch1 Peak Hold Value DINT or Ch1 Peak Hold Value REAL of I/O data to check the peal hold value.

You can use the Ch1 Bottom Hold Value DINT or Ch1 Bottom Hold value REAL of I/O data to check the bottom hold value.



Precautions for Correct Use

- The peak hold value is not assigned to I/O data by default. To use the peak hold, be sure to assign the peak hold value in I/O allocation settings.
- The bottom hold value is not assigned to I/O data by default. To use the bottom hold, be sure to assign the bottom hold value in I/O allocation settings.

8

Operation of Peak Hold

The operation of the peak hold is described below. The Ch1 designation of I/O data is omitted.

- When the Hold Execution bit is changed from 0 to 1, the Hold Executing bit changes from 0 to 1 and the peak hold is executed. (Refer to (a) in the figure below.)
- The peak value of the converted force measurement value during hold becomes the peak hold value. (Refer to period (a) and (b) in the figure below.)
- The force measurement value is converted in the conversion cycle of 125 µs regardless of the I/O refresh cycle of the NX bus.^{* 1} The peak value of converted value is refreshed in the conversion cycle of 125 µs and sent to the CPU Unit or communications master as the peak hold value during each I/O refresh cycle of the NX bus. Details are shown in the enlarged diagram. (Refer to (d) and (e) in the figure below.)
- When the Hold Execution bit is changed from 1 to 0, the Hold Executing bit changes from 1 to 0 and refreshing of the peak value stops. The peak hold value is held in a value immediately before refreshing of the peak value is stopped. (Refer to (b) in the figure below.)
- When the Hold Value Clear bit is changed from 0 to 1, the hold is canceled and the peak hold value becomes equal to the force measurement value. (Refer to (c) in the figure below.)
- *1. Such processes as AD conversion, digital filtering and conversion of force measurement value are performed in the conversion cycle of 125 μs.





Operation of Bottom Hold

The operation of the bottom hold is described below. The Ch1 designation of I/O data is omitted.

- When the Hold Execution bit is changed from 0 to 1, the Hold Executing bit changes from 0 to 1 and the bottom hold is executed. (Refer to (a) in the figure below.)
- The bottom value of the converted force measurement value during hold becomes the bottom hold value. (Refer to period (a) and (b) in the figure below.)
- The force measurement value is converted in the conversion cycle of 125 µs regardless of the I/O refresh cycle of the NX bus.^{* 1} The bottom value of converted value is refreshed in the conversion cycle of 125 µs and sent to the CPU Unit or communications master as the bottom hold value during each I/O refresh cycle of the NX bus. Details are shown in the enlarged diagram. (Refer to (d) and (e) in the figure below.)
- When the Hold Execution bit is changed from 1 to 0, the Hold Executing bit changes from 1 to 0 and refreshing of the bottom value stops. The bottom hold value is held in a value immediately before refreshing of the bottom value is stopped. (Refer to (b) in the figure below.)
- When the Hold Value Clear bit is changed from 0 to 1, the hold is canceled and the bottom hold value becomes equal to the force measurement value. (Refer to (c) in the figure below.)
- *1. Such processes as AD conversion, digital filtering and conversion of force measurement value are performed in the conversion cycle of 125 µs.



Hold Value Clear during Hold

When the Hold Value Clear bit is changed from 0 to 1 during hold, the hold value is cleared and the detection of peak value or bottom value is performed. (Refer to (a) in the figure below.)

The following figure shows an example for the peak hold.


8-12 Data Tracing

8-12-1 Function Applications and Overview

This function records the values in REAL data in the buffer of the Load Cell Input Unit and exports the data to a CSV file with the Support Software. These values indicate the gross weight values/force measurement values before and after the digital filtering for a specified period.

Use this function when you adjust the parameters of digital filtering or check the effects of digital filtering. Refer to *A-2 Digital Filter Design That Utilizes Data Tracing* on page A-3 for examples of digital filter design that utilizes data tracing.

This function is used in the weight measurement and force measurement systems.

An example for a Slave Terminal is given below.



When the Load Cell Input Unit is connected to a CPU Unit, you can export the gross weight values/force measurement values before and after the digital filtering to a CSV file, with the Support Software connected to the CPU Unit. 8-12-1 Function Applications and Overview

8-12-2 Details on the Function

Specifications of Data Tracing

The specifications of data tracing is as follows.

Item	Specification
Sampling period	125 µs
Recording data size	Gross weight values/force measurement values before filtering 80000 max.*1
	 Bross weight values/force measurement values after intering 80000 max.^{*1}
Tracing data type	REAL ^{*2}

*1. When the maximum recording data size is reached, data tracing is automatically ended.

*2. REAL data is recorded regardless of the assignment of the Gross Weight Value/Force Measurement Value DINT or Gross Weight Value/Force Measurement Value REAL of I/O data.

• Clearing and Overwriting the Tracing Data

When the power to the Unit is turned on or NX Unit is restarted, the tracing data is cleared.

If you terminate the data tracing and perform it again, the tracing data is cleared and overwritten with the data for which the data tracing is executed again.

• How to Check the Tracing Result

You can use Support Software to check the tracing result by exporting the tracing data that is stored in the buffer of the Load Cell Input Unit to a CSV file. Refer to 8-12-4 How to Check the Tracing Result on page 8-45 for details on how to check the tracing results.

Precautions for Correct Use

- When the power supply to the Unit is turned on again or NX Unit is restarted, the tracing data is cleared. Pay attention that the data is removed and you cannot check it.
- If you terminate the data tracing and perform it again, the tracing data is cleared and overwritten with the data for which the data tracing is executed again. Pay attention that you cannot check the previous data.

8-12-3 How to Execute Data Tracing

You can use I/O data or Support Software to execute data tracing.

Each method is given below.

How to Execute with I/O Data

Operate the Ch1 Data Trace Execution bit in the Ch1 Operation Command of I/O data to execute the data tracing.

You can use the Ch1 Data Trace Executing bit in the Ch1 Executing Status of I/O data to check the execution status of data tracing.

Refer to 6-2 Specifications of I/O Data on page 6-13 for details on I/O data.

• Start of Tracing

When the Data Trace Execution bit is changed from 0 to 1, the Data Trace Executing bit changes from 0 to 1 and the data tracing is executed.

• End of Tracing

When the Data Trace Execution bit is changed from 1 to 0, the Data Trace Executing bit changes from 1 to 0 and the data tracing stops.

When the amount of tracing data that are recorded in the buffer reaches 80000, data tracing is automatically stopped even if the Data Trace Execution bit is 1. At this time, the Data Trace Executing bit changes from 1 to 0.

How to Execute with Support Software

The method for executing data tracing with the Support Software is given below.

This section describes how to perform the operation with the Sysmac Studio. For details on how to perform the operation with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Display the calibration view.

For the display methods, refer to A-6 Display Methods for the Calibration View on page A-21.

× .	Calibration		
\sim	Actual Load Calibration	Stable status: ON	Execute Zero Calibration Execute Span Calibration
	Equivalent Input Calibra Click this button if yo Change fro	tion u want to execute the equivalent input calibr om Actual Load Calibration Mode to Equivale	ration after the actual load calibration. ent Input Calibration Mode

2 Click the Data Trace Button.



The following tab page is displayed.

~	Mata Trace		
	Data Trace	Data Trace Execution: Stopped Stop Data Trace	Load Trace Data

3 Click the **Start Data Trace** Button in Data Trace.

Data tracing starts, Data Trace Execution in Data Trace switches from Stopped to Executing, and the **Stop Data Trace** Button is enabled.

≺	📈 Data Trace		
	Data Trace	Data Trace Execution: Executing Stop Data Trace	Load Trace Data

4 Click the **Stop Data Trace** Button at a desired time.

Data tracing stops and Data Trace Execution in Data Trace switches from Executing to Stopped. When the amount of tracing data that is recorded in the buffer reaches 80000, data tracing is automatically stopped and Data Trace Execution in Data Trace switches from Executing to Stopped.

~	Mata Trace		
	Data Trace	Data Trace Execution: Stopped Stop Data Trace	Load Trace Data

Additional Information

- During the data tracing, the data trace execution requests are not accepted. The current data tracing will continue.
- You cannot execute the data tracing while data is exported to a CSV file from Support Software.

8-12-4 How to Check the Tracing Result

You can check the data of gross weight value/force measurement value that are recorded in the buffer of the Load Cell Input Unit, by exporting it to a CSV file from Support Software.

The following describes how to check the tracing result. You can omit procedures 1 and 2 when confirming the tracing result after data tracing.

This section describes how to perform the operation with the Sysmac Studio. For details on how to perform the operation with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Display the calibration view.

For the display methods, refer to A-6 Display Methods for the Calibration View on page A-21.

2	Calibration		
\sim	- Actual Load Calibration -	Stable status: ON	Execute Zero Calibration Execute Span Calibration
	Equivalent Input Calibra Click this button if you Change fro	tion u want to execute the equivalent input calibr m Actual Load Calibration Mode to Equivale	ation after the actual load calibration. Int Input Calibration Mode

2 Click the Data Trace Button.



The following tab page is displayed.

~	Data Trace		
	Data Trace	Data Trace Execution: Stopped Stop Data Trace	Load Trace Data

8

3 Click the Load Trace Data Button in Data Trace. The Export Trace Data Dialog Box is displayed.

Export Trace Data					×
Trace Da	ta	• •	Search Trace Dat	a	٩
Organize 🔻 New fold	er			-	?
🔶 Favorites		No items match you	ur search.		
🕞 Libraries					
📜 Computer					
Network					
File <u>n</u> ame:	eData0.csv				-
Save as type: CSV f	ormat file (*.csv)				-
Hide Folders			Save	Cancel	



4 Enter a file name, specify a save location, and then click the **Save** Button. The tracing result is saved in CSV format.

5 Open the saved CSV file in Microsoft Excel to confirm the tracing result.

The following gives the CSV file format and data layout.

Tracing data when			- • • •					FraceData	a0.csv - Microsoft Excel			×
data tracing starta		Fil	e Home Insert	Page Layout	Formulas	Data	Review	View	Team	♥ 🕜	- 6	P 83
uata tracing starts					A				В	С		
	<u> </u>	1	Gross Weight Value/F	orce Measure	ment Value	e before	Digital Fi	tering	Gross Weight Value/Force Measurement Value after Digital Filtering			=
		2						0.72304	0.60544			
	Olu	3						0.72773	0.60544			
		4						0.73123	0.60544			
		5						0.73414	0.60544			
		6						0.73672	0.60544			
		7						0.73801	0.60544			
		8						0.74149	0.60544			
		9						0.74302	0.60544			
		10						0.74518	0.60544			
		11						0.74619	0.60545			
		12						0.74695	0.60545			
		13						0.74869	0.60545			
		14						0.74787	0.60546			
		15						0.74865	0.60546			
		16						0.74868	0.60547			
		17						0.74882	0.60547			
		18						0.74831	0.60548			
		19						0.74875	0.60548			
		20						0.74749	0.60549			
		21						0.74628	0.60549			
		22						0.74468	0.6055			
		23						0.74278	0.6055			
		24						0.74169	0.60551			
	v	25						0.73969	0.60551			
	New	26	N N TurnerDat 0	9 -1				0 73746	0.60552	_		
	I NO W	Read	y riciraceData0 /				_			-0-	(÷

- The gross weight value/force measurement value before digital filtering is shown in column A.
- The gross weight value/force measurement value after digital filtering is shown in column B.
- · The second row is the tracing data when data tracing starts. The larger the number, the newer the tracing data.

Additional Information

You cannot export data to a CSV file from Support Software during the data tracing.

8-13 Decimal Point Position Setting

8-13-1 Function Applications and Overview

This function sets the number of digits which is displayed after the decimal point for each DINT data. This function is used in the weight measurement and force measurement systems.

8-13-2 Details on the Function

After the measurement values in the Load Cell Input Unit are converted to REAL data, they are converted to DINT data.

During the conversion, DINT data are rounded following the number of digits after the decimal point, which was set by this function, and the rounded results become measurement values.

In the case of a REAL measurement value of 1.45454, for example, its DINT data value varies as follows depending on the setting of the decimal point position.

Decimal point position	DINT data value
0th decimal point	1
First decimal point	15
Second decimal point	145
Third decimal point	1455
Fourth decimal point	14545

Set the decimal point position for DINT data in the Unit operation settings. The settings are shown in the following table.

ltem	Setting description	Default	Setting range	Unit	Remarks
Ch1 Deci-	Sets the decimal point	0	0: × 10 ⁰		Set values are applied when
mal Point	position for Gross Weight		440-1		the power supply to the NX
Position	Value/Force Measurement		1: × 10 ·		Unit is turned ON or the NX
	Value DINT, Net Weight		2: × 10 ⁻²		Unit is restarted.
	Value DINT, Peak Hold		2. × 10-3		
	Value DINT and Bottom		3. * 10 *		
	Hold Value DINT.		4: × 10 ⁻⁴		

8-13-3 Setting Method

The method for setting the decimal point with the Support Software is given below.

This section describes how to configure settings with the Sysmac Studio. For details on how to configure settings with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 Double-click the target Load Cell Input Unit in the Multiview Explorer to open the Edit Unit Operation Settings Tab Page.

The following tab page is displayed.

Unit 1[Node1]:NX-RS1r··· ×	•
All parameters	
Item name	Value
Digital Low- pass Filter Cutoff Frequency/Ch1 Digital Low-pass Filter Cutoff Freque	ency 80 ×0.1Hz
Filter 1 Moving Average Count/Ch1 Filter 1 Moving Average Count	160 times
Filter 2 Moving Average Count/Ch1 Filter 2 Moving Average Count	133 times
Standard Weight/Ch1 Standard Weight	5
Load Cell Rated Capacity/Ch1 Load Cell Rated Capacity	5
Load Cell Rated Output/Ch1 Load Cell Rated Output	5 mV/V
Load Cell Zero Balance/Ch1 Load Cell Zero Balance	0 uV/V
Gravity Acceleration of Calibration Site/Ch1 Gravity Acceleration of Calibration Site	e 9.80665 m/s2
Gravity Acceleration of Installation Site/Ch1 Gravity Acceleration of Installation Site	e 9.80665 m/s2
Digital Tare Value/Ch1 Digital Tare Value	0
Zero Point Range/Ch1 Zero Point Range	0
Zero Tracking Range/Ch1 Zero Tracking Range	0
Zero Tracking Period/Ch1 Zero Tracking Period	0 x0.1s
Stable Status Range/Ch1 Stable Status Range	0
Stable Status Period/Ch1 Stable Status Period	0 x0.1s
Decimal Point Position/Ch1 Decimal Point Position	x1 🔻
Event Level Setting/Event 1	Unit Over Range 🔍 🔍
Event Level Setting/Event 1 Level	Observation 🔻
Event Level Setting/Event 2	Unit Under Range 🔍 🔍
Event Level Setting/Event 2 Level	Observation 🔻
	Return to Default Value
_ Help	
Data type,	
Comment: Sets the decimal point position for Gross Weight Value/Force M	reasurement value DINT, Net Weight value DINT,
Peak Hold Value DINT and Bottom Hold Value DINT.	
Restart is required to reflect the settings.	
Transfer to	0 Unit Transfer from Unit Compare

2 Set the Ch1 Decimal Point Position.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Support Software to the NX Unit.

The settings are reflected after the NX Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Support Software is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

9

Troubleshooting

This section describes the error information and corrections for errors that can occur when the Load Cell Input Unit is used.

9-1	How t	o Check for Errors
9-2	Chec	king for Errors with the Indicators
9-3	Chec	king for Errors and Troubleshooting on the Support Software 9-5
	9-3-1	Checking for Errors from the Sysmac Studio
	9-3-2	Checking for Errors from Support Software Other Than the Sysmac Studio 9-6
	9-3-3	Event Codes and Corrections for Errors 9-6
	9-3-4	Meaning of Error
9-4	Reset	ting Errors
9-5	Unit-s	specific Troubleshooting9-27
9-6	Meas	urement Values Used When an Error Occurs
9-7	Troub	leshooting Flowchart

9-1 How to Check for Errors

Use one of the following error checking methods.

- · Checking the indicators
- · Troubleshooting with the Support Software

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for information on checking errors with the troubleshooting functions of the Support Software.

9-2 Checking for Errors with the Indicators

You can use the TS indicators on the Load Cell Input Unit to check the Load Cell Input Unit status and level of errors.

This section describes the meanings of errors that the TS indicator shows and the troubleshooting procedures for them.

In this section, the status of the indicator is indicated with the following abbreviations.

Abbreviation	Indicator status			
Lit	Lit			
Not Lit	Not lit			
FS()	Flashing. The numeric value in parentheses is the flashing interval.			
	Undefined			

Main Errors and Corrections

TS indicator		Causa	Correction				
Green	Red	Cause	Correction				
Lit	Not Lit		(This is the normal status.)				
FS (2 s)	Not Lit	Initializing	(Normal. Wait until the processing is com-				
		Downloading	pleted.)				
Lit	Lit	This status is not present.					
Not Lit	Not Lit	The Unit power supply is not sup-	Check the following items and supply the Unit				
		plied.	Power supply correctly.				
			[Check items for power supply]				
			 Make sure that the power supply cable is wired correctly. 				
			 Make sure that the power supply cable is not disconnected. 				
			• Make sure that power supply voltage is within the specified range.				
			• Make sure that the power supply has enough capacity.				
			Make sure that power supply has not failed.				
		Waiting for initialization to startRestarting	(Normal. Wait until the processing is com- pleted.)				
		If you cannot resolve the problem a Unit power supply, the Unit may ha Unit.	after you check the above items and cycle the ve a hardware failure. If this happens, replace the				
Not Lit	Lit	Non-volatile Memory Hardware	Refer to Event Non-volatile Memory Hardware				
		Error	<i>Error</i> on page 9-11.				
Not Lit	Lit	Control Parameter Error in Mas-	Refer to Event Control Parameter Error in Mas-				
		ter	<i>ter</i> on page 9-13.				
Not Lit	Lit	NX Unit Processing Error	Refer to Event NX Unit Processing Error on				
			page 9-16.				
Not Lit	Lit	NX Unit Clock Not Synchronized	Refer to Event NX Unit Clock Not Synchronized				
		Error	Error on page 9-21.				

TS inc	licator	Causa	Correction				
Green	Red	Cause	Correction				
Not Lit	Lit	A/D Conversion Error	Refer to Event A/D Conversion Error on page				
			9-12.				
Not Lit	Lit	Unit Calibration Value Error	Refer to Event Unit Calibration Value Error on				
			page 9-14.				
Not Lit	Lit	Actual Load Calibration Value	Refer to Event Actual Load Calibration Value				
		Error	Error on page 9-15.				
Not Lit FS (1 s)		NX Unit I/O Communications	Refer to Event NX Unit I/O Communications				
		Error	Error on page 9-18.				
Not Lit	FS (1 s)	NX Unit Output Synchronization	Refer to Event NX Unit Output Synchronization				
		Error	<i>Error</i> on page 9-20.				
The indicator	status is	NX Message Communications	Refer to Event NX Message Communications				
held immedia	tely before	Error	Error on page 9-24.				
the event occ	curred.	Sensor Disconnected Error	Refer to Event Sensor Disconnected Error on				
			page 9-17.				
		Over Range	Refer to Event Over Range on page 9-22.				
		Under Range	Refer to Event Under Range on page 9-23.				

9-3 Checking for Errors and Troubleshooting on the Support Software

Error management on the NX Series is based on the methods used for the NJ/NX/NY-series Controllers.

This allows you to use the Support Software to check the meanings of errors and troubleshooting procedures. The confirmation method depends on the Support Software.

9-3-1 Checking for Errors from the Sysmac Studio

When an error occurs, you can place the Sysmac Studio online to the Controller or the Communications Coupler Unit to check current Controller errors and the log of past Controller errors.

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on how to check errors.

Current Errors

Open the Sysmac Studio's Controller Error Tab Page to check the current error's level, source,

source details, event name, event codes, details, attached information 1 to 4, and correction.

Errors in the observation level are not displayed.

Additional Information

Number of Current Errors

The following table gives the number of errors that are reported simultaneously as current errors in the Load Cell Input Unit.

Unit	Number of simultaneous error notifications				
Load Cell Input Unit	15 errors				

If the number of errors exceeds the maximum number of reportable current errors, errors are reported with a priority given to the oldest and highest-level errors. Errors that exceed the limit on simultaneous error notifications are not reported.

Errors that are not reported are still reflected in the error status.

Log of Past Errors

Open the Sysmac Studio's Controller Event Log Tab Page to check the times, levels, sources, source details, event names, event codes, details, attached information 1 to 4, and corrections for previous errors.

Number of Logs of Past Errors

Additional Information

Event logs in the Load Cell Input Unit are stored in the Load Cell Input Unit itself.

The system event log can record 15 events. The access event log can record 2 events.

Refer to the troubleshooting manual for the connected CPU Unit or Industrial PC and the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for the items that you can check and the procedures to check for errors.

Refer to 9-3-3 Event Codes and Corrections for Errors on page 9-6 for details on event codes.

9-3-2 Checking for Errors from Support Software Other Than the Sysmac Studio

You can check the error descriptions and logs with Support Software other than the Sysmac Studio. For the error checking methods, refer to the user's manual for the connected Communications Coupler Unit and the operation manual for the Support Software.

Refer to 9-3-3 Event Codes and Corrections for Errors on page 9-6 for details on event codes.

The number of current errors and the number of error log errors that occurred in the past are the same as for the Sysmac Studio.

9-3-3 Event Codes and Corrections for Errors

The errors (i.e., events) that occur in the Load Cell Input Unit is given below.

The following abbreviations are used in the event level column.

Abbreviation	Name
Maj	Major fault level
Prt	Partial fault level
Min	Minor fault level
Obs	Observation
Info	Information

Symbol	Meaning
S	Event levels that are defined by the system.
U	Event levels that can be changed by the user. *1

*1. This symbol appears only for events for which the user can change the event level.

Refer to the troubleshooting manual for the connected CPU Unit or Industrial PC for information on NJ/NX/NY-series event codes.

Event code	Event name	Meaning	Assumed sause	Level			Poforonco		
Event code	Event name		Assumed cause	Maj	Prt	Min	Obs	Info	Kelefence
0020 0000 hex	Non-volatile Memory Hardware Error	An error occurred in non-volatile mem- ory.	Non-volatile memory failure			S			P. 9-11
05120000 hex	A/D Conver- sion Error	AD conversion was not performed by the AD converter.	 EXC+ terminal and EXC- terminal are short-circuited. Noise A/D converter failure 			S			P. 9-12
10410000 hex	Control Parameter Error in Mas- ter	An error occurred in the control parame- ters that are saved in the master.	 For the NX bus of CPU Units The power supply to the CPU Unit was turned OFF while writ- ing the Unit operation settings was in progress. Or there is an error in the area of the non-vol- atile memory in the CPU Unit in which the Unit operation set- tings for the relevant NX Unit are saved. For Communications Coupler Units The power supply to the Com- munications Coupler Unit was turned OFF while writing the Unit operation settings was in progress. Or there is an error in the area of the non-volatile memory in the Communica- tions Coupler Unit in which the Unit operation settings for the relevant NX Unit are saved 			S			P. 9-13
10440000 hex	Unit Calibra- tion Value Error	There is an error in the area in which the Unit calibration values are saved.	 There is an error in the area of the non-volatile memory in which the Unit calibration val- ues are saved. 			S			P. 9-14
10450000 hex	Actual Load Calibration Value Error	There is an error in the area in which the actual load cali- bration values are saved.	There is an error in the area of the non-volatile memory in which the actual load calibra- tion values are saved.			S			P. 9-15
40200000 hex	NX Unit Pro- cessing Error	A fatal error occurred in an NX Unit.	 An error occurred in the soft- ware. 			S			P. 9-16
65130000 hex	Sensor Dis- connected Error	A disconnection with the load cell was detected.	 Wiring with the load cell is not connected. Wiring with the load cell is broken. The input signal exceeds the input conversion range. Load cell failure. 			S			P. 9-17

Event code	Event name	Mooning			Assumed cause Level				Poforonoo
Event code Event hame Mean		weating	Assumed cause		Prt	Min	Obs	Info	Reference
Event code 80200000 hex	Event name NX Unit I/O Communica- tions Error	Meaning An I/O communica- tions error occurred in an NX Unit.	 Assumed cause For the NX bus of CPU Units An error that prevents normal NX bus communications occurred in a CPU Unit. An NX Unit is not mounted properly. The power cable for the Unit power supply is disconnected, or the wiring from the Unit power supply to the NX Units is incorrect. The power cable for the Unit power supply is broken. The voltage of the Unit power supply is broken. The voltage of the specified range, or the capacity of the Unit power supply is insufficient. There is a hardware error in an NX Unit. For Communications Coupler Units An error that prevents normal NX bus communications coupler Unit. The NX Unit is not mounted properly. The NX Unit is not mounted properly. 	Maj	Prt	Leve Min S	Obs	Info	P. 9-18
			 The power cable for the Unit power supply is disconnected. Or, the wiring from the Unit power supply to the NX Units is incorrect. The power cable for the Unit power supply is broken. The voltage of the Unit power supply is outside the specified range. Or, the capacity of the Unit power supply is insufficient. There is a hardware error in the NX Unit. 						
80210000 hex	NX Unit Out- put Synchro- nization Error	An output synchro- nization error occurred in the NX Unit.	 For the NX bus of CPU Units I/O refreshing on the NX bus is not performed normally due to an error in the CPU Unit. For Communications Coupler Units The communications cable connected to the Communica- tions Coupler Unit is broken or the connection is faulty. The communications cable is affected by noise. 			S			P. 9-20

Event code	Event name	Meaning	Assumed cause		Level		Poforonco		
Lvent code	Lvent name	Meaning	Assumed cause	Maj	Prt	Min	Obs	Info	Reference
80240000 hex	NX Unit Clock Not Synchro-	A time information error occurred in an NX Unit.	For the NX bus of CPU UnitsThere is a hardware error in an NX Unit.			S			P. 9-21
	nized Error		 There is a hardware error in a CPU Unit. 						
			For Communications Coupler Units						
			 There is a hardware error in an NX Unit. 						
			 There is a hardware error in a Communications Coupler Unit. 						
65140000 hex	Over Range	The input signal from the load cell	Wiring with the load cell is not connected.			U	S		P. 9-22
		limit of the input conversion range.	 Winnig with the load cell is bro- ken. EXCL terminal and EXCL terminal 						
			 EXC+ terminal and EXC- termi- nal are short-circuited. 						
			 A load cell with which the rated 						
			of the Load Cell Input Unit is used.						
			 A load that exceeds the rated capacity is applied to the load cell 						
			Noise						
65150000 hex	Under Range	The input signal from the load cell	 Wiring with the load cell is not connected. 			U	S		P. 9-23
		went below the lower limit of the	 Wiring with the load cell is bro- ken. 						
		input conversion range.	• EXC+ terminal and EXC- termi- nal are short-circuited.						
			Load cell failure.						
			A load cell with which the rated output exceeds the input range of the Load Cell laput Linit in						
			used.						
			 A load that exceeds the fated capacity is applied to the load cell. 						
			Noise						
80220000 hex	NX Message	An error was	For the NX bus of CPU Units				S		P. 9-24
	tions Error	sage communica-	 The message communications load is high. 						
		message frame was discarded.	For Communications Coupler Units						
			 The message communications load is high. 						
			The communications cable is disconnected or broken.						
	-	-	Message communications were cutoff in communications.						D 0 0 0
90400000 hex	Event Log Cleared	The event log was cleared.	 The event log was cleared by the user. 					S	Р. 9-25

9

NX-series Load Cell Input Unit User's Manual (W565)

9-3-4 Meaning of Error

This section describes the information that is given for individual errors.

How to Read Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

Event name	Gives the name of the error.			Event code Gives the code of the error.			
Meaning	Gives a short of	description of the error.					
Source	Gives the sour	ce of the error.	Source	Gives details	Detection	Tells when the	
			details	on the source	timing	error is	
				of the error.		detected.	
Error	Level	Tells the level of influe	ence on con-	Log category	Tells which log	the error is	
attributes		trol. ^{*1}			saved in.*2		
	Recovery	Gives the recovery me	ethod. ^{*3}				
Effects	User pro-	Tells what will hap-	Operation	Provides special	information on th	ne operation that	
	gram	pen to execution of		results from the error.			
		the user program.*4					
Indicators	Gives the statu	is of the built-in EtherN	et/IP port and I	built-in EtherCAT p	ort indicators. Ir	ndicator status is	
	given only for e	errors in the EtherCAT	Master Functio	on Module and the	EtherNet/IP Fur	nction Module.	
System-defined	Variable		Data type		Name		
variables	Lists the variat	ole names, data types,	, and meanings for system-defined variables that provide direct				
	error notification	on, that are directly affe	cted by the err	or, or that contain	settings that cau	use the error.	
Cause and	Assumed cau	se	Correction		Prevention		
correction	Lists the possil	ble causes, corrections	, and preventiv	ve measures for th	e error.		
Attached	This is the atta	ched information that is	s displayed by	the Support Softw	are or an HMI. [*]	5,*6	
information							
Precautions/	Provides preca	autions, restrictions, and	d supplementa	l information. If the	user can set the	e event level, the	
Remarks	event levels th	at can be set, the recov	very method, o	perational informa	ition, and other i	nformation are	
	also provided.						

- *1. One of the following: Major fault: Major fault level Partial fault: Partial fault level Minor fault: Minor fault level Observation Information
- *2. One of the following: System: System event log Access: Access event log
- *3. One of the following:

Automatic recovery: Normal status is restored automatically when the cause of the error is removed.

Error reset: Normal status is restored when the error is reset after the cause of the error is removed.

Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.

Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed. Depends on cause: The recovery method depends on the cause of the error.

- *4. One of the following: Continues: Execution of the user program will continue. Stops: Execution of the user program stops. Starts: Execution of the user program starts.
- *5. "System information" indicates internal system information that is used by OMRON.
- *6. Refer to the appendices of the NJ/NX-series Troubleshooting Manual (Cat. No. W503) for the applicable range of the HMI Troubleshooter.

Error Descriptions

Event name	Non-volatile Men	nory Hardware Erro	or	Event code	00200000 hex					
Meaning	An error occurred	d in non-volatile me	emory.		1					
Source	Depends on whe Software is conn system configura	re the Support ected and the ition.	Source details	NX Unit	Detection timing	When power is turned ON to the NX Unit				
Error	Level	Minor fault		Log category	System					
attributes	Recovery	For the NX bus o	f CPU Units		pus.					
		Cycle the power	supply to the Unit	or restart the NX b						
		For Communicati	ions Coupler Units							
		Cycle the power	supply to the Unit	or restart the Slave	e Terminal.					
		If the errors are c	letected in the Cor	ntroller, reset all of	the errors in the C	ontroller.				
Effects	User program	Continues.	Operation	I/O refreshing for	the NX Unit stops	. Messages can-				
0	Mariakla		Data tama	not be sent to the	e NX Unit.					
Sys-	Variable		Data type		Name					
variables	None									
Cause and	Assumed cause)	Correction		Prevention					
correction	Non-volatile men	nory failure.	For the NX bus o	f CPU Units	None					
			Cycle the power supply to the Unit							
			or restart the NX	bus. If the error						
			persists even atte	er you make the						
			vant NX Unit.							
			For Communicat	ions Coupler						
			Units							
			Cycle the power	supply to the Unit						
			or restart the Slav	ve Terminal. If the						
			error persists eve	en after you make						
			relevant NX Unit.	tion, replace the						
Attached	None				1					
information										
Precautions/	None									
Remarks										

Event name	A/D Conversion Error		Event code	05120000 hex		
Meaning	AD conversion w	as not performed l	by the AD converte	er.		
Source	Depends on whe Software is conne system configura	re the Support ected and the tion.	rt Source details NX Unit		Detection timing	Continuously
Error	Level	Minor fault		Log category	System	
attributes	Recovery	Restart the NX U	Init.		•	
Effects	User program	Continues.	Operation The gross weight net weight value, 2147483647 for D REAL data. The bottom hold y		t value/force meas and peak hold va DINT data, to 3.40 value goes to -21/	urement value, lue go to 2823e+38 for 47483647 for
				DINT data, to -3.	402823e+38 for REAL data.	
Sys-	Variable		Data type		Name	
tem-defined variables	None					
Cause and	Assumed cause)	Correction		Prevention	
correction	EXC+ terminal ar	nd EXC- terminal	Remove the shor	rt circuit between None		
	are short-circuite	d.	EXC+ and EXC-, cycle the power			
			to the NX Unit, a	nd check that the		
			error is reset.			
	Noise		Cycle the power	to the NX Unit	Implement noise countermea-	
					sules.	
			If the error occurs	s frequently,		
			implement noise	countermea-		
			sures as required	1.		
	A/D converter fai	lure	If the EXC+ term	inal and EXC-	None	
			terminal are not s	short-circuited		
			and cycling the p	ower supply to		
			the NX Unit does	not clear the		
			error, replace the	NX Unit.		
Attached	Attached informa	ition 1: Error chanr	1ei Channol 1			
Procautions/	None	oou nex. (
Remarks						

Event name	me Control Parameter Error in Master Event code 1041			10410000 hex			
Meaning	An error occurred	I in the control par	ameters that are s	aved in the master	ſ.		
Source	Depends on whe	re the Support	Source details	NX Unit	Detection	When power is	
	Software is conne	ected and the			timing	turned ON to	
	system configura	tion.				the NX Unit	
Error	Level	Minor fault		Log category	System	•	
attributes	Recovery	For the NX bus o	f CPU Units				
			When Fail-soft O	peration Is Set to	Stop		
			Restart the NX U	Init and then reset	the error in the NX	Bus Function	
			when Fail-soft Operation is Set to Fail-soft				
			Restart the NX Unit and then reset the error in the NX Unit.				
		For Communicat	ions Coupler Units				
			When Fail-soft O	peration Is Set to	Stop		
			If the errors are c	letected in the Con	troller, restart the	NX Unit and then	
			reset all of the errors in the Controller. If the errors are not detected in the Controller, restart the NX Unit and then reset the error in the Communications Coupler Unit. When Fail-soft Operation Is Set to <i>Fail-soft</i> Restart the NX Unit and then reset the error in the Communications Coupler Unit.				
			then reset the errors	ror in the Commun	ications Coupler L	Init.	
			When Fail-soft Operation Is Set to Fail-soft				
			Restart the NX Unit and then reset the error in the Communications				
			Coupler Unit.				
Effects	User program	Continues.	Operation	I/O refreshing for	the NX Unit stops	j.	
Sys-	Variable		Data type		Name		
tem-defined	None						
variables							
Cause and	Assumed cause		Correction	prrection Prevention			
correction	For the NX bus o	f CPU Units					
	The power supply	/ to the CPU Unit	Download the Ur	nit operation set-	Do not turn OFF	the power supply	
	was turned OFF	while writing the	tings of the NX U	nit again. If the	to the CPU Unit while transfer of		
	Unit operation se	ttings was in	error persists eve	en after you make	the Unit operation	n settings for the	
	progress. Or ther	e is an error in	the above correction, replace the		NX Unit or save of	of NX Unit param-	
	the area of the no	on-volatile mem-	CPU Unit.		eters by a messa	ige is in progress.	
	ory in the CPU U	nit in which the					
	Unit operation se	ttings for the rel-					
	Evant NX Unit are	e saveo.					
	The new or supply	to the Commu	Download the Lin	it operation act		the newer supply	
	The power supply	y to the Commu-	tings of the NY L	nit operation set-	to the Communic	the power supply	
	OFF while writing	the Unit opera-		n even after vou	Linit while transfe	ations Couplet	
	tion settings was	in progress Or	make the above		operation setting	s for the NX Unit	
	there is an error i	n the area of the	replace the Com	munications Cou-	by the Support S	oftware or save	
	non-volatile mem	orv in the Com-	pler Unit.		of NX Unit param	eters by a mes-	
	munications Cour	oler Unit in which			sage is in progre	SS.	
	the Unit operation	n settings for the					
	relevant NX Unit	are saved.					
Attached	None		1		1		
information							
Precautions/	None						
Remarks							

Event name	Unit Calibration Value Error			Event code	10440000 hex		
Meaning	There is an error	in the area in which	ch the Unit calibrat	ion values are sav	ed.		
Source	Depends on whe Software is conne system configura	re the Support ected and the tion.	Source details	NX Unit	Detection timing	When power is turned ON to the NX Unit	
Error	Level	Minor fault		Log category	System		
attributes	Recovery						
Effects	User program	Continues.	Operation	The gross weight value/force measurement value, net weight value, and peak hold value go to 2147483647 for DINT data, to 3.402823e+38 for REAL data.			
				DINT data, to -3.402823e+38 for REAL data.			
Sys-	Variable		Data type		Name		
tem-defined variables	None						
Cause and	Assumed cause)	Correction		Prevention		
correction	There is an error in the area of the non-volatile memory in which the Unit calibration values are saved.		Cycle the power and see if this cle If the error occurs you make the ab	to the NX Unit None ears the error. s again even after pove correction,			
			replace the NX U	nit.			
Attached information	None						
Precautions/ Remarks	None						

Event name	Actual Load Calibration Value Error		Event code	10450000 hex	10450000 hex	
Meaning	There is an error	in the area in whic	ch the actual load o	alibration values a	are saved.	
Source	Depends on whe	re the Support	Source details	NX Unit	Detection	When power is
	Software is conne	ected and the			timing	turned ON to
	system configura	tion.				the NX Unit
Error	Level	Minor fault		Log category	System	
attributes	Recovery	Perform actual lo	ad calibration, the	n cycle the power	supply to the NX L	Jnit.
Effects	User program	Continues.	Operation	The gross weight	value/force meas	urement value,
				net weight value,	and peak hold val	ue go to
				2147483647 for [DINT data, to 3.40	2823e+38 for
				REAL data.		
				The bottom hold	value goes to -21	47483647 for
				DINT data, to -3.402823e+38 for REAL data.		
Sys-	Variable		Data type		Name	
tem-defined	None					
variables					-	
Cause and	Assumed cause		Correction	ection Prevention		
correction	There is an error	in the area of the	Perform actual lo	ad calibration,	Do not turn OFF	the power supply
	non-volatile mem	ory in which the	then cycle the po	wer to the NX	to the NX Unit during actual load	
	actual load calibr	ation values are	Unit and see if th	is clears the	calibration.	
	saved.		error.			
			If the error occurs	again even after		
			you make the ab	ove correction,		
			replace the NX U	nit.		
Attached	Attached informa	tion 1: Error chanr				
Information		0001 hex: (Jnannel 1			
Precautions/	None					
Remarks						

Event name	NX Unit Processing Error		Event code	40200000 hex		
Meaning	A fatal error occu	irred in an NX Unit			•	
Source	Depends on whe Software is conn system configura	re the Support ected and the ition.	Source details	NX Unit	Detection timing	Continuously
Error	Level	Minor fault		Log category	System	
attributes	Recovery	For the NX bus o	of CPU Units			
		Cycle the power Module.	supply to the NX L	Init and then reset	the error in the N	X Bus Function
		For Communicat	ions Coupler Units	i		
		Cycle the power Coupler Unit.	supply to the NX L	Init and then reset	the error in the Co	ommunications
Effects	User program	Continues.	Operation	I/O refreshing for	the NX Unit stops	. Messages can-
				not be sent to the	e NX Unit.	
Sys-	Variable		Data type		Name	
tem-defined variables	None					
Cause and	Assumed cause)	Correction		Prevention	
correction	An error occurred	d in the software.	For the NX bus of	f CPU Units	CPU Units None	
			Cycle the power supply to the			
			Unit, restart the N	IX Unit, or restart		
			the NX bus. If thi	s error occurs		
			again even after	the above correc-		
			tion, contact your sentative.	OMRON repre-		
			For Communicat Units	ions Coupler		
			Cycle the power	supply to the		
			Unit, restart the N	IX Unit, or restart		
			the Slave Termin	al. If this error		
			occurs again eve	n after the above		
			correction, conta representative.	ct your OMRON		
Attached	Attached informa	tion 1: System info	ormation			
information	Attached informa	tion 2: System info	ormation			
	Attached informa	tion 3: System info	ormation			
	Attached informa	ition 4: System info	ormation			
Precautions/	None					
Remarks						

Event name	Sensor Disconne	cted Error		Event code	65130000 hex		
Meaning	A disconnection v	with the load cell w	as detected.				
Source	Depends on whe Software is conne system configura	re the Support ected and the tion.	Source details	NX Unit	Detection timing	When sensor disconnection test is executed	
Error	Level	Minor fault		Log category	System		
attributes	Recovery	Reset error in the	e NX Unit.				
Effects	User program	Continues.	Operation	During the senso whether a Senso the measuremen • The gross weig net weight valu 2147483647 fo REAL data.	r disconnection test, regardless of r Disconnected Error occurs or not, t values are as follows. Int value/force measurement value, e, and peak hold value go to or DINT data, to 3.402823e+38 for		
				DINT data, to -	-3.402823e+38 for	3.402823e+38 for REAL data.	
Sys-	Variable		Data type		Name		
tem-defined variables	None						
Cause and	Assumed cause	l.	Correction		Prevention		
correction	Wiring with the load cell is not connected.		Check for unconnected wires and connect any unconnected wires if they are found.		None		
	Wiring with the lo	ad cell is broken.	Check the wiring for breaks and replace the cable for connecting with the load cell if any are found.		Find the reasons take suitable presures.	IT data, to 3.402823e+38 for ue goes to -2147483647 for 2823e+38 for REAL data. ne vention te d the reasons for breaks and e suitable preventive mea- es. an appropriate load cell so the rated output is within the ut range of the Load Cell Input t. not apply a load that exceeds rated capacity to the load cell.	
	The input signal exceeds the input conversion range.		Check the load cell rated output. If the rated output exceeds the input range of the Load Cell Input Unit, replace with an appropriate load cell so that the rated output is within the input range.		Use an appropriate load cell so that the rated output is within the input range of the Load Cell Input Unit.		
			Check the load co and the load that load cell. When a exceeds the rate applied, take mea the load within th	cell rated capacity Do not apply a load that the rated capacity to the a load that ed capacity is easures to keep the rated capacity.		ad that exceeds y to the load cell.	
	Load cell failure.		Check to see if there are problems with the load cell. Replace the load cell if any are found.		None		
Attached	Attached informa	tion 1: Error chanr	nel		1		
information		0001 hex: 0	Channel 1				
Precautions/ Remarks	None						

Event name	NX Unit I/O Com	munications Error		Event code	80200000 hex		
Meaning	An I/O communic	ations error occur	red in an NX Unit.		•		
Source	Depends on where the Support Software is connected and the system configuration.		Source details	NX Unit	Detection timing	Continuously	
Error	Level	Minor fault		Log category	System		
attributes	Recovery	For the NX bus o	us of CPU Units				
			When Fail-soft O	peration Is Set to	Stop		
			Reset the error in the NX Bus Function Module.				
			When Fail-soft Operation Is Set to Fail-soft				
			Reset the error in the NX Unit.				
		For Communicati	tions Coupler Units				
			When Fail-soft Operation Is Set to Stop				
			If the errors are d Controller.	letected in the Cor	ntroller, reset all of	the errors in the	
			If the errors are n munications Cou	ot detected in the pler Unit and NX L	Controller, reset e Init.	rrors in the Com-	
			When Fail-soft O	peration Is Set to	Fail-soft		
			Reset errors in th	e Communication	s Coupler Unit and	d NX Unit.	
Effects	User program	Continues.	Operation	The NX Unit will	continue to operat	e.	
				Input data: Upda	ting input values s	tops.	
				Output data: The	output values dep	pend on the Load	
				Rejection Output	Setting.		
Sys-	Variable		Data type		Name		
tem-defined	None						
variables							

Cause and	Assumed cause Correction Prevention						
correction	For the NX bus of CPU Units	· · · · · · · · · · · · · · · · · · ·					
	An error that prevents normal NX	Check the error that occurred in	Take preventive measures against				
	bus communications occurred in a	the CPU Unit and perform the	the error that occurred in the CPU				
	CPU Unit.	required corrections.	Unit.				
	An NX Unit is not mounted prop-	Mount the NX Units and End	Mount the NX Units and End				
	erly.	Cover securely and secure them	Cover securely and secure them				
		with End Plates.	with End Plates.				
	The power cable for the Unit	Wire the Unit power supply to the	Wire the Unit power supply to the				
	power supply is disconnected, or	NX Units securely.	NX Units securely.				
	the wiring from the Unit power						
	supply to the NX Units is incorrect.						
	The power cable for the Unit	If the power cable between the	None				
	power supply is broken.	Unit power supply and the NX					
		Units is broken, replace it.					
	The voltage of the Unit power sup-	Configure the power supply sys-	Configure the power supply sys-				
	ply is outside the specified range,	tem configuration correctly	tem configuration correctly				
	or the capacity of the Unit power	according to the power supply	according to the power supply				
	supply is insufficient.	design method.	design method.				
	There is a hardware error in an	If the error persists even after you	None				
	NX Unit.	make the above correction,					
	replace the NX Unit.						
	For Communications Coupler Units						
	An error that prevents normal NX	Check the error that occurred in	Take preventive measures against				
	bus communications occurred in a	the Communications Coupler Unit	the error that occurred in the Com-				
	Communications Coupler Unit.	and perform the required correc-	munications Coupler Unit.				
		tions.					
	The NX Unit is not mounted prop-	Mount the NX Units and End	Mount the NX Units and End				
	eriy.	Cover securely and secure them	Cover securely and secure them				
	The neuron apple for the limit	with End Plates.	With End Plates.				
	I ne power cable for the Unit	Correctly wire the Unit power sup-	Correctly wire the Unit power sup-				
	power supply is disconnected. Or,	ply to the NX Ohits.	ply to the NX Onits.				
	supply to the NX Units is incorrect						
	The power cable for the Unit	If the nower cable between the	None				
	nower supply is broken	Unit power supply and the NX	None				
		Units is broken replace it					
	The voltage of the Unit power sup-	Correctly configure the power sup-	Correctly configure the power sup-				
	plv is outside the specified range.	ply system according to the power	ply system according to the power				
	Or the capacity of the Unit power	supply design methods.	supply design methods.				
	supply is insufficient						
	There is a hardware error in the	If the error occurs again even after	None				
	NX Unit	you make the above correction					
		replace the NX Unit.					
Attached	None	• •	1				
information							
Precautions/	None						
Remarks							

Event name	NX Unit Output Synchronization Error		Event code	80210000 hex			
Meaning	An output synchr	ronization error occ	curred in the NX U	nit.			
Source	Depends on whe Software is conn system configura	ere the Support ected and the ation.	Source details	NX Unit	nit Detection Continuous timing		
Error	Level	Minor fault		Log category	System		
attributes	Recovery	For the NX bus o	of CPU Units				
		Reset the error ir	n the NX Bus Func	tion Module.			
		For Communicat	ions Coupler Units	ns Coupler Units			
		Reset all of the e	errors in the Contro	ller.			
Effects	User program	Continues.	Operation	The NX Unit will	continue to operate	Ð.	
				Input data: Upda	ting input values st	tops.	
				Output data: The	Output data: The output values depend on the Load		
				Rejection Output	Setting.		
Sys-	Variable		Data type		Name		
tem-defined	None						
variables			0 "				
Cause and	Assumed cause		Correction		Prevention		
correction	For the NX bus o	of CPU Units				<u> </u>	
	I/O refreshing or	n the NX bus is	the CRUUpit and	the CPUL Unit and perform the		neasures against	
	error in the CPU	I Init	required correction	equired corrections.		Unit.	
	For Communicat	ions Coupler Units					
	The communicat	ions cable con-	Replace the communications		Wire the communications cable		
	nected to the Co	mmunications	cable or wire the	cable correctly.	correctly.		
	Coupler Unit is b	roken or the con-					
	nection is faulty.						
	The communicat	ions cable is	Set the Consecut	tive	Implement noise		
	affected by noise) .	Communications	Error Detection	countermeasures	8. Refer to the	
			Count parameter	Coupler Unit to a	Upits for poise or		
			suitable value that	at will not cause		untermeasures.	
			problems in oper	ation.			
			Implement noise				
			countermeasures	s if there is			
			excessive noise.				
Attached	None						
information							
Precautions/	None						
Remarks							

Event name	NX Unit Clock Not Synchronized Error		Event code	80240000 hex			
Meaning	A time informatio	n error occurred in	n an NX Unit.				
Source	Depends on whe Software is conn system configura	re the Support ected and the ttion.	Source details	NX Unit	Detection timing	Continuously	
Error	Level	Minor fault		Log category	System		
attributes	Recovery	For the NX bus o	of CPU Units				
		Cycle the power	supply to the Unit.				
		For Communicat	ations Coupler Units				
		Cycle the power	supply to the Unit	and then reset all of the errors in the Controller.			
Effects	User program	Continues.	Operation	The NX Unit will	continue to operate	е.	
				Input data: Upda	Input data: Updating input values stops.		
				Output data: The Rejection Output	The output values depend on the L utput Setting.		
Sys-	Variable		Data type		Name		
tem-defined	None						
variables					-		
Cause and	Assumed cause		Correction		Prevention	Prevention	
correction	For the NX bus o	of CPU Units	16.0				
	I here is a hardw	are error in an	If the error occurs	s only in a spe-	None		
	NA Unit.		NX Unit.				
	There is a hardw	are error in a	If the error occurs	s in all of the NX	None		
	CPU Unit.		Units mounted or	n a CPU Unit,			
			replace the CPU	Unit.			
	For Communicat	ions Coupler Units					
	There is a hardw	are error in an	If the error occurs	s only in a spe-	None		
	NX Unit.		cific NX Unit, rep	lace the relevant			
	There is a hardw	are error in a	If the error occurs	s in all of the NX	None		
	Communications	Coupler Unit.	Units mounted or	n a Communica-	None		
			tions Coupler Un	it, replace the			
			Communications	Coupler Unit.			
Attached	None						
information							
Precautions/	None						
Remarks							

_				_			
Event name	Over Range			Event code 65140000 hex			
Meaning	The input signal f	from the load cell e	exceeded the uppe	er limit of the input	conversion range		
Source	Depends on whe Software is conne system configura	re the Support ected and the tion.	Source details	NX Unit	Detection timing	Continuously	
Error	Level	Observation		Log category	System		
attributes	Recovery	Reset error in the	e NX Unit.				
Effects	User program	Continues.	Operation	The gross weigh net weight value, 2147483647 for REAL data. The bottom hold DINT data, to -3	t value/force meas and peak hold va DINT data, to 3.40 value goes to -21 402823e+38 for F	surement value, llue go to 2823e+38 for 47483647 for RFAL data	
Sve-	Variablo		Data type	Birti data, to o	Namo		
tom defined	Nana		Data type		INAILIE		
variables	None						
Causo and			Correction		Provention		
cause and	Miring with the le	ad call is not	Check for upcon	a atad wiraa and	None		
Conection	Wiring with the load cell is not connected.		connect any unco they are found.	onnected wires if	None		
	Wiring with the lo	ad cell is broken.	Check the wiring	Check the wiring for breaks and		s for the breaks	
			replace the cable	replace the cable for connecting		e preventive mea-	
			with the load cell if any are found.		sures.		
	EXC+ terminal ar	nd EXC- terminal	Check to see if th	Check to see if the EXC+ terminal		None	
	are short-circuite	d.	and EXC- terminal are short-cir-				
			cuited. If they are short-circuited				
			remove the cause of short-circuit				
			After the cause of	fter the cause of short-circuit is			
			removed, cycle the power to the NX Unit and see if this clears the				
			error.				
	Load cell failure.		Check to see if th	ere are problems	None		
			with the load cell	. Replace the			
			load cell if any ar	e found.			
	A load cell with w	hich the rated	Check the load c	ell rated output. If	Use an appropriate load cell so		
	output exceeds the	ne input range of	the rated output e	exceeds the input that the rated output		tput is within the	
	the Load Cell Inp	ut Unit is used.	range of the Load	d Cell Input Unit,	t, input range of the Load Cell Input Unit.		
			replace with an a	ppropriate load			
			cell so that the ra	ited output is			
			within the input ra	ange.			
	A load that excee	eds the rated	Check the load c	ell rated capacity	Do not apply a lo	bad that exceeds	
	capacity is applie	ed to the load cell.	and the load that	is applied to the	the rated capaci	ty to the load cell.	
			load cell. When a	a load that			
			exceeds the rate	d capacity is			
			applied, take me	asures to keep			
	Naisa		the load within th			t	
	Noise		Cycle the power	to the NX Unit	implement noise	countermea-	
					30163.		
			If the error occurs	s frequently,			
			check for hoise e	ntry paths and			
			implement noise	countermea-			
			sures as required	J.			
Attached	Attached informa	tion 1: Error chanr					
Information		0001 hex: (
Precautions/	You can change	the event level to t	ine minor fault leve	81.			
Remarks							

Event name	Under Range			Event code	65150000 hex	
Meaning	The input signal f	from the load cell v	vent below the low	er limit of the input	conversion range.	
Source	Depends on whe Software is conne system configura	re the Support ected and the tion.	Source details	NX Unit	Detection timing	Continuously
Error	Level	Observation		Log category	System	
attributes	Recovery	Reset error in the	e NX Unit.			
Effects	User program	Continues.	Operation	The gross weight value/force measure net weight value, and bottom hold va -2147483647 for DINT data, to -3.4 REAL data. The peak hold value goes to 214748 data, to 3.402823e+38 for REAL data		urement value, value go to 402823e+38 for 83647 for DINT ta.
Svs-	Variable		Data type		Name	
tem-defined	None					
variables						
Cause and	Assumed cause	•	Correction		Prevention	
correction	Wiring with the lo connected.	ad cell is not	Check for unconr connect any unco they are found.	nected wires and onnected wires if	None	
	Wiring with the lo	ad cell is broken.	Check the wiring for breaks and replace the cable if any are found.		Find the reasons for the breaks and take suitable preventive mea- sures.	
	are short-circuited.		and EXC- termina cuited. If they are remove the cause After the cause o removed, cycle th NX Unit and see error.	al are short-cir- e short-circuited, e of short-circuit. f short-circuit is ne power to the if this clears the		
	Load cell failure.		Check to see if th with the load cell load cell if any ar	ere are problems . Replace the e found.	None	
	A load cell with w output exceeds th the Load Cell Inp	hich the rated ne input range of ut Unit is used.	Check the load of the rated output e range of the Load replace with an a cell so that the ra within the input ra	ell rated output. If exceeds the input d Cell Input Unit, ppropriate load ted output is ange.	Use an appropria that the rated out input range of the Unit.	te load cell so put is within the Load Cell Input
	A load that excee capacity is applie	eds the rated d to the load cell.	Check the load c and the load that load cell. When a exceeds the rate applied, take mea the load within th	ell rated capacity is applied to the l load that d capacity is asures to keep e rated capacity.	Do not apply a load that exceeds the rated capacity to the load cell.	
	Noise		Cycle the power to the NX Unit and see if this clears the error. If the error occurs frequently, check for noise entry paths and implement noise countermea- sures as required.		Implement noise sures.	countermea-
Attached	Attached informa	tion 1: Error chanr	nel			
information		0001 hex: (Channel 1			
Precautions/ Remarks	You can change	the event level to t	he minor fault leve	l		

Event name	NX Message Communications Error			Event code	80220000 hex		
Meaning	An error was detected in message communicati			and the message frame was discarded.			
Source	Depends on where the Support Software is connected and the system configuration.		Source details	NX Unit	Detection timing	During NX message communication s	
Error	Level	Observation		Log category	System		
attributes	Recovery						
Effects	User program	Continues.	Operation	Not affected.			
Sys-	Variable		Data type		Name		
tem-defined	None						
Variables	A countrad course			0		Drougetien	
Cause and	Assumed cause		Correction		Prevention		
conection		mmunications	Reduce the num	har of times that	Boduco the num	har of times that	
	Ine message co	mmunications	instructions are u	used to send NX	Reduce the number of times that		
	load is high.		messages		messages.		
	For Communicati	ions Coupler Units					
	The message co	mmunications	Reduce the number of times that		Reduce the number of times that		
	load is high.		instructions are used to send NX		instructions are used to send NX		
			messages.		messages.		
	The communications cable is dis-		Connect the communications		Connect the communications		
	connected or bro	ken.	cable securely.		cable securely.		
	attached information	tion 2 is 0 (NX					
	bus).						
	Message communications were cutoff by executing the followings						
	in message comr	munications.					
	 Transfer of parameters by the Support Software 						
	Restoration of	the backup data					
	(if this error oc	(if this error occurred in the Eth- erCAT Slave Terminal)					
	erCAT Slave Te						
	 Disconnection of an EtherCAT 						
	slave (if this er	ror occurred in					
Attached	Ine EtherCAT 3	Slave Terminal)	rmation				
information	Attached informa	Attached information 1: System information					
internation		0. NX hus					
		U. INA DUS					
		1. EUICIOAI					
		2: Senai communications (USB)					
Procautions/	b5535: Internal Unit communications (routing)						
Remarks							

Event name	Event Log Cleared			Event code	90400000 hex	
Meaning	The event log was cleared.					
Source	Depends on where the Support		Source details	NX Unit	Detection	When
	Software is connected and the				timing	commanded
	system configuration.					from user
Error	Level	evel Information		Log category	Access	
attributes	Recovery					
Effects	User program	Continues.	Operation	Not affected.		
Sys-	Variable		Data type		Name	
tem-defined	None					
variables						
Cause and	Assumed cause		Correction		Prevention	
correction	The event log was cleared by the					
	user.					
Attached	Attached information 1: Events that were cleared					
information	1: The system event log was cleared.					
	2: The access event log was cleared.					
Precautions/	None					
Remarks						

9

9-4 Resetting Errors

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on how to reset errors.

9-5 Unit-specific Troubleshooting

The following table shows the errors, their assumed causes, and corrections for the Load Cell Input Unit.

Error	Assumed cause	Correction	
Gross weight value/force	Wiring with the load cell is	Check the wiring with the load cell.	
measurement value is not	incorrect.		
refreshed.	Wiring with the load cell is dis- connected.	Recover the wiring with the load cell.	
	Calibration is not executed	Execute the calibration again.	
	correctly.	Refer to Section 7 Calibration Methods for calibra- tion methods.	
	The input signal exceeds the upper limit or is below the lower limit of the input conver-	Check that the appropriate load cell is used so that the rated output is within the input range of the Load Cell Input Unit.	
	sion range.	Check that a load that exceeds the rated capacity is not applied to the load cell.	
	The relationship between the standard weight setting for actual load calibration and the maximum load that is actually applied to the load cell is not appropriate.	Set the standard weight so that the gross weight value/force measurement value that is acquired when the maximum load is applied to the load cell does not exceed the upper limit (or is not below the lower limit when it is used on the minus side), then execute the actual load calibration again.	
		Refer to Section 7 Calibration Methods for calibra- tion methods.	
	The sensor disconnection test is in progress.	Change the Ch1 Sensor Disconnection Test Execu- tion bit in the Ch1 Operation Command of I/O data to 0 to end the sensor disconnection test.	
		Refer to 8-9 Sensor Disconnection Test on page 8-32 for details on the sensor disconnection test.	
	The input value refreshing stop is in progress.	Change the Ch1 Input Value Refreshing Stop bit in the Ch1 Operation Command of I/O data to 0 to end the input value refreshing stop.	
		Refer to <i>8-10 Input Value Refreshing Stop</i> on page 8-35 for details on the input value refreshing stop.	
	There is a problem with the load cell.	Replace the load cell.	
	There is a problem with the Load Cell Input Unit.	Replace the Load Cell Input Unit.	
Gross weight value/force measurement value is not	Wiring with the load cell is incorrect.	Check the wiring with the load cell.	
converted correctly. (con- tinues on next page)	Wiring with the load cell is dis- connected.	Recover the wiring with the load cell.	
	Calibration is not executed	Execute the calibration again.	
	correctly.	Refer to Section 7 Calibration Methods for calibra- tion methods.	

9

Error	Assumed cause	Correction
Gross weight value/force measurement value is not converted correctly.	Basic parameters are not set according to the unit of the gross weight value/force mea-	Set the basic parameters according to the unit of the gross weight value/force measurement value to measure.
	surement value to measure.	Refer to 7-2-2 Basic Parameter Settings on page 7-7 for basic parameters of actual load calibration.
		Refer to 7-3-2 <i>Basic Parameter Settings</i> on page 7-13 for basic parameters of equivalent input calibration.
	The zero point is corrected by the zero set, zero reset, or	Check that the zero set, zero reset, or zero tracking is not used.
	zero tracking.	Refer to 8-3 Zero Set/Zero Reset on page 8-13 or 8-4 Zero Tracking on page 8-16 for details on these functions.
	There is a problem with the load cell.	Replace the load cell.
	There is a problem with the Load Cell Input Unit.	Replace the Load Cell Input Unit.
Gross weight value/force measurement value changes from the value at calibration.	Zero drift and gain drift occur in the Load Cell Input Unit or the load cell due to changes in the ambient temperatures at the calibration site and the installation site.	Use the zero set, zero reset, or zero tracking. You can improve the zero drift with these functions. Refer to 8-3 Zero Set/Zero Reset on page 8-13 or 8-4 Zero Tracking on page 8-16 for details on these functions.
		Execute the actual load calibration again at the ambient temperature of the installation site.
		Refer to <i>Section 7 Calibration Methods</i> for calibra- tion methods.
		If you use the Unit with the equivalent input calibra- tion the zero drift cannot improve even if you exe- cute the calibration again.
	Gravity acceleration of the installation site is different from that of the calibration site where the actual load calibra- tion is executed.	Use the gravity acceleration correction to correct the gross weight value.
		Refer to <i>8-1 Gravity Acceleration Correction</i> on page 8-3 for details of the gravity acceleration correction.
	The warm-up period before the operation is not sufficient.	Execute the measurement after the warm-up period.
		Refer to 2-1-2 Individual Specifications on page 2-3 for information on the warm-up period.
	The warm-up period before the actual load calibration is not sufficient.	Execute the actual load calibration after the warm-up period.
		Refer to <i>2-1-2 Individual Specifications</i> on page 2-3 for information on the warm-up period.
	The time from when the fixed tare or standard weight is	Execute the zero calibration or span calibration after a sufficient time elapses since the fixed tare or
	placed for actual load calibra- tion until zero calibration or span calibration is performed is not sufficient.	standard weight is placed. ^{*1}
Error	Assumed cause	Correction
----------------------------	-----------------------------------	---
Gross weight value is not	The set value of Ch1 Stable	Set the value of Ch1 Stable Status Range as shown
stable even after confirm-	Status Range is not appropri-	below.
ing the gross weight value	ate. For example, it is set to 0	A value other than 0
is stable using stable	or the unit of the gross weight	The unit of the gross weight value to measure
detection.	value to measure is different.	
	The set value of Ch1 Stable	Set the value of Ch1 Stable Status Period to a value
	Status Period is not appropri-	other than 0.
	ate. For example, it is set to 0.	
	The gross weight value is not	Stabilize the gross weight value using digital filter-
	stable due to noise.	ing. Refer to 8-2 Digital Filtering on page 8-5 for
		details on digital filtering.
		Check for noise entry paths and implement noise
		countermeasures as required.
	A sufficient time does not	Check that the gross weight value is stable when a
	elapse after the load applied	sufficient time elapses after the load applied to the
	to the load cell was changed.	load cell is changed. ^{*1}
The gross weight	A force is applied to the load	To change the gross weight value/force measure-
value/force measurement	cell with no load due to the	ment value with no load to 0 without changing the
value with no load does	installation method of the load	installation method of the load cell, use the zero set.
not change to 0 when you	cell.	Or, change the installation method of the load cell
use the Unit after an		so that no force is applied to the load cell with no
equivalent input calibra-		load.
tion is performed.		Refer to 8-3 Zero Set/Zero Reset on page 8-13 for details on the zero set

*1. It can take time for the measurement values to become stable after the load applied to the load cell is changed. The amount of time until the measurement values become stable varies depending on the environment in which the actual load calibration is performed, the load cell that you use, the response characteristics of the digital filter, and the mechanical characteristics of the equipment. Determine the appropriate amount of time according to the operating environment and the response characteristics of the digital filter. Refer to 8-2 Digital Filtering on page 8-5 for the response characteristics of the digital filter.

9-6 Measurement Values Used When an Error Occurs

If an error is detected in measurement value conversion, the measurement value becomes as in the table below and you can see from this measurement value that an error has occurred.

The measurement values differ depending on the data type as follows. DINT data values are always the fixed values without being affected by the decimal point position.

Error name	Data name	Values when an error occurs
 A/D Conversion Error Unit Calibration Value	Ch1 Gross Weight Value/Force Measurement Value DINT	2147483647
Error Actual Load Calibration 	Ch1 Gross Weight Value/Force Measurement Value REAL	3.402823e+38
Value Error	Ch1 Net Weight Value DINT	2147483647
Sensor Disconnected	Ch1 Net Weight Value REAL	3.402823e+38
Error ^{*1}	Ch1 Peak Hold Value DINT	2147483647
	Ch1 Peak Hold Value REAL	3.402823e+38
	Ch1 Bottom Hold Value DINT	-2147483648
	Ch1 Bottom Hold Value REAL	-3.402823e+38
Under Range	Ch1 Gross Weight Value/Force Measurement Value DINT	-2147483648
	Ch1 Gross Weight Value/Force Measurement Value REAL	-3.402823e+38
	Ch1 Net Weight Value DINT	-2147483648
	Ch1 Net Weight Value REAL	-3.402823e+38
	Ch1 Peak Hold Value DINT	2147483647
	Ch1 Peak Hold Value REAL	3.402823e+38
	Ch1 Bottom Hold Value DINT	-2147483648
	Ch1 Bottom Hold Value REAL	-3.402823e+38

*1. During the sensor disconnection test, regardless of whether a Sensor Disconnected Error occurs or not, the gross weight value/force measurement value, net weight value, peak hold value, and bottom hold value are fixed to the values when an error occurs. Refer to *8-9 Sensor Disconnection Test* on page 8-32 for details on the sensor disconnection test.

9-7 Troubleshooting Flowchart

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on the standard troubleshooting process when an error occurs.

10

10

Inspection and Maintenance

This section describes the procedures for cleaning, inspecting, and replacing the Load Cell Input Unit.

10-1 Clean	ing and Inspection	10-2
10-1-1	Cleaning	. 10-2
10-1-2	Periodic Inspection	10-2
10-2 Mainte	enance Procedures	10-5

10-1 Cleaning and Inspection

This section describes daily device maintenance such as cleaning and inspection.

Make sure to perform daily or periodic inspections in order to maintain the Load Cell Input Unit's functions in the best operating condition.

10-1-1 Cleaning

Perform the following cleaning procedures periodically to ensure the Load Cell Input Unit is maintained in the best operating condition.

- Wipe the equipment over with a soft, dry cloth when performing daily cleaning.
- If dirt remains even after wiping with a soft, dry cloth, wipe with a cloth that has been wet with a sufficiently diluted detergent (2%) and wrung dry.
- Units will become stained if items such as rubber, vinyl products, or adhesive tape are left on the NX Unit for a long period. Remove such items during regular cleaning.



Precautions for Correct Use

- · Never use benzene, thinners, other volatile solvents, or chemical cloths.
- Do not touch the NX bus connectors.

10-1-2 Periodic Inspection

NX Units do not have parts with a specific life. However, its elements can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being maintained.

Inspection is recommended at least once every six months to a year, but more frequent inspections may be necessary depending on the severe environments.

Take immediate steps to correct the situation if any of the conditions in the following table are not met.

10-1-2 Periodic Inspection

10

Periodic Inspection Items

	No.	Inspec- tion item	Inspection details	Criteria	Correction
_	1	External power supply	Is the power supply voltage measured at the terminal block within standards?	Within the power sup- ply voltage range	Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring the power supply within the power supply volt- age range.
_	2	I/O power supply	Is the power supply voltage measured at the I/O terminal block within standards?	Voltages must be within I/O specifications of each NX Unit.	Use a voltage tester to check the power voltage at the terminals. Take necessary steps to bring the I/O power supply within NX Unit stan- dards.
	3	Ambient environ- ment	Is the ambient operating tem- perature within standards?	0 to 55°C	Use a thermometer to check the temperature and ensure that the ambient operating temperature remains within the allowed range of 0 to 55°C.
			Is the ambient operating humidity within standards?	Relative humidity must be 10% to 95% with no condensation.	Use a hygrometer to check the humidity and ensure that the ambi- ent operating humidity remains between 10% and 95%.
					Make sure that condensation does not occur due to rapid changes in temperature.
			Is it subject to direct sunlight?	Not in direct sunlight	Protect the Controller if necessary.
			Is there an accumulation of dirt, dust, salt, metal powder, etc.?	No accumulation	Clean and protect the Controller if necessary.
			Is there water, oil, or chemi- cal sprays hitting the Control- ler?	No spray	Clean and protect the Controller if necessary.
			Are there corrosive or flam- mable gases in the area of the Controller?	No spray	Check by smell or use a sensor.
			Is the Unit subject to shock or vibration?	Vibration resistance and shock resistance must be within specifi- cations.	Install cushioning or other vibration and shock absorbing equipment if necessary.
			Are there noise sources near the Controller?	No significant noise sources	Either separate the Controller and noise source, or protect the Control- ler.
_	4	Installa- tion and wiring	Are the DIN track mounting hooks for each NX Unit securely locked?	No looseness	Securely lock the DIN track mount- ing hooks.
			Are the cable connectors fully inserted and locked?	No looseness	Correct any improperly installed connectors.
			Are there any loose screws on the End Plates (PFP-M)?	No looseness	Tighten loose screws with a Phil- lips-head screwdriver.
			Are the NX Units connected to each other along the hookup guides and until they touch the DIN track?	You must connect and fix the NX Units to the DIN track.	Connect the NX Units to each other along the hookup guides and until they touch the DIN track.
			Are there any damaged external wiring cables?	No visible damage	Check visually and replace cables if necessary.

Tools Required for Inspections

• Required Tools

- · Phillips screwdriver
- Flat-blade screwdriver
- · Voltage tester or digital voltmeter
- · Industrial alcohol and pure cotton cloth

• Tools Required Occasionally

- Oscilloscope
- Thermometer and hygrometer

10-2 Maintenance Procedures

When you replace a Load Cell Input Unit, follow the procedure in the user's manual for the connected CPU Unit or Communications Coupler Unit.

When you use the Load Cell Input Unit with the actual load calibration, execute the actual load calibration again.

A

Appendices

This appendix provides dimensions of the Load Cell Input Unit, examples of digital filter design that utilizes data tracing, and other information.

A-1	Dimen	sions	A-2
A-2	Digita	Filter Design That Utilizes Data Tracing	A-3
	A-2-1 A-2-2	Examples of Digital Filter Design	A-3 A-4
A-3	List of	NX Objects	A-7
	A-3-1	Format of NX Object Descriptions	A-7
	A-3-2	Unit Information Objects	A-7
	A-3-3	Objects That Accept I/O Allocations	A-8
	A-3-4	Other Objects	A-13
A-4	Versio	n Information with CPU Units	A-18
	A-4-1	Relationship between Unit Versions of Units	A-18
A-5	Versio	n Information with Communications Coupler Units	A-19
	A-5-1	Connection to the EtherCAT Coupler Unit	A-19
	A-5-2	Connection to the EtherNet/IP Coupler Unit	A-20
A-6	Displa	y Methods for the Calibration View	A-21
	A-6-1	Connection to the CPU Unit	A-21
	A-6-2	Connection to the Communications Coupler Unit	A-22

A-1 Dimensions



(Unit: mm)

The installation height is as follows:



(Unit: mm)

A-2 Digital Filter Design That Utilizes Data Tracing

This section describes the digital filter design that utilizes data tracing.

Digital filtering and data tracing are available on the Load Cell Input Unit. You can utilize these functions to achieve the optimum digital filter design. The assumed system configuration, functions to use, and the design procedure are shown hereafter.

A-2-1 System Configuration

The assumed system configuration is shown below. The system configuration assumes a status exposed to periodically external vibrations on the scale. A system with unstable measurement values caused by the effects of this mechanical noise is assumed.



In this example, even mechanical noise is assumed, you can also use the procedure that is described later to design the optimum digital filter for electrical noise.

A-2-2 Examples of Digital Filter Design

The functions to use with the design of digital filters and examples of the design procedures are shown below.

Functions To Use

The following functions are used in the design procedures.

- · Data tracing
- · Moving average filter of digital filtering

In this example, the moving average filter is used to attenuate the signals in the specific frequency because the effect of periodic noise is assumed.

Refer to 8-12 Data Tracing on page 8-41 for information on the data tracing. Refer to Moving Average Filter on page 8-8 for information on the moving average filter.

Additional Information

Use the digital low-pass filter to stabilize measurement values if they are unstable due to the effects of non-periodic noise. The smaller the cutoff frequency in the digital low-pass filter, the wider range of noise you can remove. This stabilizes the measurement values, but causes the step response time to increase. Set the value of the cutoff frequency after you consider the requirements of the response time. Refer to *Digital Low-pass Filter* on page 8-6 for information on the digital low-pass filter.

Examples of Design Procedures

The following gives an example of procedures for designing digital filters.

1 Execute the data tracing, and then export the tracing result to a CSV file on the Support Software.

Refer to 8-12-3 How to Execute Data Tracing on page 8-43 for how to perform data tracing. Refer to 8-12-4 How to Check the Tracing Result on page 8-45 for how to export tracing data to a CSV file.

2 Open the exported CSV file in Microsoft Excel, and then create a broken line graph with the axis specifications below.

ltem	Specification
Vertical axis	Gross weight value/force measurement value before filtering
Horizontal axis	Number of data

Adjust the display range of the vertical axis and horizontal axis so that you can analyze the fluctuation frequency of the measurement value.

Refer to 8-12-4 How to Check the Tracing Result on page 8-45 for the way to view the CSV file.





Tracing data when da tracing starts

Use the following formula to calculate the fluctuation frequency of the measurement value.

Fluctuation frequency = $\frac{1}{\text{Fluctuation period}} = \frac{1}{\text{Number of data x Data sampling period}}$

According to the graph, the number of data for one period of fluctuations is approximately 760. The sampling period of data for data tracing is $125 \ \mu$ s. If the fluctuation frequency of the measurement value is calculated, it will be as follows.

Fluctuation frequency = $\frac{1}{\text{Fluctuation period}} = \frac{1}{760 \text{ [data] x } 125 \text{ [}\mu\text{s]}} = 10.526 \text{ [Hz]}$

4 Calculate the moving average count of the moving average filter that attenuates the signal of the fluctuation frequency.

Use the following formula to calculate the moving average count.

Moving average count = $\frac{\text{Sampling frequency}}{f_{N}} = \frac{\text{Sampling frequency}}{\text{Fluctuation frequency}}$

The sampling frequency of the moving average filter for a Load Cell Input Unit is 8000 Hz. The fluctuation frequency is the value calculated in step 3. If the moving average count is calculated, it will be as follows.

Moving average count = $\frac{\text{Sampling frequency}}{f_{\text{N}}} = \frac{8000 \text{ [Hz]}}{10.526 \text{ [Hz]}} = 760 \text{ [times]}$

5 Set the moving average count for the moving average filter 1 to 760 times.

Refer to 8-2-3 Setting Method on page 8-11 for how to set the moving average count.

- **6** Execute the data tracing and export the tracing data to a CSV file to check the effectiveness of the moving average filter 1.
- **7** Open the exported CSV file in Microsoft Excel, and then create a broken line graph with the specifications below.

ltem	Specification
Vertical axis	Gross weight value/force measurement value after filtering
Horizontal axis	Number of data

Set the same display range for the vertical axis and the horizontal axis as step 2.

8 Check the effectiveness of moving average filter 1 on the broken line graph.

Fluctuations of measurement value are significantly suppressed by the moving average filter 1.



Additional Information

In this example, fluctuations are significantly suppressed using only the moving average filter 1. If you cannot suppress a frequency from a noise component causing fluctuations with only moving average filter 1, use the moving average filter 2 together to suppress fluctuations. At this time, design moving average filter 2 with the same design procedure and same requirements as moving average filter 1 after you design moving average filter 1.

A-3 List of NX Objects

This section describes the NX objects of the Load Cell Input Unit.

The method to access NX objects through instructions or other messages depends on where the NX Unit is connected.

If the NX Unit is connected to a CPU Unit, access is possible with the Read NX Unit Object instruction and the Write NX Unit Object instruction.

When the NX Unit is connected to a Communications Coupler Unit, the method depends on the connected communications master and Communications Coupler Unit.

Refer to the user's manual for the connected Communications Coupler Unit for method to use messages to access NX objects on Slave Terminals.

A-3-1 Format of NX Object Descriptions

The following format is used to describe objects.

Index (hex)	Subin- dex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cat- ion	Data attri- bute

Name	Description
Index (hex)	The index of the NX object expressed by a 4-digit hexadecimal number.
Subindex (hex)	The subindex of the NX object expressed by a 2-digit hexadecimal number.
Object name	The name of the object. For a subindex, this is the subindex name.
Default	The default setting.
Data range	For read-only data (RO), the displayable data range. For read/write data (RW), the valid data
	range that you can set.
Unit	The physical unit of the object.
Data type	The data type of the object.
Access	RO: Read only
	RW: Read/write
I/O allocation	Whether I/O allocation is allowed.
Data attribute	The timing at which any changes made to a writable NX object take effect.
	Y: Effective after restart
	N: Effective immediately
	: Not writable

A-3-2 Unit Information Objects

These objects are related to product information.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
1000		NX Bus Identity							
	00	Number of Entries	7	7		USINT	RO	Not pos- sible.	
	02	Model	*1			ARRAY [011]OF BYTE	RO	Not pos- sible.	
	04	Product Code	*2			UDINT	RO	Not pos- sible.	
	05	Vendor Code	00000001 hex ^{*3}			UDINT	RO	Not pos- sible.	
	06	Unit Version	*4			UDINT	RO	Not pos- sible.	
	07	Serial Number	*5	00000000 to FFFFFFF hex		UDINT	RO	Not pos- sible.	
1001		Production Info							
	00	Number of Entries	4	4		USINT	RO	Not pos- sible.	
	01	Lot Number	*6	00000000 to FFFFFFF hex		UDINT	RO	Not pos- sible.	
	02	Hardware Version	*7			ARRAY [019] OF BYTE	RO	Not pos- sible.	
	03	Software Version	*7			ARRAY [019] OF BYTE	RO	Not pos- sible.	

*1. This returns the model of the Unit in ASCII. If all 12 bytes are not required, the remaining bytes are filled with spaces (\$20).

- *2. The product codes are assigned for each product model. Bits 0 to 31: Product code
- *3. OMRON's vendor code.
- *5. The unique serial number of the product is given. Bits 0 to 31: Serial number
- *6. The date of manufacture is given for the lot number. Bits 24 to 31: Day of month of manufacture Bits 16 to 23: Month of manufacture Bits 8 to 15: Year of manufacture Bits 0 to 7: Reserved

A-3-3 Objects That Accept I/O Allocations

The following objects are assigned to I/O or used in message communications.

If you assign any of the objects that are described below to I/O, you can no longer access those objects with the Read NX Unit Object instruction or the Write NX Unit Object instruction.

Refer to the instructions reference manual for the connected CPU Unit or Industrial PC for details on the Read NX Unit Object instruction or the Write NX Unit Object instruction.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6000		Detection Status							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Detection Sta-	0000 hex	0000 to FFFF		WORD	RO	Possible.	
		tus		hex					

 This is an aggregated data of the statuses for Sensor Disconnected Error, Under Range and other items which the Load Cell Input Unit detects. Refer to *Detection Status* on page 6-15 for details on Detection Status.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6001		Executing Status							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Executing Sta- tus	0000 hex	0000 to FFFF hex		WORD	RO	Possible.	

 This is an aggregated data of the function statuses for sensor disconnection test, data tracing and other items which the Load Cell Input Unit executes. Refer to *Executing Status* on page 6-16 for details on Executing Status.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6002		Gross Weight Value/Force Mea- surement Value DINT							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Gross Weight Value/Force Mea- surement Value DINT	0	-2147483648 to 2147483647		DINT	RO	Possible.	

 This is the DINT gross weight value/force measurement value. Refer to Gross Weight Value/Force Measurement Value DINT on page 6-17 for details on Gross Weight Value/Force Measurement Value DINT.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6003		Gross Weight Value/Force Mea- surement Value REAL							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Gross Weight Value/Force Mea- surement Value REAL	0.0	-3.402823e+38 to 3.402823e+38		REAL	RO	Possible.	

 This is the REAL gross weight value/force measurement value. Refer to Gross Weight Value/Force Measurement Value REAL on page 6-18 for details on Gross Weight Value/Force Measurement Value REAL.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6004		Net Weight Value DINT							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Net Weight Value DINT	0	-2147483648 to 2147483647		DINT	RO	Possible.	

• This is the DINT net weight value. Refer to *Net Weight Value DINT* on page 6-18 for details on Net Weight Value DINT.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6005		Net Weight Value REAL							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Net Weight Value REAL	0.0	-3.402823e+38 to 3.402823e+38		REAL	RO	Possible.	

 This is the REAL net weight value. Refer to Net Weight Value REAL on page 6-18 for details on Net Weight Value REAL.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6006		Peak Hold Value DINT							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Peak Hold Value DINT	0	-2147483648 to 2147483647		DINT	RO	Possible.	

• This is the DINT peak hold value. Refer to *Peak Hold Value DINT* on page 6-19 for details on Peak Hold Value DINT.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6007		Peak Hold Value REAL							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Peak Hold Value REAL	0.0	-3.402823e+38 to 3.402823e+38		REAL	RO	Possible.	

• This is the REAL peak hold value. Refer to *Peak Hold Value REAL* on page 6-19 for details on Peak Hold Value REAL.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6008		Bottom Hold Value DINT							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Bottom Hold Value DINT	0	-2147483648 to 2147483647		DINT	RO	Possible.	

 This is the DINT bottom hold value. Refer to Bottom Hold Value DINT on page 6-19 for details on Bottom Hold Value DINT.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
6009		Bottom Hold Value REAL							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Bottom Hold Value REAL	0.0	-3.402823e+38 to 3.402823e+38		REAL	RO	Possible.	

• This is the REAL bottom hold value. Refer to *Bottom Hold Value REAL* on page 6-20 for details on Bottom Hold Value REAL.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
600A		Calibration Com-							
		mand Response SID							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Calibration	0	0 to 65535		UINT	RO	Possible.	
		Command							
		Response SID							

• This is a response to the calibration command SID. After the calibration command is executed, the SID of the calibration command that was executed is stored. Refer to *Calibration Command Response SID* on page 6-20 for details on Calibration Command Response SID.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
600B		Calibration Com- mand Response							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Calibration Command Response	0000 hex	0000 to FFFF hex		WORD	RO	Possible.	

• This response shows the execution results of the calibration command. Refer to *Calibration Com*mand Response on page 6-21 for details on Calibration Command Response.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
7000		Operation Command							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Operation Com- mand	0000 hex	0000 to FFFF hex		WORD	RW	Possible.	

• This is an aggregated data for the Operation Command which the Load Cell Input Unit uses to execute functions such as sensor disconnection test and data tracing. Refer to *Operation Command* on page 6-22 for details on Operation Command.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
7001		Calibration Com- mand SID							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Calibration Command SID	0	0 to 65535		UINT	RW	Possible.	

• With this ID, the Load Cell Input Unit identifies calibration command requests. Refer to *Calibration Command SID* on page 6-23 for details on Calibration Command SID.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
7002		Calibration Com- mand							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Calibration Command	0000 hex	0000 to FFFF hex		WORD	RW	Possible.	

 Set the command code for the calibration command. The calibration command lets you select setting items, execute calibration and change calibration modes. Refer to *Calibration Command* on page 6-23 for details on Calibration Command.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
7003		Calibration Data							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Calibration Data	0.0	-3.402823e+38 to 3.402823e+38		REAL	RW	Possible.	

• Set the calibration data. Set the values of the calibration data according to the command codes for the calibration command. Refer to *Calibration Data* on page 6-24 for details on Calibration Data.

A-3-4 Other Objects

The following objects are used in message communications.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5000		Digital Low-pass Fil- ter Cutoff Frequency							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Digital Low-pass Filter Cut- off Frequency	80	0 to 20000	x 0.1 Hz	UINT	RW	Not pos- sible.	Y

• Set the digital low-pass filter cutoff frequency to use the digital low-pass filter. Refer to *Digital Low-pass Filter* on page 8-6 for details on the digital low-pass filter.

A

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5001		Filter 1 Moving Aver- age Count							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Filter 1 Moving Average Count	160	0 to 80000	times	UDINT	RW	Not pos- sible.	Y

• Set the moving average count for the moving average filter 1 to use the moving average filter. Refer to *Moving Average Filter* on page 8-8 for details on the moving average filter.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5002		Filter 2 Moving Aver- age Count							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Filter 2 Moving Average Count	133	0 to 80000	times	UDINT	RW	Not pos- sible.	Y

• Set the moving average count for the moving average filter 2 to use the moving average filter. Refer to *Moving Average Filter* on page 8-8 for details on the moving average filter.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5003		Standard Weight							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Standard	5.0	1.175495e-38		REAL	RW	Not pos-	N
		Weight		to				sible.	
				3.402823e+38					

• Set the value of the standard weight placed on the load cell to perform an actual load calibration. Refer to 7-2-2 Basic Parameter Settings on page 7-7 for details on Standard Weight. Refer to 7-2 Actual Load Calibration on page 7-4 for details on the actual load calibration.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5004		Load Cell Rated							
		Capacity							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Load Cell Rated	5.0	1.175495e-38		REAL	RW	Not pos-	N
		Capacity		to				sible.	
				3.402823e+38					

• Set the rated capacity of the load cell to perform an equivalent input calibration. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for details on Load Cell Rated Capacity. Refer to 7-3 Equivalent Input Calibration on page 7-11 for details on the equivalent input calibration.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5005		Load Cell Rated Output							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Load Cell Rated Output	5.0	1.175495e-38 to 3.402823e+38	mV/V	REAL	RW	Not pos- sible.	N

 Set the rated output of the load cell to perform an equivalent input calibration. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for details on Load Cell Rated Output. Refer to 7-3 Equivalent Input Calibration on page 7-11 for details on the equivalent input calibration.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5006		Load Cell Zero Bal-							
		ance							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Load Cell Zero	0.0	-3.402823e+38	μV/V	REAL	RW	Not pos-	Ν
		Balance		to				sible.	
				3.402823e+38					

• Set the zero balance of the load cell to perform an equivalent input calibration. Refer to 7-3-2 Basic Parameter Settings on page 7-13 for details on Load Cell Zero Balance. Refer to 7-3 Equivalent Input Calibration on page 7-11 for details on the equivalent input calibration.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5007		Gravity Acceleration							
		of Calibration Site							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Gravity Acceler-	9.80665	9.70000 to	m/s ²	REAL	RW	Not pos-	Y
		ation of Calibration		9.99999				sible.	
		Site							

Set the gravity acceleration value of the calibration site to use the gravity acceleration correction. Refer to 8-1 Gravity Acceleration Correction on page 8-3 for details on the gravity acceleration correction.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5008		Gravity Acceleration of Installation Site							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Gravity Acceler- ation of Installation Site	9.80665	9.70000 to 9.99999	m/s ²	REAL	RW	Not pos- sible.	Y

• Set the gravity acceleration value of the installation site to use the gravity acceleration correction. Refer to 8-1 Gravity Acceleration Correction on page 8-3 for details on the gravity acceleration correction.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
5009		Digital Tare Value							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Digital Tare	0.0	0.0		REAL	RW	Not pos-	Y
		Value		to				sible.	
				3.402823e+38					

• Set the tare weight to use the digital tare subtraction. Refer to 8-6-4 Digital Tare Subtraction on page 8-25 for details on the digital tare subtraction.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500A		Zero Point Range							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Zero Point	0.0	0.0		REAL	RW	Not pos-	Y
		Range		to 3.402823e+38				sible.	

• Set the range for zero point correction to use the zero set, zero reset, or zero tracking. Refer to Zero *Point Range Setting* on page 8-21 for details on the zero point range. Refer to 8-3 Zero Set/Zero *Reset* on page 8-13 for details on the zero set and zero reset. Refer to 8-4 Zero Tracking on page 8-16 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500B		Zero Tracking							
		Range							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Zero Tracking	0.0	0.0		REAL	RW	Not pos-	Y
		Range		to				sible.	
				3.402823e+38					

• Set the zero tracking range to use the zero tracking. Refer to *8-4 Zero Tracking* on page 8-16 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500C		Zero Tracking Period							
	00	Number of Entries	1	1		USINT	RO	Not pos-	
								sible.	
	01	Ch1 Zero Tracking	0	0 to 100	x 0.1	UINT	RW	Not pos-	Y
		Period			s			sible.	

• Set the zero tracking period to use the zero tracking. Refer to 8-4 Zero Tracking on page 8-16 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500D		Stable Status Range							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Stable Status	0.0	0.0		REAL	RW	Not pos-	Y
		Range		to 3.402823e+38				sible.	

• Set the range of change for which the gross weight value is determined to be stable. Refer to 8-7 *Stable Detection* on page 8-27 for details on the stable detection.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500E		Stable Status Period							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Stable Status Period	0	0 to 100	x 0.1 s	UINT	RW	Not pos- sible.	Y

• Set the period for which the gross weight value is determined to be stable. Refer to 8-7 Stable Detection on page 8-27 for details on the stable detection.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allo- cation	Data attri- bute
500F		Decimal Point Posi- tion							
	00	Number of Entries	1	1		USINT	RO	Not pos- sible.	
	01	Ch1 Decimal Point Position	0	0 to 4		UINT	RW	Not pos- sible.	Y

 Set the decimal point position for Gross Weight Value/Force Measurement Value DINT, Net Weight Value DINT, Peak Hold Value DINT and Bottom Hold Value DINT to use the decimal point position setting. Refer to 8-13 Decimal Point Position Setting on page 8-47 for the details on the decimal point position setting.

A-4 Version Information with CPU Units

This section provides version-related information when connecting Units to a CPU Unit. This section describes the relationships between the unit versions of each Unit and the CPU Unit, and Sysmac Studio version, and the specification changes for each unit version of each Unit.

A-4-1 Relationship between Unit Versions of Units

The relationship between the unit versions of each Unit and the CPU Unit, and Sysmac Studio version are shown below.

Interpreting the Version Combination Tables

The items that are used in the version combination tables are given below.

Refer to the user's manual for the CPU Unit for the models of CPU Unit to which NX Units can be connected.

NX Ur	nit	Corresponding unit versions/versions				
Model	Unit version	CPU Unit	Sysmac Studio			
Model numbers of	Unit versions	Unit versions of the CPU that are	Sysmac Studio versions that are			
NX Units.	of NX Units.	compatible with the NX Units.	compatible with the NX Units and			
			CPU Unit.			

Version Combination Tables

- With the combinations of the unit versions/versions shown below, you can use the functions that are supported by the unit version of the Unit model. Use the unit versions/versions (or the later/higher unit versions/versions) that correspond to the NX Unit models and the unit versions. You cannot use the specifications that were added or changed for the relevant NX Unit models and the unit versions unless you use the corresponding unit versions/versions.
- Depending on the type and model of the Unit to which the NX Unit is connected, some Units do not
 have the corresponding versions given in the table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.
- If you use the corresponding unit versions/versions given in the following table or later/higher versions, refer to the version information in the user's manual for the CPU Unit.

NX Ur	nit	Corresponding unit versions/versions				
Model	Unit version	CPU Unit	Sysmac Studio			
NX-RS1201	Ver.1.0	Ver.1.13	Ver.1.17			

A-5 Version Information with Communications Coupler Units

This section provides version-related information when connecting Units to a Communications Coupler Unit. Version information is provided separately for each Communications Coupler Unit that an NX Unit is connected to.

A-5-1 Connection to the EtherCAT Coupler Unit

The relationship between the unit versions of each Unit, EtherCAT Coupler Unit, CPU Unit and Industrial PC, and versions of the Sysmac Studio are shown below.

Relationship between Unit Versions of Units

NX	Unit	Corres	sponding unit versions/ve	rsions
Model	Unit version EtherCAT Coupler Unit		CPU Unit or Industrial PC	Sysmac Studio
This is the	This is the	This is the unit version of	This is the unit version of	This is the version of the
model num-	unit version of	the EtherCAT Coupler	the NJ/NX-series CPU	Sysmac Studio that sup-
ber of the NX	the NX Unit.	Unit that supports the NX	Unit or NY-series Indus-	ports the NX Unit, Ether-
Unit.		Unit.	trial PC that supports the	CAT Coupler Unit, CPU
			EtherCAT Coupler Unit.	Unit, and Industrial PC.

The items that are used in the version combination tables are given below.

The version combination table is given below.

- With the combinations of the unit versions/versions shown below, you can use the functions that are supported by the unit version of the Unit model. Use the unit versions/versions (or the later/higher unit versions/versions) that correspond to the NX Unit models and the unit versions. You cannot use the specifications that were added or changed for the relevant NX Unit models and the unit versions unless you use the corresponding unit versions/versions.
- Depending on the type and model of the Unit to which the NX Unit is connected, some Units do not have the corresponding versions given in the table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.
- If you use the corresponding unit versions/versions given in the following table or later/higher ve sions, refer to the version information in the user's manual for the Communications Coupler Unit, CPU Unit, and Industrial PC.

NX Unit		Corresponding unit versions/versions					
Model	Unit version	EtherCAT Coupler Unit	CPU Unit or Indus- trial PC	Sysmac Studio			
NX-RS1201	Ver. 1.0	Ver. 1.0	Ver. 1.05	Ver. 1.16			

A-5-2 Connection to the EtherNet/IP Coupler Unit

The relationship between the unit versions of each Unit, EtherNet/IP Coupler Unit, CPU Unit and Industrial PC, and versions of the Sysmac Studio and NX-IO Configurator are shown below.

Relationship between Unit Versions of Units

The items that are used in the version combination tables are given below.

NX Un	it		Corre	esponding unit	t versions/vers	ions		
	Unit ver-	Application w	ith an NJ/NX/N troller	Y-series Con-	Application with a CS/CJ/CP-series PLC			
Model	sion	EtherNet/IP Coupler Unit	CPU Unit or Industrial PC	Sysmac Stu- dio	EtherNet/IP Coupler Unit	Sysmac Stu- dio	NX-IO Con- figurator	
This is the	This is the	This is the unit	This is the	This is the	This is the	This is the	This is the	
model number	unit ver-	version of the	unit version	version of the	unit version	version of the	version of the	
of the NX Unit.	sion of the	EtherNet/IP	of the	Sysmac Stu-	of the Ether-	Sysmac Stu-	NX-IO Con-	
	NX Unit.	Coupler Unit	NJ/NX-series	dio that sup-	Net/IP Cou-	dio that sup-	figurator that	
		that supports	CPU Unit or	ports the NX	pler Unit that	ports the NX	supports the	
		the NX Unit.	NY-series	Unit, Ether-	supports the	Unit, Ether-	NX Unit, Eth-	
			Industrial PC	Net/IP Cou-	NX Unit.	Net/IP Cou-	erNet/IP	
			that sup-	pler Unit,		pler Unit, and	Coupler Unit,	
			ports the Eth-	CPU Unit,		CPU Unit.	and CPU	
			erNet/IP	and Indus-			Unit.	
			Coupler Unit.	trial PC.				

The version combination table is given below.

- With the combinations of the unit versions/versions shown below, you can use the functions that are supported by the unit version of the Unit model. Use the unit versions/versions (or the later/higher unit version/versions) that correspond to the NX Unit models and the unit versions. You cannot use the specifications that were added or changed for the relevant NX Unit models and the unit versions unless you use the corresponding unit versions/versions.
- Depending on the type and model of the Unit to which the NX Unit is connected, some Units do not have the corresponding versions given in the table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.
- If you use the corresponding unit versions/versions given in the following table or later/higher versions, refer to the version information in the user's manual for the Communications Coupler Unit, CPU Unit, and Industrial PC.

NX Un	it	Corresponding unit versions/versions							
Model	Unit ver-	Application w	ith an NJ/NX/N troller ^{*1}	Y-series Con-	Application with a CS/CJ/CP-series PLC				
	sion	EtherNet/IP Coupler Unit	CPU Unit or Industrial PC	Sysmac Stu- dio	EtherNet/IP Coupler Unit	Sysmac Stu- dio	NX-IO Con- figurator ^{*3}		
NX-RS1201	Ver. 1.0	Ver. 1.2	Ver. 1.14	Ver. 1.19	Ver. 1.0	Ver. 1.16	Ver. 1.00		

*1. Refer to the user's manual for the EtherNet/IP Coupler Units for information on the unit versions of EtherNet/IP Units that are compatible with EtherNet/IP Coupler Units.

*2. Refer to the user's manual for the EtherNet/IP Coupler Units for information on the unit versions of CPU Units and EtherNet/IP Units that are compatible with EtherNet/IP Coupler Units.

*3. For connection to an EtherNet/IP Coupler Unit with unit version 1.0, You can connect only to the peripheral USB port on the EtherNet/IP Coupler Unit. You cannot connect with any other path. If you need to connect by another path, use an EtherNet/IP Coupler Unit with unit version 1.2 or later.

A-6 Display Methods for the Calibration View

A-6-1 Connection to the CPU Unit

This section describes how to display the Sysmac Studio calibration view for a Load Cell Input Unit connected to the CPU Unit.

1 In the Multiview Explorer, double-click the CPU Rack to which the target Load Cell Input Unit is connected to open the CPU and Expansion Racks Tab Page.

The following tab page is displayed.

Multiview Explorer 🗸 🕂	CPU/Expansion Racks ×
new_Controller_0	
▼ Configurations and Setup	
翻 EtherCAT	
V 🖾 CPU/Expansion Racks	
CPU Rack	
L = Unit 1 : NX-RS1201 (N1)	1 1
🗸 I/O Map	
🕨 💌 Controller Setup	
▶ 蓹 Motion Control Setup	

2 Right-click the target Load Cell Input Unit on the CPU and Expansion Racks Tab Page and select **Calibration and Data Trace**.

The following view is displayed.

2	Calibration		
	Actual Load Calibration	Stable status: ON	Execute Zero Calibration Execute Span Calibration
	Equivalent Input Calibra Click this button if you Change fro	tion u want to execute the equivalent input calibr om Actual Load Calibration Mode to Equivale	ation after the actual load calibration. Int Input Calibration Mode

A-6-2 Connection to the Communications Coupler Unit

This section describes how to display the Support Software calibration view for a Load Cell Input Unit connected to the Communications Coupler Unit.

This section describes how to display the calibration view with the Sysmac Studio. For details on how to display the calibration view with Support Software other than Sysmac Studio, refer to the operation manual for the Support Software that you are using.

1 In the Multiview Explorer, double-click the Communications Coupler Unit to which the target Load Cell Input Unit is connected to open the Edit Slave Terminal Configuration Tab Page.

The following tab page is displayed.

Multiview Explorer 🚽 🖵	Node1:NX-ECC203 (E001) ×
new_Controller_0	
▼ Configurations and Setup	
▼	
Node1 : NX-ECC203 (E001) : Offline	
∟ 🐘 Unit 1 : NX-RS1201 (N1)	
CPU/Expansion Racks	i
🖈 I/O Map	
Controller Setup	
▶ @ Motion Control Setup	

2 Right-click the target Load Cell Input Unit on the Edit Slave Terminal Configuration Tab Page and select Calibration and Data Trace.

The following view is displayed.

~	Calibration		
	Actual Load Calibration -		
\sim		Stable status: ON	Execute Zero Calibration
Equivalent Input Calibration — Click this button if you want to execute the equivalent input calibration after the actual load calibration.			
	Change fro	om Actual Load Calibration Mode to Equivale	ent Input Calibration Mode



Index

Index

Α

access	A-7
Applicable Wires	
assumed cause	
attenuation characteristics	

В

Bottom Hold Value DINT	
Bottom Hold Value REAL	
built-in EtherCAT port	11

С

Calibration Command	6-23
Calibration Command Response	6-21
Calibration Command Response SID	6-20
Calibration Command SID	6-23
Calibration Data	6-24
Coding Pin	4-16
Communications Coupler Unit	1-5
Communications Master Unit	5-3
CPU Rack	1-5
CPU Unit	5-3
crimping tool	
current error	
cutoff frequency	

D

data attribute	A-7
data range	A-7
data type	A-7
DC is enabled	
default	A-7
Detection Status	6-15
digital low-pass filter	
DIN Track contact plate	
DIN Track mounting hook	

Е

orror descriptions	0.11
event code	
event name	
Executing Status	6-16

F

Ferrule	4-5
fixed tare	6-4

G

6-4
NT.6-17
EAL 6-18
4-5, 4-6
3-5

I

I/O allocation	A-7
I/O allocation information	6-13
I/O allocation setting	6-13
I/O entry	6-13
I/O entry mapping	6-13
I/О Мар	4-19
I/O power supply	4-3
incorrect attachment prevention hole	4-16
index	A-7
indicator	3-2
Industrial PC	11

L

log of past error	 9-6
log of past error	 9-6

Μ

marker attachment location	3-2
model number indication	3-3
moving average count	8-9
moving average filter	8-8

Ν

n at waight value	C 4
net weight value	0-4
Net Weight Value DINT	6-18
Net Weight Value REAL	6-18
NX bus connector	3-2
NX Unit power supply	4-3

Ο

object name	A-7
Operation Command	6-22
operation for task period prioritized refreshing .	5-13
operation of Free-Run refreshing	5-8
operation of synchronous I/O refreshing	5-9
output characteristics of the load cell	6-3
overview of the load cell	6-2

Ρ

Peak Hold Value DINT	6-19
Peak Hold Value REAL	6-19
periodic inspection item	10-3
press fitting system	1-9
Preventing Incorrect Attachment	4-16
protrusions for removing the Unit	3-2

Q

R

refresh cycle of the NX bus	5-2, 5-3
release hole	3-5

S

scaling system	1-7
securing wire	4-11
shield	4-20
Slave Terminal	1-5
Solid Wire	4-6
step response characteristics	8-7, 8-9
subindex	A-7
summing box	4-23
Sync0	5-11
synchronization timing	5-9

т

tare	6-4
terminal block	3-2
terminal hole	3-5
terminal number indication	3-5
timing to read inputs	5-8
timing to refresh outputs	5-8
TS indicator	3-3
Twisted Wire	4-6

U

unit	A-7
Unit hookup guides	3-2
unit specifications	3-2

W

warm-up	7-3
Watch Tab Page	4-19
Weighing Control Library	2-7
Wiring Terminals	4-4

Index
OMRON Corporation **Industrial Automation Company** Kyoto, JAPAN

Contact: www.ia.omron.com

Regional Headquarters OMRON EUROPE B.V. Wegalaan 67-69, 2132 JD Hoofddorp The Netherlands Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ASIA PACIFIC PTE. LTD. No. 438A Alexandra Road # 05-05/08 (Lobby 2), Alexandra Technopark, Singapore 119967 Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON ELECTRONICS LLC

2895 Greenspoint Parkway, Suite 200 Hoffman Estates, IL 60169 U.S.A. Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON (CHINA) CO., LTD. Room 2211, Bank of China Tower, 200 Yin Cheng Zhong Road, PuDong New Area, Shanghai, 200120, China Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

 \circledast OMRON Corporation 2016-2018 All Rights Reserved. In the interest of product improvement, specifications are subject to change without notice.

Cat. No. W565-E1-05