OMRON

Machine Automation Controller

NX-series

Load Cell Input Unit

User's Manual

NX-RS□□□□

Load Cell Input Unit

SYSMAC
always in control

W565-E1-02

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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□□□□

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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.

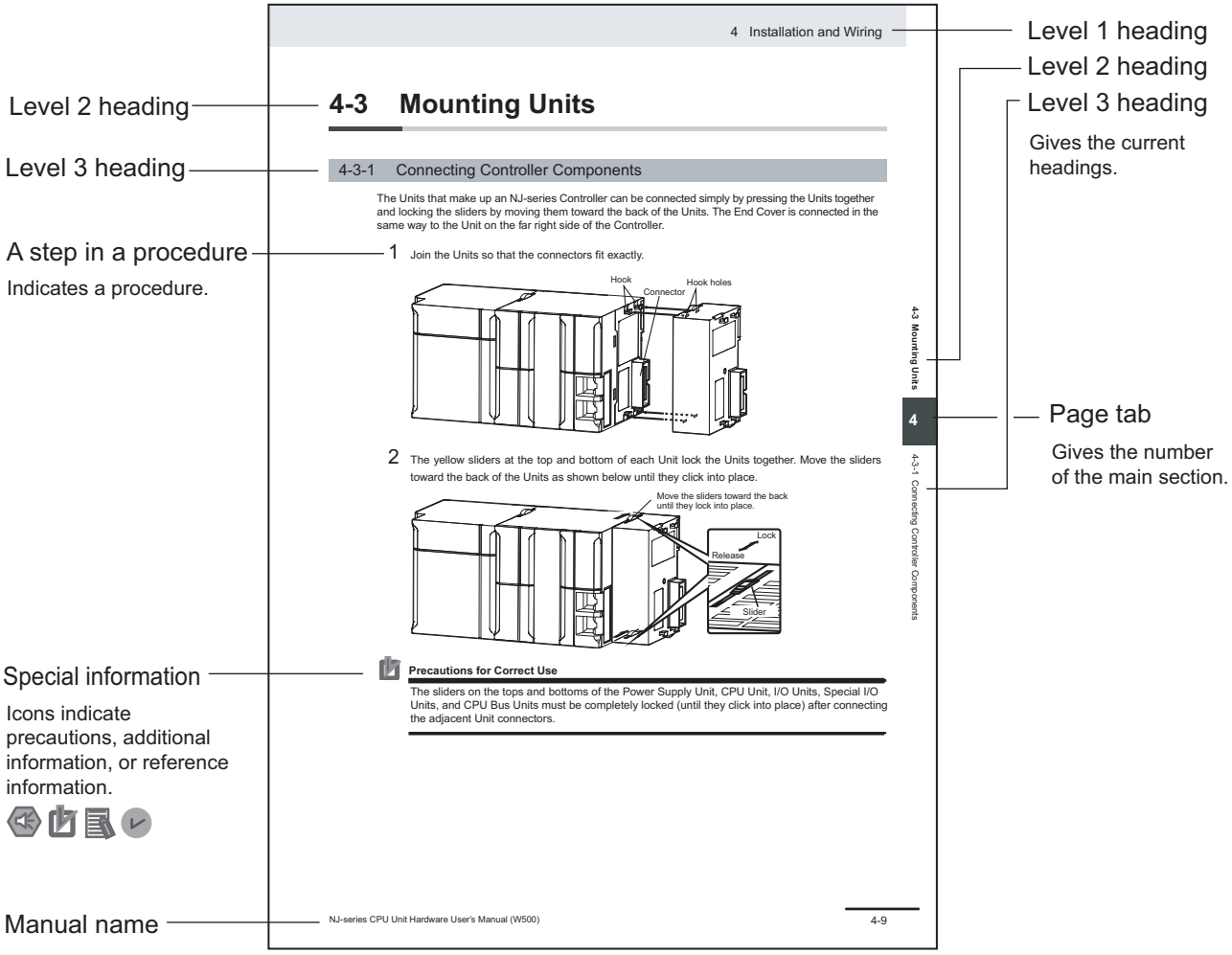
Other manuals, such as related product manuals, are necessary for specific system configurations and applications. Refer to *Related Manuals* on page 30 for the related manuals.

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

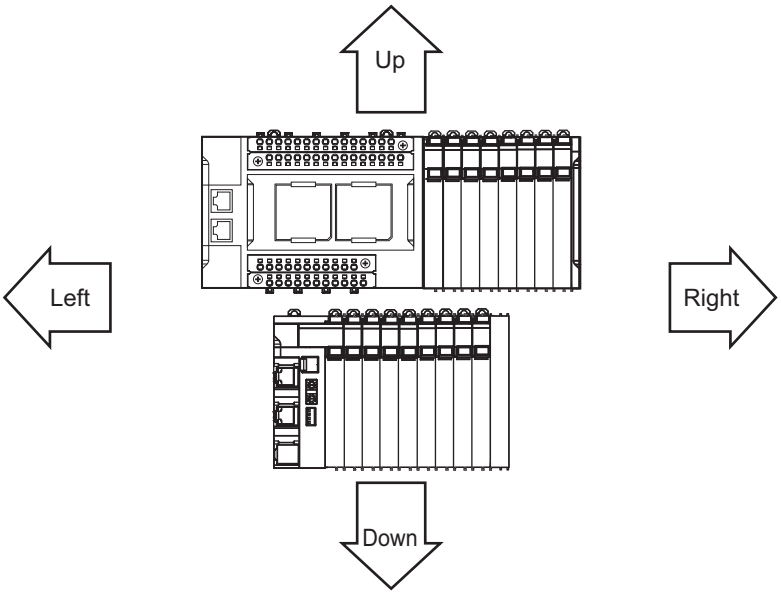
Version Information

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 Sysmac Studio 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 Sysmac Studio to the physical Controller and “upload” refers to transferring data from the physical Controller to the Sysmac Studio.
  For the Sysmac Studio, synchronization is used to both upload and download data. Here, “synchronize” means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.
- 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 30 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 User's Manual	Software user's manual for the connected CPU Unit or Industrial PC	Software User's Manual
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Software User’s Manual		
NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual	User's manual for built-in EtherCAT port on the connected CPU Unit or Industrial PC	Built-in EtherCAT port
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Built-in EtherCAT® Port User’s Manual		

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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.

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

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.

Warnings

⚠ WARNING

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

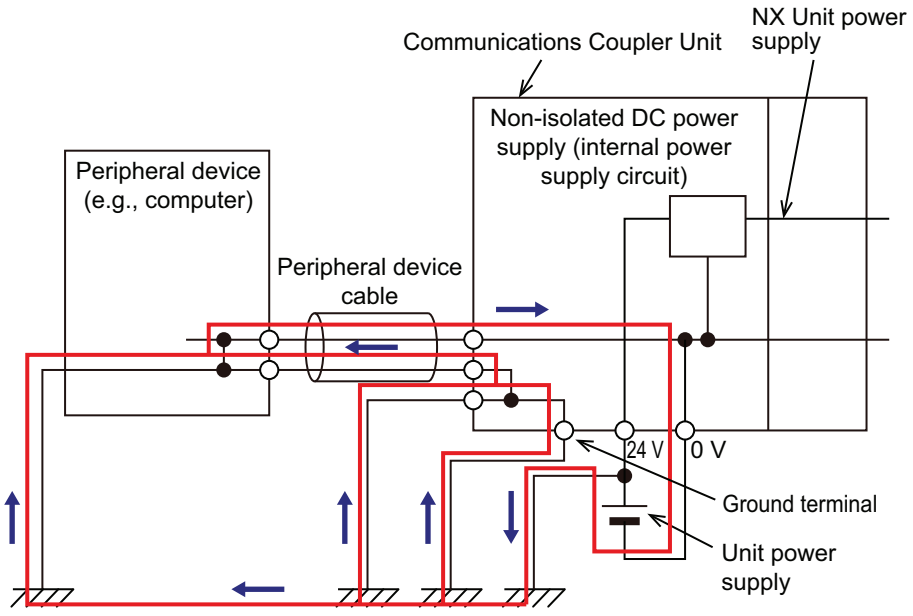
⚠ Caution

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

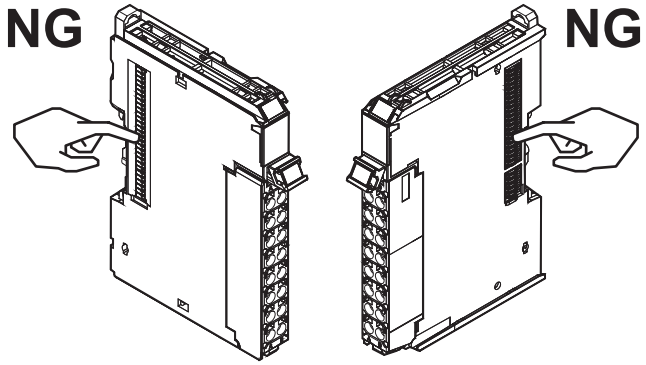
- When transporting any Unit, use the special packing box for it.
  Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock.
  Doing so may result in Unit malfunction or burning.

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.

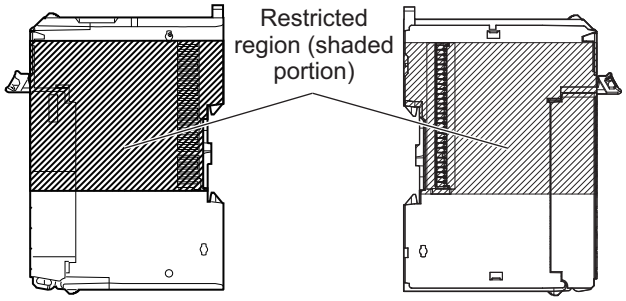
Installation

- 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.

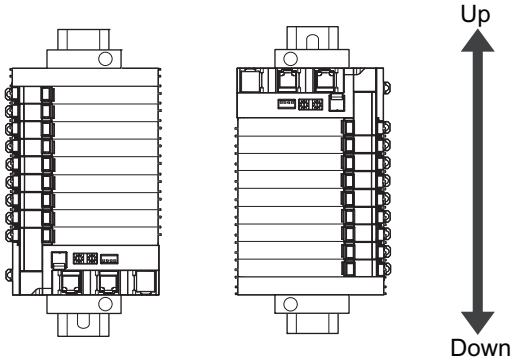


Example: NX Unit (12 mm width)

- 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.



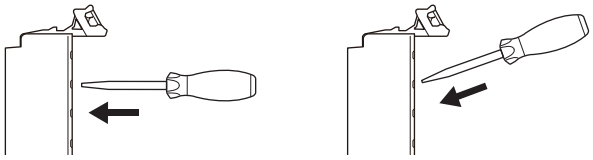
- For the installation orientations in the following figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured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

NG **OK**



- 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.

NG **NG**

- 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.
- Use the I/O power supply current for the CPU Rack of NX1P2 CPU Unit at 4 A or less. Using the currents that are outside of the specifications may cause failure or damage.
- 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 Sysmac Studio.
- 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.

  We recommend that you use the OMRON S8VK-S series Power Supplies for the CPU Racks for NX-series NX1P2 CPU Units. We recommend that you use the OMRON S8JX-series Power Supplies for Slave Terminals. EMC standard compliance was confirmed for these recommended Power Supplies.
- 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% (full scale)	Digital low-pass filter: 8 Hz 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.

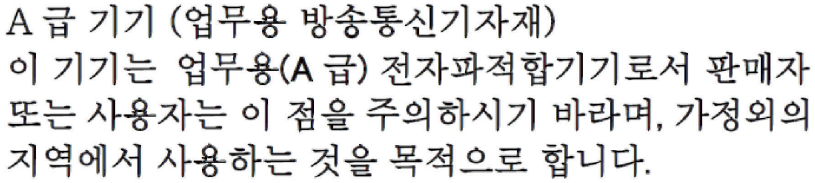
Conformance to Shipbuilding Standards

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.

Conformance to KC Standards

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



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 Sysmac Studio versions.

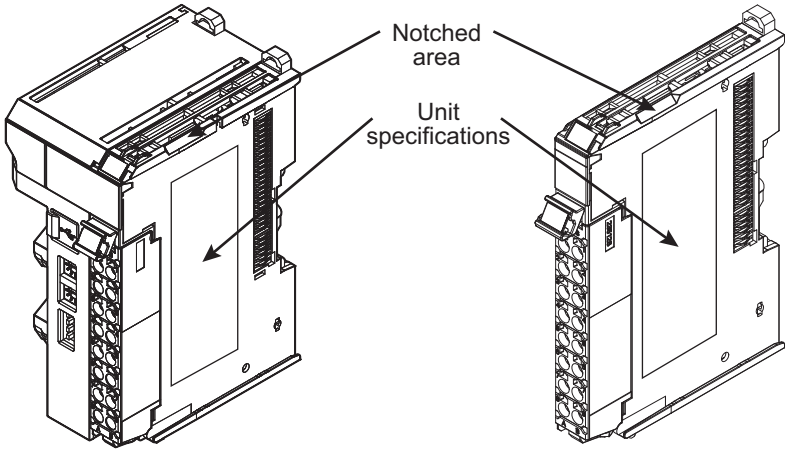
Unit Versions

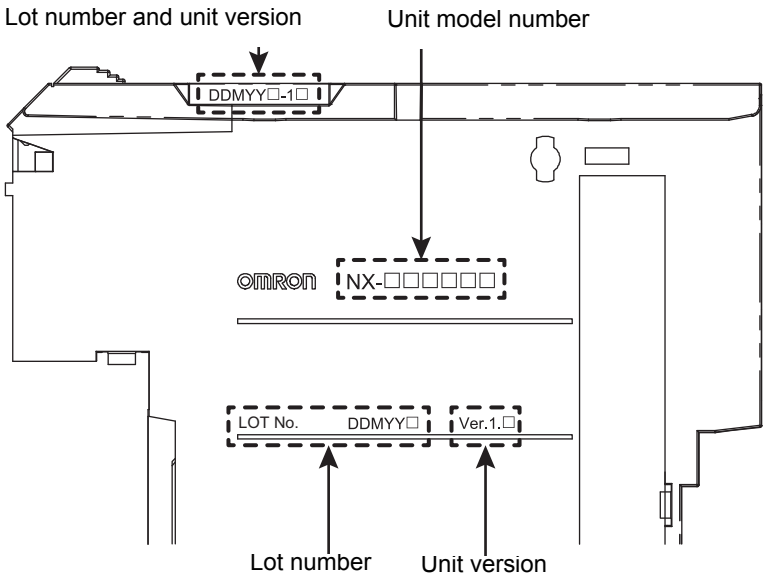
A “unit version” has been introduced to manage the Units in the NX Series according to differences in functionality accompanying Unit upgrades.

An example for a Slave Terminal is given below. 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 unit version	Gives the lot number and unit version 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) • 1□: Unit version The decimal portion of the unit version is omitted. (It is provided in the Unit specifications.)

Confirming Unit Versions with the Sysmac Studio

You can use the Production Information on the Sysmac Studio to check the unit versions of Communications Coupler Unit and NX Units.

The following example is for an EtherCAT Slave Terminal.

Refer to the user's manual for the connected Communications Coupler Unit for details on how to check the unit versions of the Units on any other type of Slave Terminal.

1 Select ***Configurations and Setup*** in the Multiview Explorer and then select ***EtherCAT***. Double-click the EtherCAT Coupler Unit under **EtherCAT**. Or, right-click the EtherCAT Coupler Unit and select ***Edit*** from the menu.
The Edit Slave Terminal Configuration Tab Page is displayed.

You can also display the Edit Slave Terminal Configuration Tab Page with any of the following operations.

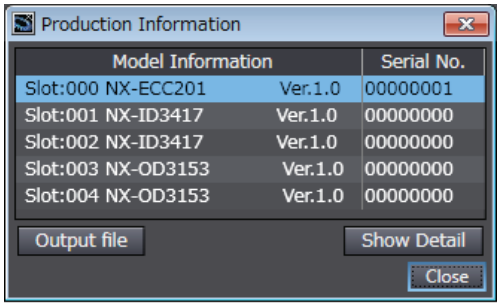
Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer, right-click the EtherCAT Coupler Unit in the EtherCAT Configuration Edit Tab Page, and select ***Edit Slave Terminal Configuration***.

Or, select the EtherCAT Coupler Unit on the EtherCAT Configuration Edit Tab Page, and then click the **Edit Slave Terminal Configuration** Button.

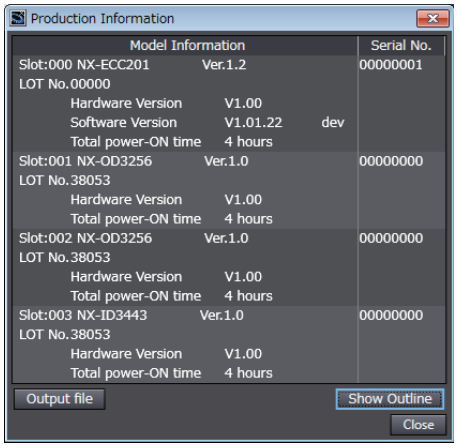
2 Go online.

3 Right-click the EtherCAT Coupler Unit and select ***Display Production Information*** from the menu.

The Production Information Dialog Box is displayed.



Simple Display



Detailed Display

In this example, “Ver.1.0” is displayed next to the Unit model.

The following items are displayed.

- Slot number
- Unit model number
- Unit version
- Serial number
- Lot number
- Hardware version
- Software version
- Total power-ON time

The software version is displayed only for Units that contain software.

Version Information

The total power-ON time is provided by function to monitor the total power-ON time. The function to monitor the total power-ON time in the Communications Coupler Unit was added for a version upgrade. Refer to the user's manual for the Communications Coupler Unit for the versions that support monitoring the total power-ON time.

Unit Versions and Sysmac Studio Versions

The functions that are supported depend on the unit version of the Unit. The version of Sysmac Studio 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-17 or *A-5 Version Information with Coupler Units* on page A-18 for the functions that are supported by each unit version.

Related Manuals

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

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 Load Cell Input Unit	The hardware, setup methods, and functions of the NX-series Load Cell Input Unit are described.
NX-series Data Reference Manual	W525	NX-□□□□□□	Referencing lists of the data that is required to configure systems with NX-series Units	Lists of the power consumptions, weights, and other NX Unit data that is required to configure systems with NX-series Units are provided.
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.
NJ/NX-series Troubleshooting Manual	W503	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□ NX1P2-□□□□	Learning about the errors that may be detected in an NJ/NX-series Controller.	Concepts on managing errors that may be detected in an NJ/NX-series Controller and information on individual errors are described.
NY-series Troubleshooting Manual	W564	NY532-□□□□ NY512-□□□□	Learning about the errors that may be detected in an NY-series Industrial PC	Concepts on managing errors that may be detected in an NY-series Controller and information on individual errors are described.
NX-series EtherCAT® Coupler Unit User's Manual	W519	NX-ECC20□	Learning how to use an NX-series EtherCAT Coupler Unit and EtherCAT Slave Terminals	The following items are described: the overall system and configuration methods of an EtherCAT Slave Terminal (which consists of an NX-series EtherCAT Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units through EtherCAT.
NX-series EtherNet/IP™ Coupler Unit User's Manual	W536	NX-EIC202	Learning how to use an NX-series EtherNet/IP Coupler Unit and EtherNet/IP Slave Terminals	The following items are described: the overall system and configuration methods of an EtherNet/IP Slave Terminal (which consists of an NX-series EtherNet/IP Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series CPU Unit Hardware User's Manual	W535	NX701-□□□□	Learning the basic specifications of the NX-series NX701 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	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 • 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 introductory information, designing, installation, and maintenance. Mainly hardware information 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 Manual	W500	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series 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
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 information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NY-series system is provided along with the following information on the Industrial Panel PC. • Features and system configuration • Introduction • 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 Box PC Hardware User's Manual	W556	NY512-□□□□	Learning the basic specifications of the NY-series Industrial Box PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NY-series system is provided along with the following 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-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□ NX1P2-□□□□	Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.	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-□□□□ NY512-□□□□	Learning how to program and set up the Controller functions of an NY-series Industrial PC	The following information is provided on NY-series Machine Automation Control 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-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□ NX1P2-□□□□	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 configuration, features, and setup.
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Built-in EtherCAT® Port User's Manual	W562	NY532-□□□□ NY512-□□□□	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 configuration, features, and setup.
NJ/NX-series Instructions Reference Manual	W502	NX701-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□ NX1P2-□□□□	Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit	The instructions in the instruction set (IEC 61131-3 specifications) are described.
NY-series Instructions Reference Manual	W560	NY532-□□□□ NY512-□□□□	Learning detailed specifications on the basic instructions of an NY-series Industrial PC	The instructions in the instruction set (IEC 61131-3 specifications) are described.
NJ/NX-series Sysmac Library User's Manual for Weighing Control Library	W569	SYSMAC-XR010	Learning the function block specifications in the Weighing Control Library.	Information required to use the Weighing Control Library is described.

Terminology

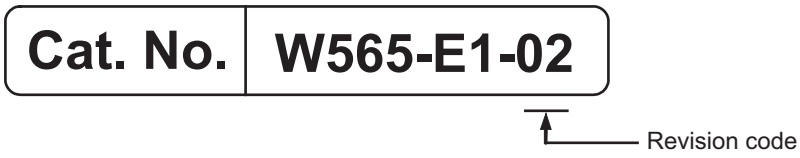
Term	Abbre-viation	Description
actual load calibration	---	One of the calibration methods of the Load Cell Input Unit. The actual weight or force is applied to the load cell to calibrate.
application layer status, AL status	---	Status for indicating information on errors that occur in an application 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 an NX1P2 CPU Unit, a CPU Rack has a CPU Unit with NX Units and an End Cover mounted to it.
DC time	---	Time indicated by the clock shared between the CPU Unit and the NX Units in a CPU Rack for an NX-series NX1P2 CPU Unit. 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 an NX-series NX1P2 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 an NX-series NX1P2 CPU Unit, 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 technology 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.
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.

Term	Abbre-viation	Description
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 CPU Unit or 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 predetermined 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 output. 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, communication objects and application objects.
Operational	---	A state in EtherCAT communications where SDO communications and I/O are possible.
PDO communications	---	An acronym for process data communications.
Pre-Operational	---	A state in EtherCAT communications where only SDO communications are possible with the slaves, i.e., no I/O can be performed.
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 EtherCAT communications where only SDO communications and reading input data from slaves are possible. Outputs from slaves are not performed.
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 to which a Communications Coupler Unit and NX Units are mounted

Term	Abbreviation	Description
span calibration	---	One of the calibration types. The gross weight value or force measurement 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 signal, 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 according 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 executed.
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 μV/°C.
zero point	---	Point on the straight line where the gross weight value or force measurement 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.

Sections in this Manual

1 Features and System Configuration

2 Specifications and Application Procedures

3 Part Names and Functions

4 Installation and Wiring

5 I/O Refreshing

6 Specifications of Input Conversion and I/O Data

7 Calibration Methods

8 Functions

9 Troubleshooting

10 Inspection and Maintenance

A Appendices

I Index

1

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 Features of Load Cell Input Unit 1-2

1-2 System 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 Models, Functions and Support Software 1-10

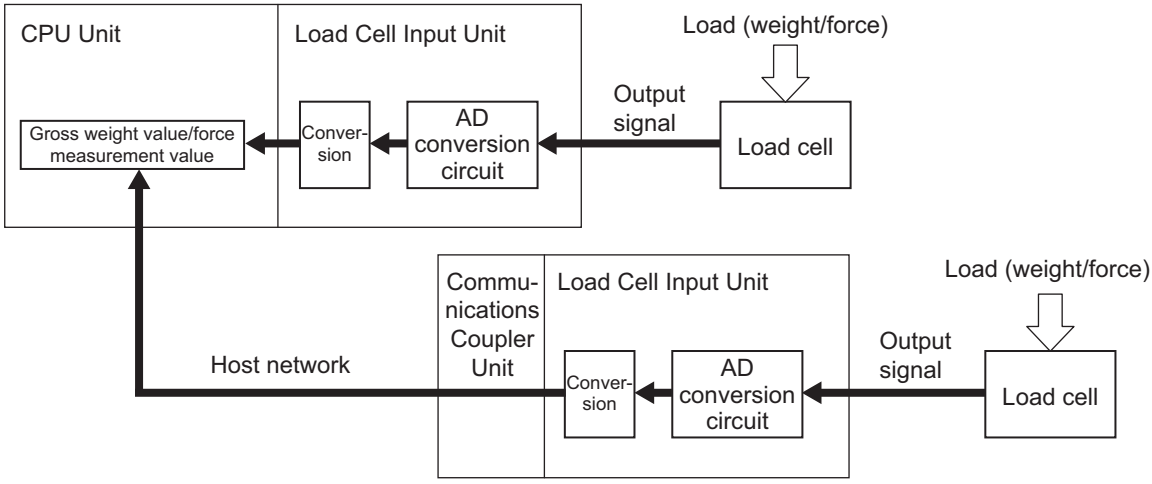
1-3-1 List of Unit Models 1-10

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

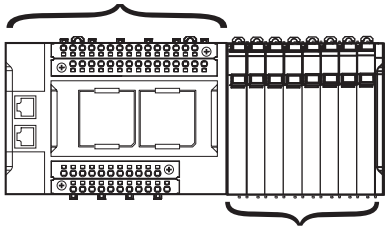
NX Unit NX-series Load Cell Input Unit can be connected to the following Units.*1

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

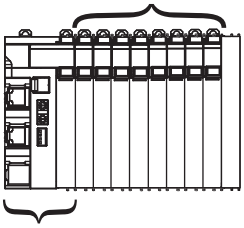
When a CPU Unit and a Communications Coupler Unit are used together, you can unify the methods for installing, wiring, and setting up NX Units, and eventually reduce design costs.

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.

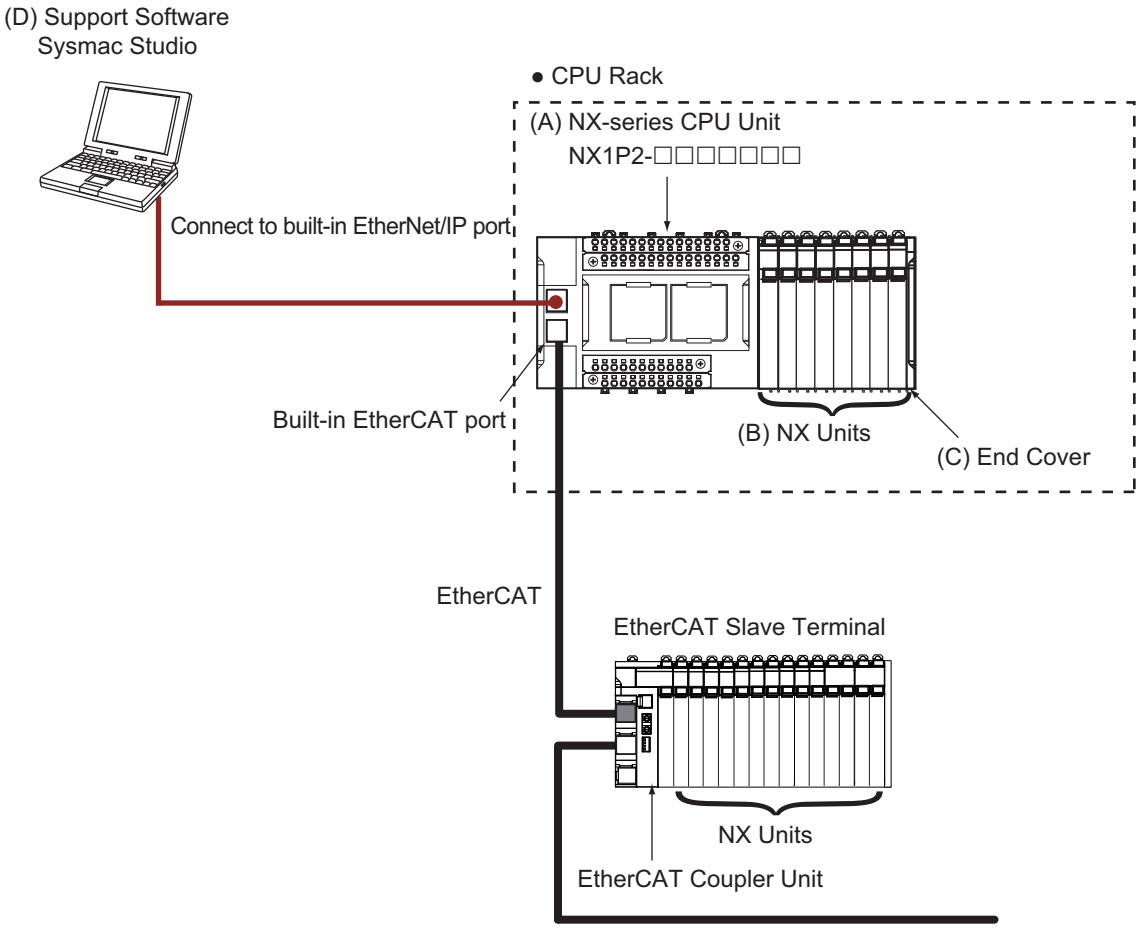
- NX-series CPU Unit
- NX-series Communications Coupler Unit

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 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.



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

Symbol	Item	Description
(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.

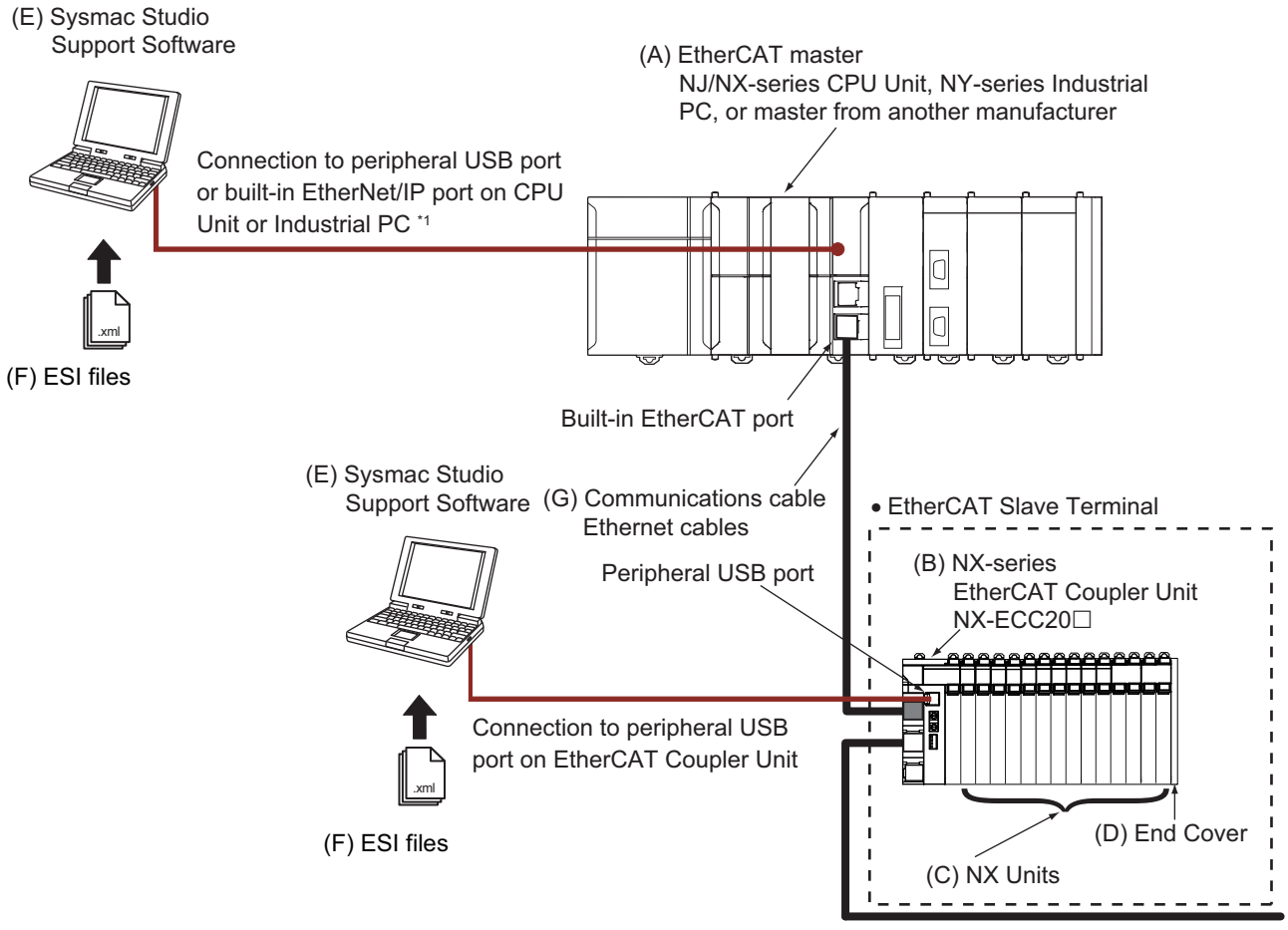
1-2-2 System Configuration of Slave Terminals

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 Sysmac Studio depends on the model of the CPU Unit or Industrial PC.

Letter	Item	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 communications on the EtherCAT network between the NX Units and the EtherCAT 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	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)	Sysmac Studio Support Software	The Sysmac Studio runs on a personal computer and it is used to configure the EtherCAT network and EtherCAT Slave Terminal, and to program, monitor, and troubleshoot the Controllers. You can connect the computer, in which the Sysmac Studio is installed, to the peripheral USB port or built-in EtherNet/IP port on an NJ/NX-series CPU Unit and an NY-series Industrial PC to set up the EtherCAT Slave Terminal. However, the usable connection methods depend on the model of the CPU Unit or Industrial PC.*2 Or you can connect it to the peripheral USB port on the EtherCAT Coupler Unit to set up the EtherCAT Slave Terminal.
(F)	ESI (EtherCAT Slave Information) file	The ESI file contains information that is unique to the EtherCAT Slave Terminal in XML format. You can load the ESI file into the Sysmac Studio to easily allocate Slave Terminal process data and configure other settings. The ESI files for OMRON EtherCAT slaves are already installed in the Sysmac Studio. You can update the Sysmac Studio 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 details on the methods for placing the Sysmac Studio online with the CPU Unit or the Industrial PC, refer to the hardware user's manual for the connected CPU Unit or Industrial PC.

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.

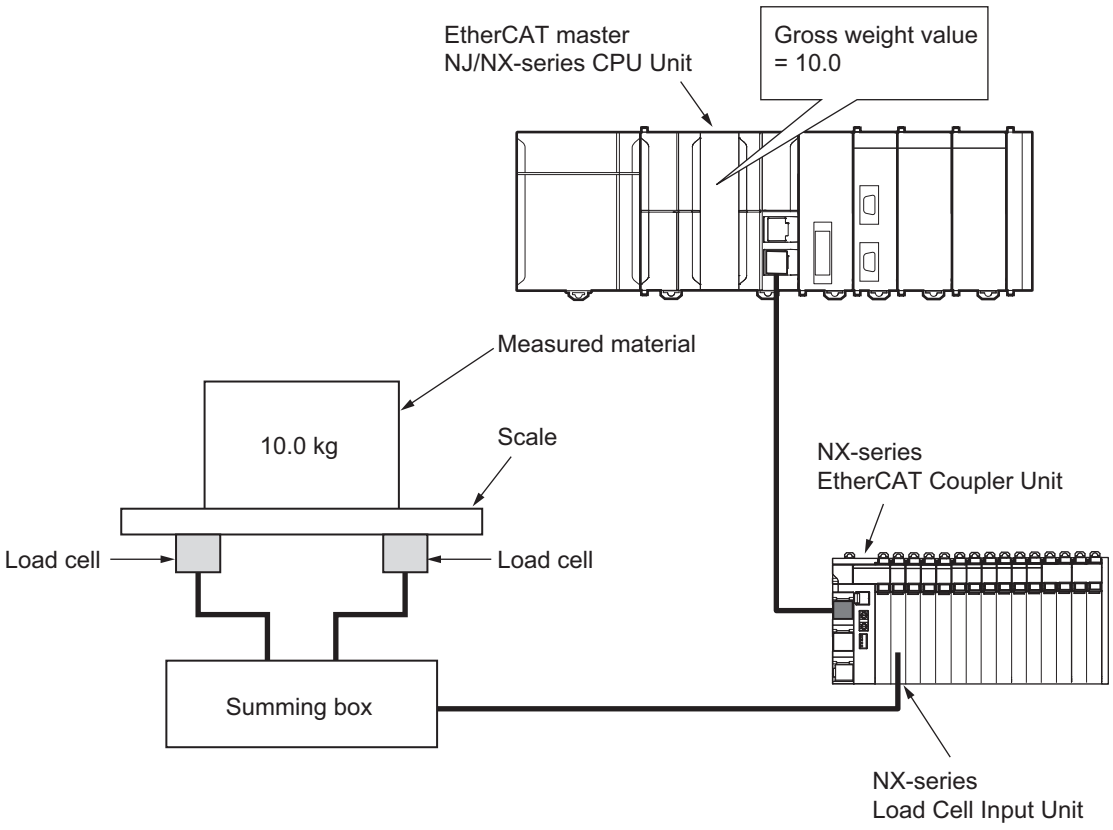
*1. The unit is kg or t.

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.



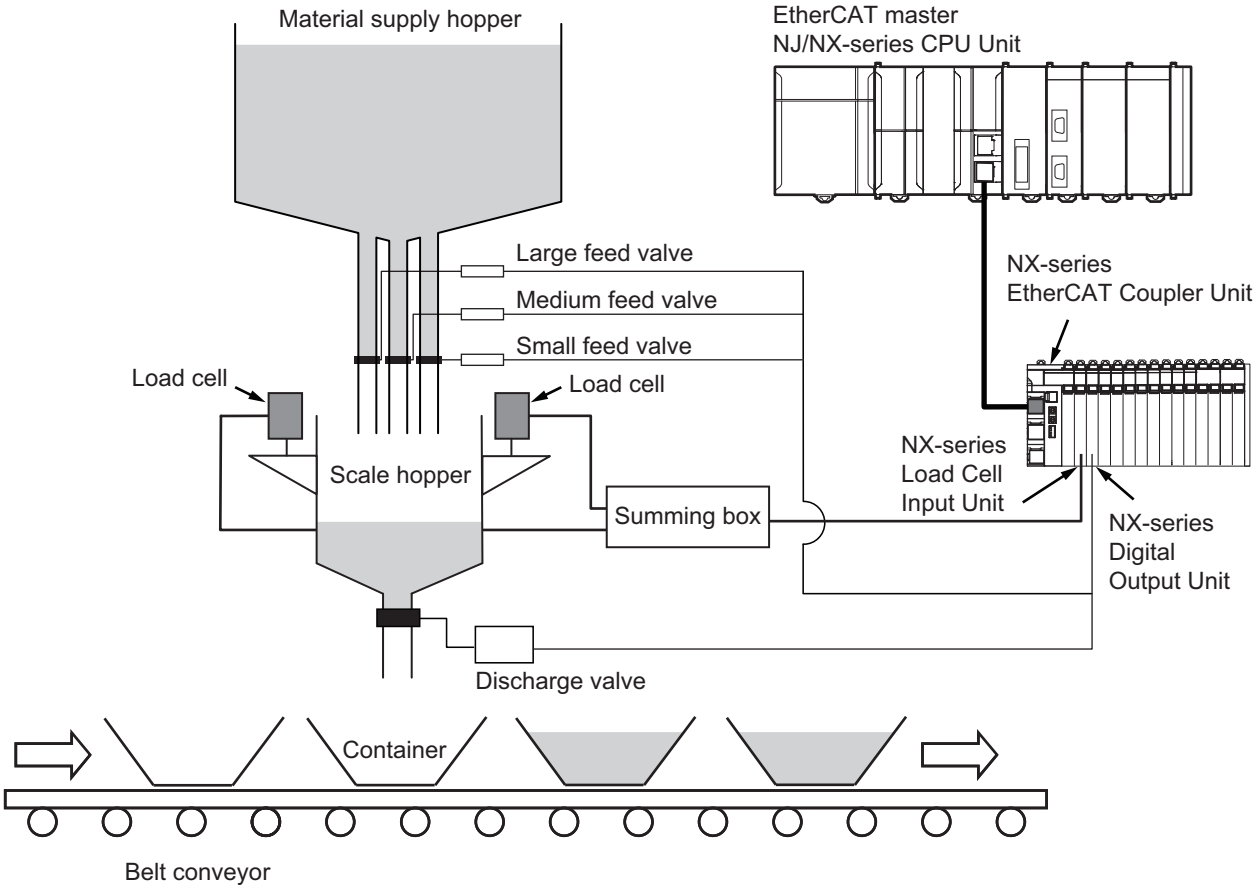
Quantitative Discharging Control System

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 → Medium feed → Small feed → 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.

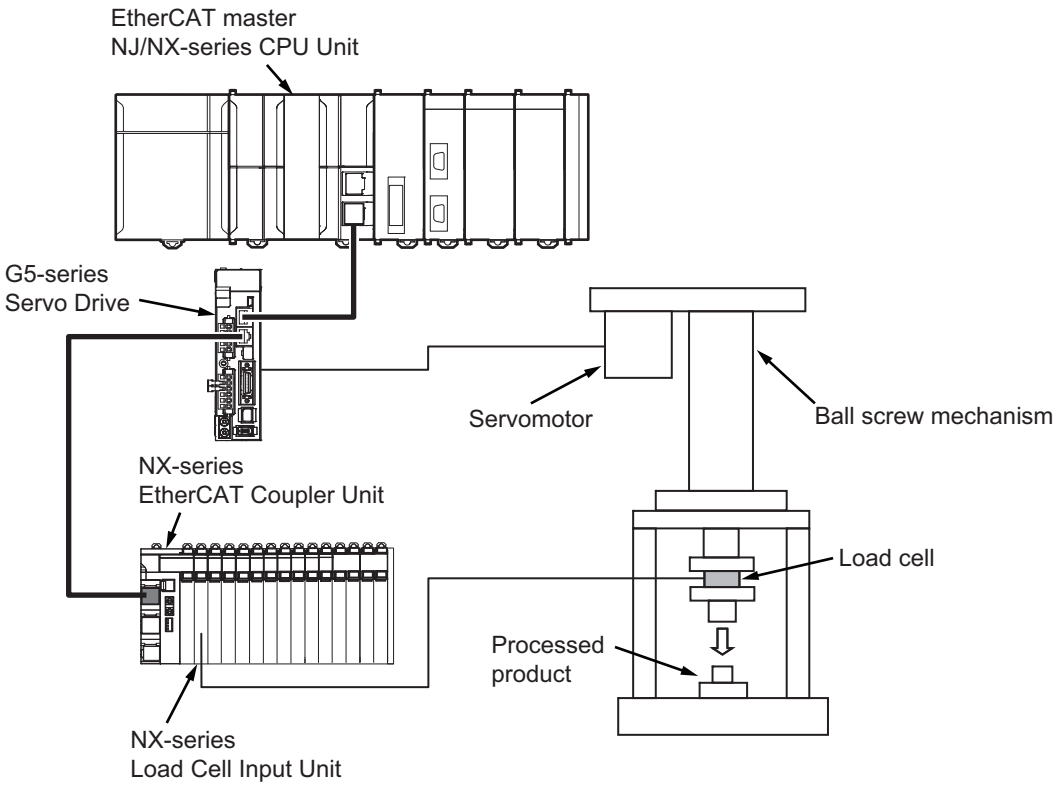
You can connect a load cell to the Load Cell Input Unit and perform calibration to configure a force measurement system. These configuration examples are for EtherCAT Slave Terminals.

*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	Conversion cycle	I/O refreshing method	Load cell excitation voltage	Input range
NX-RS1201	1 point	125 µs	• Free-Run refreshing • Synchronous I/O refreshing • Task period prioritized refreshing	5 VDC ± 10%	–5.0 to 5.0 mV/V

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

Function	Application		Description	Reference
	Weight measurement*1	Force measurement*2		
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 calibration	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 acceleration correction	Supported.	-	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.	*8-1 Gravity Acceleration Correction* on page 8-3
Digital filtering	Supported.	Supported.	This function uses the digital filter to remove noise components that are contained in input signals to suppress fluctuations of measurement values. You can use the digital low-pass filter and moving average filter.	*8-2 Digital Filtering* on page 8-5

Function	Application		Description	Reference
	Weight measurement*1	Force measurement*2		
Zero set/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 8-12
Zero tracking	Supported.	-	This function automatically corrects the zero point within the set range.	*8-4 Zero Tracking* on page 8-15
Zero point range over detection	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 Detection* on page 8-19
Tare subtraction	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 Subtraction* on page 8-22
One-touch tare subtraction	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 8-22
Digital tare subtraction	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 8-24
Stable detection	Supported.	-	This function detects whether the gross weight value is stable.	*8-7 Stable Detection* on page 8-26
Over range/under range detection	Supported.	Supported.	This function detects when the input signal exceeds the input conversion range.	*8-8 Over Range/Under Range Detection* on page 8-30
Sensor disconnection test	Supported.	Supported.	This function tests if the cable that connects 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 Disconnection Test* on page 8-31
Input value refreshing stop	Supported.	Supported.	This function stops refreshing the input value in a specified period.	*8-10 Input Value Refreshing Stop* on page 8-34
Peak hold/bottom hold	-	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 8-36
Data tracing	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 in a specified period.	*8-12 Data Tracing* on page 8-40
Decimal point position setting	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 8-46

*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

Refer to *A-4 Version Information with CPU Units* on page A-17 or *A-5 Version Information with Coupler Units* on page A-18 for information on the Support Software that can perform the settings of the Load Cell Input Unit.

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
2-1-1 General Specifications 2-2
2-1-2 Individual Specifications 2-3
2-2 Operating Procedures 2-6

2-1 Specifications

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

2-1-1 General Specifications

Item		Specification
Enclosure		Mounted in a panel
Grounding methods		Ground of 100 Ω or less
Operating environment	**Ambient operating temperature**	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 temperature	−25 to 70°C (with no icing or condensation)
	Altitude	2,000 m max.
	Pollution degree	Pollution degree 2 or less: Conforms to JIS B 3502 and IEC 61131-2.
	Noise immunity	Conforms to IEC 61000-4-4, 2 kV (power supply line)
	Overvoltage category	Category II: Conforms to JIS B 3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance	Conforms to IEC 60068-2-6. 5 to 8.4 Hz with amplitude of 3.5 mm, 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

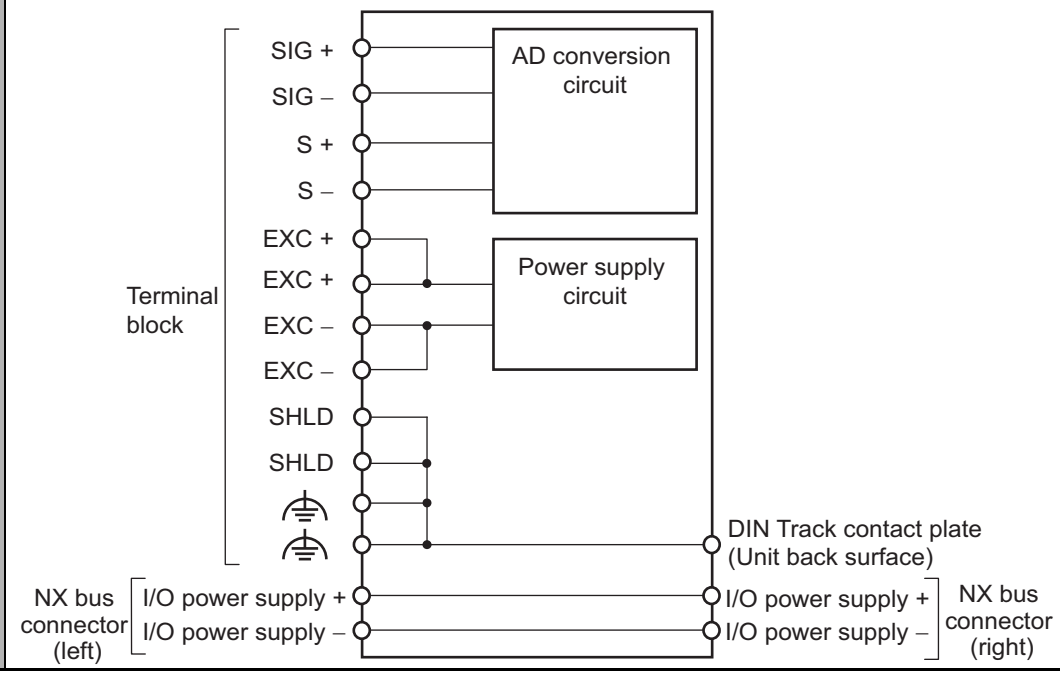
Item Descriptions

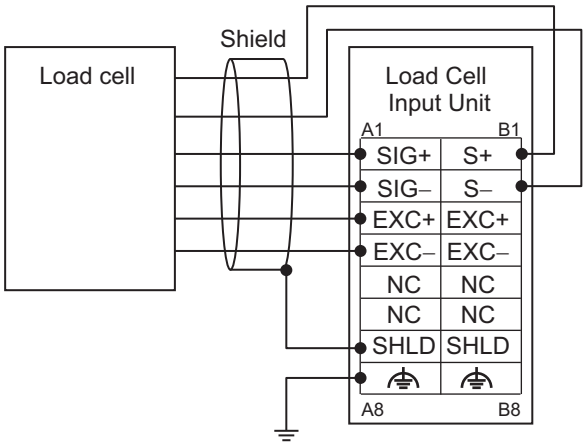
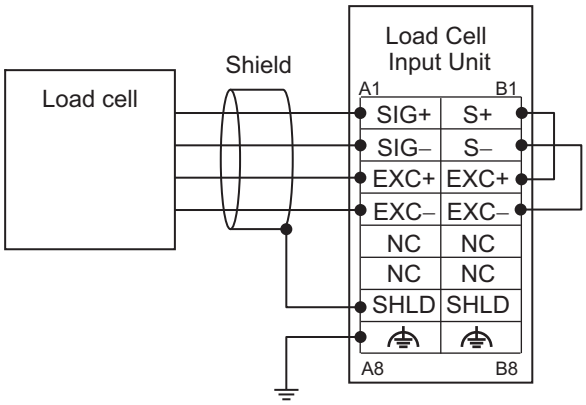
The meanings of each item of the Load Cell Input Unit are described in the table below.

Item	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 terminals	The type of terminal block and connector that is used for connecting the Unit. The 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.
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 measurement values range is fixed to the conversion limit value.
Load cell excitation voltage	The excitation voltage that is supplied from the Unit to the load cell. The output current of the load cell excitation voltage that the Unit can supply is also listed.
Zero point adjustment range	The range of input values you can set as the zero point of the Unit.
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 consumption	The power consumption of the NX Unit power supply of the Unit. The power consumption 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 from I/O power supply	The current consumption from I/O power supply of the Unit. The current consumption 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 orientation of a Slave Terminal containing the Unit. Any restrictions to specifications that result from the installation orientation are also given.

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

Individual Specifications

Unit name	Load Cell Input Unit	**Model**		NX-RS1201
Number of points	1 point	**External connection terminals**		Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing, synchronous I/O refreshing, or task period prioritized refreshing			
Indicators	TS indicator	**Input range**		−5.0 to 5.0 mV/V
		Input conversion range		−5.5 to 5.5 mV/V
		Load cell excitation voltage		5 VDC ± 10%, Output current: 60 mA max.
		Zero point adjustment range		−5.0 to 5.0 mV/V
		Gain point adjustment range		−5.0 to 5.0 mV/V
		Accuracy *1	**Nonlinearity**	±0.01% (full scale)*2
			Zero drift	±0.1 μV/°C RTI
			Gain drift	±10 ppm/°C
		A/D converter resolution		24 bits
Warm-up period	30 minutes	**Conversion cycle**		125 μs
Dimensions	12 (W) × 100 (H) × 71 (D)	**Isolation method**		Between the input and the NX bus: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**		510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**		Without I/O power supply terminals
NX Unit power consumption	• Connected to a CPU Unit 2.05 W max. • Connected to a Communications Coupler Unit 1.70 W max.	**Current consumption from I/O power supply**		No consumption
Weight	70 g max.			
Circuit layout				

Installation orientation and restrictions	Installation orientation: • Connected to a CPU Unit Possible in upright installation. • Connected to a Communications Coupler Unit Possible in 6 orientations. Restrictions: No restrictions
Terminal connection diagram	Diagram of the 6-wire connection between the Unit and a load cell.  Ground of 100 Ω or less Diagram of the 4-wire connection between the Unit and a load cell.  Ground of 100 Ω or less

*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 Sysmac Studio. 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 Methods* • *Section 8 Functions*
2	Creating the User Program	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 Sysmac Studio. 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 • *NJ/NX-series 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 Installation and Wiring*
4	Wiring the Unit	Wire the Load Cell Input Unit.	*Section 4 Installation and Wiring*
5	Downloading the Unit Settings and the User Program	Download the Unit settings that are made with the Sysmac Studio 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 connected Communications Coupler Unit
6	Calibrating the Unit	Calibrate the Load Cell Input Unit. Calibration is performed with actual load calibration or equivalent input calibration.	*Section 7 Calibration Methods*
7	Checking Operation	Confirm that gross weight values/force measurement values that are appropriate for the load on the load cell are acquired from the I/O Map or Watch Tab Page of the Sysmac Studio. Confirm that the Unit settings and the user program operate correctly.	*4-3-2 Checking the Wiring* on page 4-19

3

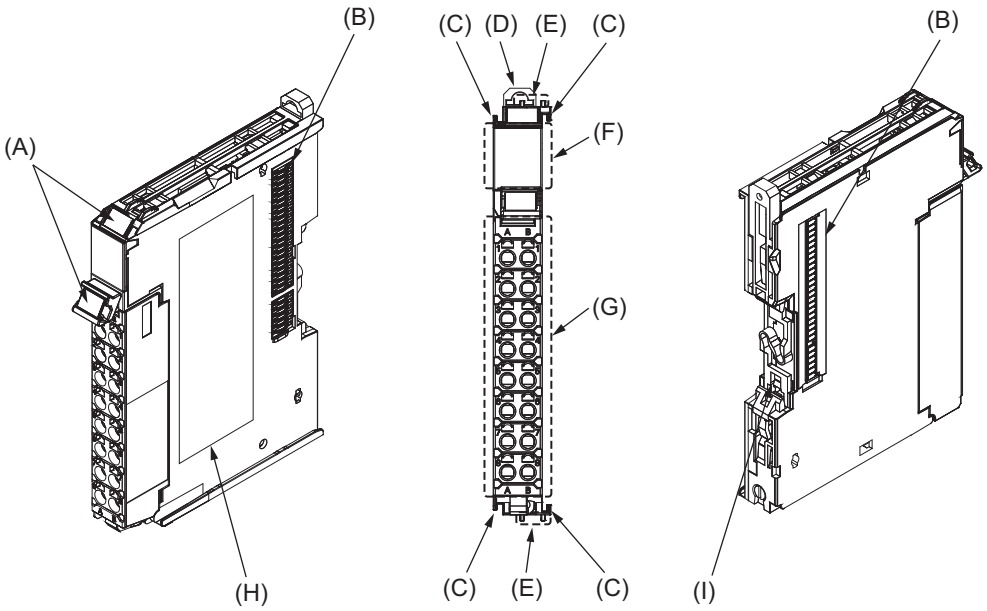
Part Names and Functions

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 3-4

3-1 Part Names

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

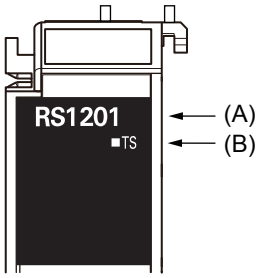


Letter	Name	Description
(A)	Marker attachment location	This is where the markers are attached. OMRON markers are pre-installed at the factory. You can also install commercially available markers.
(B)	NX bus connector	This connector is used to connect each Unit.
(C)	Unit hookup guides	These guides are used to connect two Units.
(D)	DIN Track mounting hooks	These hooks are used to mount the NX Unit to a DIN Track.
(E)	Protrusions for removing the Unit	These protrusions are to hold onto when you need to pull out 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 terminal block.

3-2 Indicators

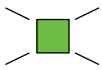
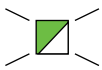
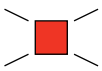
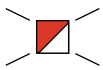
There are indicators to show the current operating status of the Unit on the Load Cell Input Unit.

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



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 meanings of TS indicator light statuses are described as follows:

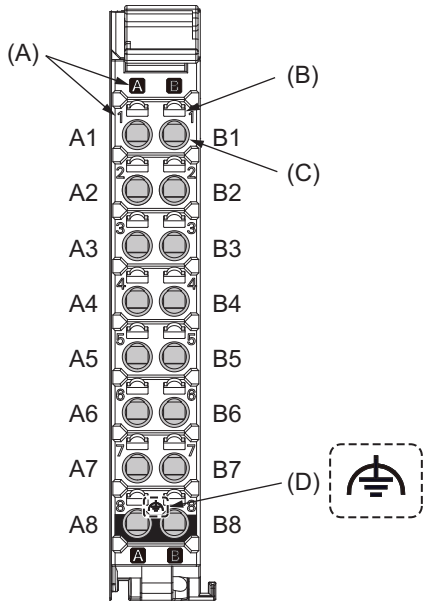
Color	Status		Description
Green		Lit	• The Unit is operating normally. • The Unit is ready for I/O refreshing. • I/O checking is operating.*1
		Flashing at 2-s intervals.	• Initializing • Restarting is in progress for the Unit. • Downloading
Red		Lit	A hardware failure, WDT error, or other fatal error that is common to all I/O Units occurred.
		Flashing at 1-s intervals.	A communications error or other NX bus-related error that is common to all I/O Units occurred.
---		Not lit	• No Unit power supply • Restarting is in progress for the Unit. • Waiting for initialization to start

*1. Refer to the user's manual for the Communications Coupler Unit for the status of the indicator on the Communications Coupler Units when I/O checking is in progress.

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 indication	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 Installing NX Units 4-2
4-2 Wiring the Power Supply and Ground 4-3
4-3 Wiring the Terminals 4-4
4-3-1 Wiring the Screwless Clamping Terminal Blocks 4-4
4-3-2 Checking the Wiring 4-19
4-4 Wiring the Connected External Devices 4-20
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

Use the I/O power supply current for the CPU Rack of NX1P2 CPU Unit at 4 A or less. Using the currents that are outside of the specifications may cause failure or damage.

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

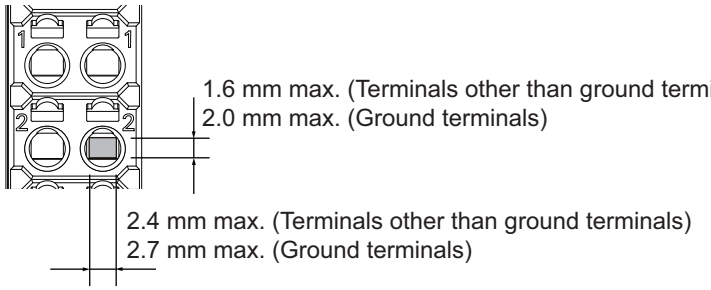
The following table gives the recommended wires.

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.

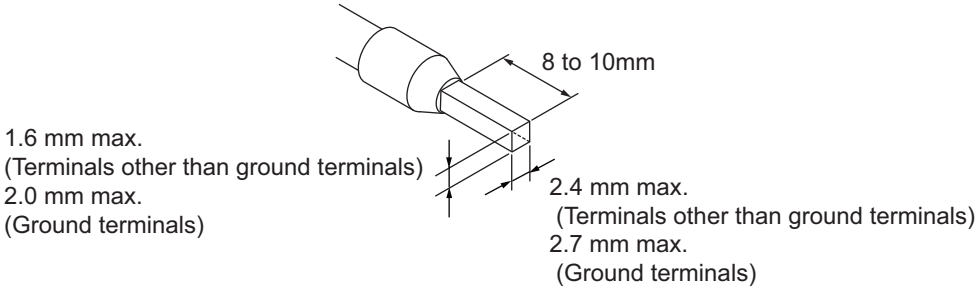
Always use plated one-pin ferrules. Do not use unplated ferrules or two-pin ferrules.

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

Terminal types	Manufacturer	Ferrule model	Applicable wire (mm^2 (AWG))	Crimping tool
Terminals other than ground terminals	Phoenix Contact	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the applicable wire size.) CRIMPFOX 6 (0.25 to 6 mm^2, AWG24 to 10)
		AI0,5-8	0.5 (#20)	
		AI0,5-10		
		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 terminals		AI2,5-10	2.0 *1	
Terminals other than ground terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmuller (The figure in parentheses is the applicable wire size.) PZ6 Roto (0.14 to 6 mm^2, AWG26 to 10)
		H0.25/12	0.25 (#24)	
		H0.34/12	0.34 (#22)	
		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)	
		H1.5/16		

*1. Some AWG14 wires exceed 2.0 mm^2 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.



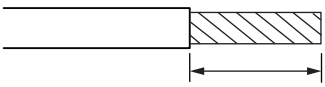
Using Twisted Wires/Solid Wires

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

Terminals		Wire type				Wire size	Conductor length (stripping length)
Classification	Current capacity	Twisted wires		Solid wire			
		Plated	Unplated	Plated	Unplated		
All terminals except ground terminals	2 A max.	Possible	Possible	Possible	Possible	0.08 to 1.5 mm^2 (AWG 28 to 16)	8 to 10 mm
	Greater than 2 A and 4 A or less		Not possible	Possible *1	Not possible		
	Greater than 4 A	Possible *1		Not possible			
Ground terminals	---	Possible	Possible	Possible *2	Possible *2	2.0 mm^2	9 to 10 mm

*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.

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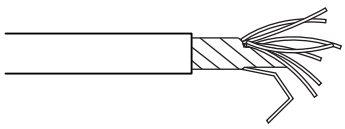

Unravel wires

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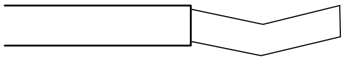


Bend wires

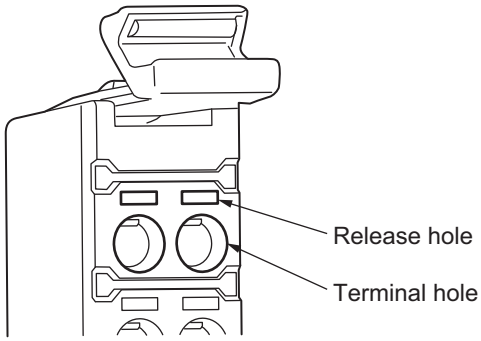
Additional Information

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.

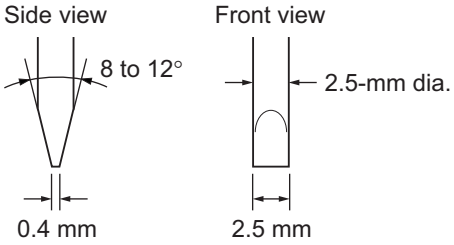
● Terminal Block Parts and Names



Required Tools

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

Use the following flat-blade screwdriver.



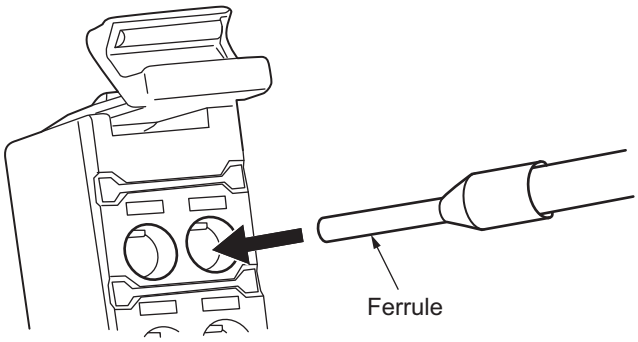
Recommended screwdriver

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.

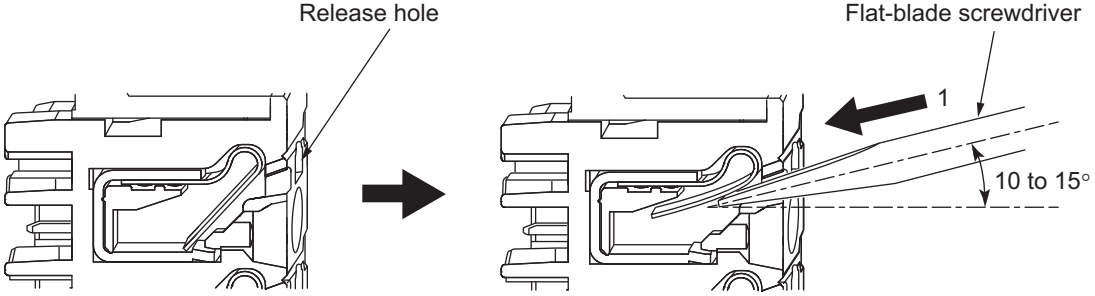
Connecting Twisted Wires/Solid Wires

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.

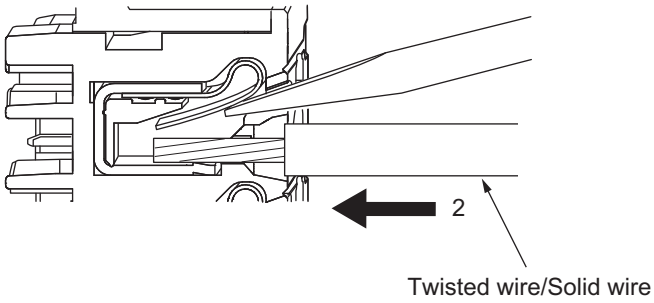
Press at an angle of 10° to 15°.

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

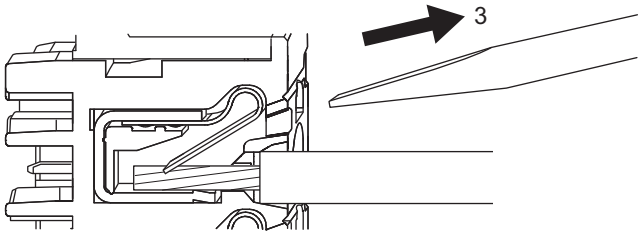


2 Leave the flat-blade screwdriver pressed into the release hole and insert the twisted wire or the solid wire into the terminal hole.

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.

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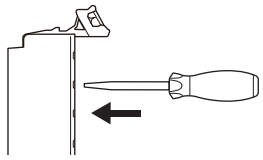

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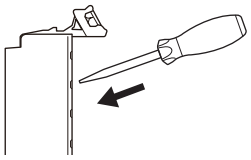

- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

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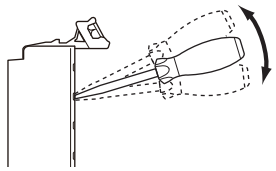

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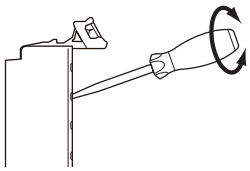


- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

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.

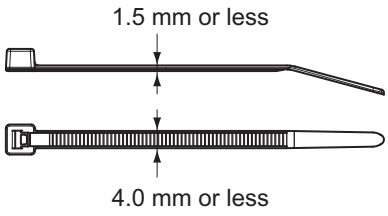
Terminals		Wire type				
		Ferrule	Twisted wires		Solid wire	
Classification	Current capacity		Plated	Unplated	Plated	Unplated
All terminals except ground terminals	2 A max.	No	No	No	No	No
	Greater than 2 A and 4 A or less			Not Possible	Yes	Not Possible
	Greater than 4 A		Yes		Not Possible	
Ground terminals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

Use the following procedure to secure the wires.

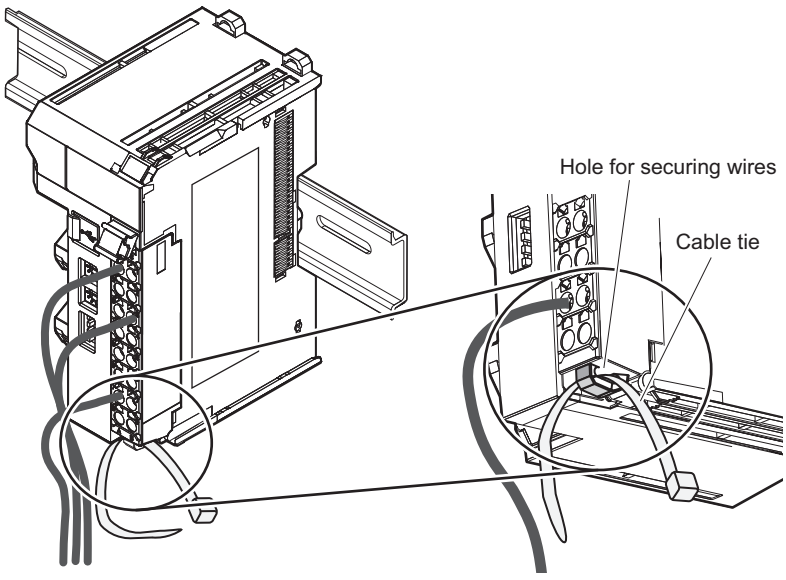
1 Prepare a cable tie.

A cable tie can be used with a width of 4 mm or less and a thickness of 1.5 mm or less.

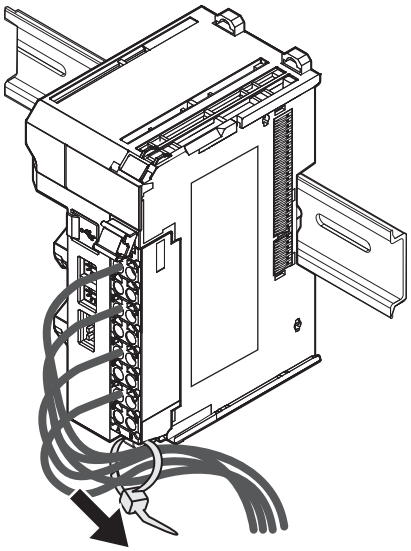
Select a cable tie correctly for the operating environment.



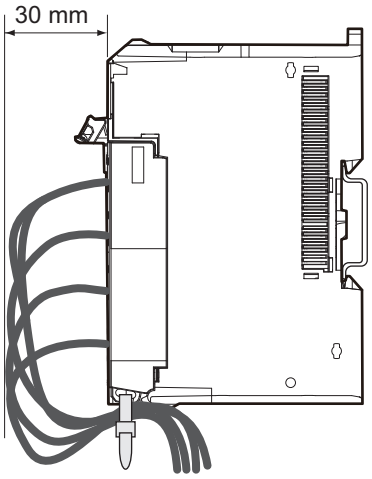
2 Pass a cable tie through the hole for securing wires on the bottom of the screwless clamping terminal block.



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

Use the following procedure to remove the wires from the terminal block.

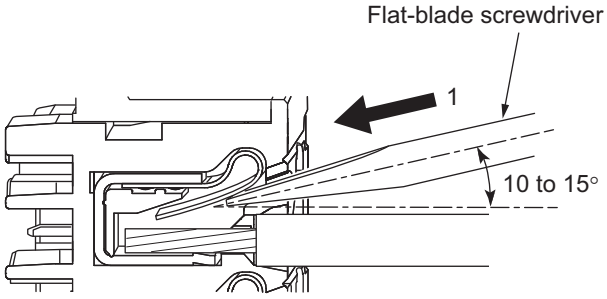
The removal method is the same for ferrules, twisted wires, and solid wires.

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

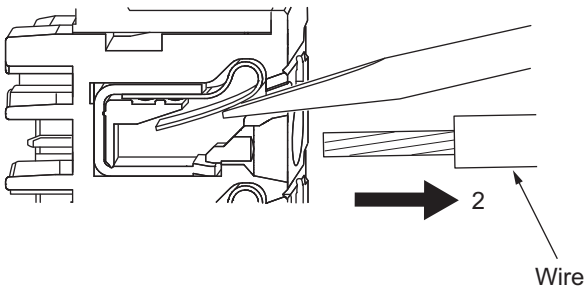
1 Press the flat-blade screwdriver diagonally into the release hole.

Press at an angle of 10° to 15°.

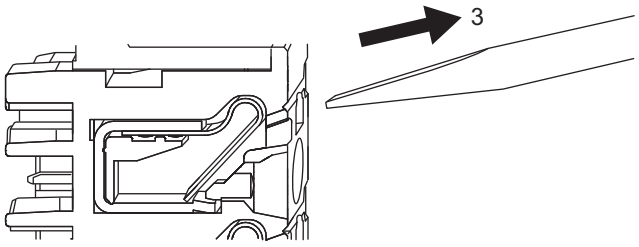
If you press in the screwdriver correctly, you will feel the spring in the release hole.



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.

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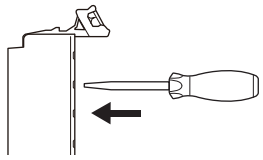
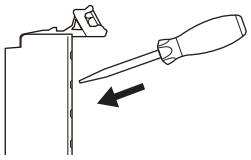
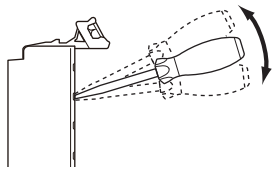


OK

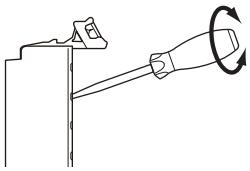


- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

NG



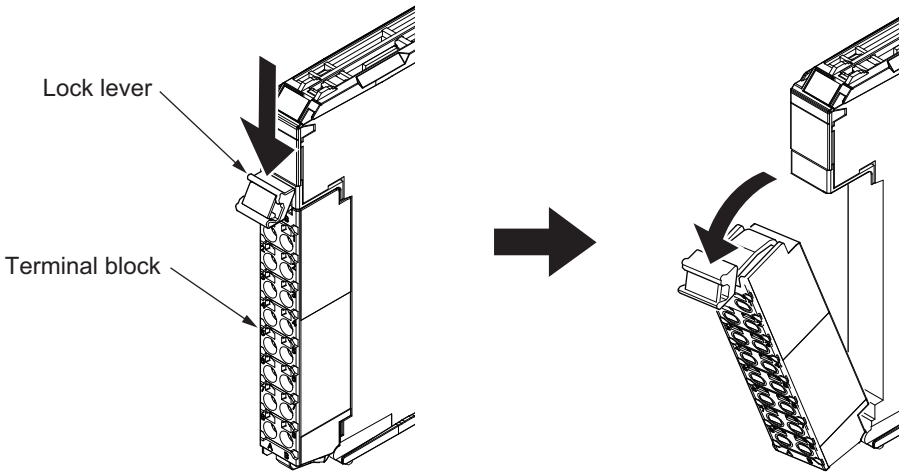
NG



- 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.

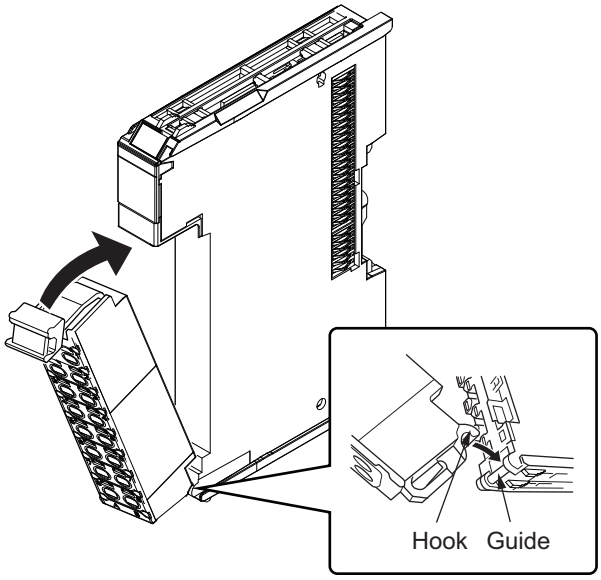


Attaching a Terminal Block

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.

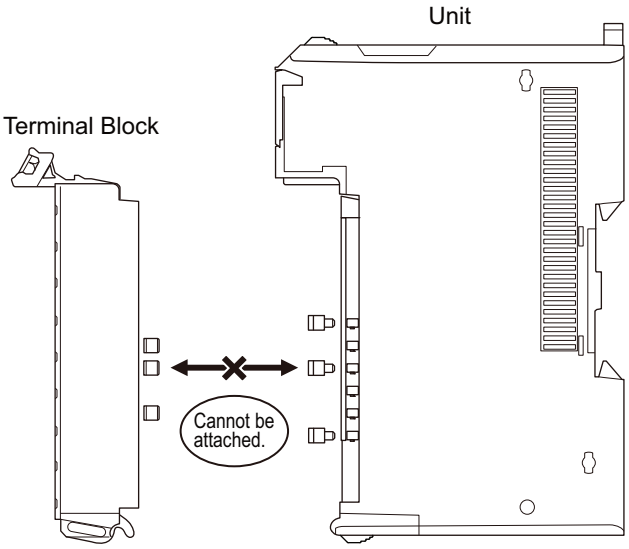
Refer to *3-3 Terminal Blocks* on page 3-4 for the applicable Terminal Blocks to the Load Cell Input Unit.

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.

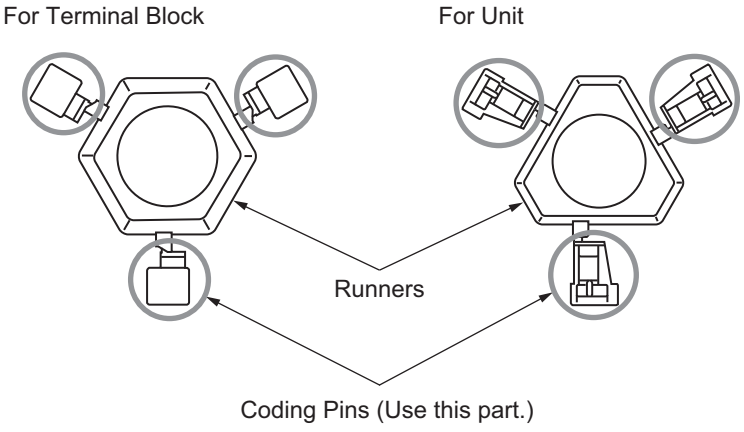
You can use these pins to create a combination in which the wrong terminal block cannot be attached because the pin patterns do not match.



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.



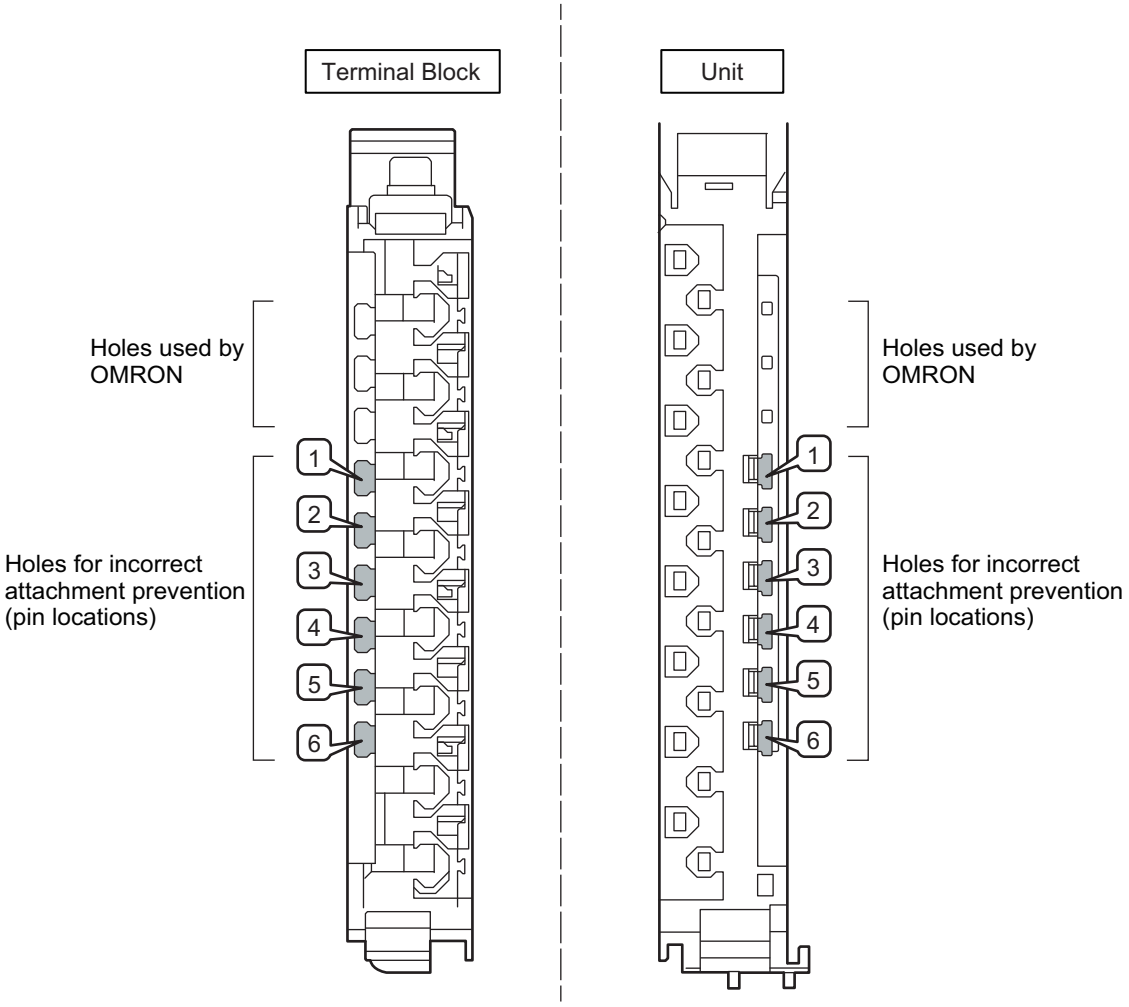
Use the following Coding Pins.

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.



○: Pin inserted

Pattern	Pin locations for Terminal Block						Pin locations for Unit					
	1	2	3	4	5	6	1	2	3	4	5	6
No.1	○	○	○							○	○	○
No.2	○	○		○					○		○	○
No.3	○	○			○				○	○		○
No.4	○	○				○			○	○	○	
No.5	○		○	○				○			○	○
No.6	○		○		○			○		○		○
No.7	○		○			○		○		○	○	
No.8	○			○	○			○	○			○
No.9	○			○		○		○	○		○	
No.10	○				○	○		○	○	○		
No.11		○	○	○			○				○	○
No.12		○	○		○		○			○		○
No.13		○	○			○	○			○	○	
No.14		○		○	○		○		○			○
No.15		○		○		○	○		○		○	
No.16		○			○	○	○		○	○		
No.17			○	○	○		○	○				○
No.18			○	○		○	○	○			○	
No.19			○		○	○	○	○		○		
No.20				○	○	○	○	○	○			

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

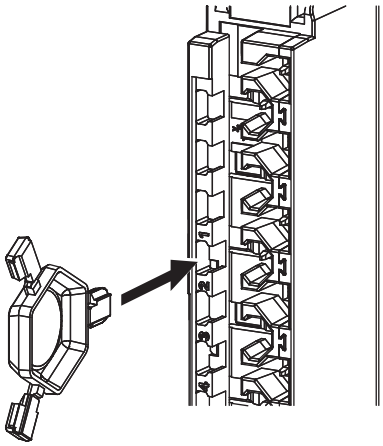
Precautions for Correct Use

- 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.

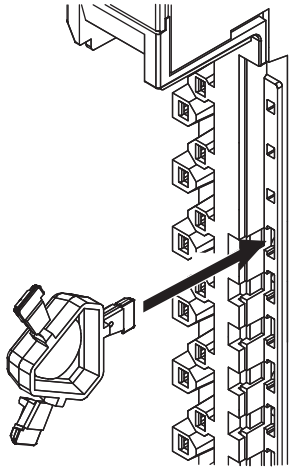
Inserting the Coding Pins

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

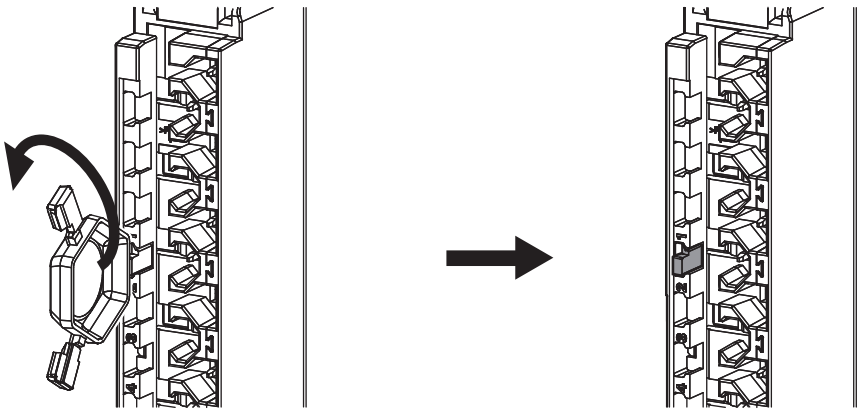


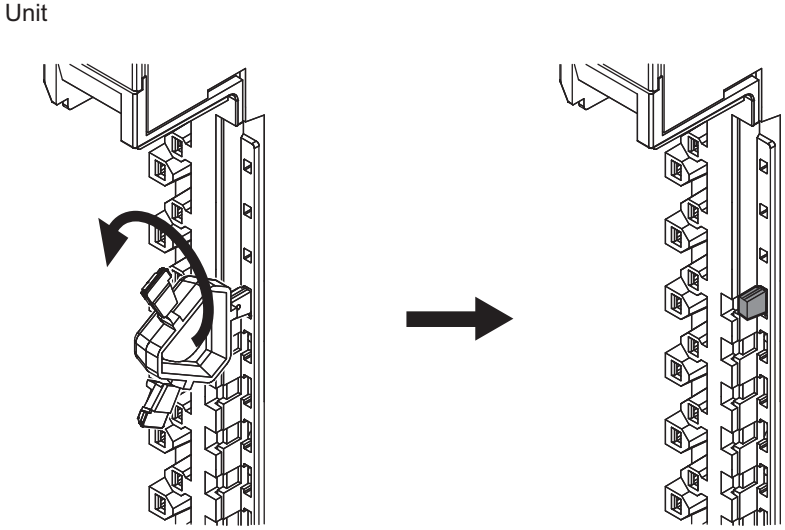
Unit



2 Rotate the runner to break off the Coding Pins.

Terminal Block





4-3-2 Checking the Wiring

Check the wiring from the I/O Map or Watch Tab Page of the Sysmac Studio.

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 refresh the I/O outputs of the target Units with the specified values by forced refreshing, and check the operation of the connected external devices.

If you use the I/O Map, you can also monitor and perform forced refreshing even if does not define the variables and create the algorithms. Therefore, you can easily check the wiring.

Also, for an EtherCAT Slave Terminal, if you use I/O checking, you can check the wiring by connecting the computer in which the Sysmac Studio is installed to the peripheral USB port on the EtherCAT Coupler Unit. Therefore, you can check the wiring in conditions such as the following.

- When you want to check the wiring in advance even though the CPU Unit or Industrial PC is temporarily unavailable, such as when commissioning the equipment
- When you want to check the wiring in advance even though the wiring of the EtherCAT network is not completed, such as when commissioning the equipment
- When you want to check the wiring when the CPU Unit or Industrial PC and an EtherCAT Slave Terminal have some distance from each other
- When more than one EtherCAT Slave Terminal is used and more than one person wants to check the wiring at the same time

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519-E1-03 or later) for details on I/O checking.

Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for details on monitoring and forced refreshing operations.

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

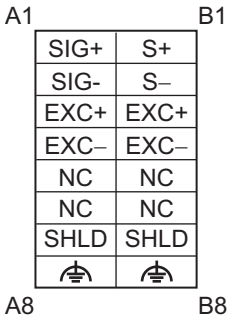
- We recommend that you use a 6-wire connection for connecting the load cell with the Load Cell Input Unit to achieve high-precision measurements. When you use a 4-wire connection, the measurement resolution of wiring resistance is deteriorated due to temperature changes.
- Keep the wiring resistance 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.

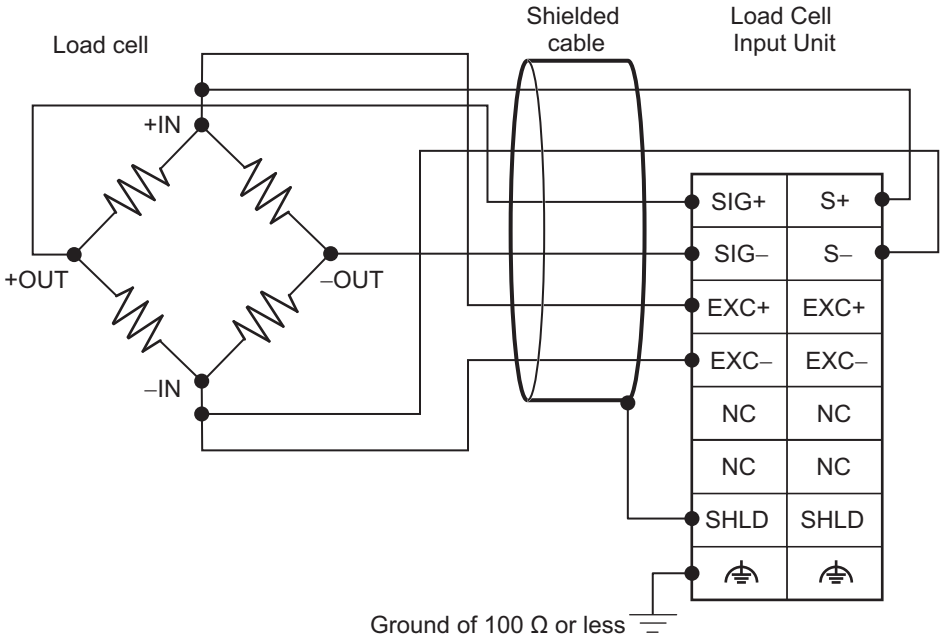
Pin No.	Symbol	I/O	Name
A1	SIG+	I	Load cell input (+)
A2	SIG–	I	Load cell input (–)
A3	EXC+	O	Load cell excitation voltage 5 V
A4	EXC–	O	Load cell excitation voltage 0 V
A5	NC	---	Not used.
A6	NC	---	Not used.
A7	SHLD	---	Shield terminal
A8	⏚	---	Functional ground terminal

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



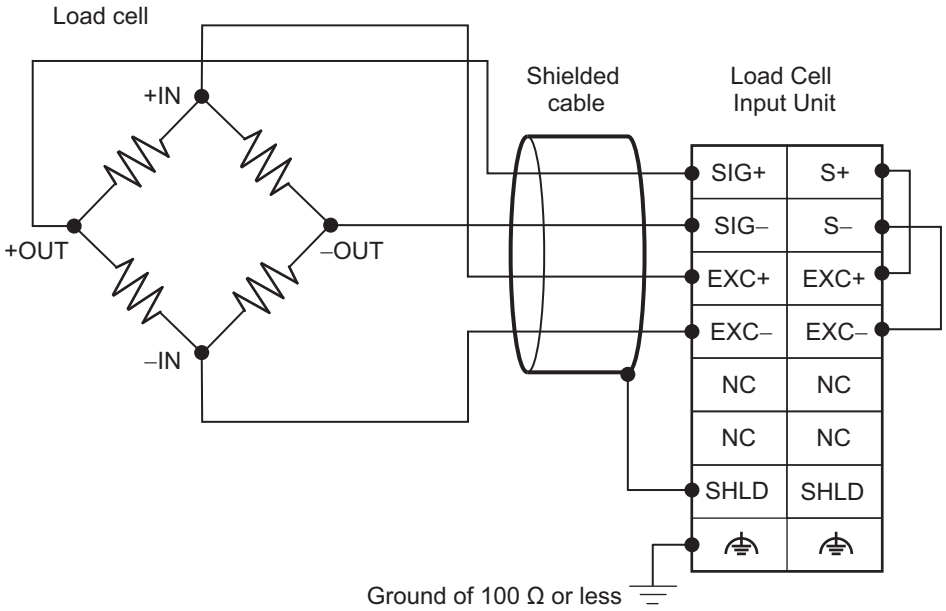
4-4-2 Wiring Example with 6-wire Connection

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.



Precautions for Safe Use

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.

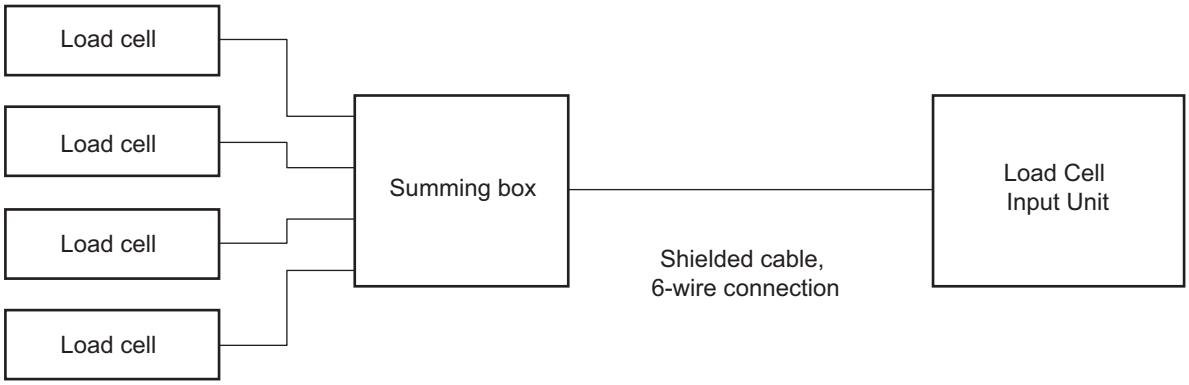
When multiple load cells with the same specifications are connected to a summing box in parallel, they function as a single load cell that has the following specifications.

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

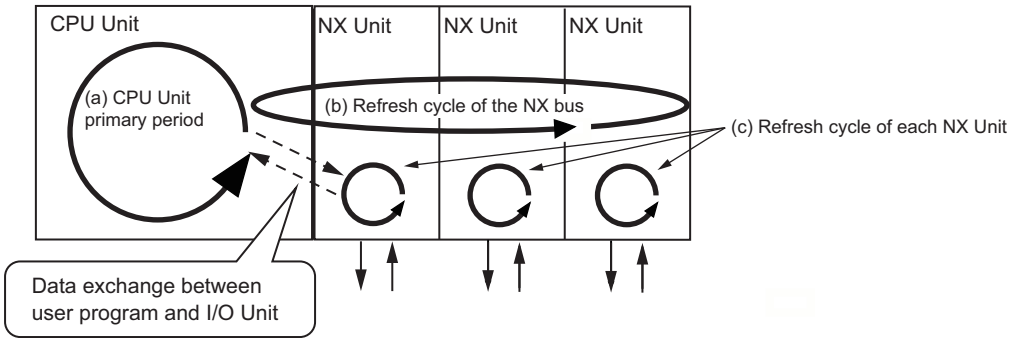
An NX-series NX1P2 CPU Unit cyclically performs I/O refreshing with the NX Units.

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-E1-16 or later) for detailed information on I/O refreshing between the NX-series NX1P2 CPU Unit and the NX Units.

Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501-E1-16 or later) for the I/O response times of NX Units in a CPU Rack.

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.

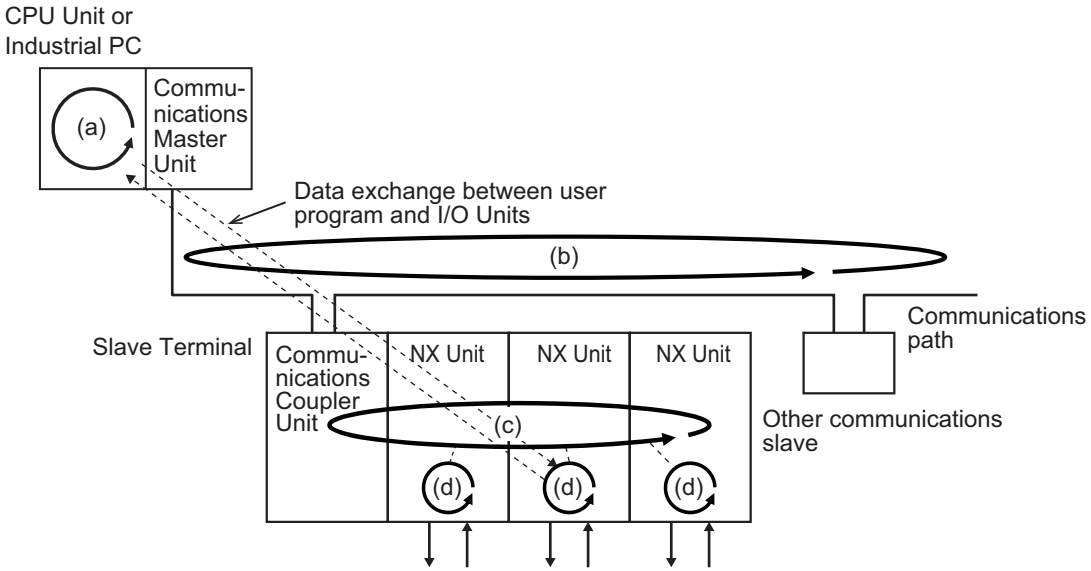
The following four cycles affect operation of the I/O refreshing between the CPU Unit or Industrial PC and the NX Units in a Slave Terminal:

(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.

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-E1-16 or later) 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 Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519-E1-08 or later) for detailed information on I/O refreshing between the built-in EtherCAT port and EtherCAT Slave Terminals.

I/O Response Times of NX Units on Slave Terminals

Refer to the user's manual for the connected Communications Coupler Unit for the I/O response times of NX Units on Slave Terminals.

When you connect the Load Cell Input Unit to the EtherCAT Coupler Unit, refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519-E1-08 or later) and the *NX-series Data Reference Manual* (Cat. No. W525-E1-11 or later).

5-2 I/O Refreshing Methods

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

5-2-1 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 NX-series NX1P2 CPU Unit and the NX Units are determined by the CPU Unit.

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 synchronized 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 NX-series NX1P2 CPU Unit.

Since the 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 Communications Coupler Units 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 you use.

● EtherCAT Coupler Unit

The I/O refreshing methods that you can use between an EtherCAT Coupler Unit and the Load Cell Input Unit when the EtherCAT Coupler Unit is connected to the built-in EtherCAT port on an NJ/NX-series CPU Unit or an NY-series Industrial PC are listed 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 refreshing*1	With this I/O refreshing method, shortening the task period is given priority over synchronizing the I/O timing with other NX Units. With this I/O refreshing 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.

With an EtherCAT Coupler Unit, you can use all of the I/O refreshing methods at the same time. Therefore, you can mix NX Units with different I/O refreshing methods on the same 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.

- **EtherNet/IP Coupler Unit**

  Free-Run refreshing is always used as the I/O refreshing method between the EtherNet/IP Coupler Unit and the NX Units.

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

Setting Methods between the CPU Unit and the NX Units

The I/O refreshing methods between the NX-series NX1P2 CPU Unit and the NX Units are determined according to the following table. No settings are required.

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, synchronous 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

This section describes the settings of the I/O refreshing method for each Communications Coupler Unit.

- **EtherCAT Coupler Unit**

  The I/O refreshing method between the EtherCAT Coupler Unit and the Load Cell Input Unit depends on the *Enable Distributed Clock* setting in the EtherCAT Coupler Unit.

Enable Distributed Clock 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.

- **EtherNet/IP Coupler Unit**

  Free-Run refreshing is always used as the I/O refreshing method between the EtherNet/IP Coupler Unit and the Load Cell Input Unit. There is no setting for the I/O refreshing method.

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 Sysmac Studio

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

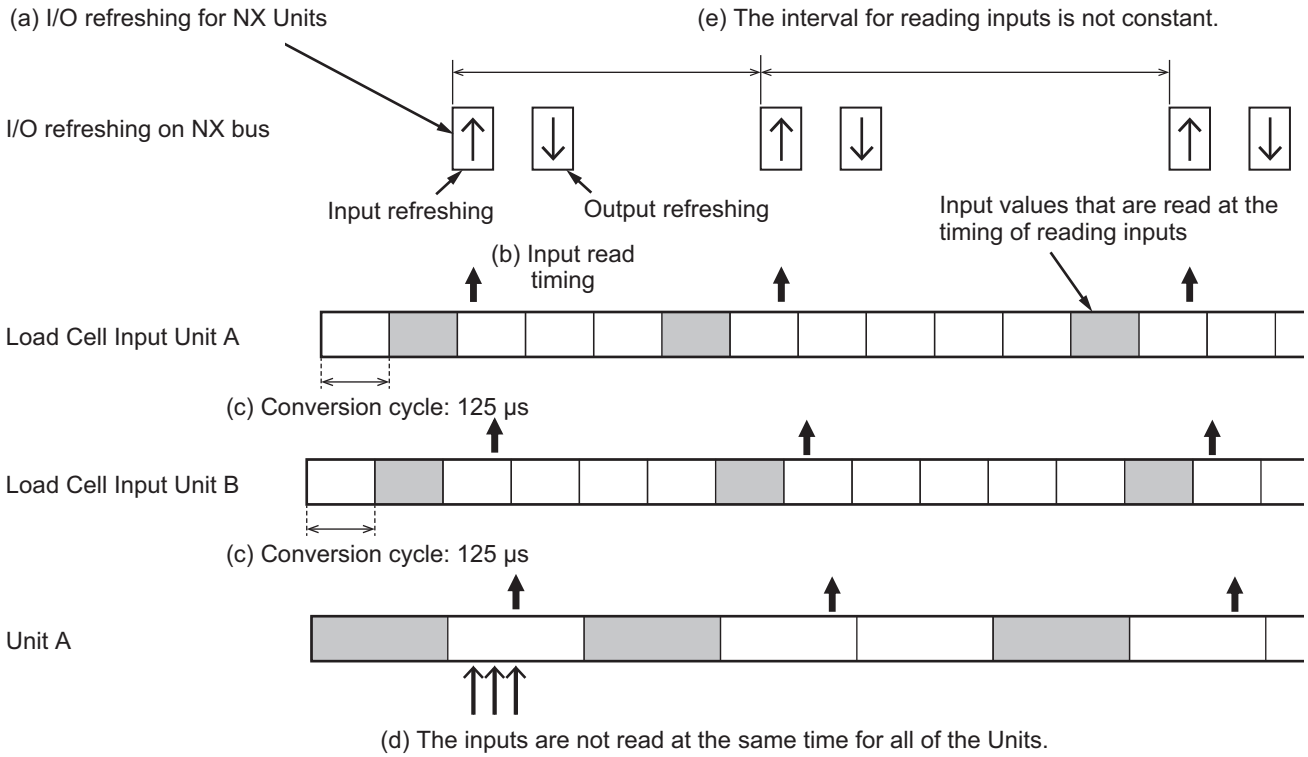
This section describes the operation of the following I/O refreshing methods: Free-Run refreshing, synchronous I/O refreshing, and task period prioritized refreshing.

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.)



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.

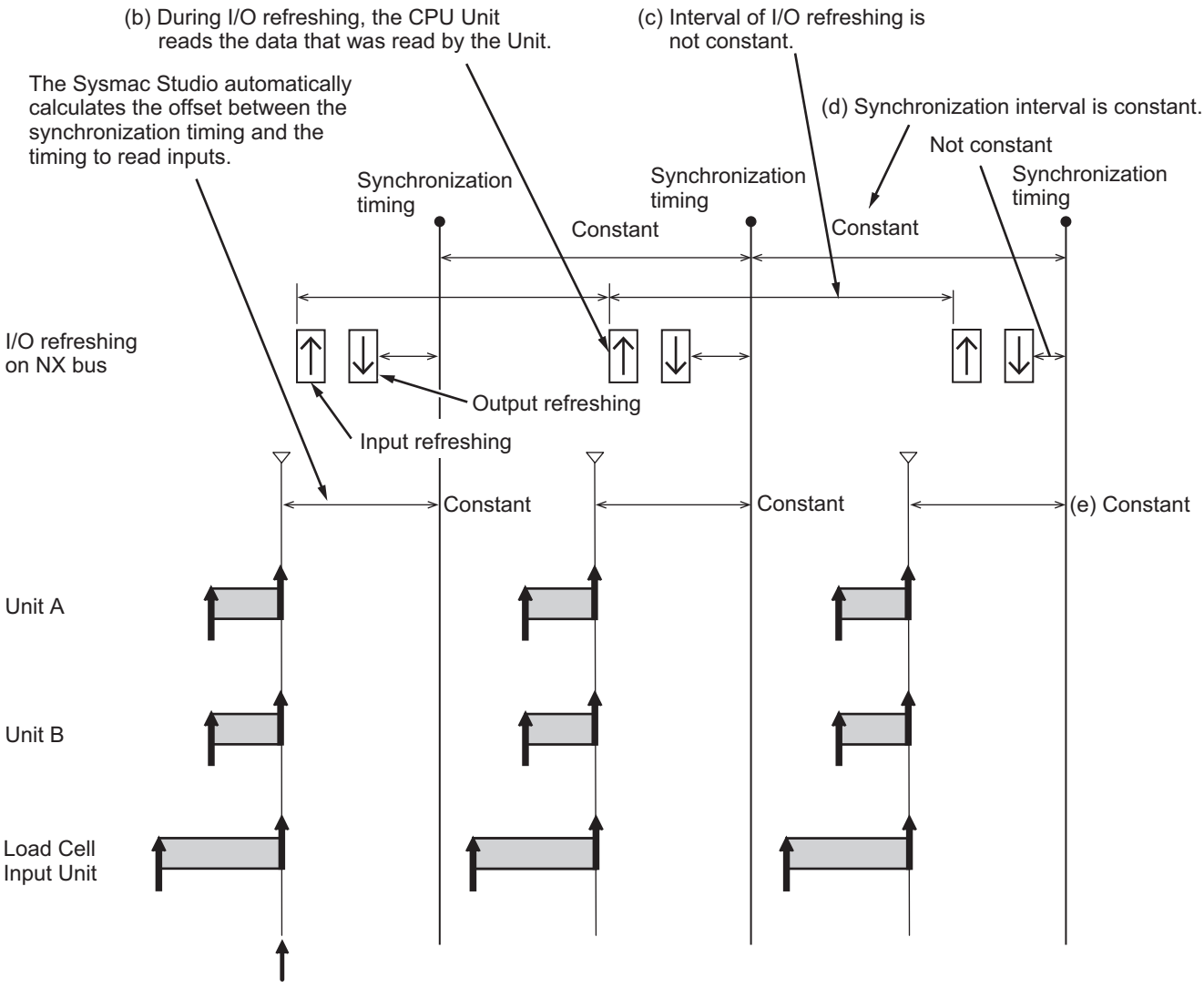
The operation of I/O refreshing in the CPU Unit and that in the Slave Terminal are given below.

● CPU Unit Operation

The following describes the operation of synchronous I/O refreshing between the NX-series NX1P2 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 Sysmac Studio 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.

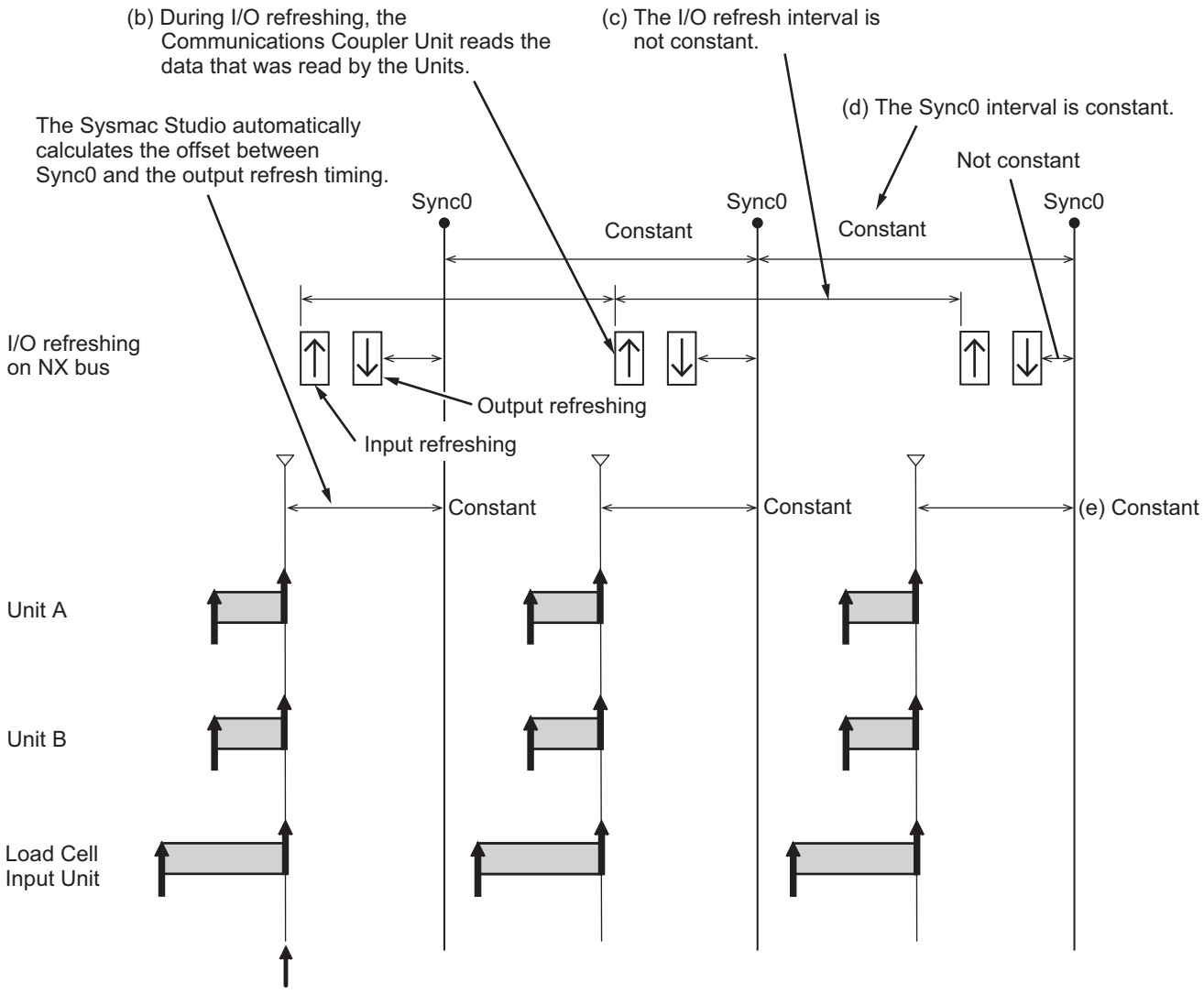
Slave Terminal Operation

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-E1-05 or later) for information on the Slave Terminals that operate with the same timing when more than one Slave Terminal is placed on the same EtherCAT 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.


(b) During I/O refreshing, the Communications Coupler Unit reads the data that was read by the Units.
(c) The I/O refresh interval is not constant.
(d) The Sync0 interval is constant.
The Sysmac Studio automatically calculates the offset between Sync0 and the output refresh timing.
Not constant
Sync0
Sync0
Sync0
Constant
Constant
I/O refreshing on NX bus
Output refreshing
Input refreshing
Constant
Constant
(e) Constant
Unit A
Unit B
Load Cell Input Unit
(a) All Input Units that support synchronous input refreshing read their inputs simultaneously.

Operation for Task Period Prioritized Refreshing

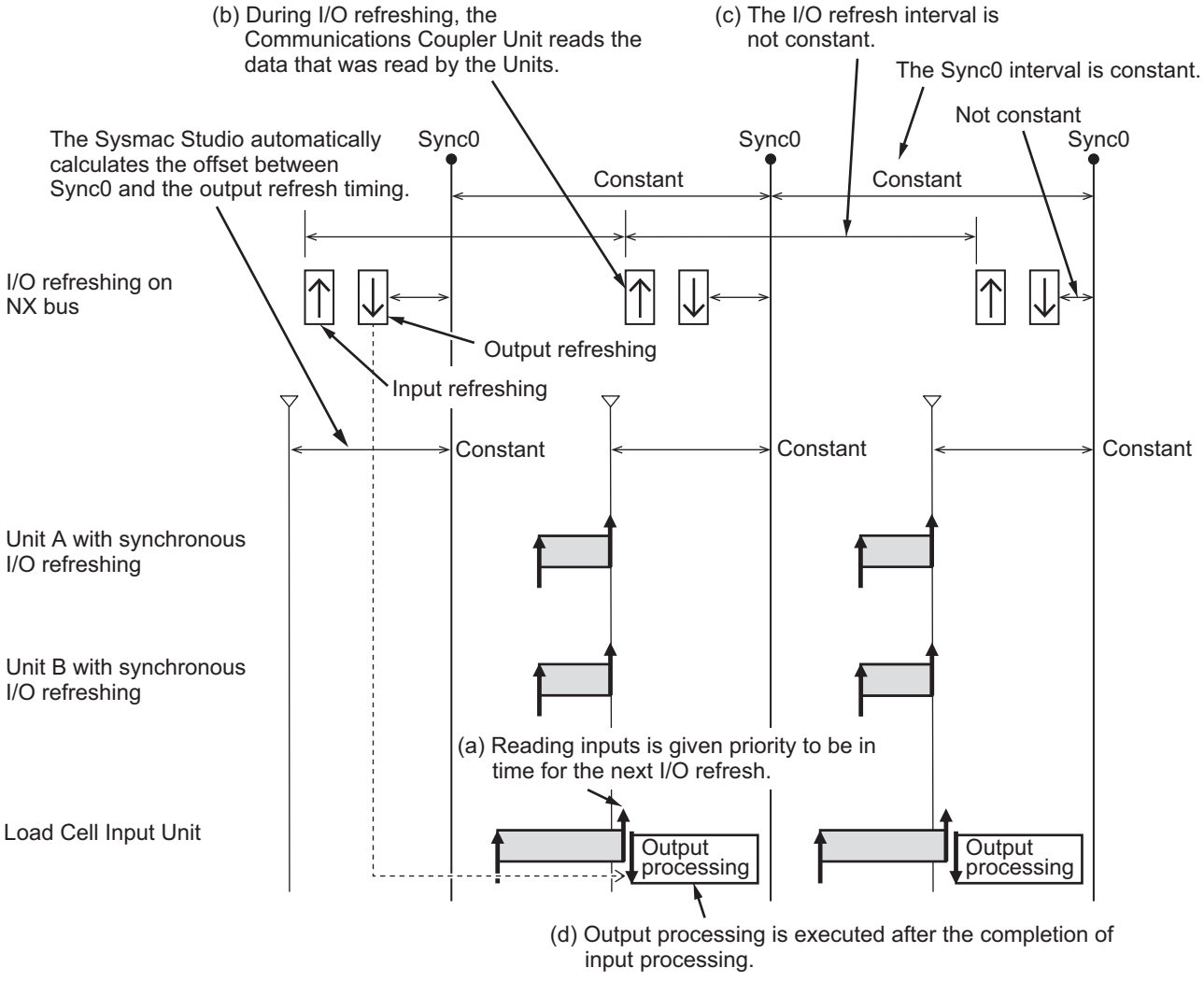
With task period prioritized refreshing, shortening the task period is given priority over synchronizing the I/O timing with other NX Units that use synchronous I/O refreshing. For the Load Cell Input Unit, this refreshing method is applicable when Unit is connected in an EtherCAT Slave Terminal.

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 Sysmac Studio 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 6-2
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 Specifications 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

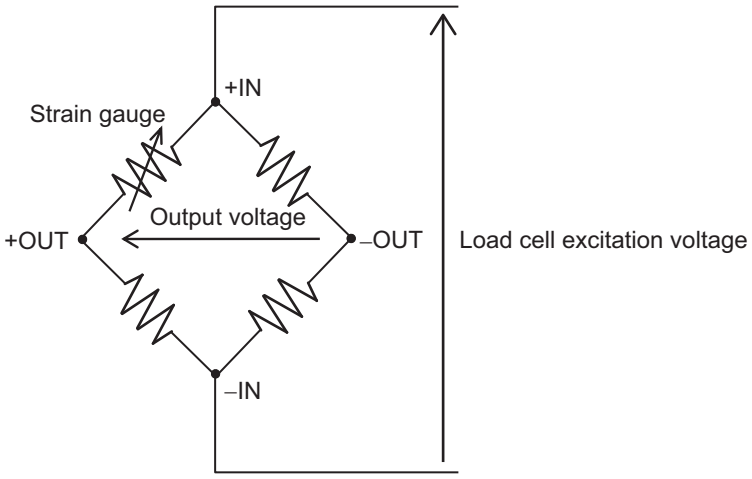
This section describes the specifications of input conversion in which output signals from the load cell are entered and converted into measurement values on the Load Cell Input Unit. This section first describes the general properties of the load cell and the terms used in weight measurement that are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

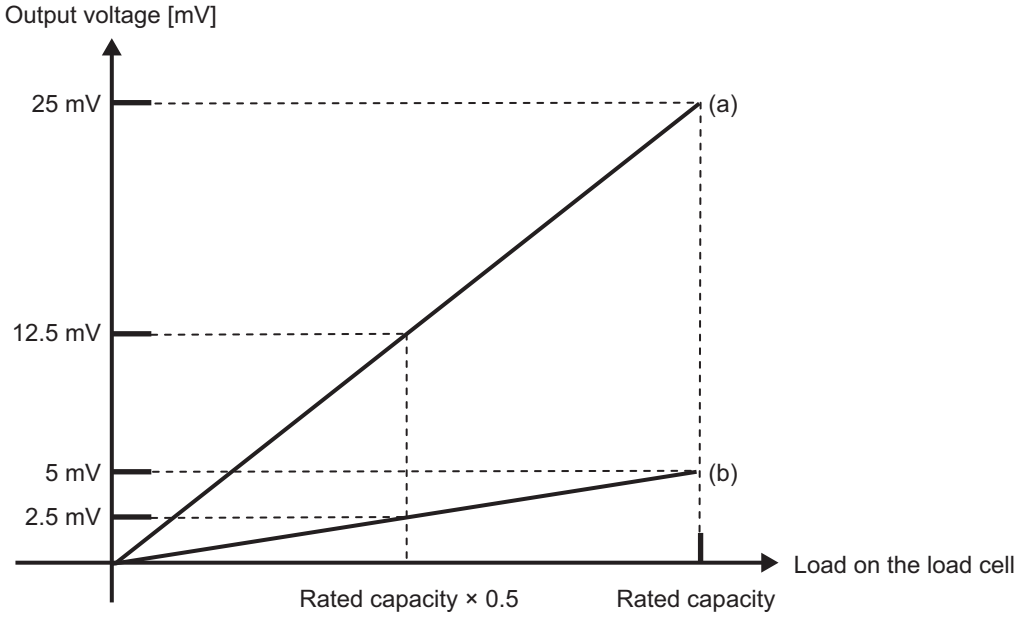
There is a maximum load that is measured for a load cell with its specifications maintained, and it is defined as the rated capacity. When a constant voltage is applied to the load cell, the output voltage is proportional to the load applied to the load cell. The specific voltage applied to the load 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
= 5 [mV/V] × 5 [V]
= 25 [mV]

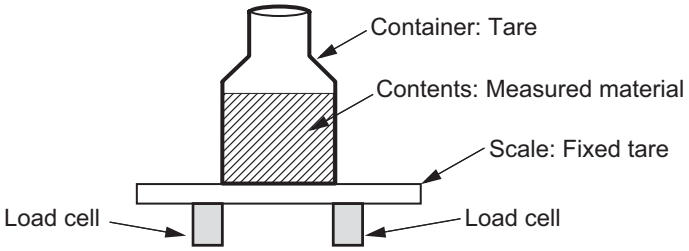
The following shows the output characteristics of the load cell when the load cell excitation voltage is 5 V.



(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.



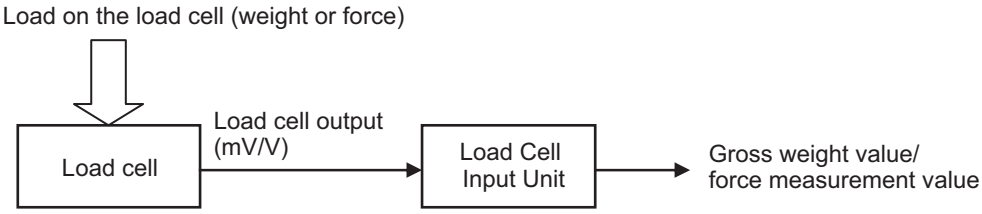
Term	Description
Fixed tare	This is an area of the scale or the scale hopper fixed on top of the load cell that does not change permanently. In this example, it is the scale where the container and the material are placed.
Tare	This is the container, such as a bag or a bottle, in which the measured material 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



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.

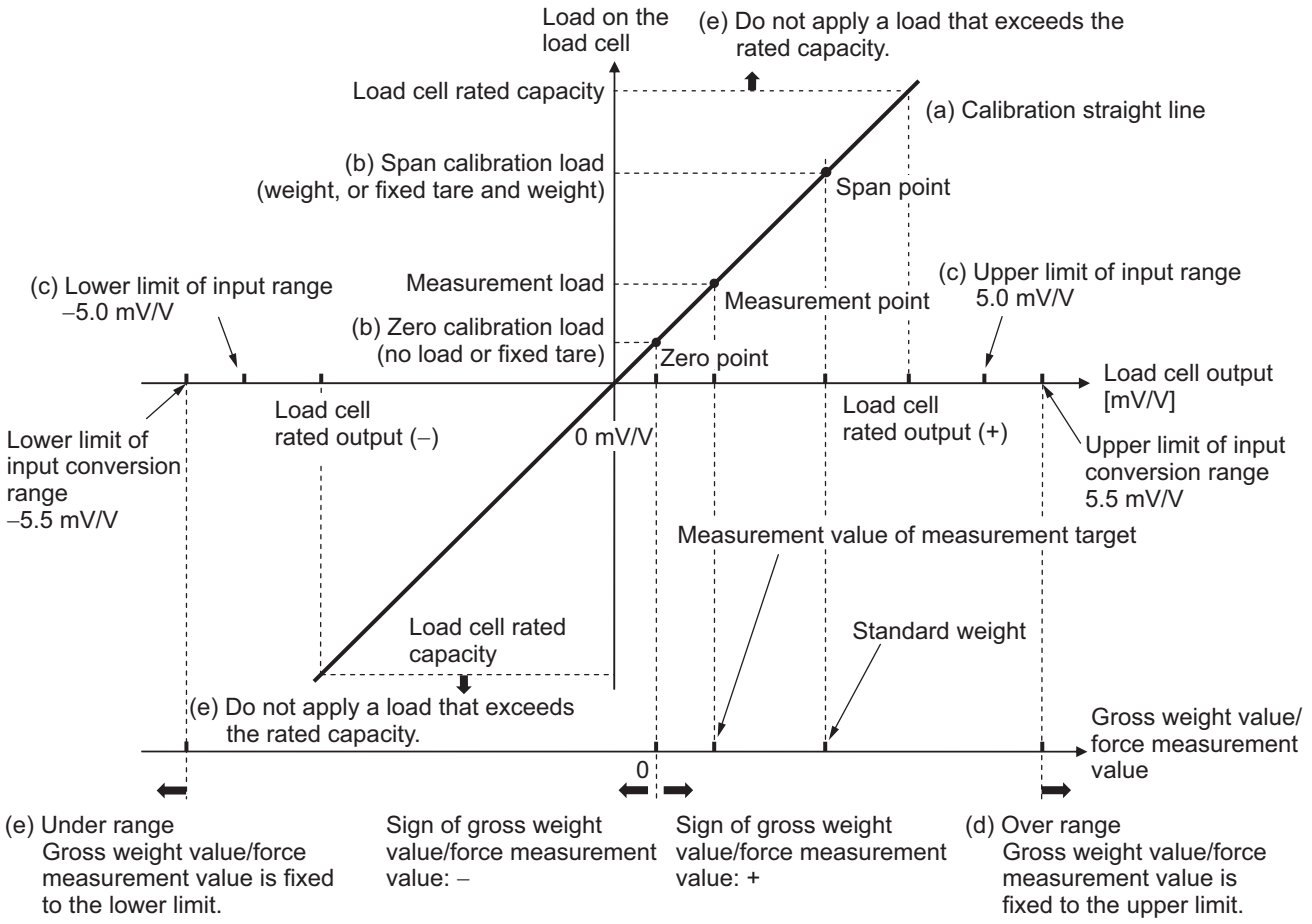
● Specifications of Input Conversion

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.

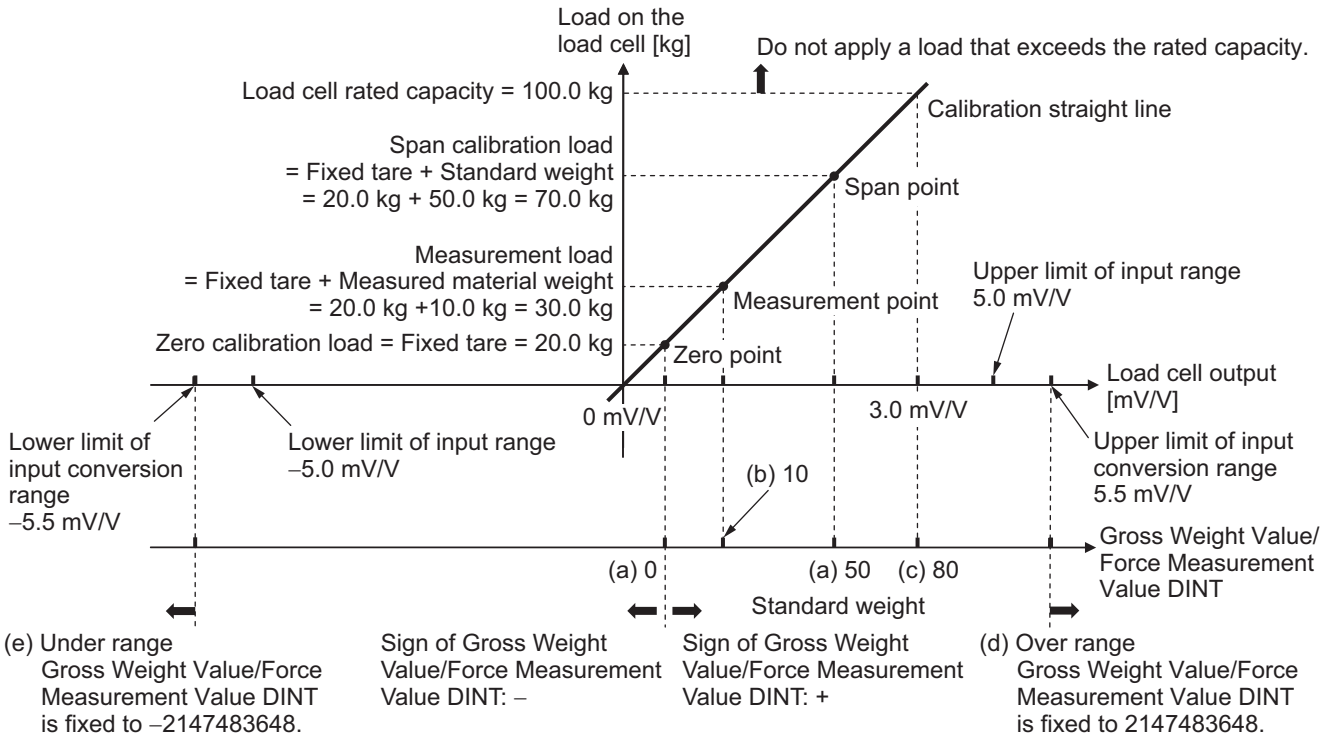
The conditions are as follows: If a setting is specified for an item, the set value is indicated.

Item	Condition	Set value	Remarks
Standard weight	50.0 kg	50.0	Set this in Standard Weight in the Unit operation settings. Refer to *7-2-2 Basic Parameter Settings* on page 7-7 for the detailed settings of standard weight.
Weight of the fixed tare	20.0 kg	---	---
Load cell rated capacity	100.0 kg	---	---
Load cell rated output	3.0 mV/V	---	---
Display of digits after the decimal point	$\times 10^0$	0	This is the default setting of Decimal Point Position in the Unit operation settings*1. Refer to *8-13 Decimal Point Position Setting* on page 8-46 for the detailed settings of the decimal point position.
Weight of the measured material	10.0 kg	---	---
Measurement display	Gross Weight Value/Force Measurement 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 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 value when an error occurs.



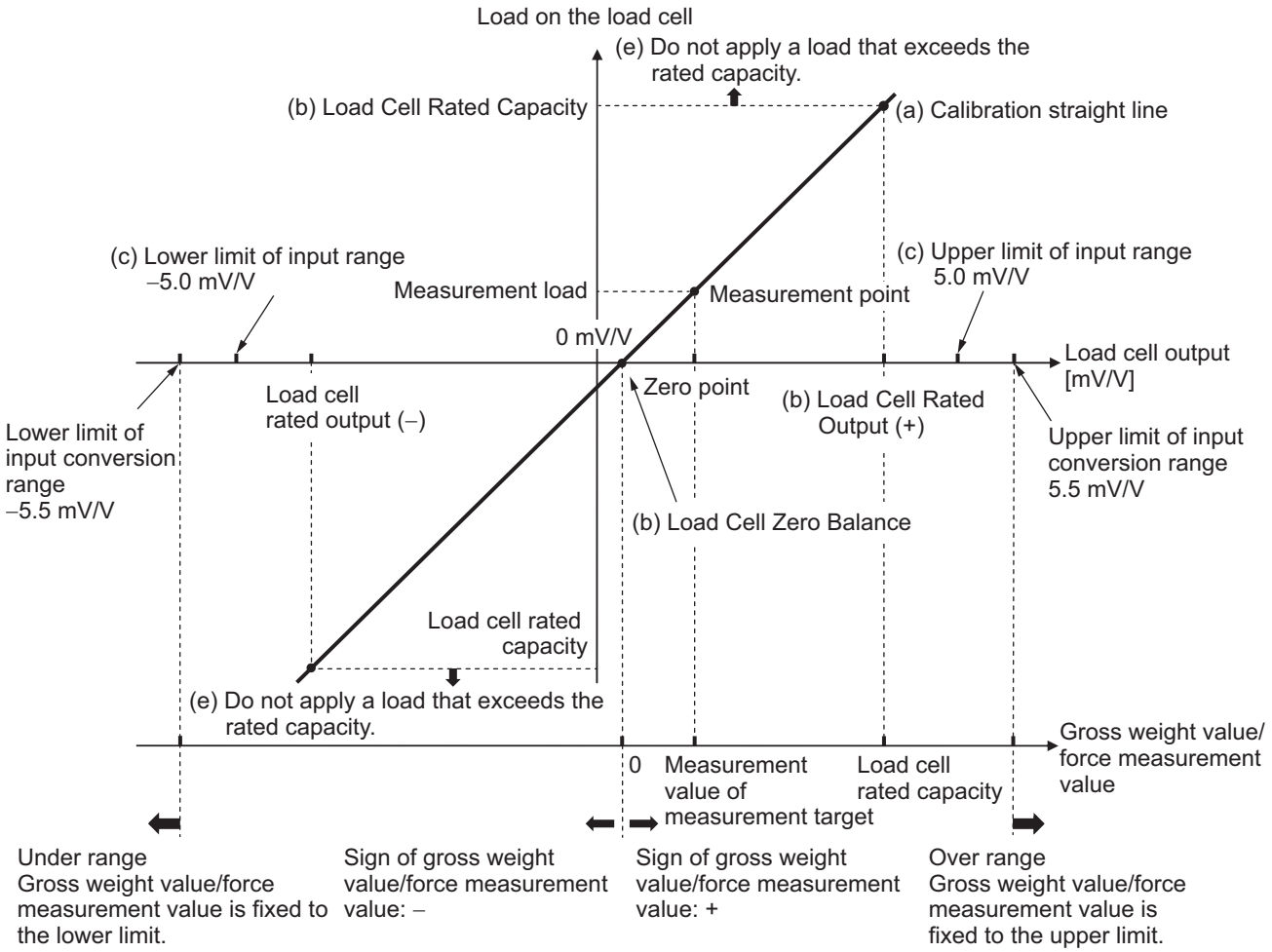
Specifications of Input Conversion Used for an Equivalent Input Calibration

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.)


Load on the load cell
(e) Do not apply a load that exceeds the rated capacity.
(b) Load Cell Rated Capacity
(a) Calibration straight line
(c) Lower limit of input range
–5.0 mV/V
Measurement load
Measurement point
(c) Upper limit of input range
5.0 mV/V
0 mV/V
Load cell output [mV/V]
Load cell rated output (–)
Zero point
(b) Load Cell Rated Output (+)
Lower limit of input conversion range
–5.5 mV/V
Upper limit of input conversion range
5.5 mV/V
(b) Load Cell Zero Balance
Load cell rated capacity
(e) Do not apply a load that exceeds the rated capacity.
Gross weight value/ force measurement value
0
Measurement value of measurement target
Load cell rated capacity
Under range
Gross weight value/force measurement value is fixed to the lower limit.
Sign of gross weight value/force measurement value: –
Sign of gross weight value/force measurement value: +
Over range
Gross weight value/force measurement value is fixed to the upper limit.

Specific Example of an Input Conversion

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

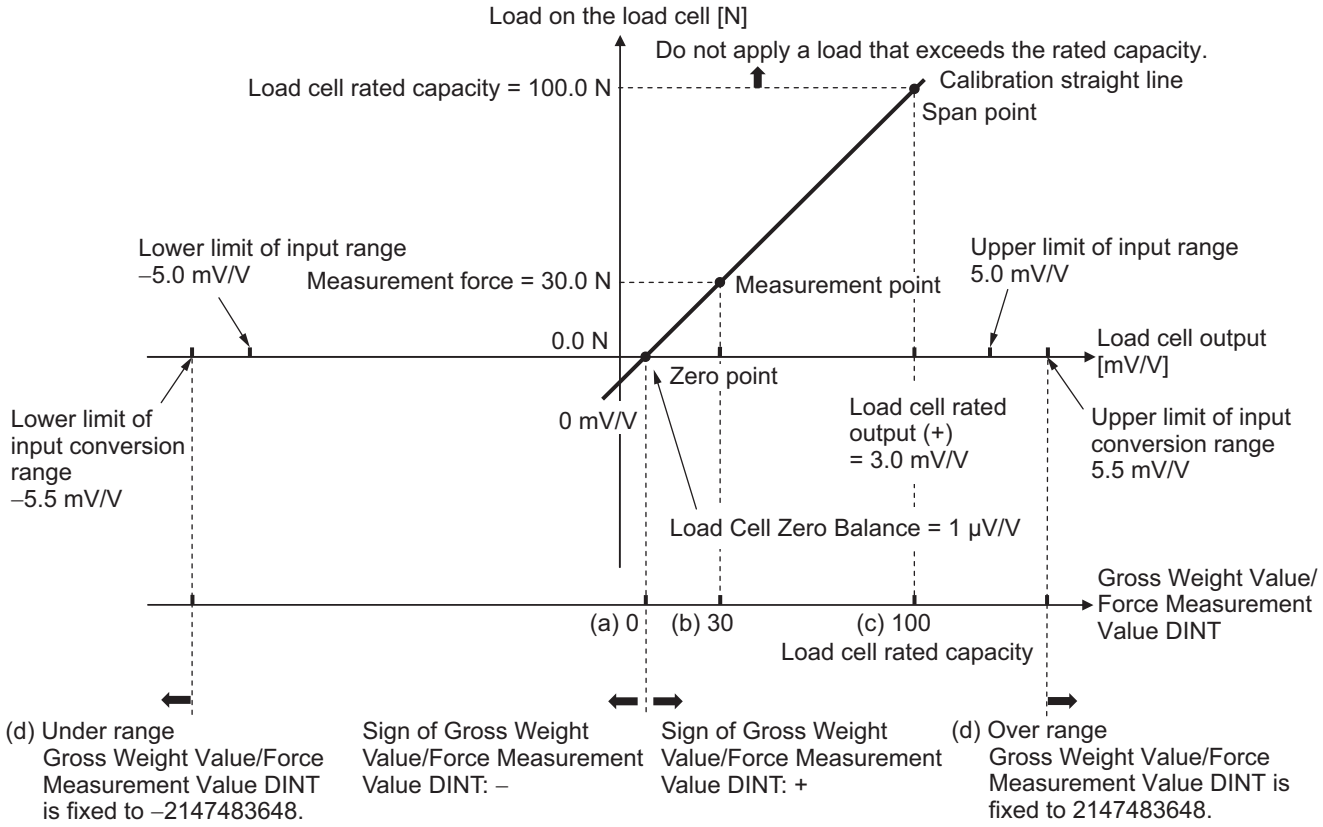
The conditions are as follows: If a setting is specified for an item, the set value is indicated.

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 capacity	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	$\times 10^0$	0	This is the default setting of Decimal Point Position in the Unit operation settings*1. Refer to *8-13 Decimal Point Position Setting* on page 8-46 for the detailed settings of decimal point position.
Measurement force	30.0 N	---	---
Measurement display	Gross Weight Value/Force Measurement 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 Units connected to the NX-series CPU Unit to the CPU Unit, use the I/O ports for the allocated I/O data.

To assign the I/O allocation information of the EtherCAT 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.

Do not use the I/O ports for the EtherNet/IP Slave Terminal. Refer to the *NX-series EtherNet/IP Coupler Unit User's Manual* (Cat. No. W536) for details on how to use the I/O data with EtherNet/IP Coupler Units.

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		*Net Weight Value DINT* on page 6-18
	Ch1 Net Weight Value REAL	4	REAL		*Net Weight Value REAL* 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		*Bottom Hold Value DINT* on page 6-19
	Ch1 Bottom Hold Value REAL	4	REAL		*Bottom Hold Value REAL* on page 6-20
	Ch1 Calibration Command Response SID[*3]	2	UINT		*Calibration Command Response SID* 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	*Operation Command* 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 connect to a CPU Unit or EtherCAT Coupler Unit, you can use the Read NX Unit Object instruction or the Write NX Unit Object instruction to access data that is not assigned as I/O. You use index numbers and subindex numbers with these instructions.
  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.
  For the index numbers and subindex numbers, refer to *A-3 List of NX Objects* on page A-7.
- If you use an EtherNet/IP Coupler Unit, you cannot access data that is not assigned to I/O.

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	ZPRO1	ADCE1	OR1	UR1	SDE1
+1	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)

Abbreviation	Data name	Description*1	Data type	I/O port name
SDE1	Ch1 Sensor Disconnected Error	1: A sensor disconnection was detected. 0: A sensor disconnection was not detected. It is fixed to 0 unless during the sensor disconnection test.	BOOL	Ch1 Sensor Disconnected Error
UR1	Ch1 Under Range	1: An under range was detected. 0: An under range was not detected. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Under Range
OR1	Ch1 Over Range	1: An over range was detected. 0: An over range was not detected. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Over Range
ADCE1	Ch1 AD Conversion Error	1: An AD conversion error was detected. 0: An AD conversion error was not detected.	BOOL	Ch1 AD Convertion Error
ZPRO1	Ch1 Zero Point Range Over	1: A zero point range over was detected. 0: A zero point range over was not detected. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Zero Point Range Over
SST1	Ch1 Stable Status	1: A gross weight value/force measurement value was detected to be stable. 0: A gross weight value/force measurement value was not detected to be stable. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Stable Status
(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-EXC1	ZSEXC1	HEXC1	MAF2DIS1	MAF1DIS1	DLPF-DIS1	IRSEXC1	SDTEXC1
+1	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	(RSV)	DTEXC1

Abbreviation	Data name	Description[*1]	Data type	I/O port name
SDTEXC1	Ch1 Sensor Disconnection Test Executing	1: The sensor disconnection test is in progress. 0: The sensor disconnection test is not in progress.	BOOL	Ch1 Sensor Disconnection Test Executing
IRSEXC1	Ch1 Input Value Refreshing Stopping	1: The input value refreshing stop is in progress. 0: The input value refreshing stop is not in progress. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Input Value Refreshing Stopping
DLPFDIS1	Ch1 Digital Low-pass Filter Disabled	1: The digital low-pass filter is disabled. 0: 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	1: The moving average filter 1 is disabled. 0: The moving average filter 1 is enabled. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Moving Average Filter 1 Disabled
MAF2DIS1	Ch1 Moving Average Filter 2 Disabled	1: The moving average filter 2 is disabled. 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 Executing	1: The peak hold or bottom hold is in progress. 0: The peak hold or bottom hold is not in progress. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Hold Executing

Abbreviation	Data name	Description*1	Data type	I/O port name
ZSEXC1	Ch1 Zero Set Executing	1: The zero set is in progress. 0: The zero set is not in progress. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Zero Set Executing
OTTSEXC1	Ch1 One-touch Tare Subtraction Executing	1: One-touch tare subtraction is in progress. 0: One-touch tare subtraction is not in progress. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 One-touch Tare Subtraction Executing
DTEXC1	Ch1 Data Trace Executing	1: The data tracing is in progress. 0: The data tracing is not in progress. During the sensor disconnection test, it is fixed to 0.	BOOL	Ch1 Data Trace Executing
(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 Value/Force Measurement Value DINT	DINT	0	Ch1 Gross Weight Value/Force Measurement Value DINT	6002	01

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 Weight Value/Force Measurement Value DINT LL							
+1	Ch1 Gross Weight Value/Force Measurement Value DINT LH							
+2	Ch1 Gross Weight Value/Force Measurement Value DINT HL							
+3	Ch1 Gross Weight Value/Force Measurement Value 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 Value/Force Measurement Value REAL	REAL	0.0	Ch1 Gross Weight Value/Force Measurement Value REAL	6003	01

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	DINT	0	Ch1 Net Weight Value DINT	6004	01

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 Weight Value DINT LH							
+2	Ch1 Net Weight Value DINT HL							
+3	Ch1 Net Weight Value DINT 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	REAL	0.0	Ch1 Net Weight Value REAL	6005	01

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 Hold Value DINT LH							
+2	Ch1 Peak Hold Value DINT HL							
+3	Ch1 Peak Hold Value DINT 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	REAL	0.0	Ch1 Peak Hold Value REAL	6007	01

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 Hold Value DINT LL							
+1	Ch1 Bottom Hold Value DINT LH							
+2	Ch1 Bottom Hold Value DINT HL							
+3	Ch1 Bottom 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	REAL	0.0	Ch1 Bottom Hold Value REAL	6009	01

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 Command Response SID	UINT	0	Ch1 Calibration Command Response SID	600A	01

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 Command Response	WORD	0000 hex	Ch1 Calibration Command 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 calibration commands listed below. 0090 hex, 0091 hex, 0092 hex, 0093 hex, 0020 hex, 0030 hex, 0040 hex	Send the correct calibration command.
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-volatile 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 Command	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

Abbreviation	Data name	Meaning[*1]	Data type	I/O port name
SDTE1	Ch1 Sensor Disconnection Test Execution	1: Executes the sensor disconnection test. 0: Ends the sensor disconnection test.	BOOL	Ch1 Sensor Disconnection Test Execution
IRSE1	Ch1 Input Value Refreshing Stop	1: Executes the input value refreshing stop. 0: Ends the input value refreshing stop.	BOOL	Ch1 Input Value Refreshing Stop
DLPFD1	Ch1 Digital Low-pass Filter Disable	1: Disables the digital low-pass filter. 0: Enables the digital low-pass filter. If the Digital Low-pass Filter Cutoff Frequency[*2] is set to 0, the digital low-pass filter will not enable even if you set this bit to 0.	BOOL	Ch1 Digital Low-pass Filter Disable
MAF1D1	Ch1 Moving Average Filter 1 Disable	1: Disables the moving average filter 1. 0: Enables the moving average filter 1. If the Filter 1 Moving Average Count[*2] is set to 0, the moving average filter 1 will not enable even if you set this bit to 0.	BOOL	Ch1 Moving Average Filter 1 Disable
MAF2D1	Ch1 Moving Average Filter 2 Disable	1: Disables the moving average filter 2. 0: Enables the moving average filter 2. If the Filter 2 Moving Average Count[*2] is set to 0, the moving average filter 2 will not enable even if you set this bit to 0.	BOOL	Ch1 Moving Average Filter 2 Disable
HE1	Ch1 Hold Execution	1: Executes the hold. 0: Ends the hold.	BOOL	Ch1 Hold Execution
ZSE1	Ch1 Zero Set Execution	1: Executes the zero set. 0: Executes the zero reset.	BOOL	Ch1 Zero Set Execution
OTTSE1	Ch1 One-touch Tare Subtraction Execution	1: Executes the one-touch tare subtraction. 0: Ends the one-touch tare subtraction.	BOOL	Ch1 One-touch Tare Subtraction Execution
DTE1	Ch1 Data Trace Execution	1: Executes the data tracing. 0: Ends the data tracing.	BOOL	Ch1 Data Trace Execution

Abbreviation	Data name	Meaning*1	Data type	I/O port name
HVC1	Ch1 Hold Value Clear	1: Clears the held peak value/bottom value. 0: Do not clear the held peak value/bottom value.	BOOL	Ch1 Hold Value Clear
(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 Command SID	UINT	0	Ch1 Calibration Command 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 Command	WORD	0000 hex	Ch1 Calibration Command	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							
+1	Mantissa							
+2	Exponent	Mantissa						
+3	Sign	Exponent						

7

Calibration Methods

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

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7-1-1 Overview of Actual Load Calibration and Equivalent Input Calibration 7-2
7-1-2 Precautions for Calibration 7-3
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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

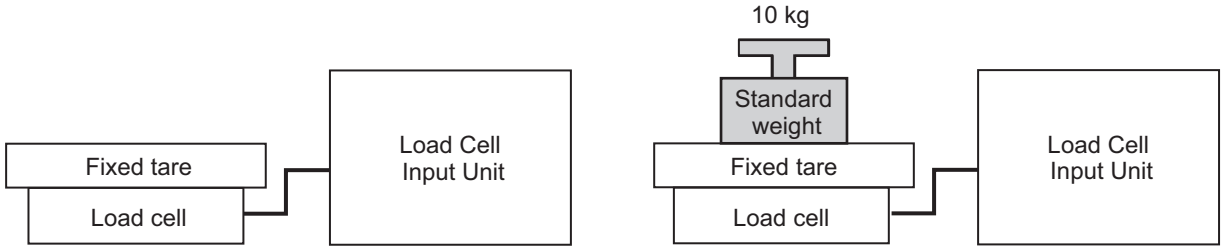
The Load Cell Input Unit can properly convert the input into measurement values according to the load on the load cell when a calibration is performed. For example, when a load of 10 kg is applied to the load cell, perform a calibration in order for the Load Cell Input Unit to convert the measurement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

7-2 Actual Load Calibration

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

7-2-1 Calibration Procedure

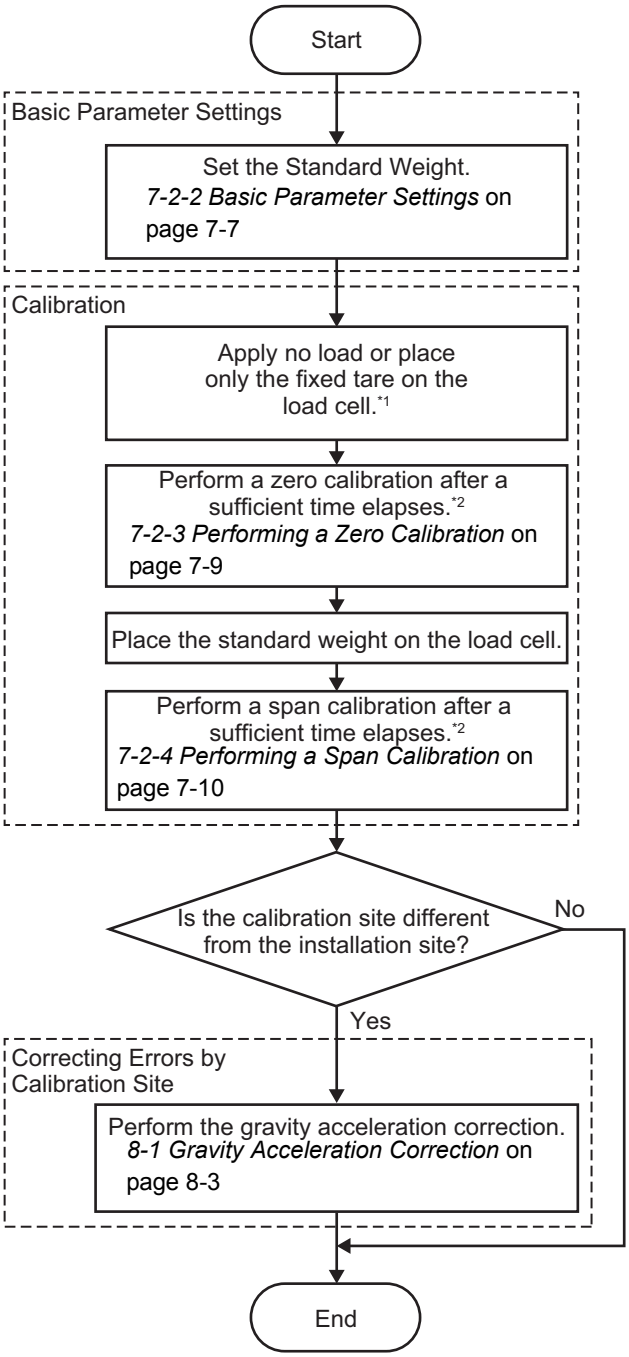
The calibration procedure varies depending on the following situations:

- 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.

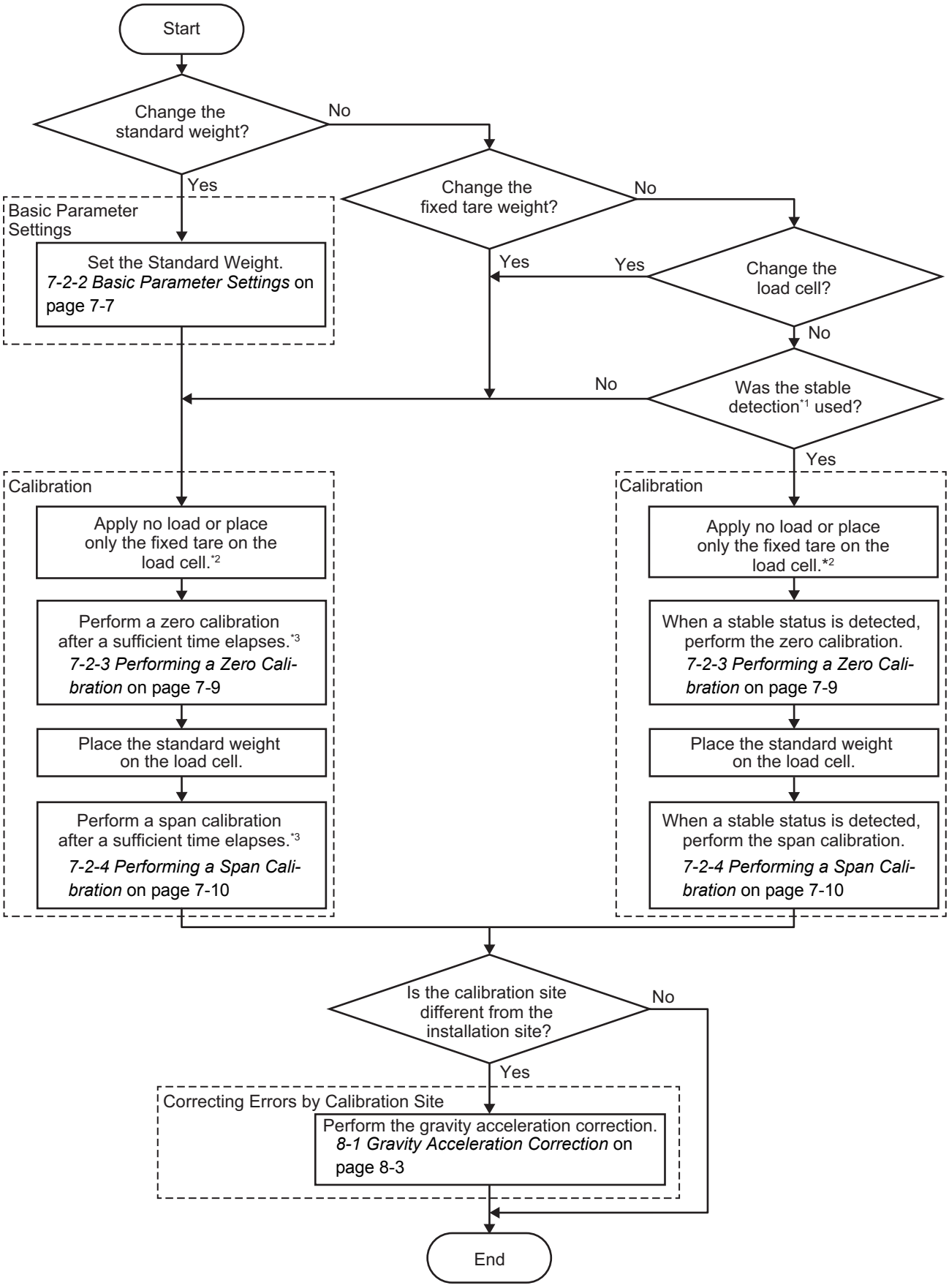


*1. Place the fixed tare on the load cell if you use it during the measurement. If you do not use a fixed tare, do not apply any load to the load cell.

*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.

When Performing an Actual Load Calibration Again

The following is a procedure to perform an actual load calibration again.



*1. This function detects whether the gross weight values are stable. Refer to *8-7 Stable Detection* on page 8-26 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.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Standard Weight	Sets the value of the standard weight placed on the load cell to perform a span calibration.	5.0	1.175495e−38 to 3.402823e+38	---	Set the value that matches the unit of the gross weight value/force measurement value to measure. For example, if the value of the standard weight is 100 kg and the unit of the measurement is kg, set 100 as the set value. For the measurement 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 Sysmac Studio 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.

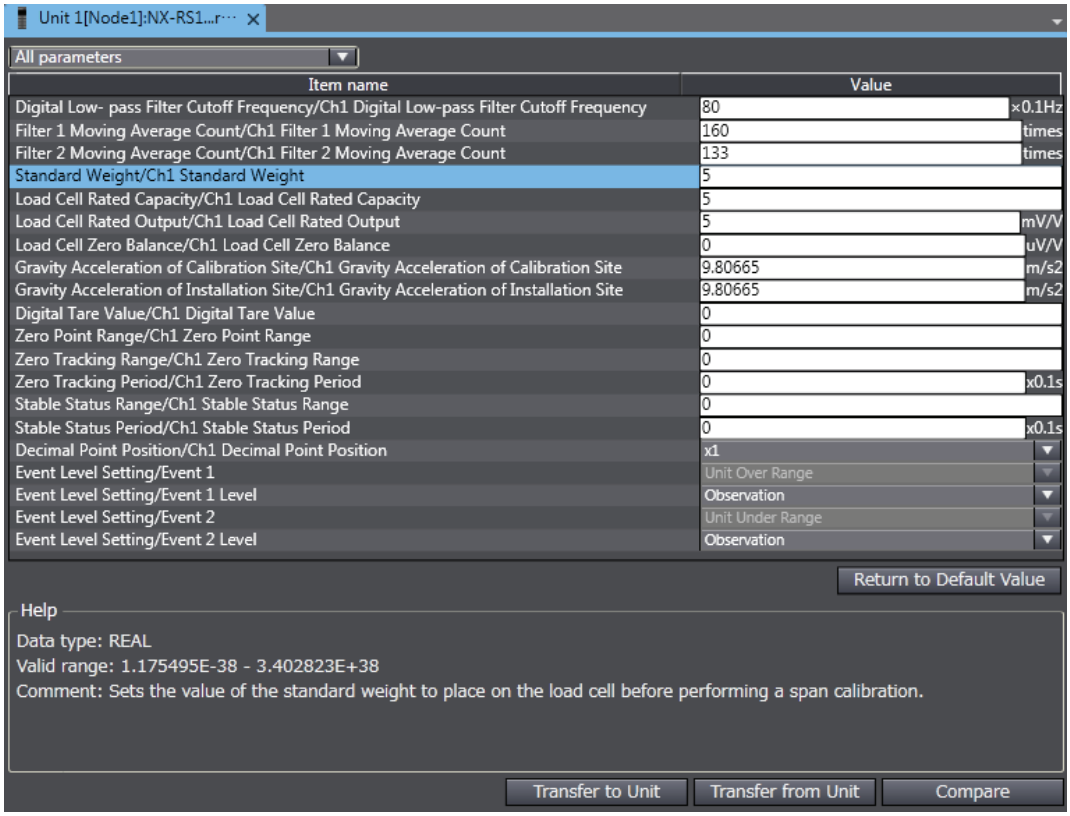
Perform the actual load calibration again or set the value of the Ch1 Standard Weight to the value before you clear all memory to convert the measurement value correctly. If the standard weight is already set, you do not need to perform the actual load calibration again because the calibration value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

Setting Method

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

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.



2 Set the Ch1 Standard Weight.

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

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

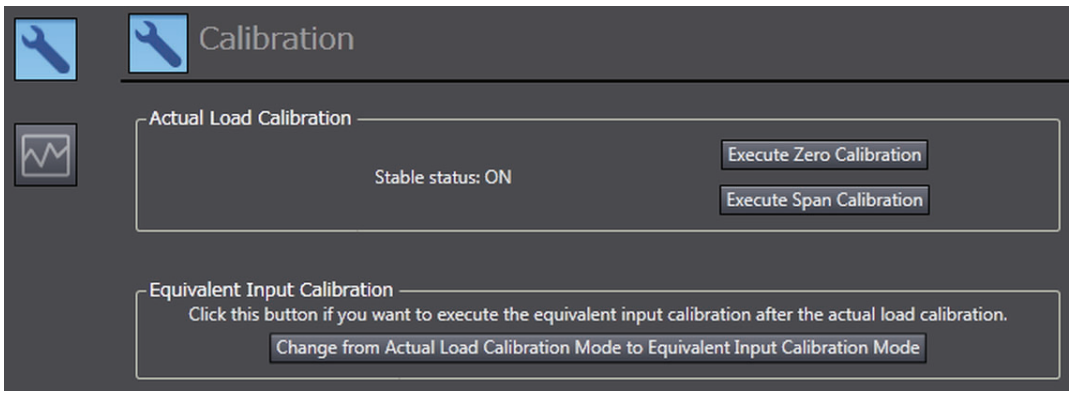
The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

7-2-3 Performing a Zero Calibration

The method for performing a zero calibration with the Sysmac Studio is given below.

1 Display the calibration view.

For the display methods, refer to *A-6 Display Methods for the Calibration View* on page A-19.

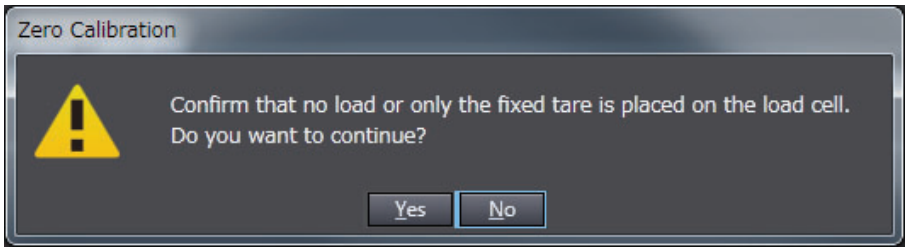


2 Check Stable status in Actual Load Calibration is ON if the stability of the gross weight value is being checked using the stable detection. A check of Stable status is not required if the stability of the gross weight value is not being checked.

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.



4 Click the **Yes** Button.

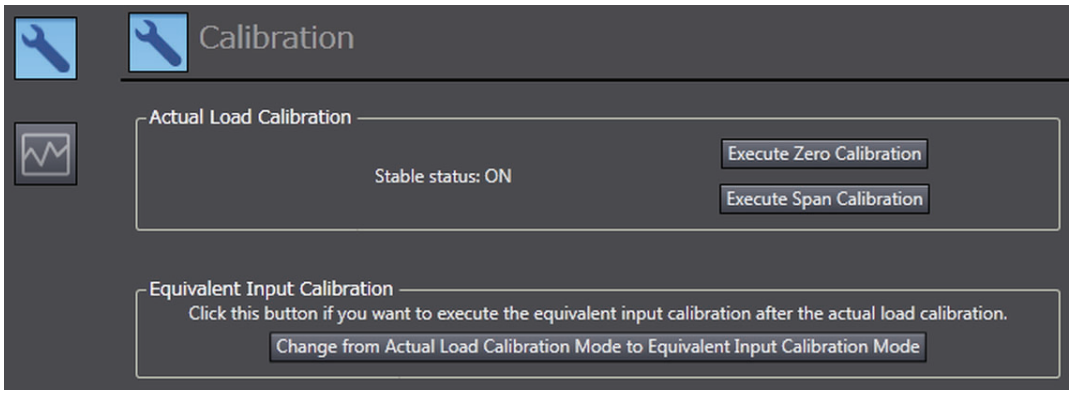
A zero calibration is performed.

7-2-4 Performing a Span Calibration

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

1 Display the calibration view.

For the display methods, refer to *A-6 Display Methods for the Calibration View* on page A-19.

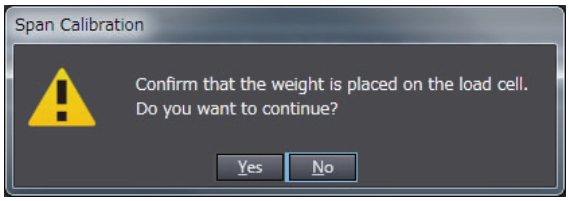


2 Check Stable status in Actual Load Calibration is ON if the stability of the gross weight value is being checked using the stable detection. A check of Stable status is not required if the stability of the gross weight value is not being checked.

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.



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.

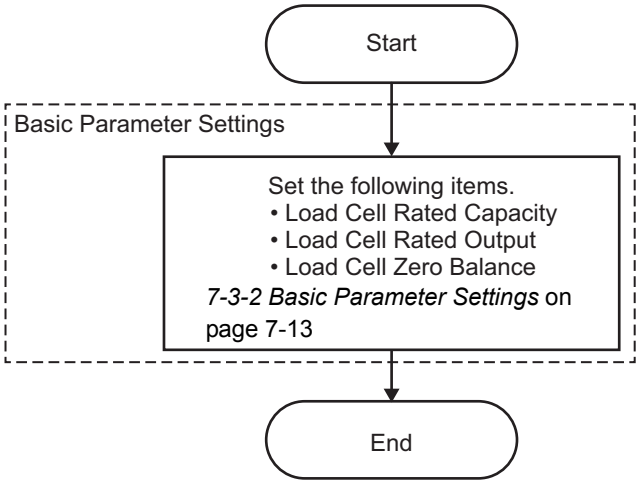
7-3-1 Calibration Procedure

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

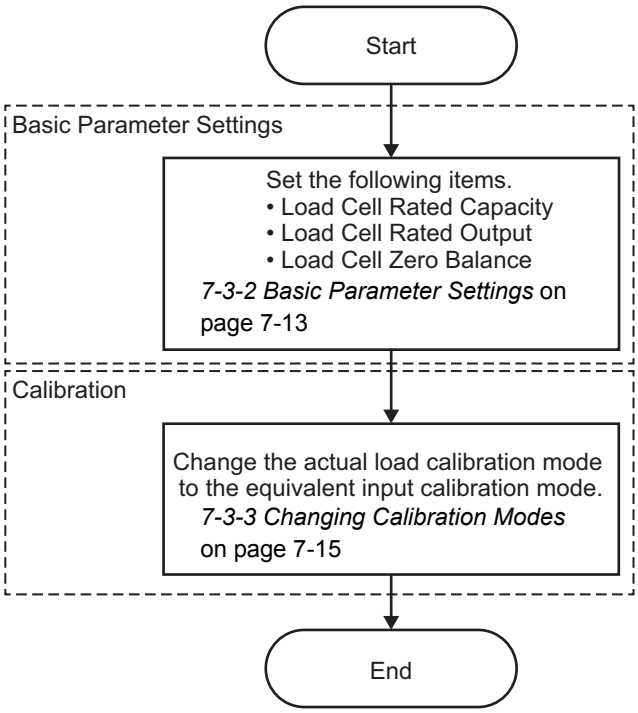
The procedure of an equivalent input calibration for each situation is described.

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 8-12 for details on the zero set.

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 8-12 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.

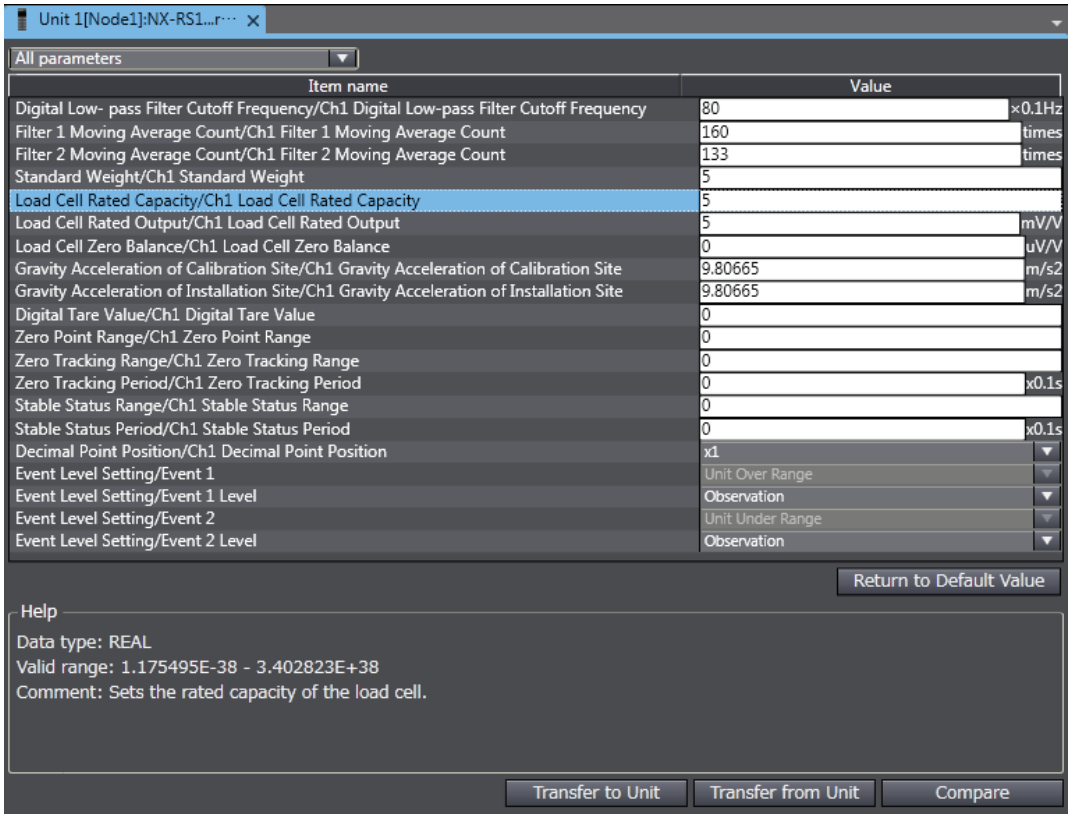
Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Load Cell Rated Capacity	Sets the rated capacity of the load cell.	5.0	1.175495e−38 to 3.402823e+38	---	• When more than one load cell is connected in parallel, set a value calculated from Rated capacity per load cell × Number of load cell 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 output 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 balance of the load cell.	0.0	−3.402823e+38 to 3.402823e+38	μV/V	• 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 *8-3 Zero Set/Zero Reset* on page 8-12 for details on the zero set.

Setting Method

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

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.



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 Sysmac Studio to the NX Unit.

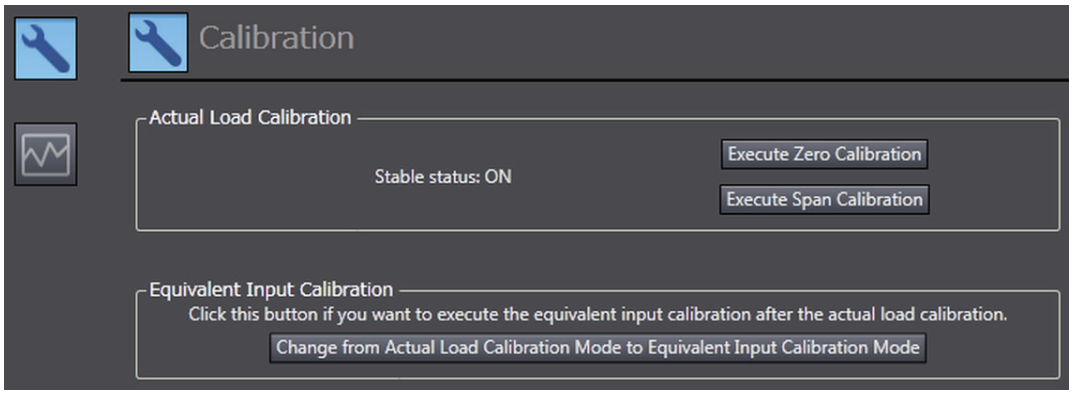
The settings are reflected immediately after the transfer of settings to the NX Unit is completed.

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 Sysmac Studio is given below.

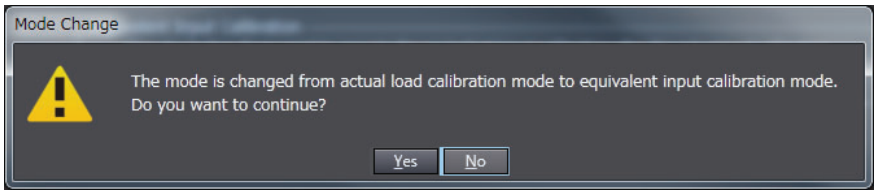
1 Display the calibration view.

For the display methods, refer to *A-6 Display Methods for the Calibration View* on page A-19.



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.



3 Click the **Yes** Button.

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

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

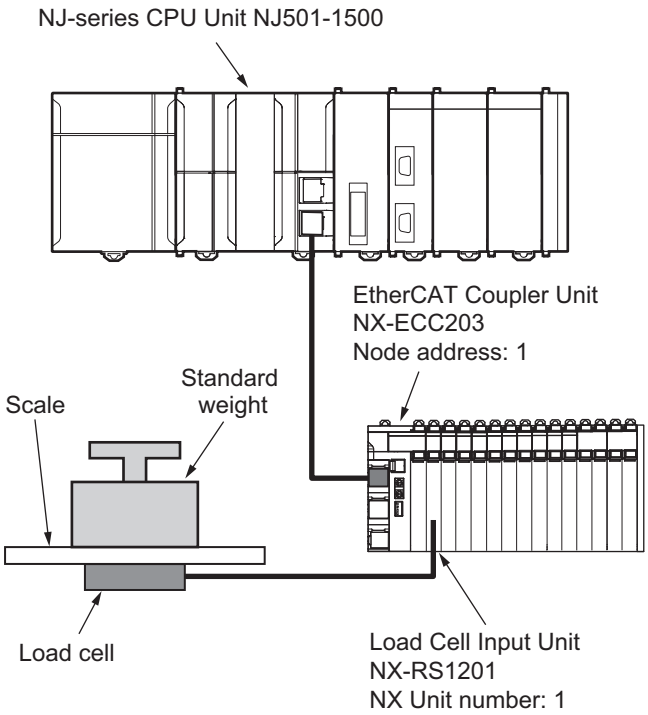
7-4-1 Performing an Actual Load Calibration

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 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 7-29 for an application example when the Load Cell Input Unit is connected to an NX-series NX1P2 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 assign in the I/O allocation settings.
NX-RS1201	Ch1 Calibration Command Response SID	
	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 Calibration Command SID to 0		When the user sets the following internal variable to TRUE, this processing is performed.*1 • Actual_Load_Calibration_Start
Setting Ch1 Standard Weight	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	
Performing a zero calibration	Sending Ch1 Calibration Command SID and Ch1 Calibration Command	When the user sets the following internal variable to TRUE, this processing is performed.*1 • Zero_Calibration_Start
	Checking whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched	
	Checking Ch1 Calibration Command Response	
Performing a span calibration	Sending Ch1 Calibration Command SID and Ch1 Calibration Command	When the user sets the following internal variable to TRUE, this processing is performed.*1 • Span_Calibration_Start
	Checking whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched	
	Checking Ch1 Calibration Command Response	

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 performed. • 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 performed. • 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 Sysmac Studio.

Unit	Port	Meaning	Data type	Variable name	Variable type
NX-ECC203	NX Unit I/O Data Active Status 63	This status is given as an array of BOOL data. TRUE indicates that the I/O data in the NX Unit can be used for control.	ARRAY [0..63] OF BOOL	E001_NX_Unit_I_O_Data_Active_Status_63	Global variable
	NX Unit Error Status 63	This status is given as an array of BOOL data. TRUE indicates that an error occurs in the NX Unit.	ARRAY [0..63] OF BOOL	E001_NX_Unit_Error_Status_63	Global variable
NX-RS1201	Ch1 Calibration Command Response SID	Ch1 Calibration Command Response SID	UINT	N1_Ch1_Calibration_Command_Response_SID	Global variable
	Ch1 Calibration Command Response	Ch1 Calibration Command Response	WORD	N1_Ch1_Calibration_Command_Response	Global variable
	Ch1 Calibration Command SID	Ch1 Calibration Command SID	UINT	N1_Ch1_Calibration_Command_SID	Global variable
	Ch1 Calibration Command	Ch1 Calibration Command	WORD	N1_Ch1_Calibration_Command	Global variable
	Ch1 Calibration Data	Ch1 Calibration Data	REAL	N1_Ch1_Calibration_Data	Global variable

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 Sysmac Studio 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 process data communications status	Process_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that EtherCAT process data communications are active and normal.	-
Resetting Ch1 Calibration Command SID to 0	Actual_Load_Calibration_Start	BOOL	FALSE	This variable is used to start an actual load calibration. Set it to TRUE when you set Ch1 Standard Weight. When this variable is TRUE and EtherCAT process data communications are active and normal, Ch1 Calibration Command SID is reset to 0 and Ch1 Standard Weight is set.	Yes
	Initial_State_Setting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibration Command SID is reset to 0.	-
	Initial_State_SID_Check	BOOL	FALSE	When this variable changes to TRUE, whether Ch1 Calibration 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 Standard Weight	Standard_Weight_Setting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Standard Weight is set.	-
	Standard_Weight_Command	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Standard Weight. Before you perform the sample programming, set this variable to 0093 hex.	Yes
	Standard_Weight_Value	REAL	0.0	This variable is used to set Ch1 Calibration Command for Ch1 Standard Weight. Before you perform the sample programming, set a value according to the standard weight to use.	Yes
	Standard_Weight_SID_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match in the setting of Ch1 Standard Weight.	-
	Standard_Weight_Setting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal in the setting of Ch1 Standard Weight.	-
	Standard_Weight_Error_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the setting of Ch1 Standard Weight, Ch1 Calibration Command Response is stored in this variable.	-
	Standard_Weight_Setting_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Standard Weight was completed normally.	-
	Standard_Weight_Check_instance	Send_Response_Check_FB	---	This instance is used to set Ch1 Standard Weight. Use the Send_Response_Check_FB function block.*1	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Performing a zero calibration	Zero_Calibration_Start	BOOL	FALSE	This variable is used to start a zero calibration. Set it to TRUE when you perform a zero calibration. When this variable is TRUE and EtherCAT process data communications are active and normal, a zero calibration is performed.	Yes
	Zero_Calibration_Command	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to perform a zero calibration. Before you perform the sample programming, set this variable to 0020 hex.	Yes
	Zero_Calibration_SID_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match in the execution of a zero calibration.	-
	Zero_Calibration_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal in the execution of a zero calibration.	-
	Zero_Calibration_Error_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the execution of a zero calibration, Ch1 Calibration Command Response is stored in this variable.	-
	Zero_Calibration_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the zero calibration was completed normally.	-
	Zero_Calibration_Check_instance	Send_Response_Check_FB	---	This instance is used to perform a zero calibration. Use the Send_Response_Check_FB function block.*1	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Performing a span calibration	Span_Calibration_Start	BOOL	FALSE	This variable is used to start a span calibration. Set it to TRUE when you perform a span calibration. When this variable is TRUE and EtherCAT process data communications are active and normal, a span calibration is performed.	Yes
	Span_Calibration_Command	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to perform a span calibration. Before you perform the sample programming, set this variable to 0030 hex.	Yes
	Span_Calibration_SID_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match in the execution of a span calibration.	-
	Span_Calibration_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal in the execution of a span calibration.	-
	Span_Calibration_Error_Code	WORD	0000 hex	If Ch1 Calibration Command Response is abnormal in the execution of a span calibration, Ch1 Calibration Command Response is stored in this variable.	-
	Span_Calibration_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the span calibration was completed normally.	-
	Span_Calibration_Check_instance	Send_Response_Check_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_Command_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 completion of actual load calibration	Actual_Load_Calibration_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.

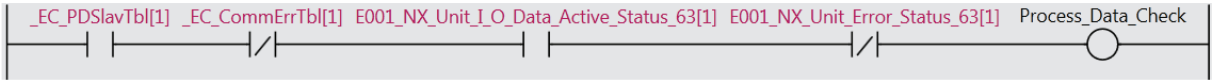
Refer to *Internal Variables* on page 7-19 for details on these internal variables.

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.

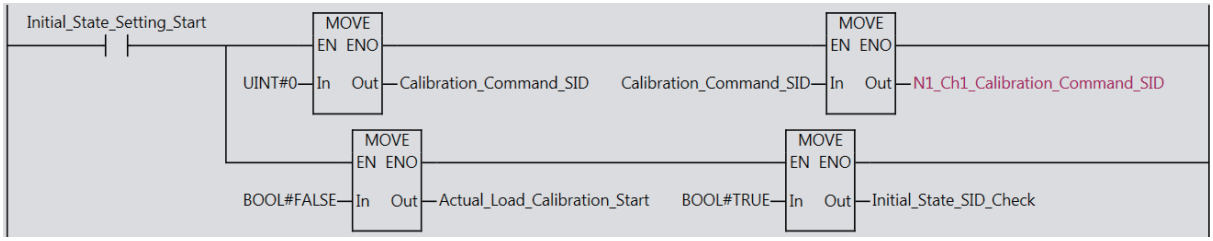
The status of process data communications is always monitored to see if communications are active and normal.

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

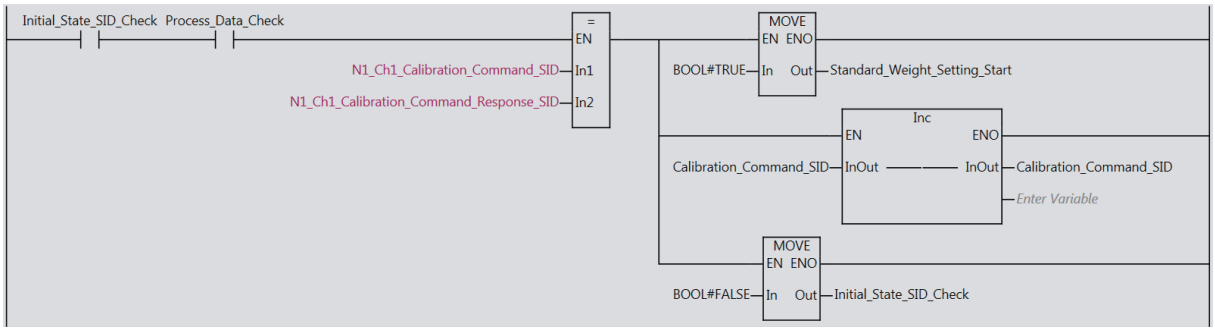


When *Actual_Load_Calibration_Start* changes to TRUE, an actual load calibration is started.

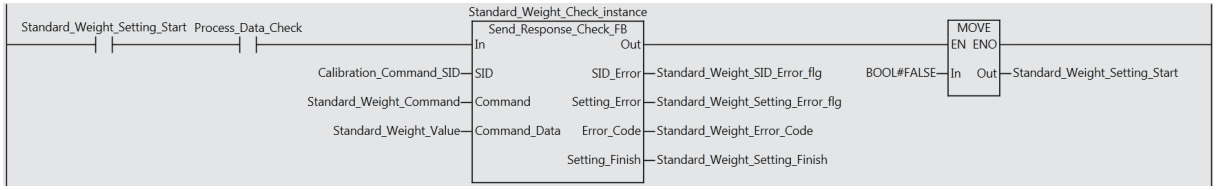
Ch1 Calibration Command SID is sent by 0 and Ch1 Calibration Command SID is reset to 0.



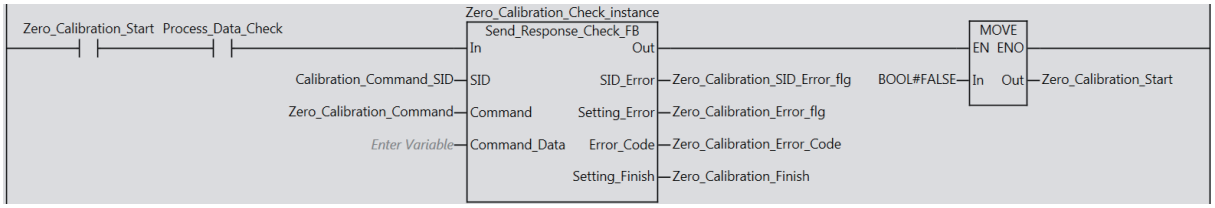
Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are compared. If they match, 1 is added to the previous value of Ch1 Calibration Command SID.



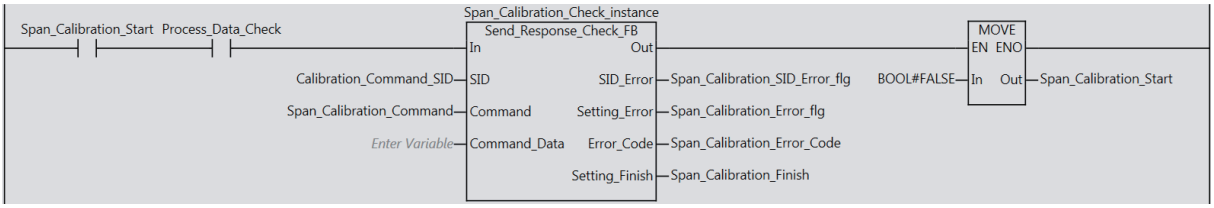
When *Standard_Weight_Setting_Start* changes to TRUE, Ch1 Standard Weight is set by *Standard_Weight_Check_instance*. The operation of *Standard_Weight_Check_instance* is defined in the Send_Response_Check_FB function block[*1].



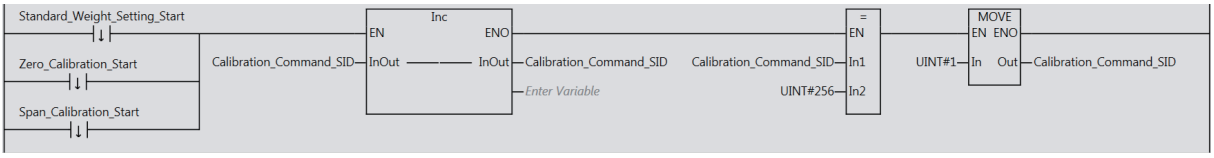
When *Zero_Calibration_Start* changes to TRUE, a zero calibration is performed by *Zero_Calibration_Check_instance*. Perform a zero calibration with no load applied or only the fixed tare placed on the load cell. The operation of *Zero_Calibration_Check_instance* is defined in the Send_Response_Check_FB function block[*1].



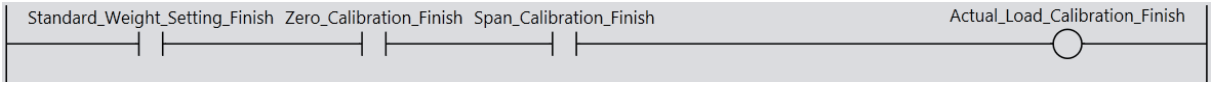
When *Span_Calibration_Start* changes to TRUE, a span calibration is performed by *Span_Calibration_Check_instance*. Perform a span calibration with the standard weight placed on the load cell. The operation of *Span_Calibration_Check_instance* is defined in the Send_Response_Check_FB function block*1.



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



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.



*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 Sysmac Studio. The user must create this function block and register in the Sysmac Studio. Refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501) for details on how to create a function block. Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for the registration procedure.

Functions of the Send_Response_Check_FB are as follows.

Sample programming	Function	Description
Performing an actual load calibration	Setting basic parameters	Sets Ch1 Standard Weight.
	Calibration	Performs a zero calibration and a span calibration.
Performing an equivalent input calibration	Setting basic parameters	Sets Ch1 Load Cell Rated Capacity, Ch1 Load Cell Rated Output, and Ch1 Load Cell Zero Balance.
	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 Calibration Command Response SID is checked.	-
Next_Step	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibration 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. 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.	Yes
Elapsed_time	TIME	T#0 ms	This variable indicates the time elapsed from monitoring 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 hex	This variable is used to set Ch1 Calibration Command. The 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.

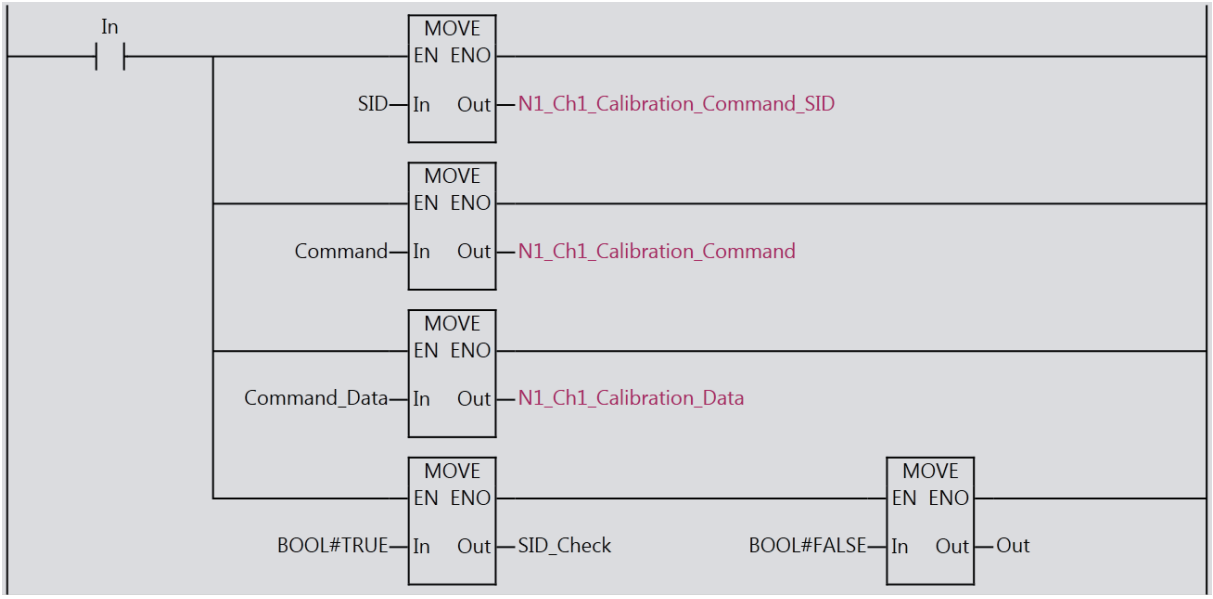
Variable name	Data type	Set value
Set_Time	TIME	Set a desired value. We recommend a value around 1000 ms.

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

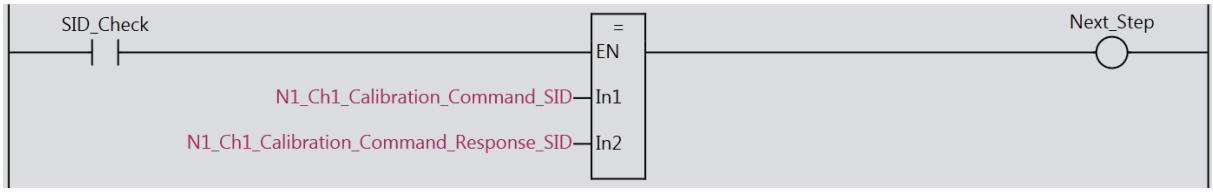
● Sample Programming of the Function Block

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.

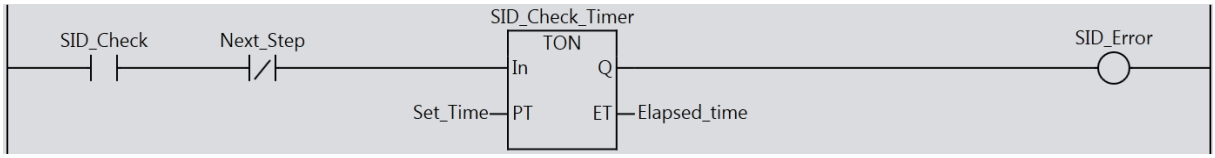
Ch1 Calibration Command SID, Ch1 Calibration Command, and Ch1 Calibration Data are sent.



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



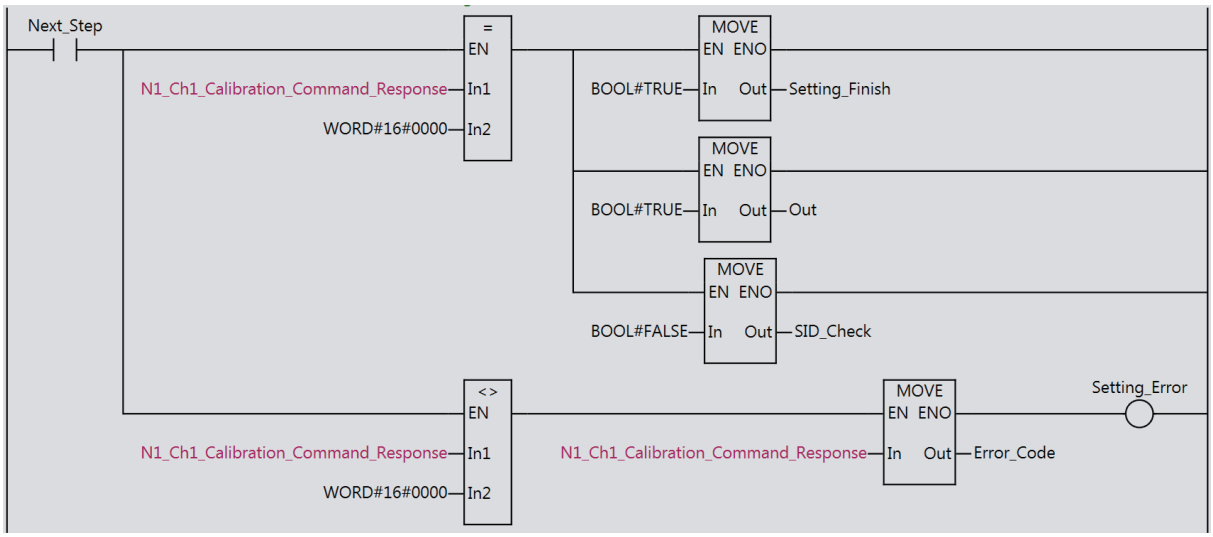
If Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match even after the time that was set by *Set_time* elapses, *SID_Error* changes to TRUE and it is notified that they do not match.



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

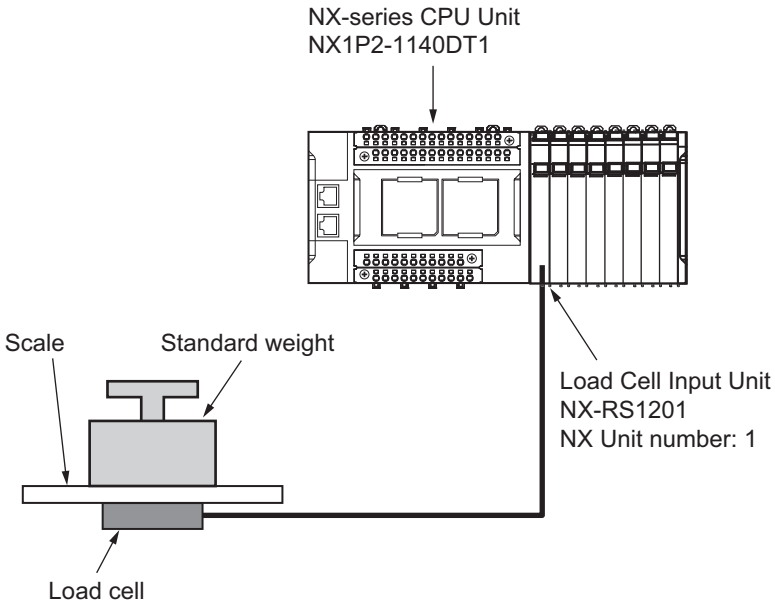
The following is an application example when the Load Cell Input Unit shown in the above configuration examples is connected to an NX-series NX1P2 CPU Unit. Here, only the differences from the examples for EtherCAT Slave Terminals are shown.

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

● System Configuration

The system configuration is given below.

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



● 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 communications status	There are no execution conditions. 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 Data Active Status	TRUE indicates that the I/O data in the NX Unit can be used for control.	BOOL	NXBus_N1_NX_Unit_I_O_Data_Active_Status	Global variable
	N1 NX Unit Error Status	TRUE indicates that an error occurs in the NX Unit.	BOOL	NXBus_N1_NX_Unit_Error_Status	Global 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 communications status	I_O_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that I/O data communications with the NX Units are active and normal.	-

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

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

● 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.

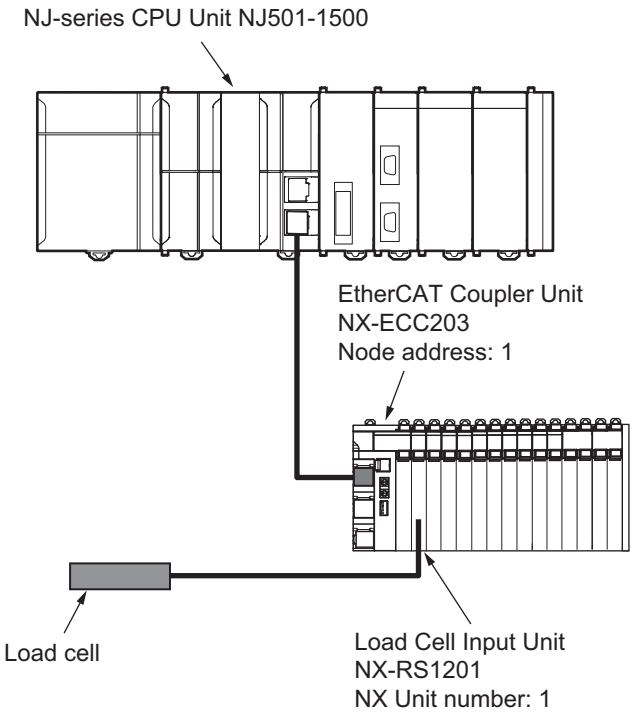
7-4-2 Performing an Equivalent Input Calibration

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 NX1P2 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 Command SID to 0		When the user sets the following internal variable to TRUE, this processing is performed.*1 • Equivalent_Input_Calibration_Start
Setting Ch1 Load Cell Rated Capacity	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	
Setting Ch1 Load Cell Rated Output	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	
Setting Ch1 Load Cell Zero Balance	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	
Changing the actual load calibration mode to the equivalent input calibration mode	Sending Ch1 Calibration Command SID and Ch1 Calibration Command	
	Checking whether Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are matched	
	Checking Ch1 Calibration Command Response	
Adding 1 to the previous value 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 calibration 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 Sysmac Studio 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 communications status	Process_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that EtherCAT process data communications are active and normal.	-
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 perform an equivalent input calibration. 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 calibration is performed.	Yes
	Initial_State_Setting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Calibration Command SID is reset to 0.	-
	Initial_State_SID_Check	BOOL	FALSE	When this variable changes to TRUE, whether Ch1 Calibration 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_Setting_Start	BOOL	FALSE	When this variable changes to TRUE, Ch1 Load Cell Rated Capacity is set.	-
	Rated_Capacity_Command	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 programming, set this variable to 0090 hex.	Yes
	Rated_Capacity_Value	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Rated Capacity. Before you perform the sample programming, set a value according to the rated capacity of the load cell to use.	Yes
	Rated_Capacity_SID_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command SID and Ch1 Calibration Command Response SID do not match in the setting of Ch1 Load Cell Rated Capacity.	-
	Rated_Capacity_Setting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal in the setting of Ch1 Load Cell Rated Capacity.	-
	Rated_Capacity_Error_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_Setting_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Rated Capacity was completed normally.	-
	Rated_Capacity_Check_instance	Send_Response_Check_FB	---	This instance is used to set Ch1 Load Cell Rated Capacity. Use the Send_Response_Check_FB function block.	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Setting Ch1 Load Cell Rated Output	Rated_Output_Command	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Load Cell Rated Output. Before you perform the sample programming, set this variable to 0091 hex.	Yes
	Rated_Output_Value	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Rated Output. Before you perform the sample 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 Calibration Command Response SID do not match in the setting of Ch1 Load Cell Rated Output.	-
	Rated_Output_Setting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal 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 Command Response is stored in this variable.	-
	Rated_Output_Setting_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Rated Output was completed normally.	-
	Rated_Output_Check_instance	Send_Response_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_Command	WORD	0000 hex	This variable is used to set Ch1 Calibration Command for which to set Ch1 Load Cell Zero Balance. Before you perform the sample programming, set this variable to 0092 hex.	Yes
	Zero_Balance_Value	REAL	0.0	This variable is used to set Ch1 Calibration Data for Ch1 Load Cell Zero Balance. Before you perform the sample 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 Calibration Command Response SID do not match in the setting of Ch1 Load Cell Zero Balance.	-
	Zero_Balance_Setting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 Calibration Command Response is abnormal 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_Setting_Finish	BOOL	FALSE	When this variable is TRUE, it indicates that the setting of Ch1 Load Cell Zero Balance was completed normally.	-
	Zero_Balance_Check_instance	Send_Response_Check_FB	---	This instance is used to set Ch1 Load Cell Zero Balance. Use the Send_Response_Check_FB function block.*1	-

Processing	Variable name	Data type	Default	Comment	Setting by the user
Changing the actual load calibration mode to the equivalent input calibration mode	Mode_Switch_Command	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 Calibration Command Response SID do not match when the actual load calibration mode is changed to the equivalent input calibration mode.	-
	Mode_Switch_Setting_Error_flg	BOOL	FALSE	When this variable is TRUE, it indicates that Ch1 calibration Command Response is abnormal when the actual load calibration 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 equivalent input calibration mode, Ch1 Calibration Command Response is stored in this variable.	-
	Mode_Switch_Setting_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 completed normally.	-
	Mode_Switch_Check_instance	Send_Response_Check_FB	---	This instance is used to change the actual load calibration 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 Calibration Command SID	Calibration_Command_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 Load Cell Rated Capacity • Setting Ch1 Load Cell Rated Output • Setting Ch1 Load Cell Zero Balance	-
	Calibration_Command_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 calibration	Equivalent_Input_Calibration_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.

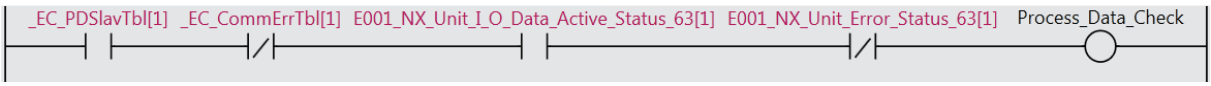
Refer to *Internal Variables* on page 7-34 for details on internal variables.

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.

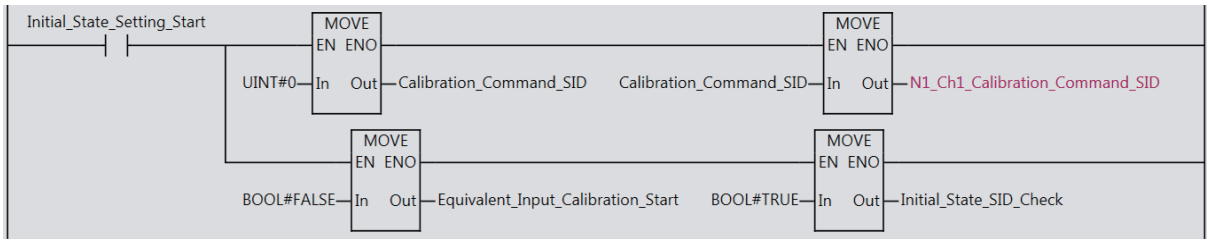
The status of process data communications is always monitored to see if communications are active and normal.

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

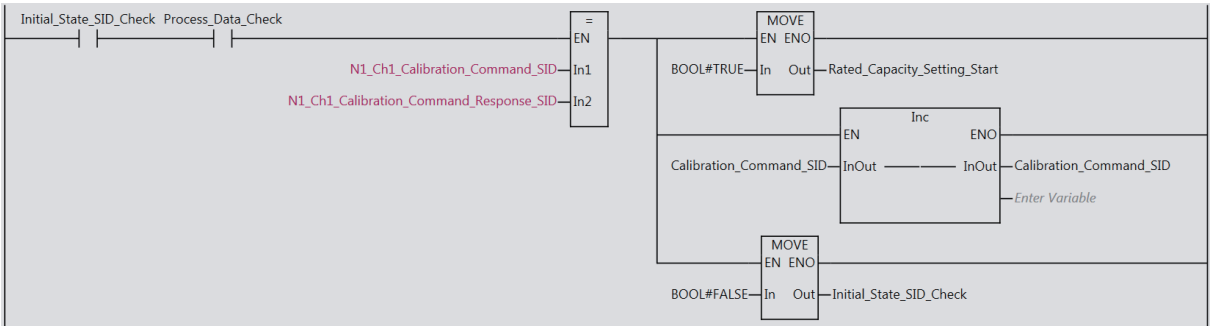


When *Equivalent_Input_Calibration_Start* changes to TRUE, an equivalent input calibration is started.

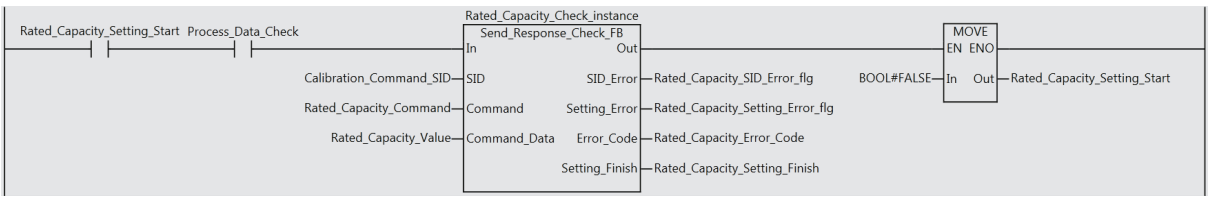
Ch1 Calibration Command SID is sent by 0 and Ch1 Calibration Command SID is reset to 0.



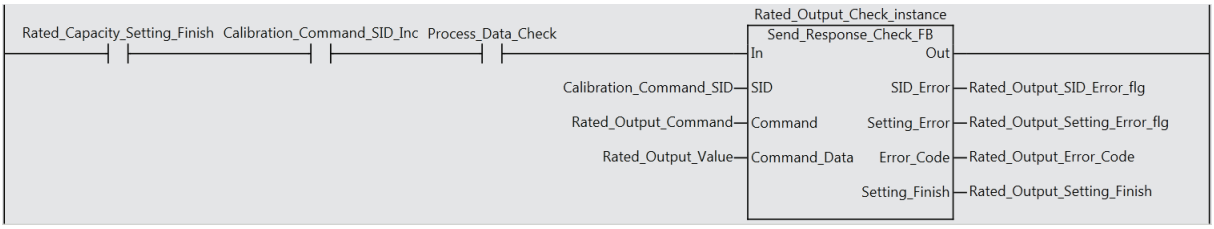
Ch1 Calibration Command SID and Ch1 Calibration Command Response SID are compared. If they match, 1 is added to the previous value of Ch1 Calibration Command SID.



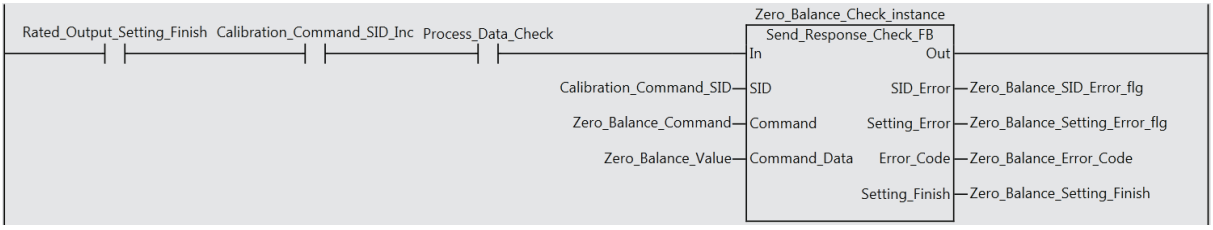
When *Rated_Capacity_Setting_Start* changes to TRUE, Ch1 Load Cell Rated Capacity is set by *Rated_Capacity_Check_instance*. The operation of *Rated_Capacity_Check_instance* is defined in the Send_Response_Check_FB function block[*1].



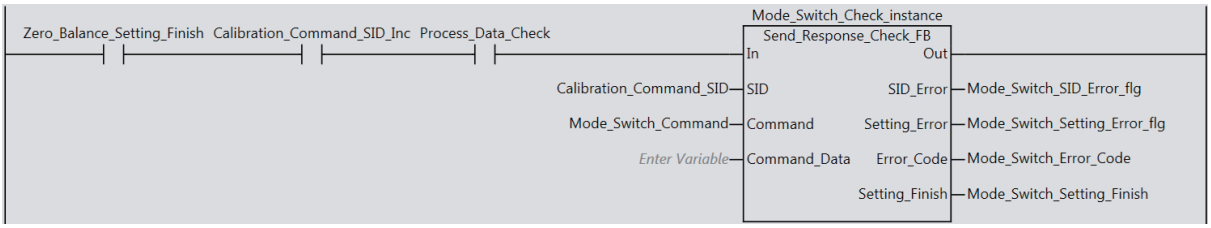
When the setting of Ch1 Load Cell Rated Capacity is completed normally, Ch1 Load Cell Rated Output is set by *Rated_Output_Check_instance*. The operation of *Rated_Output_Check_instance* is defined in the Send_Response_Check_FB function block*1.



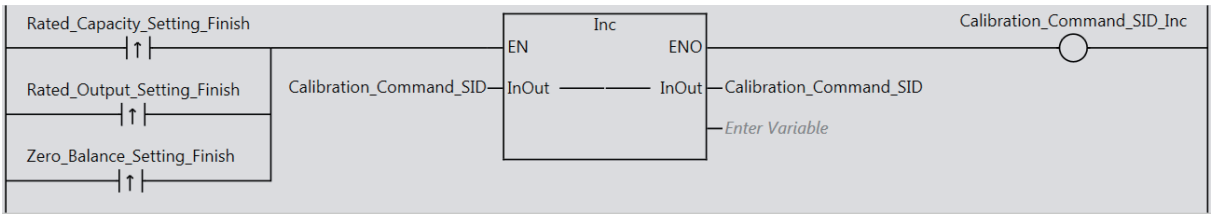
When the setting of Ch1 Load Cell Rated Output is completed normally, Ch1 Load Cell Zero Balance is set by *Zero_Balance_Check_instance*. The operation of *Zero_Balance_Check_instance* is defined in the Send_Response_Check_FB function block*1.



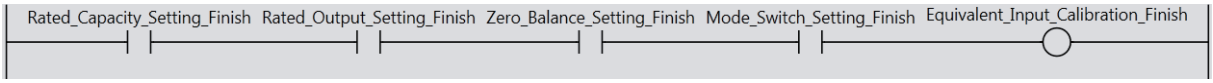
When the setting of Ch1 Load Cell Zero Balance is completed normally, the actual load calibration mode is changed to the equivalent input calibration mode by *Mode_Switch_Check_instance*. The operation of *Mode_Switch_Check_instance* is defined in the Send_Response_Check_FB function block*1.



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.



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.



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

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

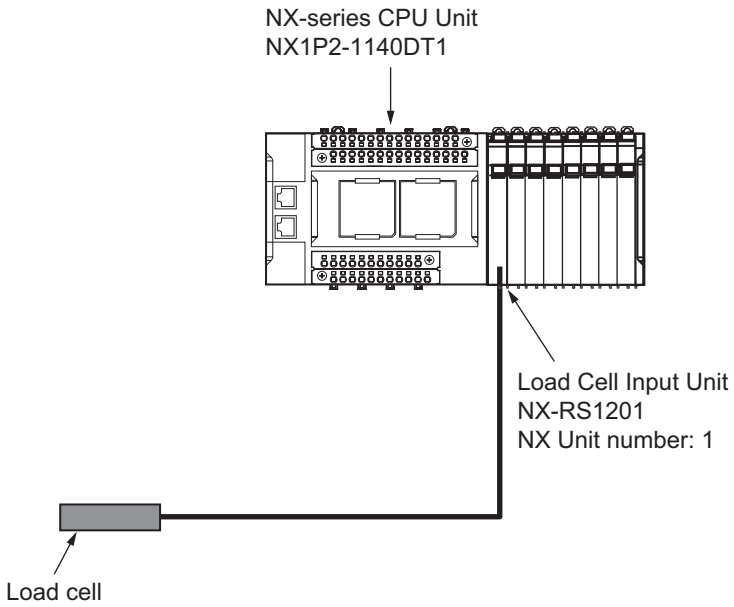
The following is an application example when the Load Cell Input Unit shown in the above configuration examples is connected to an NX-series NX1P2 CPU Unit. Here, only the differences from the examples for EtherCAT Slave Terminals are shown.

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 Cell Input Unit	1



● 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 communications status	I_O_Data_Check	BOOL	FALSE	When this variable is TRUE, it indicates that I/O data communications 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 perform an equivalent input calibration. 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 calibration 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.

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 Sysmac Studio

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, try again.	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 Disconnection Test* on page 8-31 for details on the sensor disconnection test.
	A calibration was executed when an A/D Conversion Error occurred.	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to *Section 9 Troubleshooting* for details on errors.
	One of the following errors was detected while the calibration was in progress. • A/D Conversion Error • Over Range • Under Range	
	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 *Section 9 Troubleshooting* for details on errors.

Error	Assumed cause	Correction
The following error message is displayed when the calibration view is opened or you open the calibration view. • An error occurred. After removing the error causes, open the view again.	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 Error	Remove the cause of the error and reset the error. Close the calibration view and open it again. And then, execute the calibration again. Refer to *Section 9 Troubleshooting* for details on errors.

● 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, 0001 hex is returned in the Ch1 Calibration Command Response of I/O data.	An incorrect calibration command was sent.	Send the correct calibration command.
When a calibration is executed, 0002 hex is returned in the Ch1 Calibration Command Response of I/O data.	An incorrect calibration data outside of the specified range was sent.	Send the calibration data that is within the specified range.
When a calibration is executed, 0003 hex is returned in the Ch1 Calibration Command Response of I/O data.	A calibration was executed while the sensor disconnection test was in progress.	Execute the calibration again after the sensor disconnection test. Refer to *8-9 Sensor Disconnection Test* on page 8-31 for details on the sensor disconnection test.
	A new calibration command was sent when the calibration command is processed by the Unit.	Send a new command after processing of the current calibration command is completed.
	A calibration was executed when an A/D Conversion Error occurred.	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to *Section 9 Troubleshooting* for details on errors.
When a calibration is executed, 0004 hex is returned in the Ch1 Calibration Command Response of I/O data.	One of the following errors was detected while the calibration was in progress. • A/D Conversion Error • Over Range • Under Range	
	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.

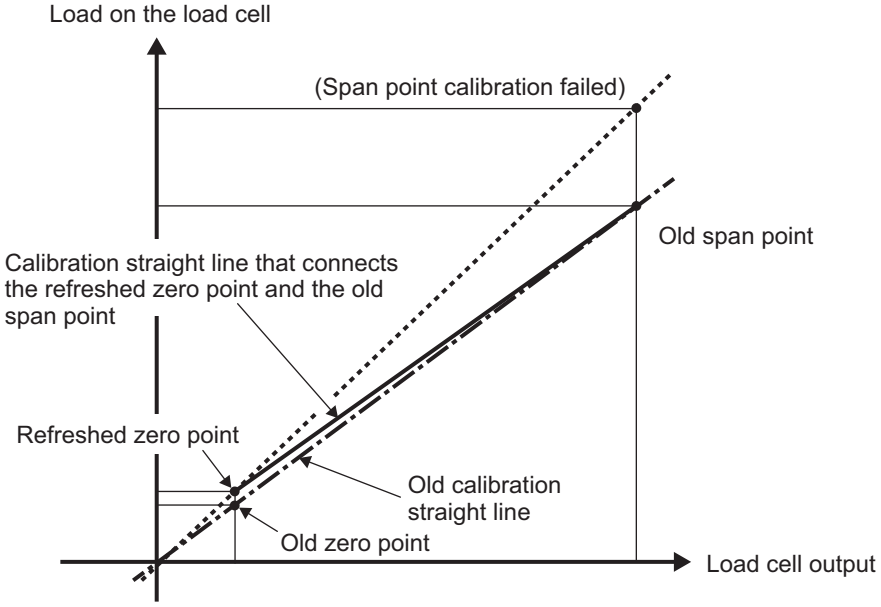
Error	Assumed cause	Correction
The Ch1 Calibration Command Response of I/O data is not returned even if a calibration command is sent.*1	A calibration was executed when one of the following errors occurred. • NX Unit Processing Error • Non-volatile Memory Hardware Error • Control Parameter Error in Master • NX Unit I/O Communications Error • NX Unit Clock Not Synchronized Error	Remove the cause of the error, reset the error, and then execute the calibration again. Refer to *Section 9 Troubleshooting* for details on errors.
	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 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 *9-3-2 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.

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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.

$$\text{Gross weight value after correction} = \text{Gross weight value before correction} \times \frac{\text{Gravity acceleration of calibration site}}{\text{Gravity acceleration of installation site}}$$

Set the gravity acceleration in the Unit operation settings. The settings are shown in the following table.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Gravity Acceleration of Calibration Site	Sets the gravity acceleration value of the calibration site.	9.80665	9.70000 to 9.99999	m/s^2	Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted.
Ch1 Gravity Acceleration of Installation Site	Sets the gravity acceleration value of the installation site.	9.80665	9.70000 to 9.99999	m/s^2	

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.

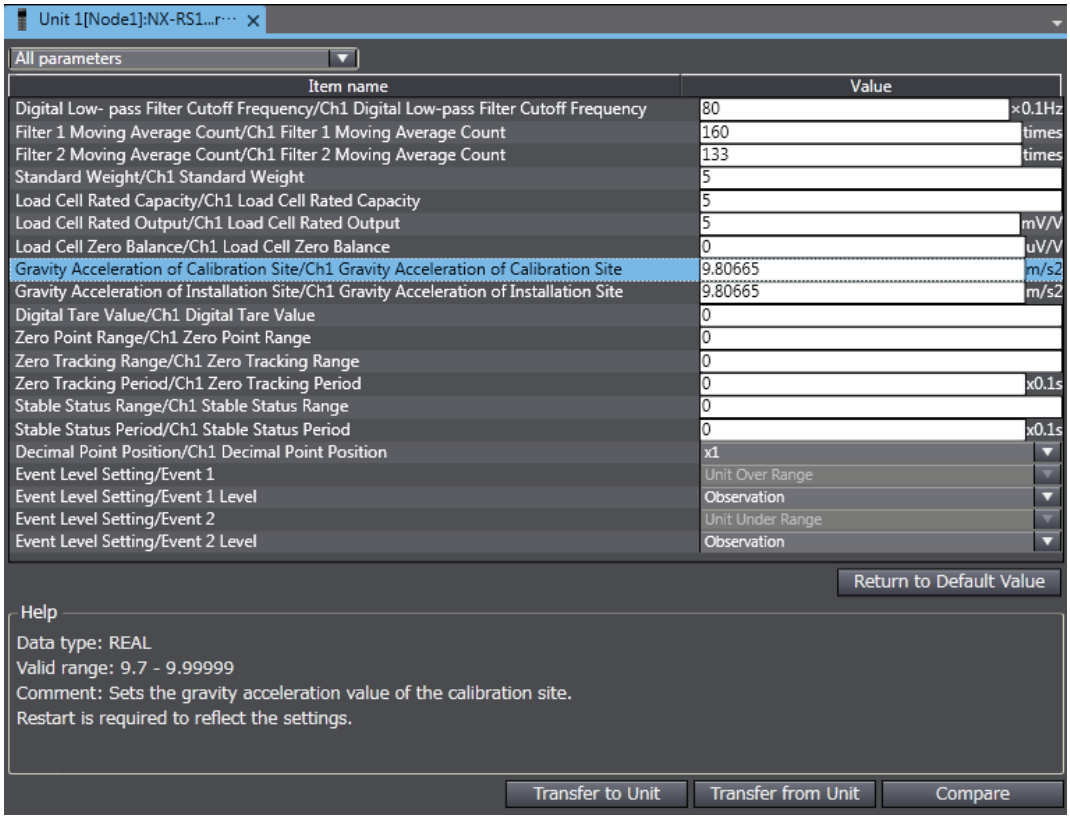
http://www.ptb.de/cartoweb3/SISproject.php

8-1-3 Setting Method

The method for setting the gravity acceleration with the Sysmac Studio is given below.

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.



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 Sysmac Studio 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 Sysmac Studio 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.

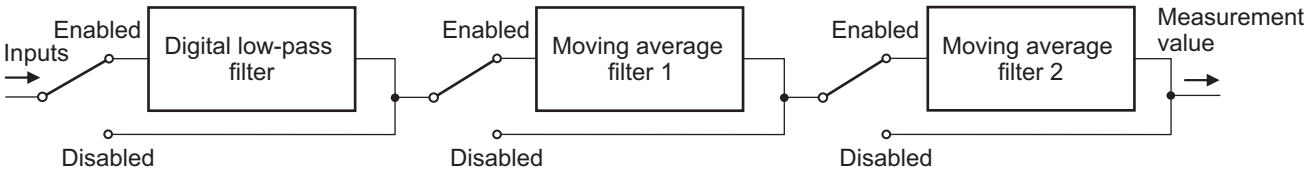
A digital filter can remove electrical noise and mechanical vibration noise that are contained in input signals to provide stable measurements.

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 8-40 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 Low-pass Filter Cutoff Frequency	Sets the digital low-pass filter cutoff frequency.	80	0 to 20000	× 0.1 Hz	• Set this parameter to 0 to disable the digital 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.

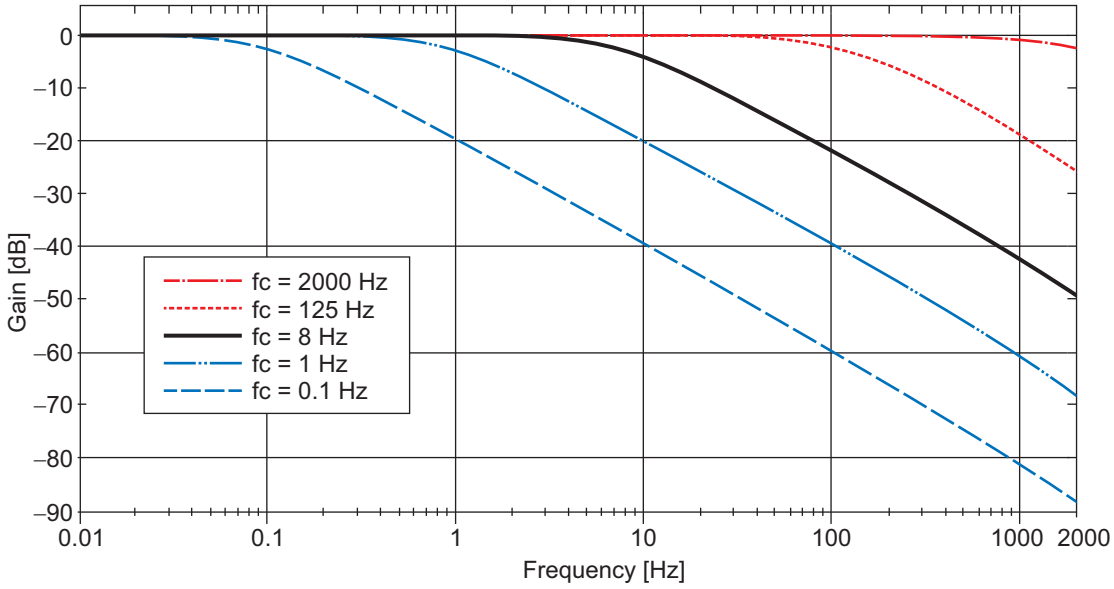
To enable/disable the digital low-pass filter with the relevant bit, set the cutoff frequency in the Unit operation settings to a value other than 0. If the cutoff frequency is set to 0, the digital low-pass filter will not be enabled even if the relevant bit is set to enable.

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

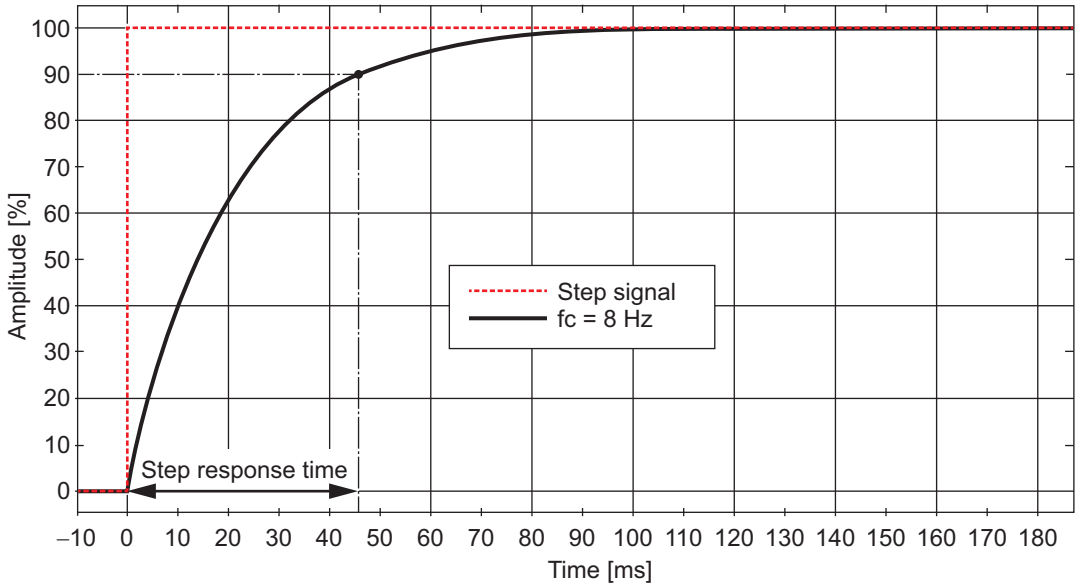
a) Attenuation characteristics

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

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.

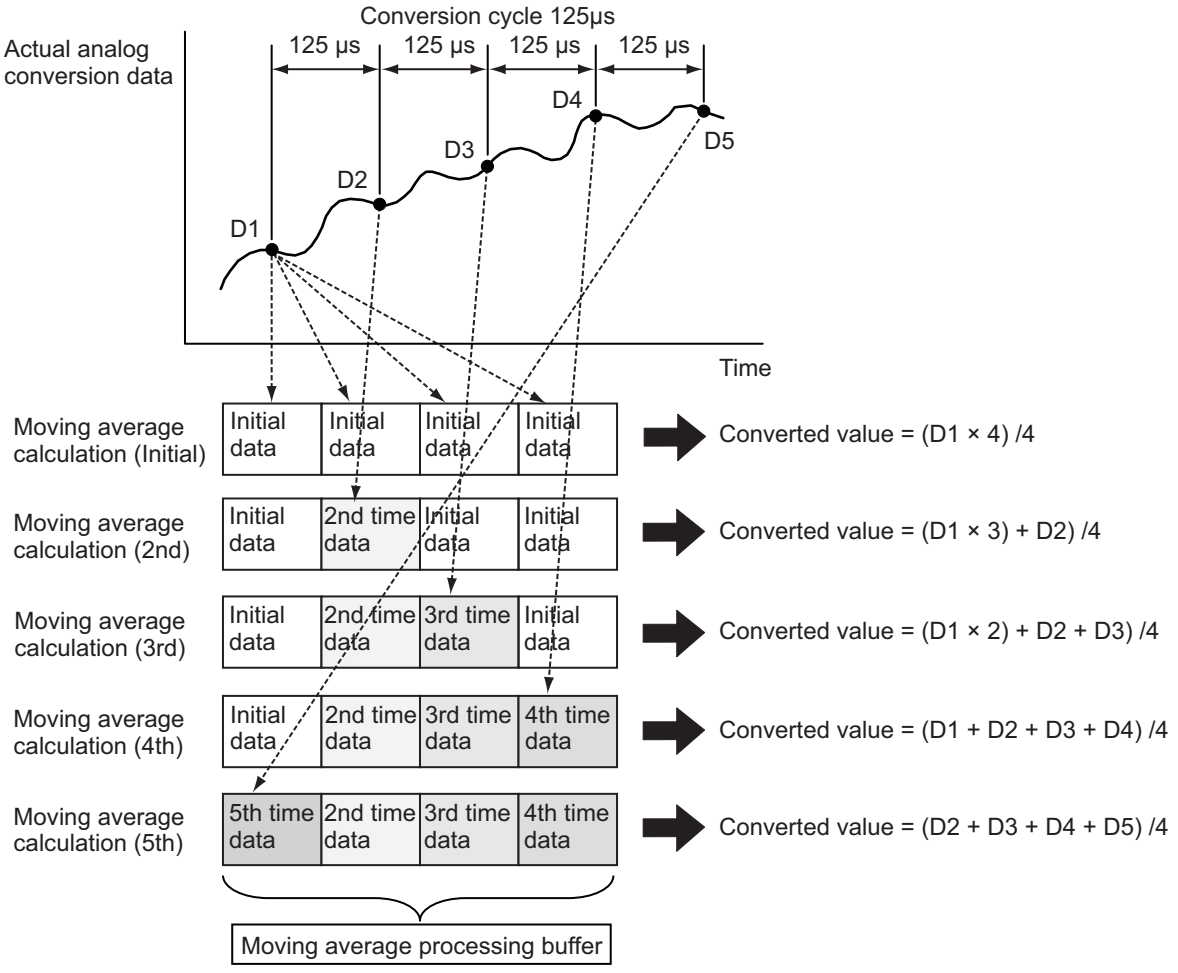
You can use the moving average filter to significantly attenuate the signals in the specific frequency and the frequencies that are integer multiples of that frequency.

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.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Filter 1 Moving Average Count	Sets the moving average count for the moving average filter 1.	160	0 to 80000	times	• Set this parameter to 0 to disable the moving average filter. • Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted.
Ch1 Filter 2 Moving Average Count	Sets the moving average count for the moving average filter 2.	133	0 to 80000	times	

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.

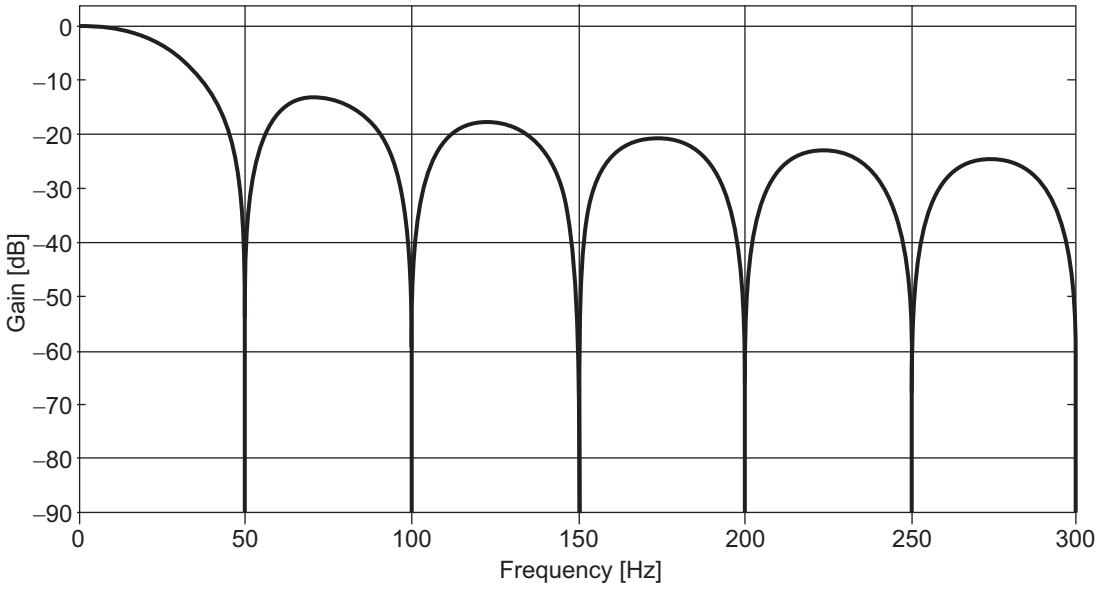
$$\text{Moving average count} = \frac{\text{Sampling frequency}^{*1}}{f_N\ [\text{Hz}]} = \frac{8000\ [\text{Hz}]}{f_N\ [\text{Hz}]}$$

*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.

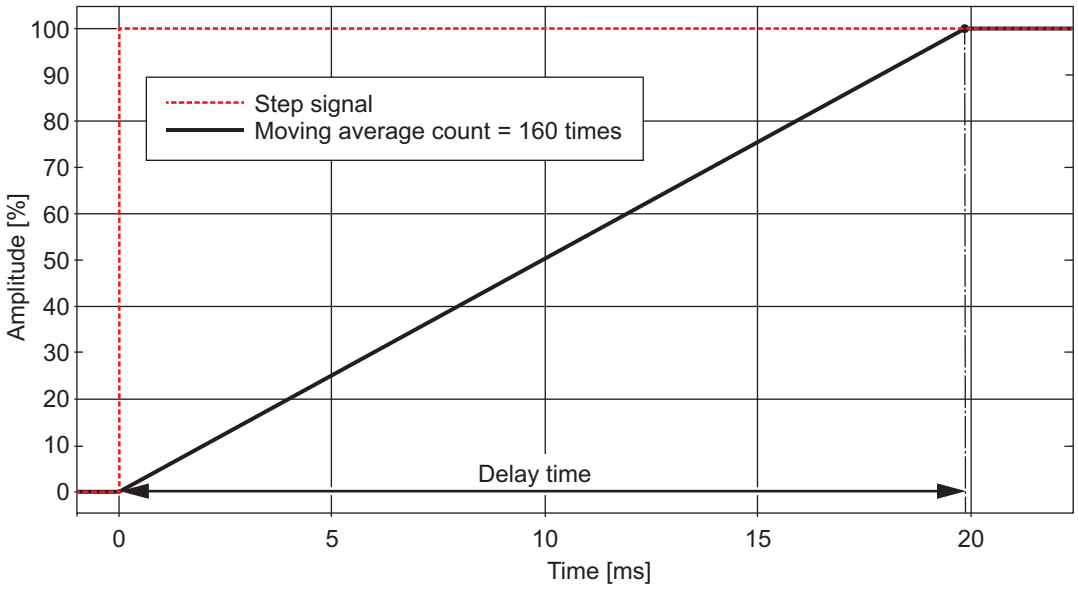
The following shows an example of attenuation characteristics for when only the moving average filter 1 is used and the moving average count is set to 160 times.

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) × 125 × 10^{-3}

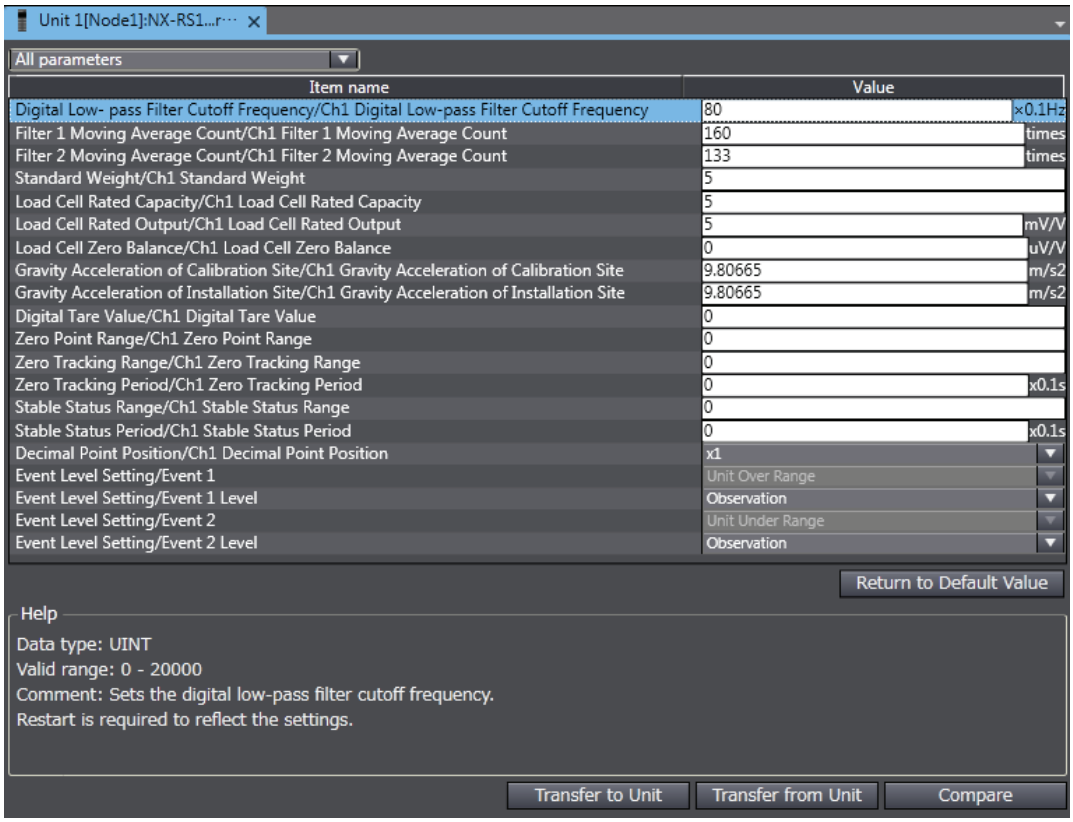
The larger the moving average count, the wider range of noise you can remove. This stabilizes the measurement values, but causes the delay time to increase. When you use the moving average filter, the values are measured with a delay in response to the input as shown in the step response characteristics. 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 Sysmac Studio is given below.

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.



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 Sysmac Studio 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 Sysmac Studio 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

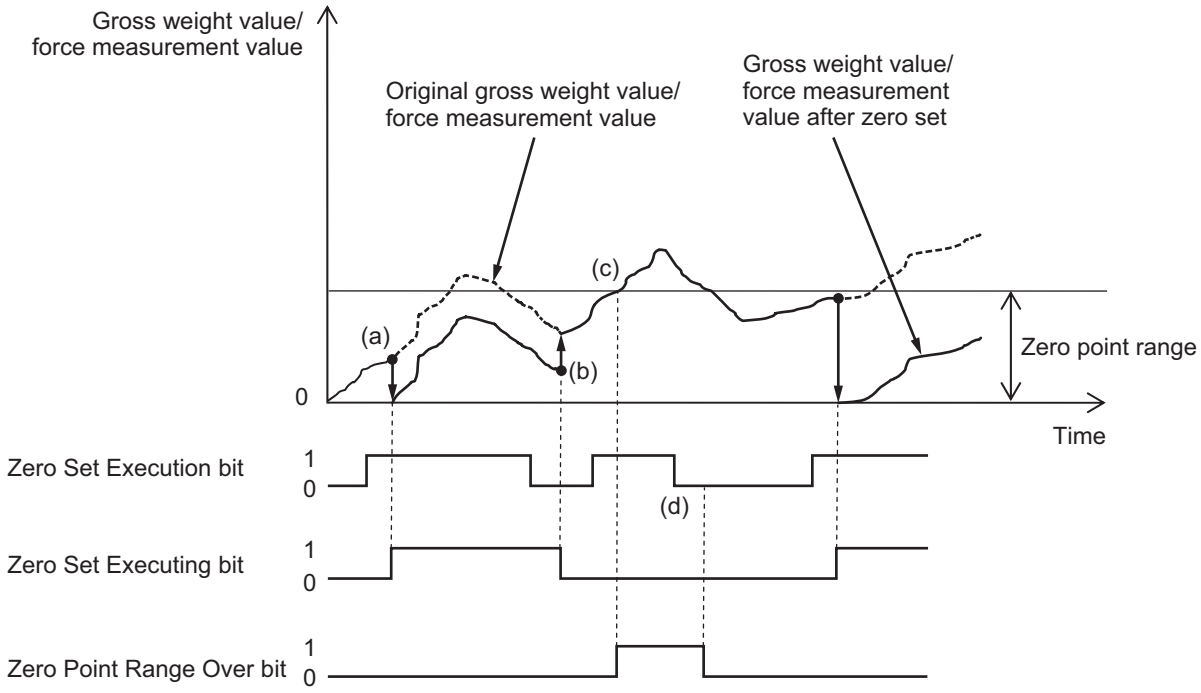
You can check the zero set or the zero reset execution status with the Ch1 Zero Set Executing bit in the Ch1 Executing Status of I/O data.

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 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 8-19 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 8-19 for the setting of zero point range.

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 ± 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

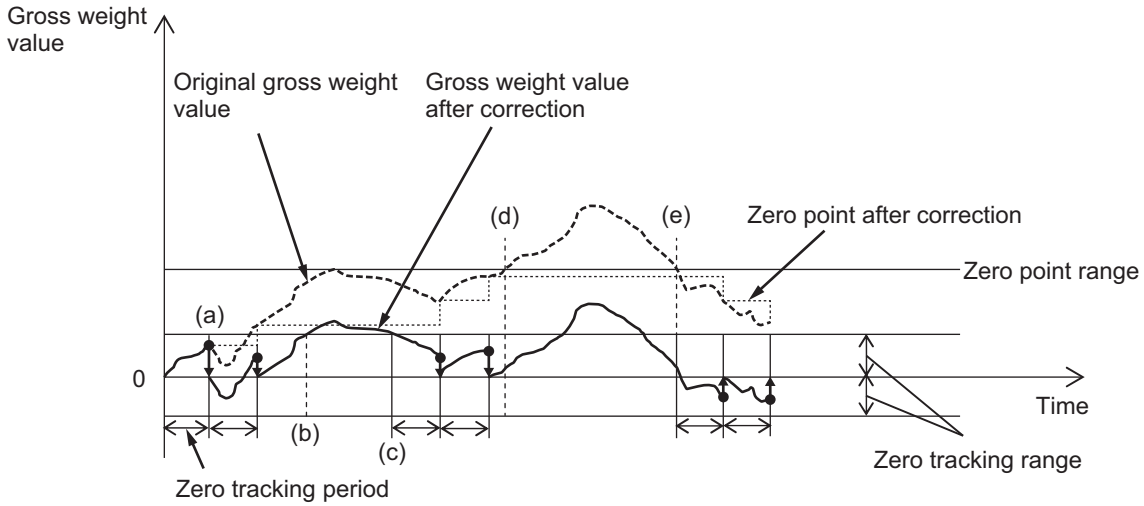
Set the above items to a value other than 0 to use the zero tracking.

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.

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 8-19 for the setting of zero point range.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Zero Tracking Range*1	Sets the zero tracking range.	0.0	0.0 to 3.402823e+38	---	• The zero tracking 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 measure as you would when setting the load cell rated capacity.*3
Ch1 Zero Tracking Period	Sets the zero tracking period.	0	0 to 100	× 0.1 s	• Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is 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.

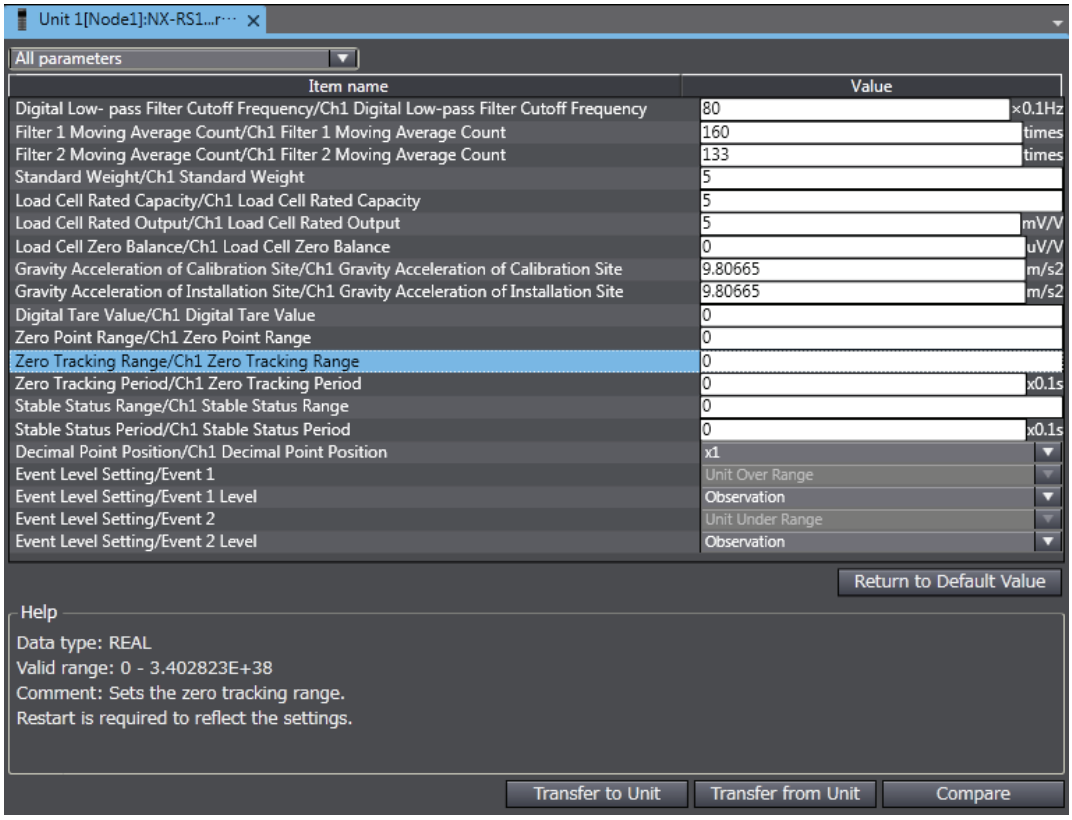
*3. Refer to *7-3-2 Basic Parameter Settings* on page 7-13 for the setting of load cell rated capacity.

8-4-3 Setting Method

The method for setting the zero tracking range and zero tracking period with the Sysmac Studio is given below.

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.



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 Sysmac Studio 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 Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

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 8-12 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.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Zero Point Range*1	Sets the range for zero point correction in the zero set, zero reset, and zero tracking.	0.0	0.0 to 3.402823e+38	---	• 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 measurement 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.

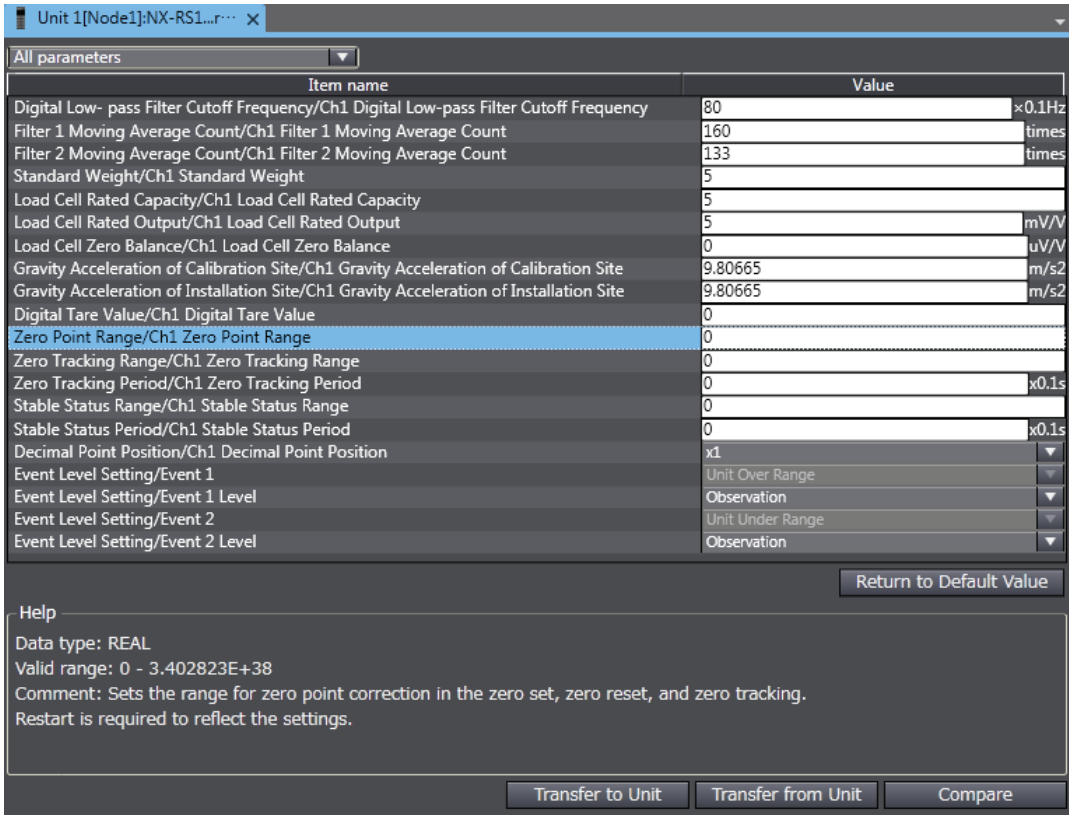
*3. Refer to *7-3-2 Basic Parameter Settings* on page 7-13 for the setting of load cell rated capacity.

8-5-3 Setting Method

The method for setting the zero point range with the Sysmac Studio is given below.

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.



2 Set the Ch1 Zero Point Range.

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

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

The settings are reflected after the NX Unit is restarted.

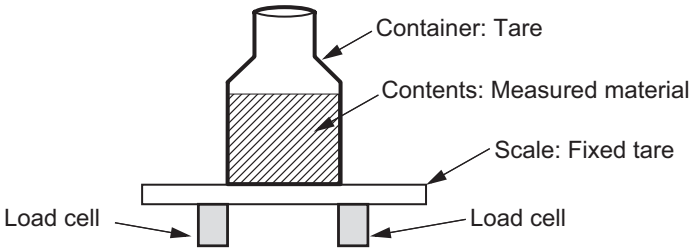
Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio 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

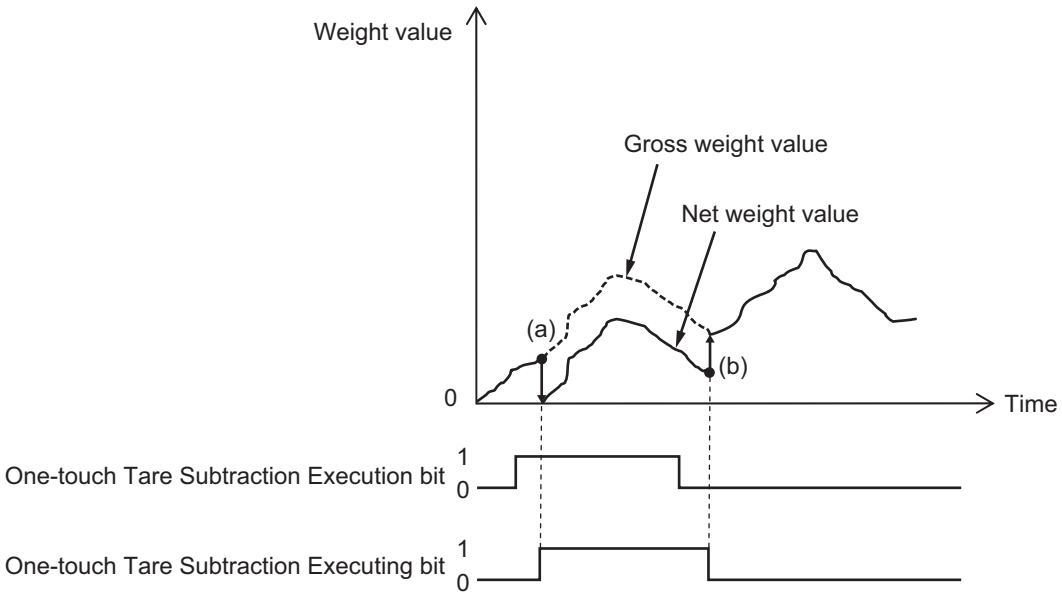
The net weight value is not assigned to I/O data by default. To use this function, be sure to assign the net weight value in I/O allocation settings.

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.

Item	Setting description	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 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.*1 • To perform an equivalent input 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 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

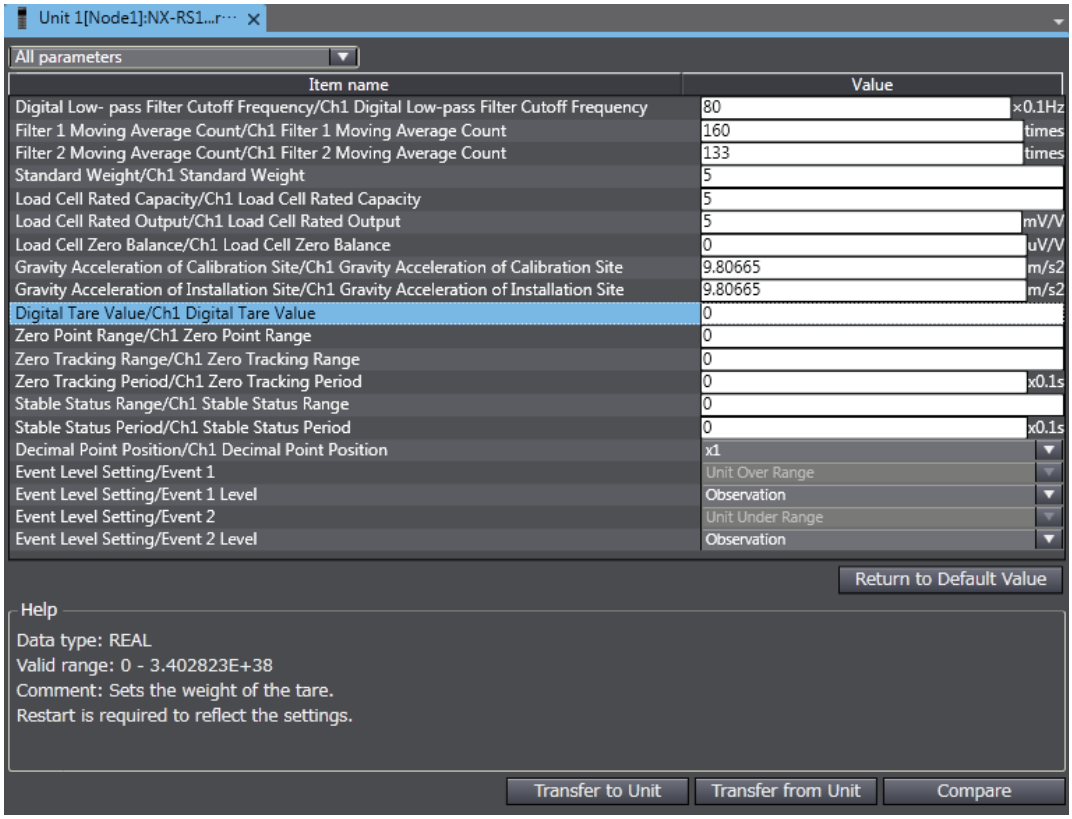
The net weight value is not assigned to I/O data by default. To use this function, be sure to assign the net weight value in I/O allocation settings.

Setting Method

The method for setting the digital tare value with the Sysmac Studio is given below.

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.



2 Set the Ch1 Digital Tare Value.

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

The settings are transferred from the Sysmac Studio 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 Sysmac Studio 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 ± 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

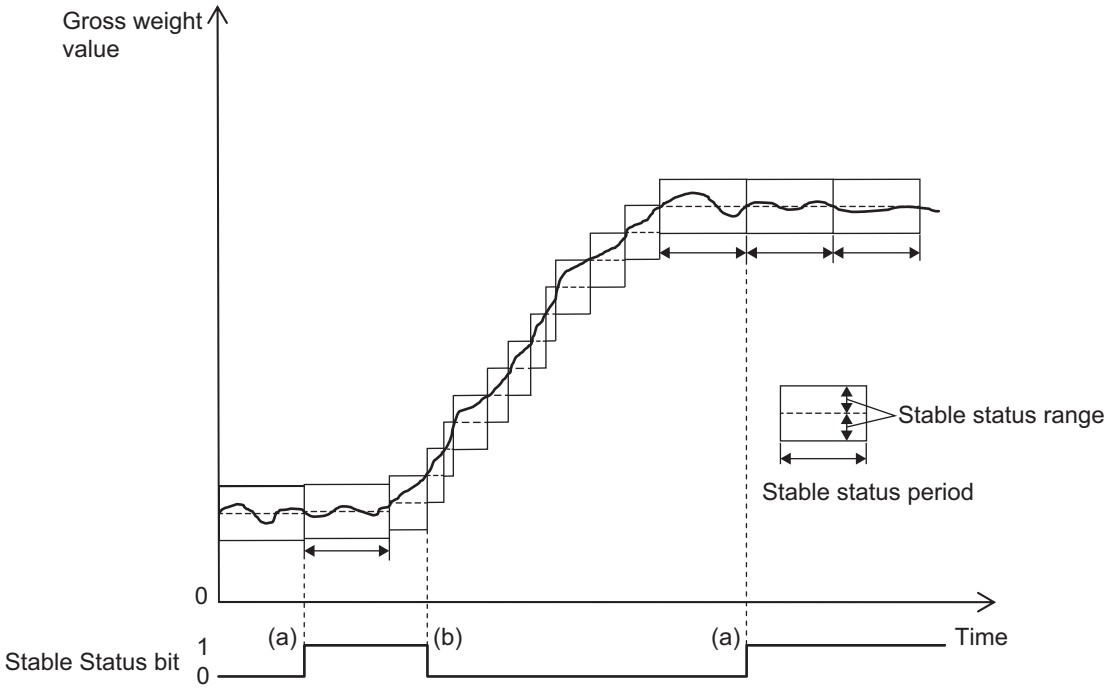
You can use Ch1 Stable Status bit in the Ch1 Detection Status of I/O data to check the execution status of the stable detection.

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.

Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Stable Status Range*1	Sets the range of change for which the gross weight value is determined 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 measure 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.

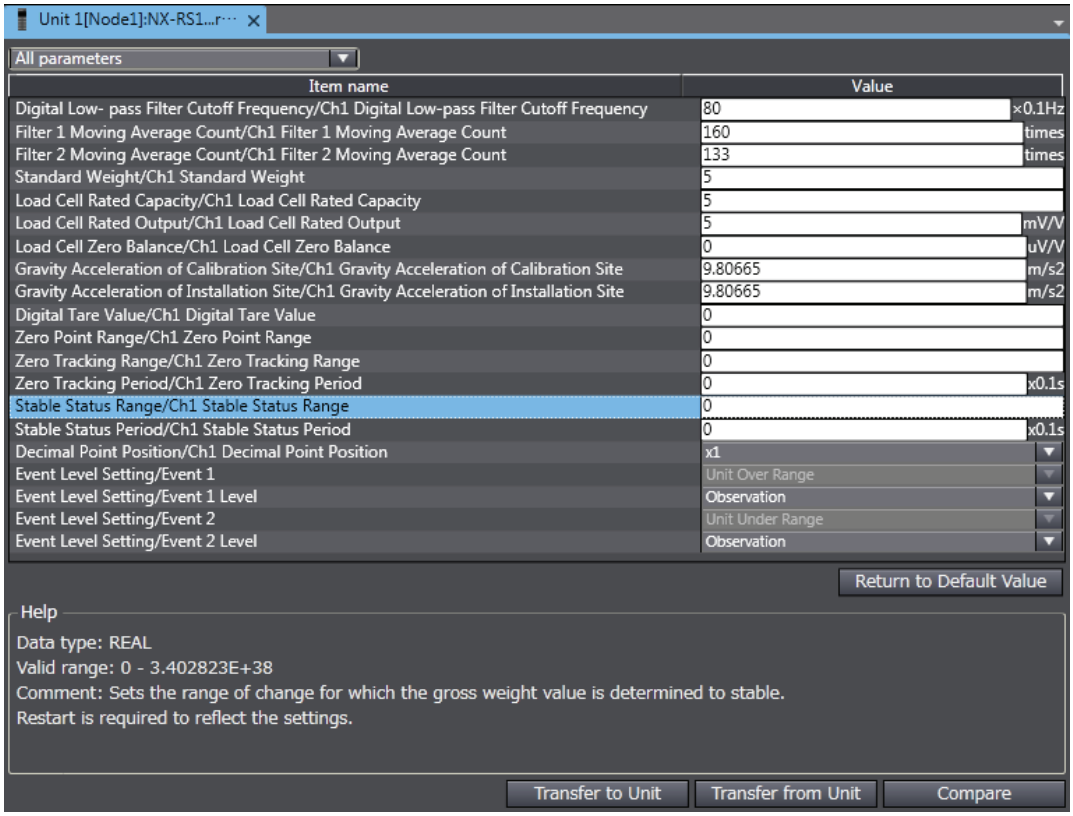
*3. Refer to *7-3-2 Basic Parameter Settings* on page 7-13 for the setting of load cell rated capacity.

8-7-3 Setting Method

The method for setting the stable status range and stable status period with the Sysmac Studio is given below.

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.



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 Sysmac Studio 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 Sysmac Studio 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 *9-3-2 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 *9-3-2 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

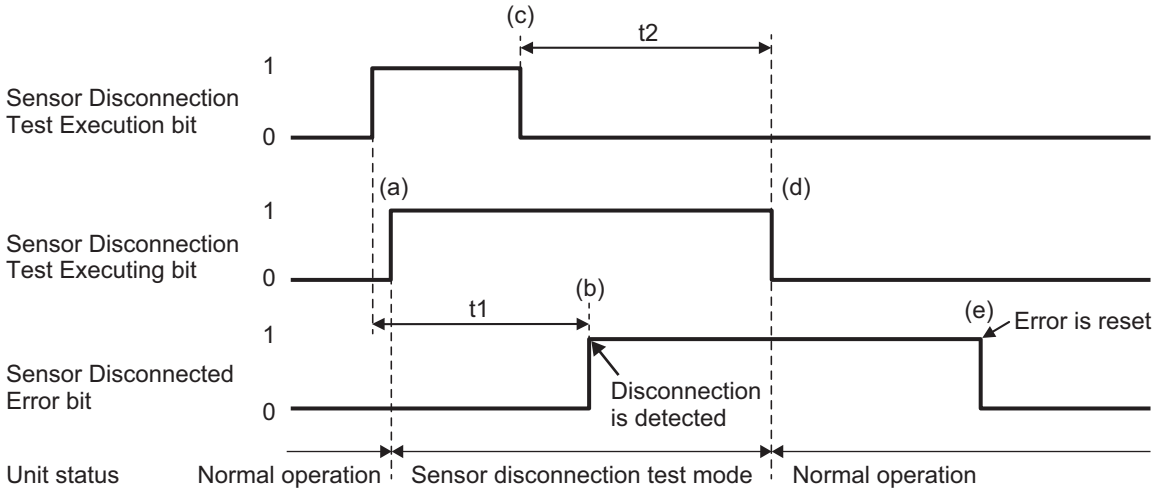
You can use the Ch1 Sensor Disconnected Error bit in the Ch1 Detection Status of I/O data to check if the cable is disconnected.

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 Measurement Value DINT	Fixed to 2147483647.
	Ch1 Gross Weight Value/Force Measurement Value REAL	Fixed to 3.402823e+38.
	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 SID	An error response is returned if a calibration command is 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 is returned if a calibration command is sent.
	Ch1 Calibration Command	
	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.

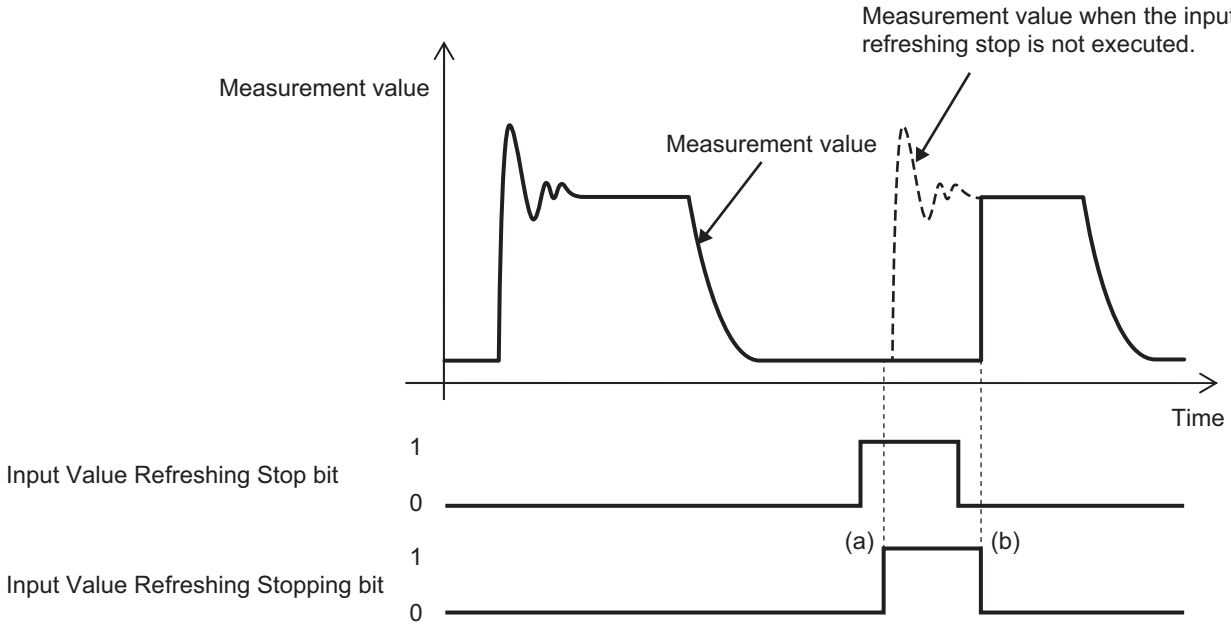
● How to Check the Execution Status

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

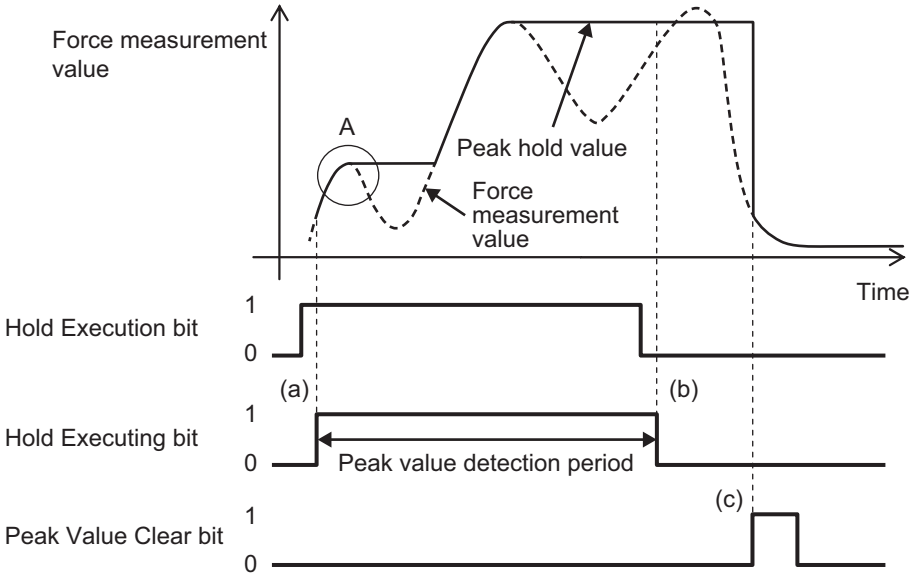
- The peak hold value is not assigned to I/O data by default. To use the peak hold, be sure to assign the peak hold value in I/O allocation settings.
- The bottom hold value is not assigned to I/O data by default. To use the bottom hold, be sure to assign the bottom hold value in I/O allocation settings.

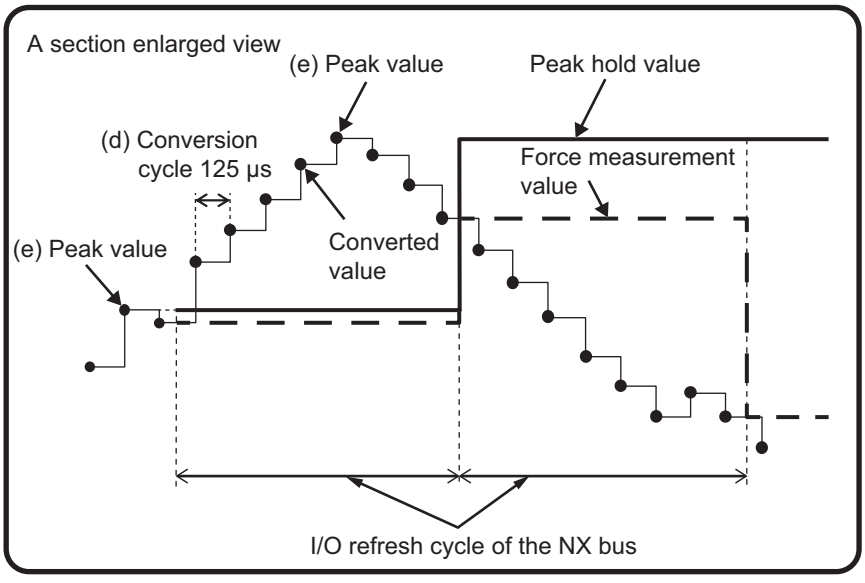
Operation of Peak Hold

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.



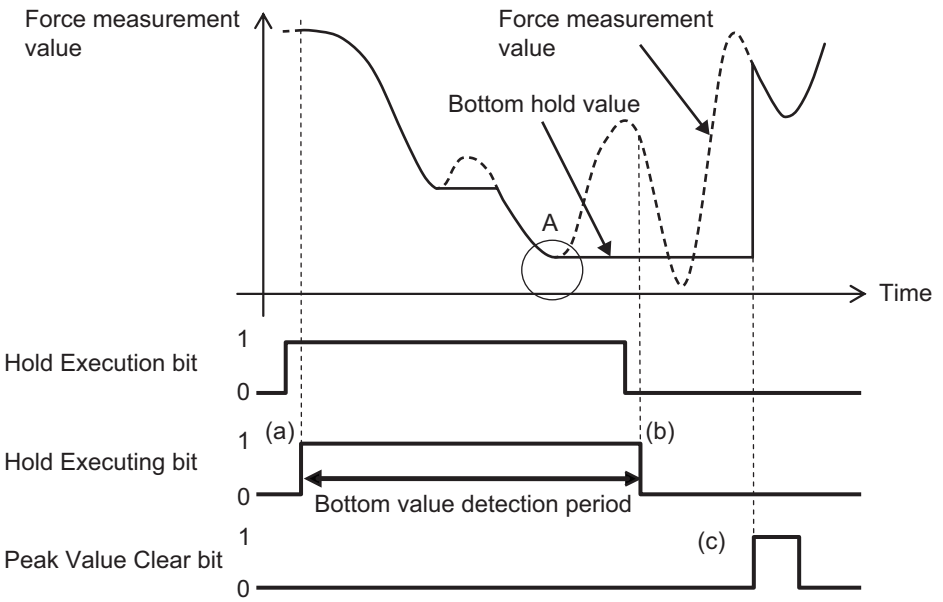


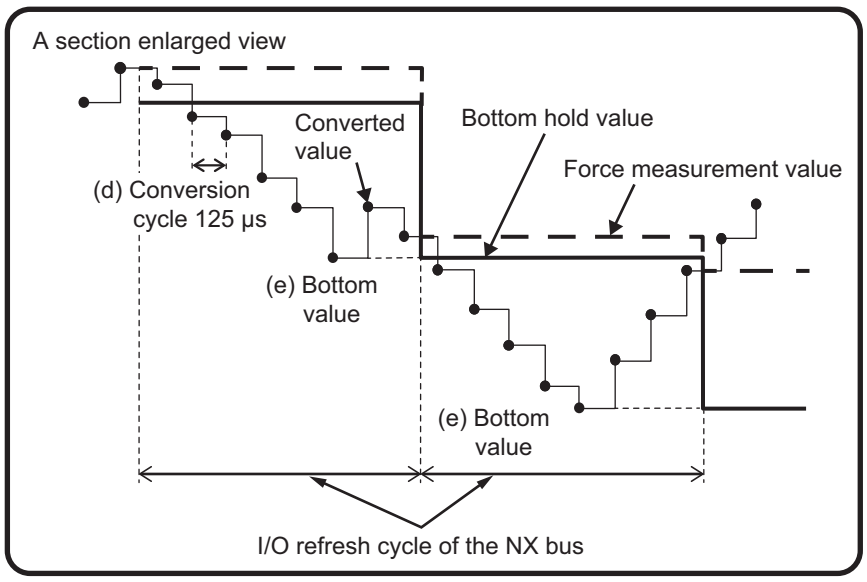
Operation of Bottom Hold

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.

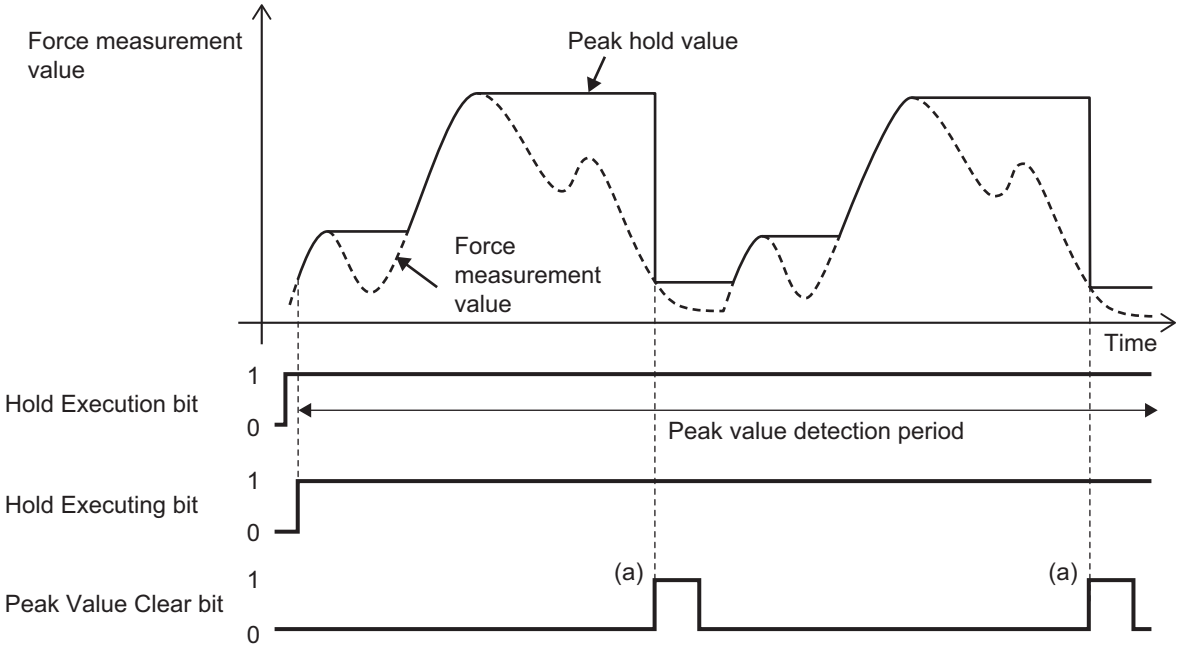




Hold Value Clear during Hold

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

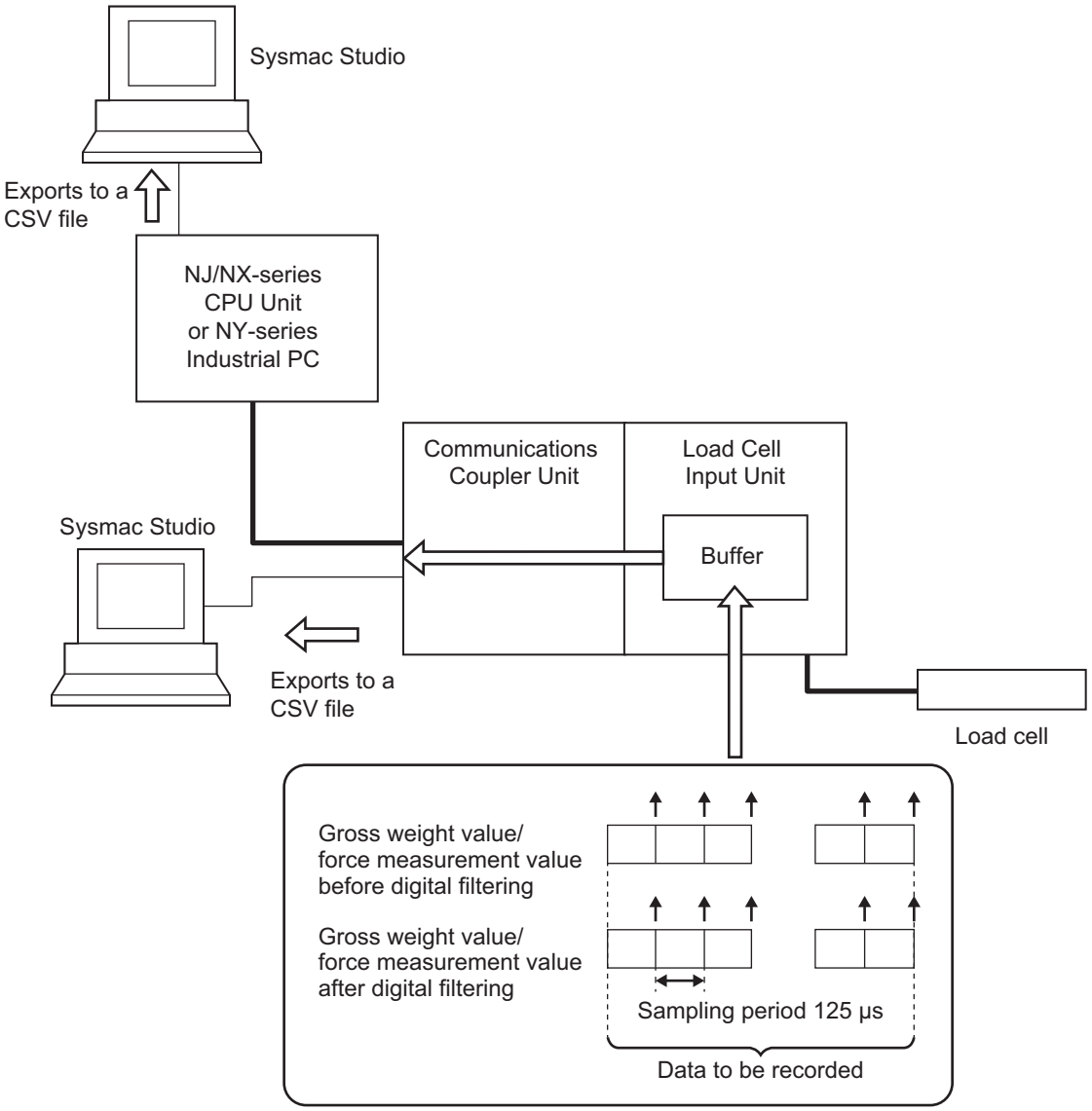
This function records the values in REAL data in the buffer of the Load Cell Input Unit and exports the data to a CSV file.

These values indicate the gross weight values/force measurement values before and after the digital filtering in 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 an NX-series NX1P2 CPU Unit, you can export the gross weight values/forces measurement values before and after the digital filtering to a CSV file, from the Sysmac Studio connected to the CPU Unit.

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 • Gross weight values/force measurement values after filtering 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 Sysmac Studio 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 8-44 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 Sysmac Studio 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.

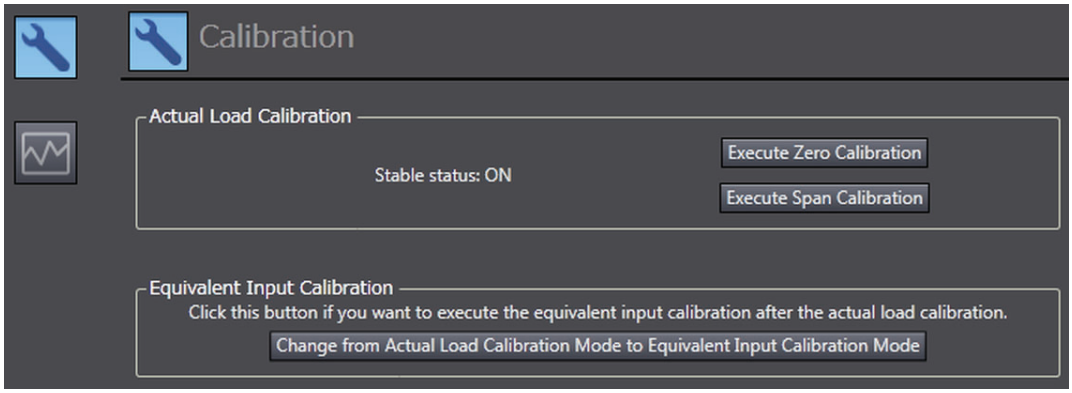
When the amount of tracing data that are recorded in the buffer reaches 80000, data tracing is automatically stopped even if the Data Trace Execution bit is 1. At this time, the Data Trace Executing bit changes from 1 to 0.

How to Execute with Sysmac Studio

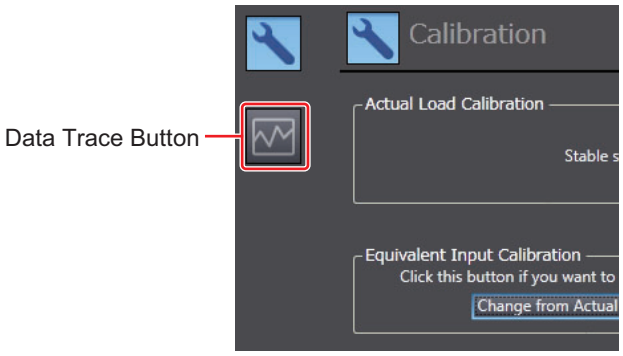
The method for executing data tracing with the Sysmac Studio is given below.

1 Display the calibration view.

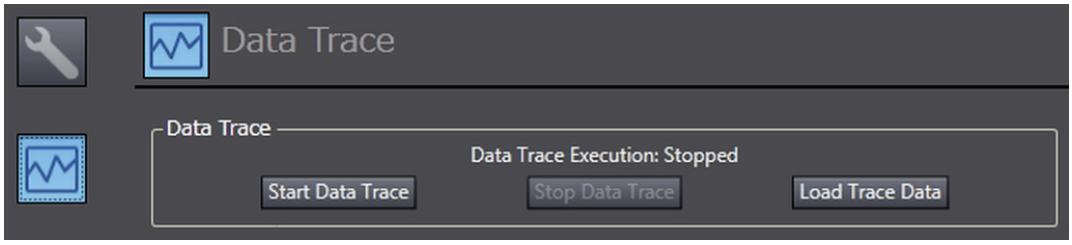
For the display methods, refer to *A-6 Display Methods for the Calibration View* on page A-19.



2 Click the **Data Trace** Button.

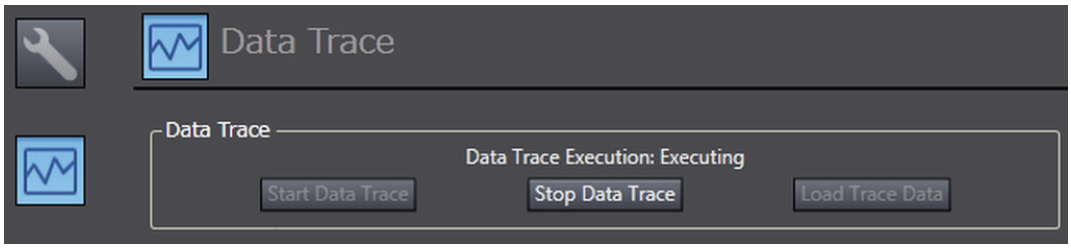


The following tab page is displayed.



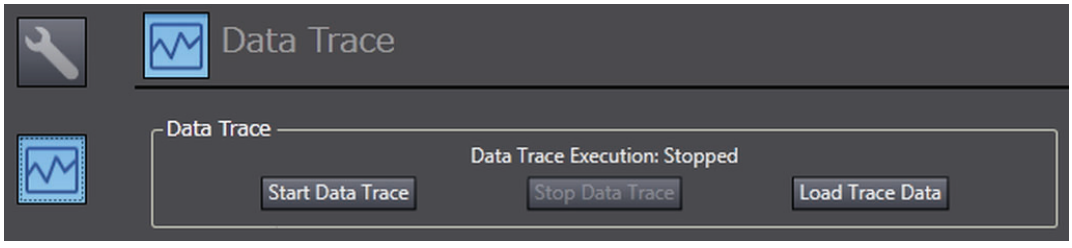
3 Click the **Start Data Trace** Button in Data Trace.

Data tracing starts, Data Trace Execution in Data Trace switches from Stopped to Executing, and the **Stop Data Trace** Button is enabled.



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.



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 Sysmac Studio.

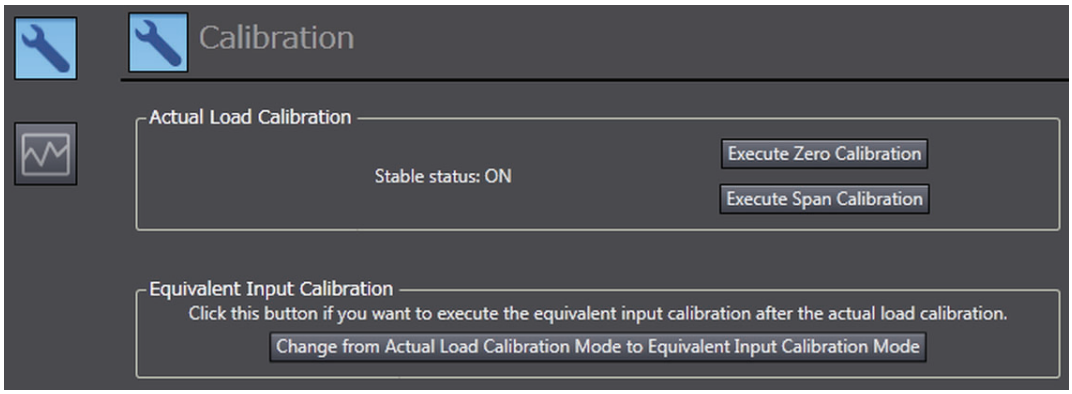
8-12-4 How to Check the Tracing Result

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 Sysmac Studio.

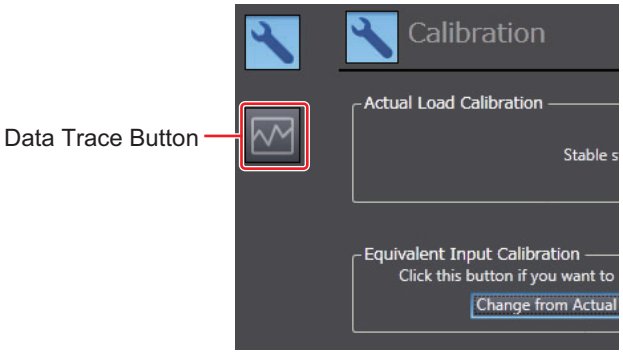
The following describes how to check the tracing result. You can omit procedures 1 and 2 when confirming the tracing result after data tracing.

1 Display the calibration view.

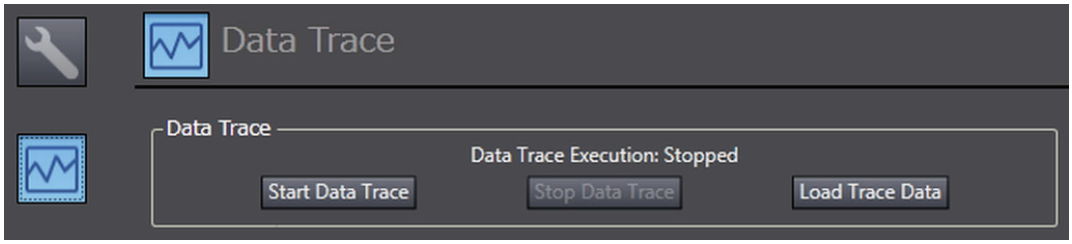
For the display methods, refer to *A-6 Display Methods for the Calibration View* on page A-19.



2 Click the **Data Trace** Button.

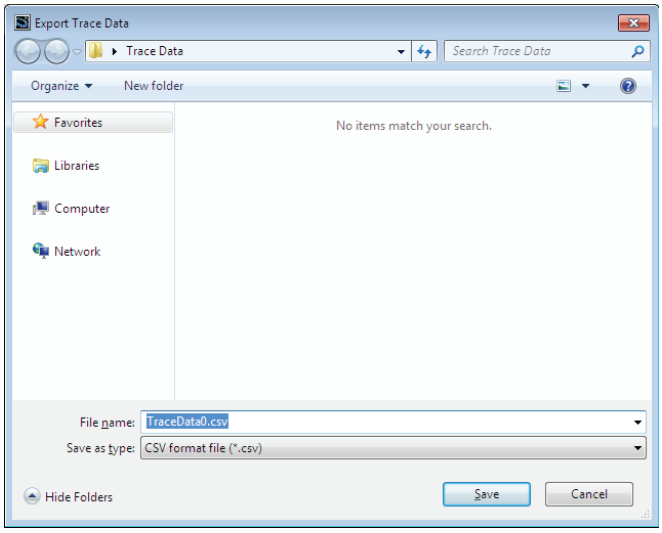


The following tab page is displayed.



3 Click the **Load Trace Data** Button in Data Trace.

The Export Trace Data Dialog Box is displayed.



4 Enter a file name, specify a save location, and then click the **Save** Button.

The tracing result is saved in CSV format.

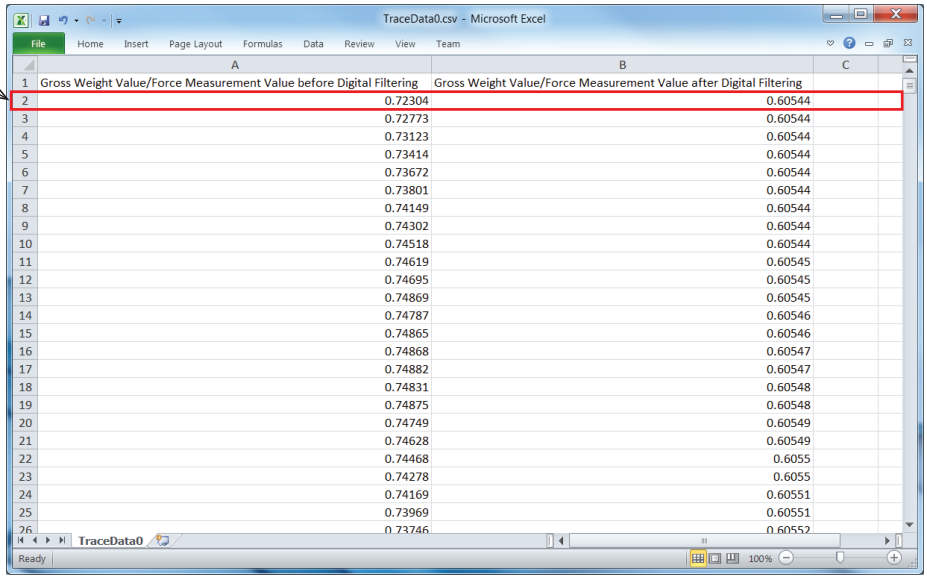
5 Open the saved CSV file in Microsoft Excel to confirm the tracing result.

The following gives the CSV file format and data layout.

Tracing data when data tracing starts

Old

New



- 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 Sysmac Studio 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.

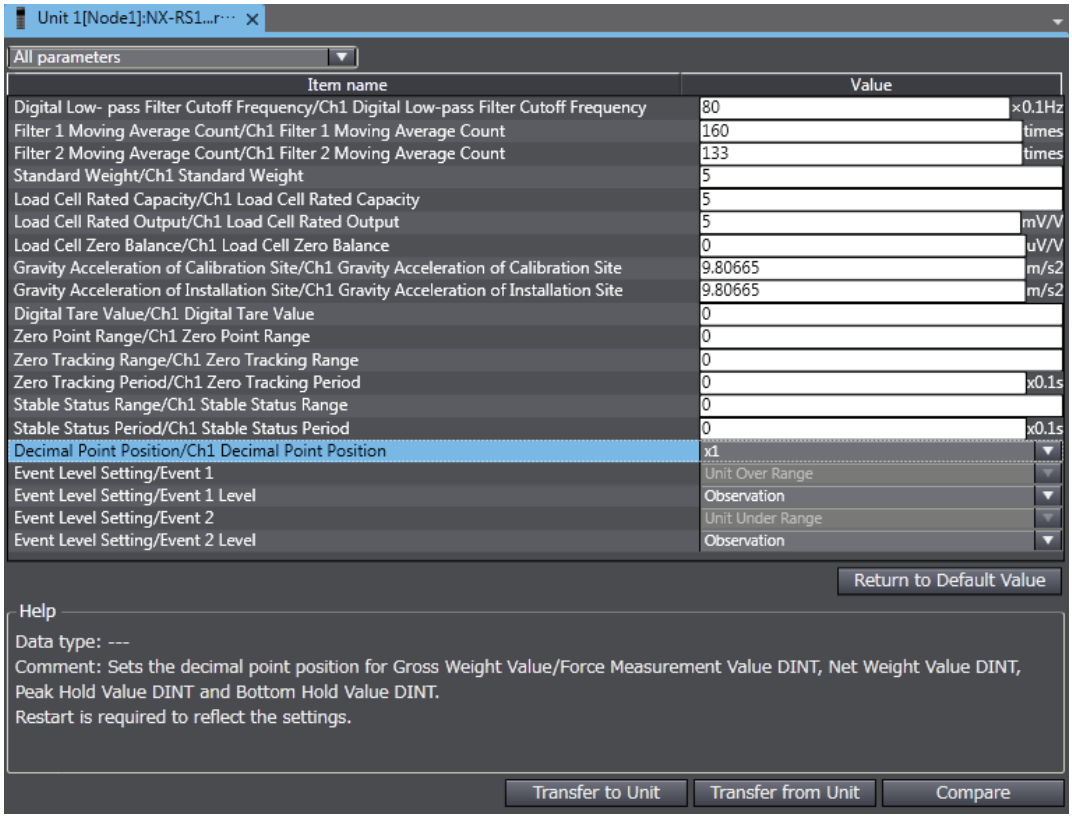
Item	Setting description	Default	Setting range	Unit	Remarks
Ch1 Decimal Point Position	Sets the decimal point position for Gross Weight Value/Force Measurement Value DINT, Net Weight Value DINT, Peak Hold Value DINT and Bottom Hold Value DINT.	0	0: $\times 10^{0}$ 1: $\times 10^{-1}$ 2: $\times 10^{-2}$ 3: $\times 10^{-3}$ 4: $\times 10^{-4}$	---	Set values are applied when the power supply to the NX Unit is turned ON or the NX Unit is restarted.

8-13-3 Setting Method

The method for setting the decimal point with the Sysmac Studio is given below.

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.



2 Set the Ch1 Decimal Point Position.

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

The settings are transferred from the Sysmac Studio 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 Sysmac Studio 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 to Check for Errors 9-2

9-2 Checking for Errors with the Indicators 9-3

9-3 Checking for Errors and Troubleshooting on the Sysmac Studio 9-5

9-3-1 Checking for Errors from the Sysmac Studio 9-5

9-3-2 Event Codes and Corrections for Errors 9-6

9-3-3 Meaning of Error 9-10

9-4 Resetting Errors 9-26

9-5 Unit-specific Troubleshooting 9-27

9-6 Measurement Values Used When an Error Occurs 9-30

9-7 Troubleshooting Flowchart 9-31

9-1 How to Check for Errors

Use one of the following error checking methods.

- Checking the indicators
- Troubleshooting with the Sysmac Studio

Refer to the user's manual for the connected CPU Unit or Communications Coupler Unit for details on troubleshooting with the Sysmac Studio.

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		Cause	Correction
Green	Red		
Lit	Not Lit	---	--- (This is the normal status.)
FS (2 s)	Not Lit	• Initializing • Downloading	--- (Normal. Wait until the processing is completed.)
Lit	Lit	This status is not present.	
Not Lit	Not Lit	The Unit power supply is not supplied.	Check the following items and supply the Unit 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 start • Restarting	--- (Normal. Wait until the processing is completed.)
		If you cannot resolve the problem after you check the above items and cycle the Unit power supply, the Unit may have a hardware failure. If this happens, replace the Unit.	
Not Lit	Lit	Non-volatile Memory Hardware Error	Refer to Event *Non-volatile Memory Hardware Error* on page 9-11.
Not Lit	Lit	Control Parameter Error in Master	Refer to Event *Control Parameter Error in Master* 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 Error	Refer to Event *NX Unit Clock Not Synchronized Error* on page 9-21.

TS indicator		Cause	Correction
Green	Red		
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 Error	Refer to Event *Actual Load Calibration Value Error* on page 9-15.
Not Lit	FS (1 s)	NX Unit I/O Communications Error	Refer to Event *NX Unit I/O Communications Error* on page 9-18.
Not Lit	FS (1 s)	NX Unit Output Synchronization Error	Refer to Event *NX Unit Output Synchronization Error* on page 9-20.
The indicator status is held immediately before the event occurred.		NX Message Communications Error	Refer to Event *NX Message Communications Error* on page 9-24.
		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 Sysmac Studio

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 Sysmac Studio to check the meanings of errors and troubleshooting procedures.

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.

Additional Information

Number of Logs of Past Errors

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 *9-3-2 Event Codes and Corrections for Errors* on page 9-6 for details on event codes.

9-3-2 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 cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
00200000 hex	Non-volatile Memory Hardware Error	An error occurred in non-volatile memory.	• Non-volatile memory failure			S			P. 9-11
05120000 hex	A/D Conversion 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

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
10410000 hex	Control Parameter Error in Master	An error occurred in the control parameters that are saved in the master.	For the NX bus of CPU Units • The power supply to the CPU 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 CPU Unit in which the Unit operation settings for the relevant NX Unit are saved. For Communications Coupler Units • The power supply to the Communications 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 Communications Coupler Unit in which the Unit operation settings for the relevant NX Unit are saved.			S			P. 9-13
10440000 hex	Unit Calibration 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 values 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 calibration values are saved.	• There is an error in the area of the non-volatile memory in which the actual load calibration values are saved.			S			P. 9-15
40200000 hex	NX Unit Processing Error	A fatal error occurred in an NX Unit.	• An error occurred in the software.			S			P. 9-16
65130000 hex	Sensor Disconnected 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	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
80200000 hex	NX Unit I/O Communications Error	An I/O communications error occurred in an NX Unit.	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 outside 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 occurred in a Communications Coupler Unit. • The 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 outside the specified range. Or, the capacity of the Unit power supply is insufficient. • There is a hardware error in the NX Unit.			S			P. 9-18
80210000 hex	NX Unit Output Synchronization Error	An output synchronization 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 Communications 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					Reference
				Maj	Prt	Min	Obs	Info	
80240000 hex	NX Unit Clock Not Synchronized Error	A time information error occurred in an NX Unit.	For the NX bus of CPU Units • There is a hardware error in an NX Unit. • 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 an EtherCAT Coupler Unit.			S			P. 9-21
65140000 hex	Over Range	The input signal from the load cell exceeded the upper limit of the input conversion range.	• Wiring with the load cell is not connected. • Wiring with the load cell is broken. • EXC+ terminal and EXC- terminal are short-circuited. • Load cell failure. • A load cell with which the rated output exceeds the input range of the Load Cell Input Unit is used. • A load that exceeds the rated capacity is applied to the load cell. • Noise			U	S		P. 9-22
65150000 hex	Under Range	The input signal from the load cell went below the lower limit of the input conversion range.	• Wiring with the load cell is not connected. • Wiring with the load cell is broken. • EXC+ terminal and EXC- terminal are short-circuited. • Load cell failure. • A load cell with which the rated output exceeds the input range of the Load Cell Input Unit is used. • A load that exceeds the rated capacity is applied to the load cell. • Noise			U	S		P. 9-23
80220000 hex	NX Message Communications Error	An error was detected in message communications and the message frame was discarded.	For the NX bus of CPU Units • The message communications load is high. For Communications Coupler Units • The message communications load is high. • The communications cable is disconnected or broken. • Message communications were cut off as the result of executing a synchronization or restoration operation on the Sysmac Studio or as the result of disconnecting an EtherCAT slave.				S		P. 9-24
90400000 hex	Event Log Cleared	The event log was cleared.	• The event log was cleared by the user.					S	P. 9-25

9-3-3 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.

<table>
<tr><td>Event name</td><td colspan="3">Gives the name of the error.</td><td>Event code</td><td colspan="2">Gives the code of the error.</td></tr>
<tr><td>Meaning</td><td colspan="6">Gives a short description of the error.</td></tr>
<tr><td>Source</td><td colspan="2">Gives the source of the error.</td><td>Source details</td><td>Gives details on the source of the error.</td><td>Detection timing</td><td>Tells when the error is detected.</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td colspan="2">Tells the level of influence on control.*1</td><td>Log category</td><td colspan="2">Tells which log the error is saved in.*2</td></tr>
<tr><td>Recovery</td><td colspan="5">Gives the recovery method.*3</td></tr>
<tr><td>Effects</td><td>User program</td><td>Tells what will happen to execution of the user program.*4</td><td>Operation</td><td colspan="3">Provides special information on the operation that results from the error.</td></tr>
<tr><td>Indicators</td><td colspan="6">Gives the status of the built-in EtherNet/IP port and built-in EtherCAT port indicators. Indicator status is given only for errors in the EtherCAT Master Function Module and the EtherNet/IP Function Module.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td>Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="5">Lists the variable names, data types, and meanings for system-defined variables that provide direct error notification, that are directly affected by the error, or that contain settings that cause the error.</td></tr>
<tr><td rowspan="2">Cause and correction</td><td colspan="2">Assumed cause</td><td>Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="5">Lists the possible causes, corrections, and preventive measures for the error.</td></tr>
<tr><td>Attached information</td><td colspan="6">This is the attached information that is displayed by the Sysmac Studio or an HMI.*5,*6</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">Provides precautions, restrictions, and supplemental information. If the user can set the event level, the event levels that can be set, the recovery method, operational information, and other information are also provided.</td></tr>
</table>

*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 Memory Hardware Error			**Event code**	00200000 hex	
Meaning	An error occurred in non-volatile memory.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	When power is turned ON to the NX Unit
Error attributes	**Level**	Minor fault		**Log category**	System	
	Recovery	For the NX bus of CPU Units Cycle the power supply to the Unit or restart the NX bus. For Communications Coupler Units Cycle the power supply to the Unit or restart the Slave Terminal and then reset all of the errors in the Controller.				
Effects	**User program**	Continues.	**Operation**	I/O refreshing for the NX Unit stops. Messages cannot be sent to the NX Unit.		
System-defined variables	**Variable**		**Data type**		**Name**	
	None		---		---	
Cause and correction	**Assumed cause**		**Correction**		**Prevention**	
	Non-volatile memory failure.		For the NX bus of CPU Units Cycle the power supply to the Unit or restart the NX bus. If the error persists even after you make the above correction, replace the relevant NX Unit. For Communications Coupler Units Cycle the power supply to the Unit or restart the Slave Terminal. If the error persists even after you make the above correction, replace the relevant NX Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

<table>
<tr><td>Event name</td><td colspan="2">A/D Conversion Error</td><td>Event code</td><td colspan="2">05120000 hex</td></tr>
<tr><td>Meaning</td><td colspan="5">AD conversion was not performed by the AD converter.</td></tr>
<tr><td>Source</td><td colspan="2">Depends on where the Sysmac Studio is connected and the system configuration.</td><td>Source details</td><td>NX Unit</td><td>Detection timing</td><td>Continuously</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td colspan="2">Minor fault</td><td>Log category</td><td colspan="2">System</td></tr>
<tr><td>Recovery</td><td colspan="5">Restart the NX Unit.</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">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.
The bottom hold value goes to −2147483647 for DINT data, to −3.402823e+38 for REAL data.</td></tr>
<tr><td>System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td></td><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="4">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="2">EXC+ terminal and EXC- terminal are short-circuited.</td><td colspan="2">Remove the short circuit between EXC+ and EXC-, cycle the power to the NX Unit, and check that the error is reset.</td><td colspan="2">None</td></tr>
<tr><td colspan="2">Noise</td><td colspan="2">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 countermeasures as required.</td><td colspan="2">Implement noise countermeasures.</td></tr>
<tr><td colspan="2">A/D converter failure</td><td colspan="2">If the EXC+ terminal and EXC- terminal are not short-circuited and cycling the power supply to the NX Unit does not clear the error, replace the NX Unit.</td><td colspan="2">None</td></tr>
<tr><td>Attached information</td><td colspan="5">Attached information 1: Error channel
0001 hex: Channel 1</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="5">None</td></tr>
</table>

<table>
<tr><td>Event name</td><td colspan="2">Control Parameter Error in Master</td><td>Event code</td><td colspan="2">10410000 hex</td></tr>
<tr><td>Meaning</td><td colspan="5">An error occurred in the control parameters that are saved in the master.</td></tr>
<tr><td>Source</td><td colspan="2">Depends on where the Sysmac Studio is connected and the system configuration.</td><td>Source details</td><td>NX Unit</td><td>Detection timing</td><td>When power is turned ON to the NX Unit</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td colspan="2">Minor fault</td><td>Log category</td><td colspan="2">System</td></tr>
<tr><td>Recovery</td><td colspan="5">For the NX bus of CPU Units
When Fail-soft Operation Is Set to Stop
Restart the NX Unit and then reset the error in the NX Bus Function Module.
When Fail-soft Operation Is Set to Fail-soft
Restart the NX Unit and then reset the error in the NX Unit.
For Communications Coupler Units
When Fail-soft Operation Is Set to Stop
Restart the NX Unit and then reset all of the errors in the Controller.
When Fail-soft Operation Is Set to Fail-soft
Restart the NX Unit and then reset the error in the Communications Coupler Unit.</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="2">I/O refreshing for the NX Unit stops.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="5">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="6">For the NX bus of CPU Units</td></tr>
<tr><td colspan="2">The power supply to the CPU 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 CPU Unit in which the Unit operation settings for the relevant NX Unit are saved.</td><td colspan="2">Download the Unit operation settings of the NX Unit again. If the error persists even after you make the above correction, replace the CPU Unit.</td><td colspan="2">Do not turn OFF the power supply to the CPU Unit while transfer of the Unit operation settings for the NX Unit or execution of the NX_SaveParam instruction is in progress.</td></tr>
<tr><td colspan="6">For Communications Coupler Units</td></tr>
<tr><td colspan="2">The power supply to the Communications 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 Communications Coupler Unit in which the Unit operation settings for the relevant NX Unit are saved.</td><td colspan="2">Download the Unit operation settings of the NX Unit again. If the error occurs again even after you make the above correction, replace the Communications Coupler Unit.</td><td colspan="2">Do not turn OFF the power supply to the Communications Coupler Unit while transfer of the Unit operation settings to the NX Unit or execution of the NX_SaveParam instruction is in progress.</td></tr>
<tr><td>Attached information</td><td colspan="6">None</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">None</td></tr>
</table>

Event name	Unit Calibration Value Error			**Event code**	10440000 hex	
Meaning	There is an error in the area in which the Unit calibration values are saved.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	When power is turned ON to the NX Unit
Error attributes	**Level**	Minor fault		**Log category**	System	
	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. The bottom hold value goes to −2147483647 for DINT data, to −3.402823e+38 for REAL data.		
System-defined variables	**Variable**		**Data type**		**Name**	
	None		---		---	
Cause and correction	**Assumed cause**		**Correction**		**Prevention**	
	There is an error in the area of the non-volatile memory in which the Unit calibration values are saved.		Cycle the power to the NX Unit and see if this clears the error. If the error occurs again even after you make the above correction, replace the NX Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	Actual Load Calibration Value Error		**Event code**	10450000 hex	
Meaning	There is an error in the area in which the actual load calibration values are saved.				
Source	Depends on where the Sysmac Studio is connected and the system configuration.	**Source details**	NX Unit	**Detection timing**	When power is turned ON to the NX Unit
Error attributes	**Level**	Minor fault	**Log category**	System	
	Recovery	Perform actual load calibration, then cycle the power supply to the NX Unit.			
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. The bottom hold value goes to −2147483647 for DINT data, to −3.402823e+38 for REAL data.	

System-defined variables	**Variable**	**Data type**	**Name**
	None	---	---

Cause and correction	**Assumed cause**	**Correction**	**Prevention**
	There is an error in the area of the non-volatile memory in which the actual load calibration values are saved.	Perform actual load calibration, then cycle the power to the NX Unit and see if this clears the error. If the error occurs again even after you make the above correction, replace the NX Unit.	Do not turn OFF the power supply to the NX Unit during actual load calibration.

Attached information	Attached information 1: Error channel 0001 hex: Channel 1
Precautions/ Remarks	None

<table>
<tr><td>Event name</td><td colspan="3">NX Unit Processing Error</td><td>Event code</td><td colspan="2">40200000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">A fatal error occurred in an NX Unit.</td></tr>
<tr><td>Source</td><td colspan="2">Depends on where the Sysmac Studio is connected and the system configuration.</td><td>Source details</td><td>NX Unit</td><td>Detection timing</td><td>Continuously</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td>Minor fault</td><td></td><td>Log category</td><td colspan="2">System</td></tr>
<tr><td>Recovery</td><td colspan="5">For the NX bus of CPU Units
Cycle the power supply to the NX Unit and then reset the error in the NX Bus Function Module.
For Communications Coupler Units
Cycle the power supply to the NX Unit and then reset the error in the Communications Coupler Unit.</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">I/O refreshing for the NX Unit stops. Messages cannot be sent to the NX Unit.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="2">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="2">An error occurred in the software.</td><td colspan="2">Contact your OMRON representative.</td><td colspan="2">None</td></tr>
<tr><td>Attached information</td><td colspan="6">Attached information 1: System information
Attached information 2: System information
Attached information 3: System information
Attached information 4: System information</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">None</td></tr>
</table>

Event name	Sensor Disconnected Error			**Event code**	65130000 hex	
Meaning	A disconnection with the load cell was detected.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	When sensor disconnection test is executed
Error attributes	**Level**	Minor fault		**Log category**	System	
	Recovery	Reset error in the NX Unit.				
Effects	**User program**	Continues.	**Operation**	During the sensor disconnection test, regardless of whether a Sensor Disconnected Error occurs or not, the measurement values are as follows. • 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. • The bottom hold value goes to −2147483647 for DINT data, to −3.402823e+38 for REAL data.		

System-defined variables	**Variable**	**Data type**	**Name**
	None	---	---

Cause and correction	**Assumed cause**	**Correction**	**Prevention**
	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 load 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 for breaks and take suitable preventive measures.
	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 cell rated capacity and the load that is applied to the load cell. When a load that exceeds the rated capacity is applied, take measures to keep the load within the rated capacity.	Do not apply a load that exceeds the rated capacity 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 information	Attached information 1: Error channel 0001 hex: Channel 1
Precautions/ Remarks	None

<table>
<tr><td>Event name</td><td colspan="3">NX Unit I/O Communications Error</td><td>Event code</td><td colspan="2">80200000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">An I/O communications error occurred in an NX Unit.</td></tr>
<tr><td>Source</td><td colspan="2">Depends on where the Sysmac Studio is connected and the system configuration.</td><td>Source details</td><td>NX Unit</td><td>Detection timing</td><td>Continuously</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td colspan="2">Minor fault</td><td>Log category</td><td colspan="2">System</td></tr>
<tr><td>Recovery</td><td colspan="5">For the NX bus of CPU Units
When Fail-soft Operation 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 Communications Coupler Units
When Fail-soft Operation Is Set to Stop
Reset all of the errors in the Controller.
When Fail-soft Operation Is Set to Fail-soft
Reset errors in the Communications Coupler Unit and NX Unit.</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">The NX Unit will continue to operate.
Input data: Updating input values stops.
Output data: The output values depend on the Load Rejection Output Setting.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
</table>

Cause and correction	Assumed cause	Correction	Prevention
	For the NX bus of CPU Units		
	An error that prevents normal NX bus communications occurred in a CPU Unit.	Check the error that occurred in the CPU Unit and perform the required corrections.	Take preventive measures against the error that occurred in the CPU Unit.
	An NX Unit is not mounted properly.	Mount the NX Units and End Cover securely and secure them with End Plates.	Mount the NX Units and End Cover securely and secure them with End Plates.
	The power cable for the Unit power supply is disconnected, or the wiring from the Unit power supply to the NX Units is incorrect.	Wire the Unit power supply to the NX Units securely.	Wire the Unit power supply to the NX Units securely.
	The power cable for the Unit power supply is broken.	If the power cable between the Unit power supply and the NX Units is broken, replace it.	None
	The voltage of the Unit power supply is outside the specified range, or the capacity of the Unit power supply is insufficient.	Configure the power supply system configuration correctly according to the power supply design method.	Configure the power supply system configuration correctly according to the power supply design method.
	There is a hardware error in an NX Unit.	If the error persists even after you make the above correction, replace the NX Unit.	None
	For Communications Coupler Units		
	An error that prevents normal NX bus communications occurred in a Communications Coupler Unit.	Check the error that occurred in the Communications Coupler Unit and perform the required corrections.	Take preventive measures against the error that occurred in the Communications Coupler Unit.
	The NX Unit is not mounted properly.	Mount the NX Units and End Cover securely and secure them with End Plates.	Mount the NX Units and End Cover securely and secure them with End Plates.
	The power cable for the Unit power supply is disconnected. Or, the wiring from the Unit power supply to the NX Units is incorrect.	Correctly wire the Unit power supply to the NX Units.	Correctly wire the Unit power supply to the NX Units.
	The power cable for the Unit power supply is broken.	If the power cable between the Unit power supply and the NX Units is broken, replace it.	None
	The voltage of the Unit power supply is outside the specified range. Or, the capacity of the Unit power supply is insufficient.	Correctly configure the power supply system according to the power supply design methods.	Correctly configure the power supply system according to the power supply design methods.
	There is a hardware error in the NX Unit.	If the error occurs again even after you make the above correction, replace the NX Unit.	None
Attached information	None		
Precautions/ Remarks	None		

Event name	NX Unit Output Synchronization Error		**Event code**	80210000 hex	
Meaning	An output synchronization error occurred in the NX Unit.				
Source	Depends on where the Sysmac Studio is connected and the system configuration.	**Source details**	NX Unit	**Detection timing**	Continuously
Error attributes	**Level**	Minor fault	**Log category**	System	
	Recovery	For the NX bus of CPU Units Reset the error in the NX Bus Function Module. For Communications Coupler Units Reset all of the errors in the Controller.			
Effects	**User program**	Continues.	**Operation**	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.	
System-defined variables	**Variable**		**Data type**	**Name**	
	None		---	---	
Cause and correction	**Assumed cause**		**Correction**	**Prevention**	
	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.		Check the error that occurred in the CPU Unit and perform the required corrections.	Take preventive measures against the error that occurred in the CPU Unit.	
	For Communications Coupler Units				
	The communications cable connected to the Communications Coupler Unit is broken or the connection is faulty.		Replace the communications cable or wire the cable correctly.	Wire the communications cable correctly.	
	The communications cable is affected by noise.		Set the Consecutive Communications Error Detection Count parameter for the Communications Coupler Unit to a suitable value that will not cause problems in operation. Implement noise countermeasures if there is excessive noise.	Implement noise countermeasures. Refer to the operation manuals for the specific Units for noise countermeasures.	
Attached information	None				
Precautions/ Remarks	None				

Event name	NX Unit Clock Not Synchronized Error			Event code	80240000 hex	
Meaning	A time information error occurred in an NX Unit.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		Source details	NX Unit	Detection timing	Continuously
Error attributes	Level	Minor fault		Log category	System	
	Recovery	For the NX bus of CPU Units Cycle the power supply to the Unit. For Communications 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. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.		

System-defined variables	Variable	Data type	Name
	None	---	---

Cause and correction	Assumed cause	Correction	Prevention
	For the NX bus of CPU Units		
	There is a hardware error in an NX Unit.	If the error occurs only in a specific NX Unit, replace the relevant NX Unit.	None
	There is a hardware error in a CPU Unit.	If the error occurs in all of the NX Units mounted on a CPU Unit, replace the CPU Unit.	None
	For Communications Coupler Units		
	There is a hardware error in an NX Unit.	If the error occurs only in a specific NX Unit, replace the relevant NX Unit.	None
	There is a hardware error in an EtherCAT Coupler Unit.	If the error occurs in all of the NX Units mounted on a Communications Coupler Unit, replace the Communications Coupler Unit.	None
Attached information	None		
Precautions/ Remarks	None		

Event name	Over Range			**Event code**	65140000 hex	
Meaning	The input signal from the load cell exceeded the upper limit of the input conversion range.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	Continuously
Error attributes	**Level**	Observation		**Log category**	System	
	Recovery	Reset error in the NX Unit.				
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. The bottom hold value goes to −2147483647 for DINT data, to −3.402823e+38 for REAL data.		

	Variable	**Data type**	**Name**
System-defined variables	None	---	---

	Assumed cause	**Correction**	**Prevention**
Cause and 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 load 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 for the breaks and take suitable preventive measures.
	EXC+ terminal and EXC- terminal are short-circuited.	Check to see if the EXC+ terminal and EXC- terminal are short-circuited. If they are short-circuited, remove the cause of short-circuit. After the cause of short-circuit is removed, cycle the power to the NX Unit and see if this clears the error.	None
	Load cell failure.	Check to see if there are problems with the load cell. Replace the load cell if any are found.	None
	A load cell with which the rated output exceeds the input range of the Load Cell Input Unit is used.	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.
	A load that exceeds the rated capacity is applied to the load cell.	Check the load cell rated capacity and the load that is applied to the load cell. When a load that exceeds the rated capacity is applied, take measures to keep the load within the 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 countermeasures as required.	Implement noise countermeasures.

Attached information	Attached information 1: Error channel 0001 hex: Channel 1
Precautions/ Remarks	You can change the event level to the minor fault level.

Event name	Under Range			**Event code**	65150000 hex	
Meaning	The input signal from the load cell went below the lower limit of the input conversion range.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	Continuously
Error attributes	**Level**	Observation		**Log category**	System	
	Recovery	Reset error in the NX Unit.				
Effects	**User program**	Continues.	**Operation**	The gross weight value/force measurement value, net weight value, and bottom hold value go to −2147483647 for DINT data, to −3.402823e+38 for REAL data. The peak hold value goes to 2147483647 for DINT data, to 3.402823e+38 for REAL data.		

	Variable	**Data type**	**Name**
System-defined variables	None	---	---

	Assumed cause	**Correction**	**Prevention**
Cause and 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 load 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 measures.
	EXC+ terminal and EXC- terminal are short-circuited.	Check to see if the EXC+ terminal and EXC- terminal are short-circuited. If they are short-circuited, remove the cause of short-circuit. After the cause of short-circuit is removed, cycle the power to the NX Unit and see if this clears the error.	None
	Load cell failure.	Check to see if there are problems with the load cell. Replace the load cell if any are found.	None
	A load cell with which the rated output exceeds the input range of the Load Cell Input Unit is used.	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.
	A load that exceeds the rated capacity is applied to the load cell.	Check the load cell rated capacity and the load that is applied to the load cell. When a load that exceeds the rated capacity is applied, take measures to keep the load within the 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 countermeasures as required.	Implement noise countermeasures.

Attached information	Attached information 1: Error channel 0001 hex: Channel 1
Precautions/ Remarks	You can change the event level to the minor fault level.

<table>
<tr><td>Event name</td><td colspan="3">NX Message Communications Error</td><td>Event code</td><td colspan="2">80220000 hex</td></tr>
<tr><td>Meaning</td><td colspan="6">An error was detected in message communications and the message frame was discarded.</td></tr>
<tr><td>Source</td><td colspan="2">Depends on where the Sysmac Studio is connected and the system configuration.</td><td>Source details</td><td>NX Unit</td><td>Detection timing</td><td>During NX message communications</td></tr>
<tr><td rowspan="2">Error attributes</td><td>Level</td><td colspan="2">Observation</td><td>Log category</td><td colspan="2">System</td></tr>
<tr><td>Recovery</td><td colspan="5">---</td></tr>
<tr><td>Effects</td><td>User program</td><td>Continues.</td><td>Operation</td><td colspan="3">Not affected.</td></tr>
<tr><td>System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td></td><td colspan="2">None</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td rowspan="8">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="6">For the NX bus of CPU Units</td></tr>
<tr><td colspan="2">The message communications load is high.</td><td colspan="2">Reduce the number of times that instructions are used to send NX messages.</td><td colspan="2">Reduce the number of times that instructions are used to send NX messages.</td></tr>
<tr><td colspan="6">For Communications Coupler Units</td></tr>
<tr><td colspan="2">The message communications load is high.</td><td colspan="2">Reduce the number of times that instructions are used to send NX messages.
Refer to the appendix of the NJ/NX-series Instructions Reference Manual (Cat. No. W502) for information on the instructions that send messages.</td><td colspan="2">Reduce the number of times that instructions are used to send NX messages.</td></tr>
<tr><td colspan="2">The communications cable is disconnected or broken.
This cause does not apply if attached information 2 is 0 (NX bus).</td><td colspan="2">Connect the communications cable securely.</td><td colspan="2">Connect the communications cable securely.</td></tr>
<tr><td colspan="2">Message communications were cut off as the result of executing a synchronization or restoration operation on the Sysmac Studio or as the result of disconnecting an EtherCAT slave.</td><td colspan="2">---</td><td colspan="2">---</td></tr>
<tr><td>Attached information</td><td colspan="6">Attached information 1: System information
Attached information 2: Type of communications where error occurred
0: NX bus
1: EtherCAT
2: Serial communications (USB)
3: EtherNet/IP
65535: Internal Unit communications (routing)</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">None</td></tr>
</table>

Event name	Event Log Cleared			**Event code**	90400000 hex	
Meaning	The event log was cleared.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	When commanded from user
Error attributes	**Level**	Information		**Log category**	Access	
	Recovery	---				
Effects	**User program**	Continues.	**Operation**	Not affected.		
System-defined variables	**Variable**		**Data type**		**Name**	
	None		---		---	
Cause and correction	**Assumed cause**		**Correction**		**Prevention**	
	The event log was cleared by the user.		---		---	
Attached information	Attached information 1: Events that were cleared 1: The system event log was cleared. 2: The access event log was cleared.					
Precautions/ Remarks	None					

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 measurement value is not refreshed.	Wiring with the load cell is incorrect.	Check the wiring with the load cell.
	Wiring with the load cell is disconnected.	Recover the wiring with the load cell.
	Calibration is not executed correctly.	Execute the calibration again. Refer to *Section 7 Calibration Methods* for calibration methods.
	The input signal exceeds the upper limit or is below the lower limit of the input conversion range.	Check that the appropriate load cell is used so that the rated output is within the input range of the Load Cell Input Unit.
		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 calibration methods.
	The sensor disconnection test is in progress.	Change the Ch1 Sensor Disconnection Test Execution 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 8-31 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 *8-10 Input Value Refreshing Stop* on page 8-34 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 converted correctly. (continues on next page)	Wiring with the load cell is incorrect.	Check the wiring with the load cell.
	Wiring with the load cell is disconnected.	Recover the wiring with the load cell.
	Calibration is not executed correctly.	Execute the calibration again. Refer to *Section 7 Calibration Methods* for calibration methods.

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 measurement value to measure.	Set the basic parameters according to the unit of the gross weight value/force measurement 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 Basic Parameter Settings* on page 7-13 for basic parameters of equivalent input calibration.
	The zero point is corrected by the zero set, zero reset, or zero tracking.	Check that the zero set, zero reset, or zero tracking is not used. Refer to *8-3 Zero Set/Zero Reset* on page 8-12 or *8-4 Zero Tracking* on page 8-15 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 8-12 or *8-4 Zero Tracking* on page 8-15 for details on these functions.
		Execute the actual load calibration again at the ambient temperature of the installation site. Refer to *Section 7 Calibration Methods* for calibration methods. If you use the Unit with the equivalent input calibration the zero drift cannot improve even if you execute the calibration again.
	Gravity acceleration of the installation site is different from that of the calibration site where the actual load calibration is executed.	Use the gravity acceleration correction to correct the gross weight value. Refer to *8-1 Gravity Acceleration Correction* 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 *2-1-2 Individual Specifications* on page 2-3 for information on the warm-up period.
	The time from when the fixed tare or standard weight is placed for actual load calibration until zero calibration or span calibration is performed is not sufficient.	Execute the zero calibration or span calibration after a sufficient time elapses since the fixed tare or standard weight is placed.*1

Error	Assumed cause	Correction
Gross weight value is not stable even after confirming the gross weight value is stable using stable detection.	The set value of Ch1 Stable Status Range is not appropriate. For example, it is set to 0 or the unit of the gross weight value to measure is different.	Set the value of Ch1 Stable Status Range as shown below. • A value other than 0 • The unit of the gross weight value to measure
	The set value of Ch1 Stable Status Period is not appropriate. For example, it is set to 0.	Set the value of Ch1 Stable Status Period to a value other than 0.
	The gross weight value is not stable due to noise.	Stabilize the gross weight value using digital filtering. 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 elapse after the load applied to the load cell was changed.	Check that the gross weight value is stable when a sufficient time elapses after the load applied to the load cell is changed.*1
The gross weight value/force measurement value with no load does not change to 0 when you use the Unit after an equivalent input calibration is performed.	A force is applied to the load cell with no load 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. Or, change the installation method of the load cell so that no force is applied to the load cell with no load. Refer to *8-3 Zero Set/Zero Reset* on page 8-12 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 Error • Actual Load Calibration Value Error • Sensor Disconnected Error*1	Ch1 Gross Weight Value/Force Measurement Value DINT	2147483647
	Ch1 Gross Weight Value/Force Measurement Value REAL	3.402823e+38
	Ch1 Net Weight Value DINT	2147483647
	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
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 8-31 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

Inspection and Maintenance

This section describes the procedures for cleaning, inspecting, and replacing the Load Cell Input Unit.

10-1 Cleaning and Inspection 10-2
10-1-1 Cleaning 10-2
10-1-2 Periodic Inspection 10-2
10-2 Maintenance 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.

Periodic Inspection Items

No.	Inspection item	Inspection details	Criteria	Correction
1	External power supply	Is the power supply voltage measured at the terminal block within standards?	Within the power supply 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 voltage 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 standards.
3	Ambient environment	Is the ambient operating temperature 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 ambient 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 chemical sprays hitting the Controller?	No spray	Clean and protect the Controller if necessary.
		Are there corrosive or flammable 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 specifications.	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 Controller.
4	Installation and wiring	Are the DIN track mounting hooks for each NX Unit securely locked?	No looseness	Securely lock the DIN track mounting 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 Phillips-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.

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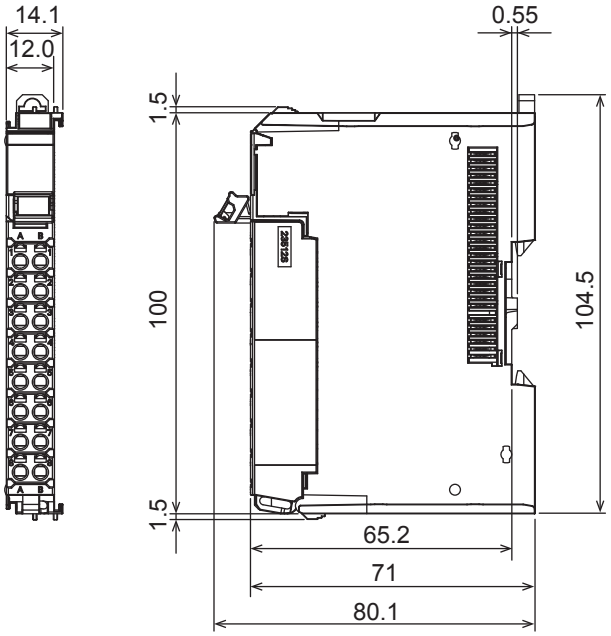
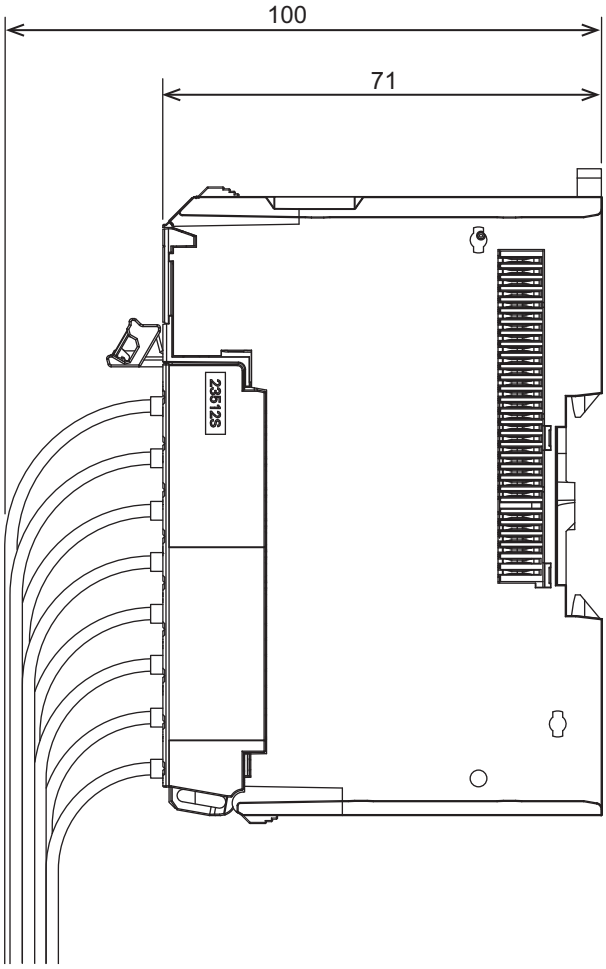
A-1 Dimensions



(Unit: mm)

The installation height is as follows:



(Unit: mm)

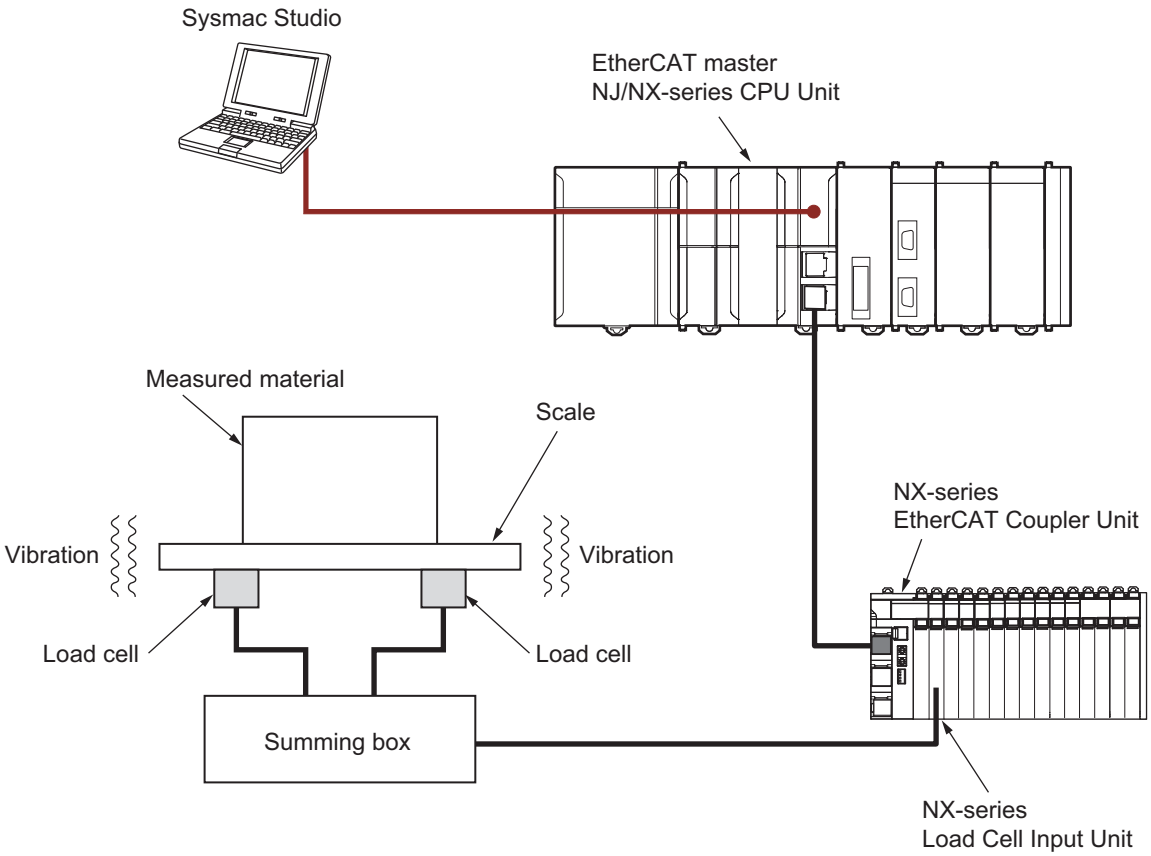
A-2 Digital Filter Design That Utilizes Data Tracing

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 8-40 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 Sysmac Studio.

Refer to *8-12-3 How to Execute Data Tracing* on page 8-42 for how to perform data tracing. Refer to *8-12-4 How to Check the Tracing Result* on page 8-44 for how to export tracing data to a CSV file.

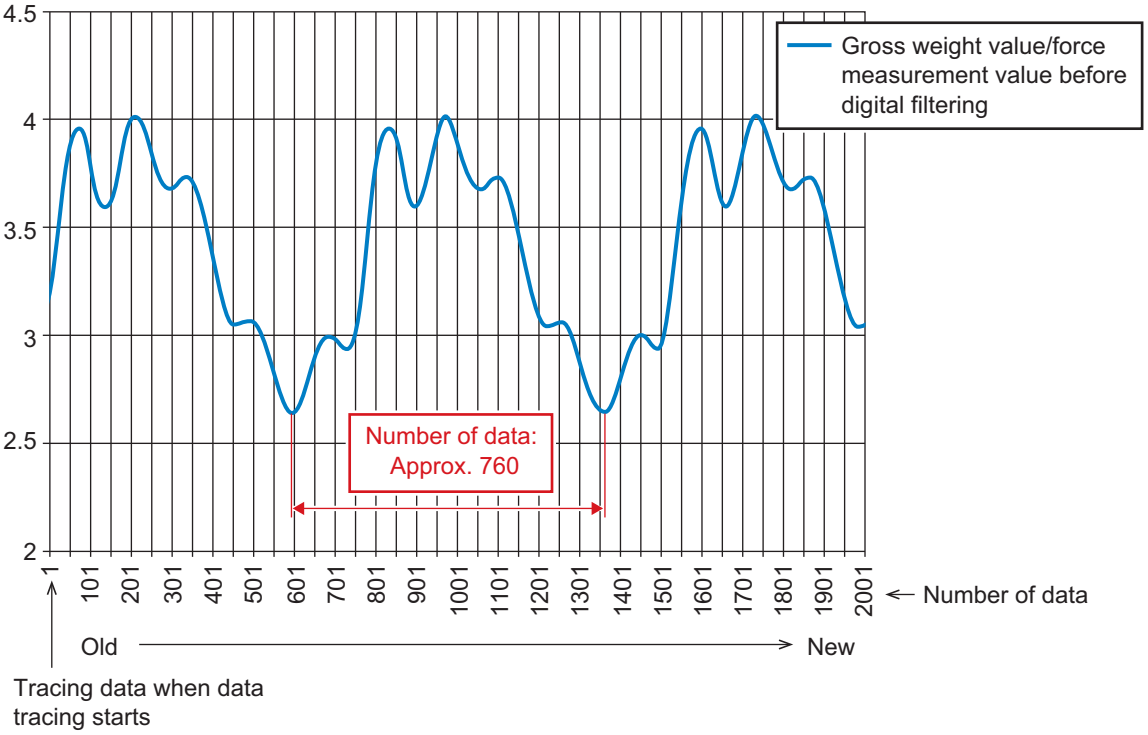
2 Open the exported CSV file in Microsoft Excel, and then create a broken line graph with the axis specifications below.

Item	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 8-44 for the way to view the CSV file.

3 Calculate the fluctuation frequency that is contained in the measurement value from the broken line graph.



Use the following formula to calculate the fluctuation frequency of the measurement value.

$$\text{Fluctuation frequency} = \frac{1}{\text{Fluctuation period}} = \frac{1}{\text{Number of data} \times \text{Data sampling period}}$$

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 µs. If the fluctuation frequency of the measurement value is calculated, it will be as follows.

$$\text{Fluctuation frequency} = \frac{1}{\text{Fluctuation period}} = \frac{1}{760\ [\text{data}] \times 125\ [\mu\text{s}]} = 10.526\ [\text{Hz}]$$

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.

$$\text{Moving average count} = \frac{\text{Sampling frequency}}{f_N} = \frac{\text{Sampling frequency}}{\text{Fluctuation frequency}}$$

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.

$$\text{Moving average count} = \frac{\text{Sampling frequency}}{f_N} = \frac{8000\ [\text{Hz}]}{10.526\ [\text{Hz}]} = 760\ [\text{times}]$$

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.

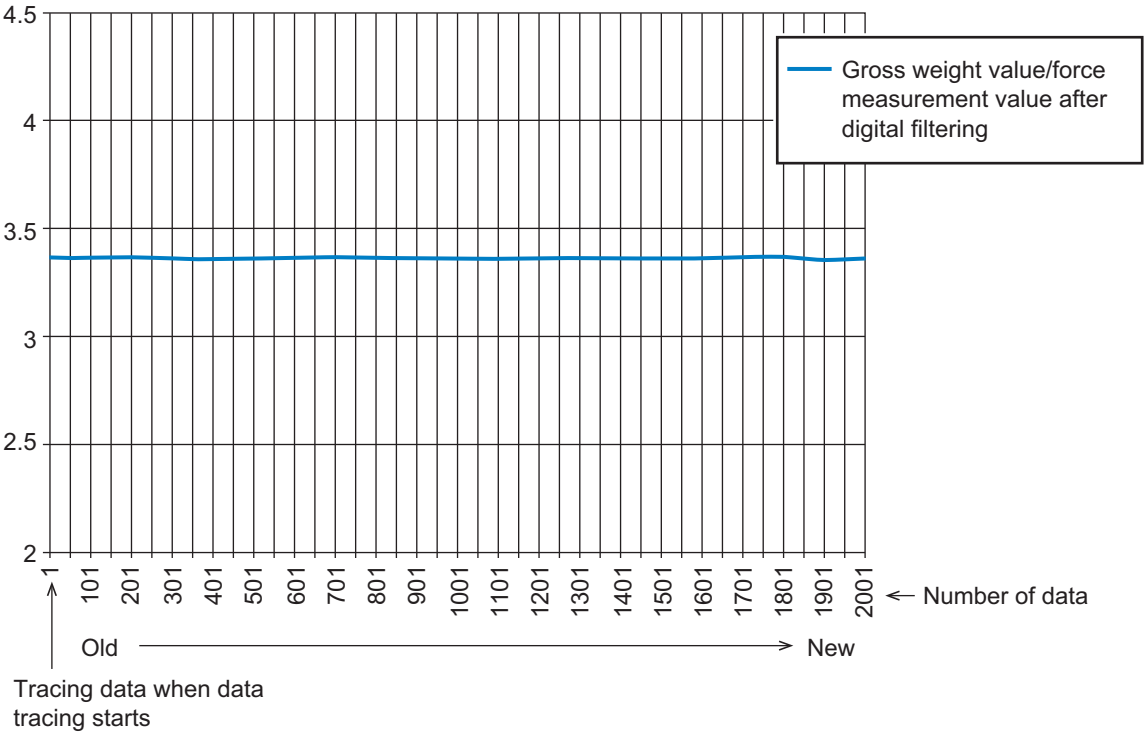
7 Open the exported CSV file in Microsoft Excel, and then create a broken line graph with the specifications below.

Item	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.

A-3-1 Format of NX Object Descriptions

The following format is used to describe objects.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute

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 allocation	Data attribute
1000	---	NX Bus Identity	---	---	---	---	---	---	---
	00	Number of Entries	7	7	---	USINT	RO	Not possible.	---
	02	Model	*1	---	---	ARRAY [0..11] OF BYTE	RO	Not possible.	---
	04	Product Code	*2	---	---	UDINT	RO	Not possible.	---
	05	Vendor Code	00000001 hex *3	---	---	UDINT	RO	Not possible.	---
	06	Unit Version	*4	---	---	UDINT	RO	Not possible.	---
	07	Serial Number	*5	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible.	---

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1001	---	Production Info	---	---	---	---	---	---	---
	00	Number of Entries	4	4	---	USINT	RO	Not possible.	---
	01	Lot Number	*6	00000000 to FFFFFFFF hex	---	UDINT	RO	Not possible.	---
	02	Hardware Version	*7	---	---	ARRAY [0..19] OF BYTE	RO	Not possible.	---
	03	Software Version	*7	---	---	ARRAY [0..19] OF BYTE	RO	Not possible.	---

*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.

*4. Bits 24 to 31: Integer part of the unit version
Bits 16 to 23: Decimal part of the unit version
Bits 0 to 15: Reserved
Example for version 1.0: 0100□□□□ hex

*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

*7. The version is returned in ASCII. It is given as follows: "V" ($56), integer part of version, period ($2E), decimal part of version. If all 20 bytes are not required, the remaining bytes are filled with spaces ($20).
Example for version 1.00: $56$31$2E$30$30$20$20$20$20$20$20$20$20$20$20$20$20$20$20

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 allocation	Data attribute
6000	---	Detection Status	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Detection Status	0000 hex	0000 to FFFF hex	---	WORD	RO	Possible.	---

- 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 allocation	Data attribute
6001	---	Executing Status	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Executing Status	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 allocation	Data attribute
6002	---	Gross Weight Value/Force Measurement Value DINT	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Gross Weight Value/Force Measurement 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 allocation	Data attribute
6003	---	Gross Weight Value/Force Measurement Value REAL	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Gross Weight Value/Force Measurement 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 allocation	Data attribute
6004	---	Net Weight Value DINT	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
6005	---	Net Weight Value REAL	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
6006	---	Peak Hold Value DINT	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
6007	---	Peak Hold Value REAL	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
6008	---	Bottom Hold Value DINT	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
6009	---	Bottom Hold Value REAL	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
600A	---	Calibration Command Response SID	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Calibration Command Response SID	0	0 to 65535	---	UINT	RO	Possible.	---

- 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 allocation	Data attribute
600B	---	Calibration Command Response	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 Command 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 allocation	Data attribute
7000	---	Operation Command	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Operation Command	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 allocation	Data attribute
7001	---	Calibration Command SID	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
7002	---	Calibration Command	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
7003	---	Calibration Data	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	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 allocation	Data attribute
5000	---	Digital Low-pass Filter Cutoff Frequency	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Digital Low-pass Filter Cutoff Frequency	80	0 to 20000	x 0.1 Hz	UINT	RW	Not possible.	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.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5001	---	Filter 1 Moving Average Count	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Filter 1 Moving Average Count	160	0 to 80000	times	UDINT	RW	Not possible.	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 allocation	Data attribute
5002	---	Filter 2 Moving Average Count	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Filter 2 Moving Average Count	133	0 to 80000	times	UDINT	RW	Not possible.	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 allocation	Data attribute
5003	---	Standard Weight	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Standard Weight	5.0	1.175495e−38 to 3.402823e+38	---	REAL	RW	Not possible.	N

- 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 allocation	Data attribute
5004	---	Load Cell Rated Capacity	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Load Cell Rated Capacity	5.0	1.175495e-38 to 3.402823e+38	---	REAL	RW	Not possible.	N

- 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 allocation	Data attribute
5005	---	Load Cell Rated Output	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Load Cell Rated Output	5.0	1.175495e−38 to 3.402823e+38	mV/V	REAL	RW	Not possible.	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 allocation	Data attribute
5006	---	Load Cell Zero Balance	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Load Cell Zero Balance	0.0	−3.402823e+38 to 3.402823e+38	μV/V	REAL	RW	Not possible.	N

- 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 allocation	Data attribute
5007	---	Gravity Acceleration of Calibration Site	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Gravity Acceleration of Calibration Site	9.80665	9.70000 to 9.99999	m/s^2	REAL	RW	Not possible.	Y

- 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 allocation	Data attribute
5008	---	Gravity Acceleration of Installation Site	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Gravity Acceleration of Installation Site	9.80665	9.70000 to 9.99999	m/s^2	REAL	RW	Not possible.	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 allocation	Data attribute
5009	---	Digital Tare Value	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Digital Tare Value	0.0	0.0 to 3.402823e+38	---	REAL	RW	Not possible.	Y

- Set the tare weight to use the digital tare subtraction. Refer to *8-6-4 Digital Tare Subtraction* on page 8-24 for details on the digital tare subtraction.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500A	---	Zero Point Range	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Zero Point Range	0.0	0.0 to 3.402823e+38	---	REAL	RW	Not possible.	Y

- 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 8-20 for details on the zero point range. Refer to *8-3 Zero Set/Zero Reset* on page 8-12 for details on the zero set and zero reset. Refer to *8-4 Zero Tracking* on page 8-15 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500B	---	Zero Tracking Range	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Zero Tracking Range	0.0	0.0 to 3.402823e+38	---	REAL	RW	Not possible.	Y

- Set the zero tracking range to use the zero tracking. Refer to *8-4 Zero Tracking* on page 8-15 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500C	---	Zero Tracking Period	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Zero Tracking Period	0	0 to 100	x 0.1 s	UINT	RW	Not possible.	Y

- Set the zero tracking period to use the zero tracking. Refer to *8-4 Zero Tracking* on page 8-15 for details on the zero tracking.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500D	---	Stable Status Range	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Stable Status Range	0.0	0.0 to 3.402823e+38	---	REAL	RW	Not possible.	Y

- Set the range of change for which the gross weight value is determined to be stable. Refer to *8-7 Stable Detection* on page 8-26 for details on the stable detection.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500E	---	Stable Status Period	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Stable Status Period	0	0 to 100	x 0.1 s	UINT	RW	Not possible.	Y

- Set the period for which the gross weight value is determined to be stable. Refer to *8-7 Stable Detection* on page 8-26 for details on the stable detection.

Index (hex)	Subindex (hex)	Object name	Default	Data range	Unit	Data type	Access	I/O allocation	Data attribute
500F	---	Decimal Point Position	---	---	---	---	---	---	---
	00	Number of Entries	1	1	---	USINT	RO	Not possible.	---
	01	Ch1 Decimal Point Position	0	0 to 4	---	UINT	RW	Not possible.	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 8-46 for the details on the decimal point position setting.

A-4 Version Information with CPU Units

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 Unit		Corresponding versions	
Model	Unit version	CPU Unit	Sysmac Studio
Model numbers of NX Units.	Unit versions of NX Units.	Unit versions of the CPU that are compatible with the NX Units.	Sysmac Studio versions that are compatible with the NX Units and CPU Unit.

Version Combination Tables

- With the combinations of the unit versions/versions shown below, you can use all 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.
- If you use the corresponding unit versions/versions given in the following table or later/higher versions, refer to the version information on the CPU Unit.

NX Unit		Corresponding versions*1	
Model	Unit version	CPU Unit	Sysmac Studio
NX-RS1201	Ver.1.0	Ver.1.13	Ver.1.17

*1. Some Units do not have all of the versions given in the above 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.

A-5 Version Information with Coupler Units

Version-related information when connecting Units to a Communications Coupler Unit. This section describes the relationship between the unit versions of each Unit and the Communications Coupler Units, CPU Units, Industrial PCs, and Sysmac Studio versions, and the specification changes for each unit version of each Unit.

A-5-1 Relationship between Unit Versions of Units

The relationship between the unit versions of each Unit and the Communications Coupler Unit, CPU Units, Industrial PCs, 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.

NX Units		Corresponding versions				
		EtherCAT			EtherNet/IP	
Model	Unit version	Communications Coupler Unit	CPU Unit or Industrial PC	Sysmac Studio	Communications Coupler Unit	Sysmac Studio
This is the model number of the NX Unit.	This is the unit version of the NX Unit.	This is the unit version of the EtherCAT Coupler Unit that supports the NX Units.	This is the unit version of the NJ/NX-series CPU Units or NY-series Industrial PC that support the EtherCAT Coupler Unit.	This is the version of the Sysmac Studio that supports the NX Units, EtherCAT Coupler Unit, CPU Unit, and Industrial PC.	This is the unit version of the EtherNet/IP Coupler Unit that supports the NX Units.	This is the version of the Sysmac Studio that supports the NX Units and EtherNet/IP Coupler Unit.

Version Combination Tables

- With the combinations of the unit versions/versions shown below, you can use all 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.
- If you use the corresponding versions given in the following table or later/higher versions, refer to version information on the Communications Coupler Unit, CPU Unit, and Industrial PC.

NX Unit		Corresponding versions*1				
		EtherCAT			EtherNet/IP	
Model	Unit version	Communications Coupler Unit	CPU Unit or Industrial PC	Sysmac Studio	Communications Coupler Unit	Sysmac Studio
NX-RS1201	Ver.1.0	Ver.1.0	Ver.1.05	Ver.1.16	Ver.1.0	Ver.1.16

*1. Some Units do not have all of the versions given in the above 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.

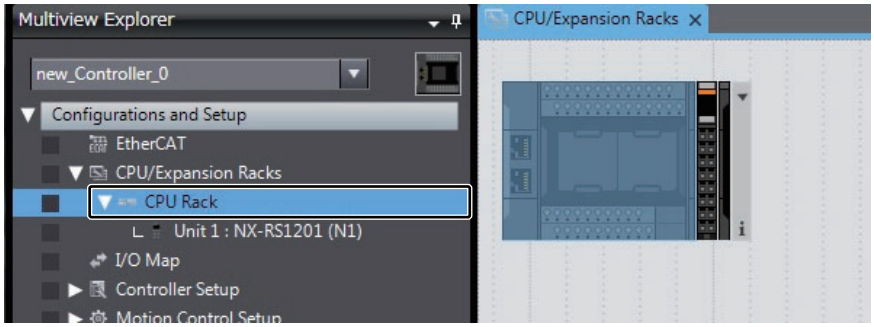
A-6 Display Methods for the Calibration View

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.

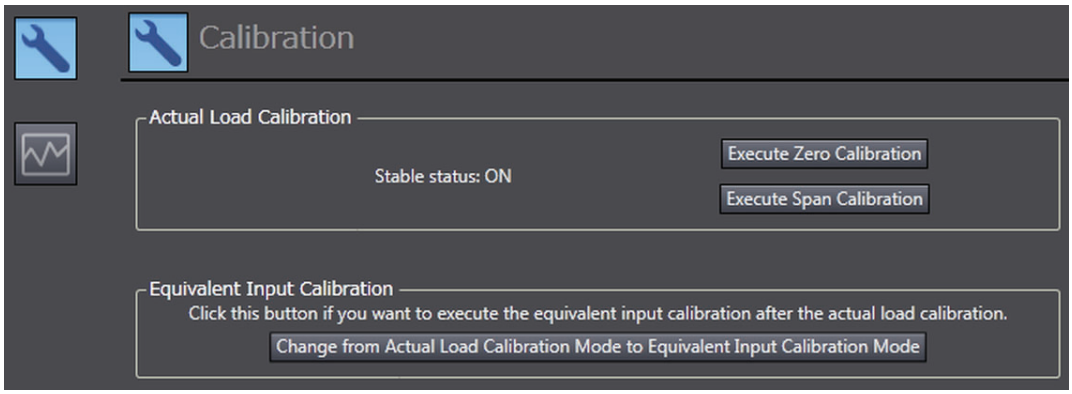
1 In the Multiview Explorer, double-click the CPU Rack to which the target Load Cell Input Unit is connected to open the CPU and Expansion Racks Tab Page.

The following tab page is displayed.



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.

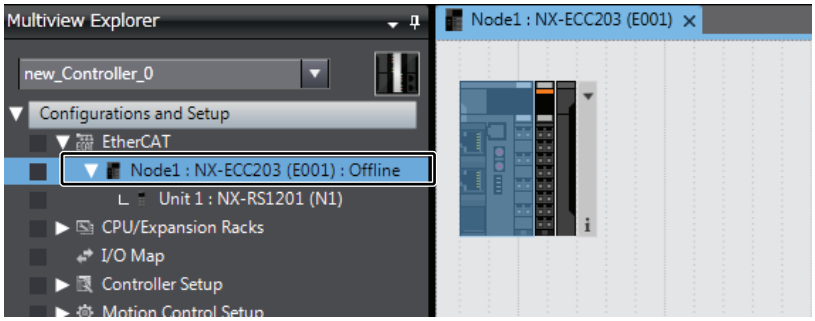


A-6-2 Connection to the Communications Coupler Unit

This section describes how to display the Sysmac Studio calibration view for a Load Cell Input Unit connected to the Communications Coupler Unit.

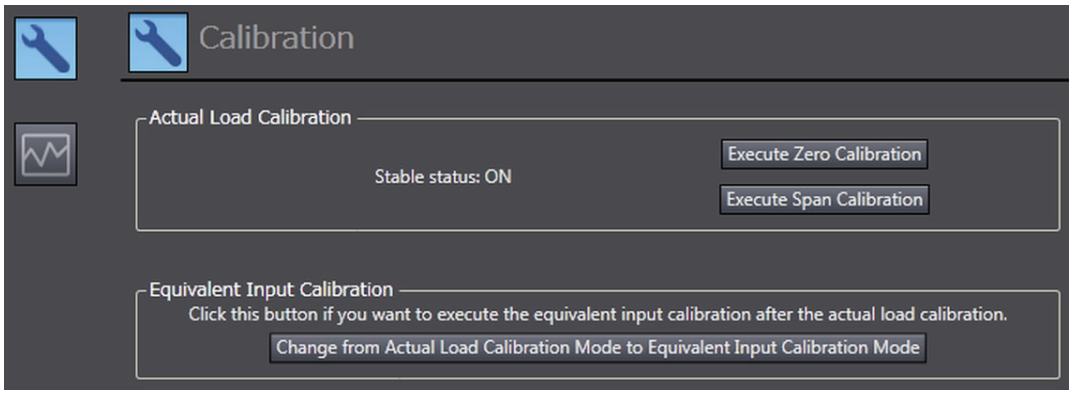
1 In the Multiview Explorer, double-click the Communications Coupler Unit to which the target Load Cell Input Unit is connected to open the Edit Slave Terminal Configuration Tab Page.

The following tab page is displayed.



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.



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