Cat. No. W484-E1-01

CompoNet

CRT1-VAD02SD/MLD
CRT1-VDA02SD/MLD

Analog I/O Slave
(Numerical indicator type)

USER'S MANUAL

OMRON

CompoNet
Analog I/O Slave
(Numerical indicator type)
CRT1-VAD02SD/MLD
CRT1-VDA02SD/MLD

User’s Manual

Revised May 2009

Introduction

Thank you for purchasing a CRT1-VAD02SD / VAD02MLD / VDA02SD/ VDA02MLD Analog I/O Slave. This manual contains information that is necessary to use the CRT1-VAD02SD / VAD02MLD / VDA02SD/ VDA02MLD. Please thoroughly read and understand this manual before you use the CRT1-VAD02SD / VAD02MLD / VDA02SD/ VDA02MLD.

Intended Audience

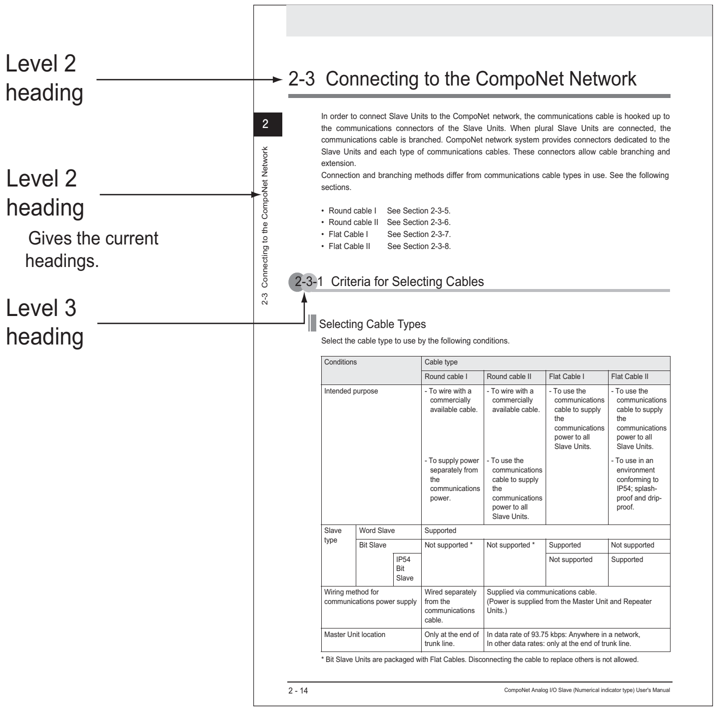
This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

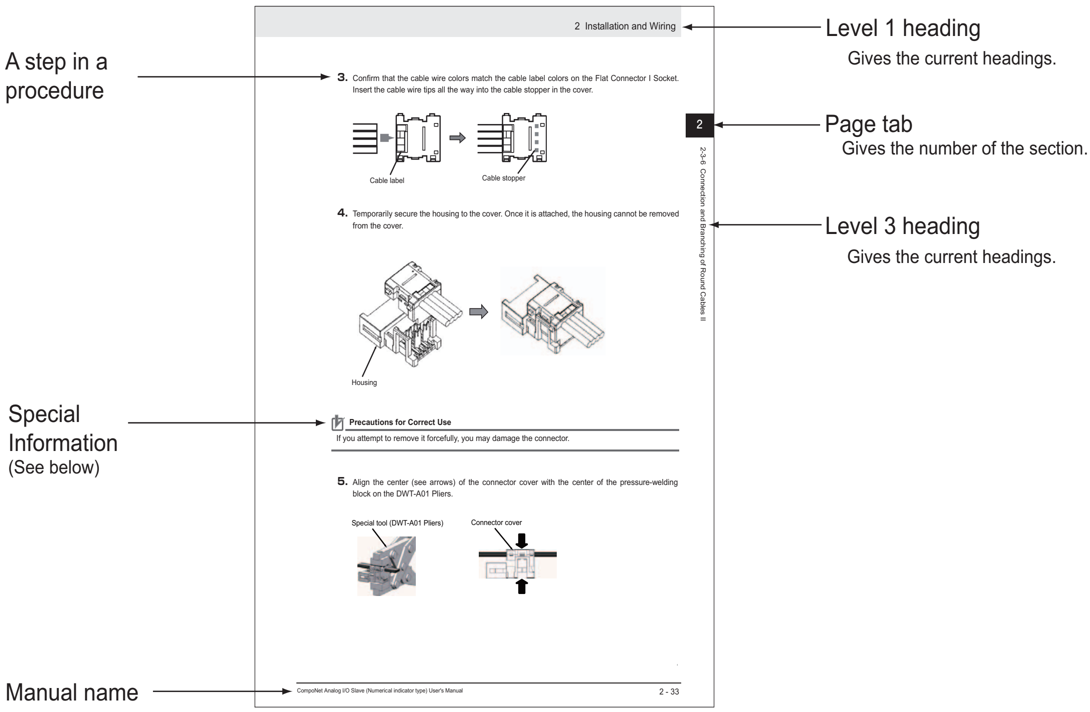
- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

Manual Structure

Page Structure

The following page structure is used 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 using the product safely.

Precautions for Correct Use

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

General Information

General or supplemental information related to the subject matter.

Additional Information

Additional information to increase understanding or make operation easier.

Manual Configuration

The Analog I/O Slave manual is organized in the sections listed in the following tables. Refer to the appropriate section in the manual as required.

Section		Content
Section 1	Basic Information about CompoNet Networks	This section explains CompoNet features, the wiring formations, the communications cables, and the communications specifications.
Section 2	Installation and Wiring	This section explains the installation and wiring for the Analog I/O Slave Units. It includes description about mounting and connecting producers of the Units with the Network, the power supplies and the External I/O Devices.
Section 3	General Specifications	This section describes the general specifications of Analog I/O Slave Units.
Section 4	Features of Analog Input and Output Slave Units	This section describes the features of the Analog I/O Slave Units, the data processing, the data allocation, and the status areas.
Section 5	Unit Component Names and Functions	This section describes the component names of the Analog I/O Slave Units, and the switch setting functions provided on them.
Section 6	Numerical Indicator	This section describes the functions and the usage procedures of the Numerical indicators provided on the Analog I/O Slave Units.
Section 7	Functions and Settings operable on the Body of Slave Units	This section describes the functions and settings operable by the Numerical indicators. The description is made for each target function.
Section 8	CX-Integrator	This section outlines how to start up the system configuration software, i.e., CX-Integrator. It also explains the main windows.
Section 9	Functions and Settings operable by CX-Integrator	This section describes the supported functions and setting by the CX-Integrator. The description is made for each target function.
Section 10	Simple Set-up Example	This section provides examples about the system set-up procedures, the cable and sensor connections, and the various setting on the Slave Units.
Section 11	Expansion Units	This section describes the Expansion Units that are mounted on to the Analog I/O Slave Units. The description includes the specifications, the installation and wiring, and the supported functions and their settings.
Section 12	Troubleshooting and Maintenance	This section describes the troubleshooting and the maintenance.
Appendices		The appendices summarize information such as the Numerical indicator parameters, the CompoNet explicit messaging, the object mounting, the connectable devices, and the current consumption.

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an Analog I/O Slave. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

WARNING	Indicates an imminently hazardous situation which, if not avoided, will 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.

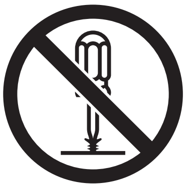
Precautions for Safe Use

Indicates precautions on what to do and what not to do to ensure using the product safely.

Precautions for Correct Use

Indicates precautions on what to do and what not to do to ensure proper operation and performance.

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 a prohibition of disassemble of precaution.
	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.

⚠ WARNING

Do not apply the voltage/current outside the specified range to this unit. It may cause a malfunction or fire.

Do not attempt to take any Unit apart and do not touch the interior of any Unit while the power is being supplied. Also, do not turn ON the power supply while the cover is open. Doing any of these may result in electric shock.

Provide safety measures in external circuits (i.e., not in the Slave Units), including the following items, to ensure safety in the system if an abnormality occurs due to malfunction of the PLC or another external factor affecting the PLC operation. ("PLC" includes CPU Units, other Units mounted in the PLC, and Remote I/O Terminals.) Not doing so may result in serious accidents.

- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
- The PLC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. As a countermeasure for such errors, external safety measures must be provided to ensure safety in the system.
- The PLC outputs may remain ON or OFF due to deposits on 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 safety in the system.
- When the 24-VDC output (service power supply) is overloaded or shortcircuited, the voltage may drop and result in the outputs being turned OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

-

The CPU Unit refreshes I/O even when the program is stopped (i.e., even in PROGRAM mode). Confirm safety thoroughly in advance before changing the status of any part of memory allocated to I/O Units, Special I/O Units, or CPU Bus Units. Any changes to the data allocated to any Unit may result in unexpected operation of the loads connected to the Unit. Any of the following operation may result in changes to memory status.

- Transferring I/O memory data to the CPU Unit from a Programming Device.
- Changing present values in memory from a Programming Device.
- Force-setting/-resetting bits from a Programming Device.
- Transferring I/O memory files from a Memory Card or EM file memory to the CPU Unit.
- Transferring I/O memory from a host computer or from another PLC on a network.

Application Precautions

Observe the following precautions when using an Analog I/O Slave.

• Power Supply

- Always use the power supply voltage specified in the user manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Always turn OFF the power supply to the PLC and Slave Unit/Repeater Unit before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Assembling any Units (Expansion Units).
  - Removing or attaching terminal blocks and connectors to Slave Unit/Repeater Unit.
  - Replacing parts (relay, etc.).
  - Setting DIP switches or rotary switches.
  - Connecting cables or wiring the system.

• Installation

- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Make sure that the terminal blocks, communications cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Mount the Units securely using DIN Track, Bracket or screws.
- Make sure that all Unit mounting screws and cable screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Make sure that all terminal block screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Always use the specified communications cables and connectors.
- Do not extend connection distances or the number of connected nodes beyond the ranges given in the specifications.

• Wiring

- Wire all connections correctly according to instructions in the manuals.
- Check all wiring and switch settings to be sure they are correct.
- Use the correct wiring materials to wire the Units.
- Use the correct wiring tools to wire the Units.
- Confirm the polarity of all terminals before wiring them.
- Observe the following precautions when wiring the communications cable.
  - Separate the communications cables from the power lines or high-tension lines.
  - Do not bend the communications cables past their natural bending radius.
  - Do not pull on the communications cables.
  - Do not place heavy objects on top of the communications cables.
  - Always lay communications cable inside ducts.
- Confirm voltage specifications when wiring communications, the power supply, and I/O crossovers. Incorrect wiring may result in malfunction.

- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- Always separate Flat Cables for different CompoNet lines by at least 5 mm to prevent unstable operation due to interference. Do not bundle Flat Cables.

- Handling

- When transporting the Unit, use special packing boxes and protect it from being exposed to excessive vibration or impact during transportation.
- Do not drop any Unit or subject any Unit to excessive shock or vibration. Otherwise, Unit failure or malfunction may occur.
- Do not bend cables past their natural bending radius or pull on cables.
- Do not allow foreign matter to enter the Unit.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in unexpected operation.
- Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
  - Changing the operating mode of the PLC.
  - Setting/resetting any bit in memory.
  - Changing the present value of any word or any set value in memory.
  - Operating the I/O Test functions.
  - Operating the User Adjustment functions on Output Units.
- Do not use thinner for cleaning. Use commercially available alcohol instead.

- External Circuits

- Install external breakers and take other safety measures against short-circuiting in external wiring, etc. Insufficient safety measures against short-circuiting may result in burning.
- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Take appropriate and sufficient countermeasures when installing systems in the following locations:
  - 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 supplies.

Operating Environment Precautions

- Install correctly according to instructions in this manual. Improper installation of the Unit may result in malfunction.
- Do not operate the control system in the following locations:
  - 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.
- Prevent cables and other substances from unnecessary or accidental pressing on the entry buttons.

Conformance to EC Directives

Applicable Directives

- EMC Directives

Concepts

- EMC Directives

The OMRON products described in this manual are designed so that they individually comply with the related EMC Directives 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 Directives*. Whether the products conform to the standards in the system used by the customer, however, cannot be checked by OMRON and must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC 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.

* Applicable EMC (Electromagnetic Compatibility) standards are as follows:
  EMS (Electromagnetic Susceptibility): EN 61131-2 and EN 61000-6-2
  EMI (Electromagnetic Interference): EN 61131-2 and EN 61000-6-4 (Radiated emission: 10-m regulations)

- Conformance to EC Directives

The OMRON products described in this manual comply with the related EMC Directives. To ensure that the machine or device in which the products are used complies with EC Directives, the products must be installed as follows:

- The products must be installed within a control panel.
- A DC power supply with reinforced insulation or double insulation that can maintain a stable output even if the input is interrupted for 10 ms must be used for communications power, internal power, and I/O power. The OMRON S82J-series Power Supply is recommended *.
- Products complying with EC Directives also conform to the Emission Standards (EN 61131-2 and EN 61000-6-4). 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 complies with EC Directives.
- Conformance with the EC Directives was confirmed with a system configuration using I/O wiring lengths of less than 30 m.

* Conformance with the EMC Directive was confirmed when using the recommended power supply.

TradeMarks

- Windows is a registered trademark of Microsoft Corporation.
- CompoNet is a registered trademark of ODVA (Open DeviceNet Vendor Association, Inc.).
- SYSMAC is a registered trademark for Programmable Controllers made by OMRON Corporation.
- CX-One is a registered trademark for Programming Software made by OMRON Corporation.
- CX-Integrator is a registered trademark for Designing Software made by OMRON Corporation.

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

Related Manuals

Cat.No.	Name	Description
W484 (this manual)	CompoNet Analog I/O Slave (Numerical Indicator Type) User's Manual	Provides the specifications of CompoNet Analog I/O Slave (Numerical Indicator Type, CRT1-VAD02SD/MLD and CRT1-VDA02SD/MLD).
W457	CompoNet Slave Units and Repeater Unit Operation Manual	Provides the specifications of other CompoNet Slave Units and Repeater Unit.
W456	CS/CJ-series CompoNet Master Units Operation Manual	Provides an overview of CompoNet Networks, communications specifications, wring methods, and CompoNet Master Unit functions.
W342	SYSMAC CS/CJ/CP Series SYSMAC One NSJ Series Communications Commands Reference Manual	Describes the communications commands used with CS-series, CJ-series, and CP-series PLCs and NSJ Controllers.
W464	SYSMAC CS/CJ/CP/NSJ Series CX-Integrator Ver.*.* Operation Manual	Describes CX-Integrator operating methods, e.g., for setting up and monitoring networks.

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Section 2 Installation and Wiring

Section 3 General Specifications

Section 4 Features of Analog Input and Output Slave Units

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Section 8 CX-Integrator

Section 9 Functions and Settings operable by CX-Integrator

Section 10 Simple Set-up Example

Section 11 Expansion Units

Section 12 Troubleshooting and Maintenance

Appendices

1

Basic Information about CompoNet Networks

1-1 CompoNet Features

CompoNet is a field network designed for applications dominated by sensors and actuators. It is a multi-vendor network, and not only connectable to OMRON devices, but also supported by many other vendor devices.
A Master Unit alone can control multiple nodes and large capacity of I/O points. It requires less wiring labor but provides high-maintainability. Thus it reduces wiring and maintenance cost. Here are the main features.

High-speed communications of multiple nodes

- High-speed communication for 1024 points per millisecond.
- Accessible to 2560 I/O points in maximum.
- Connectable with 384 nodes in maximum.

Simple setting

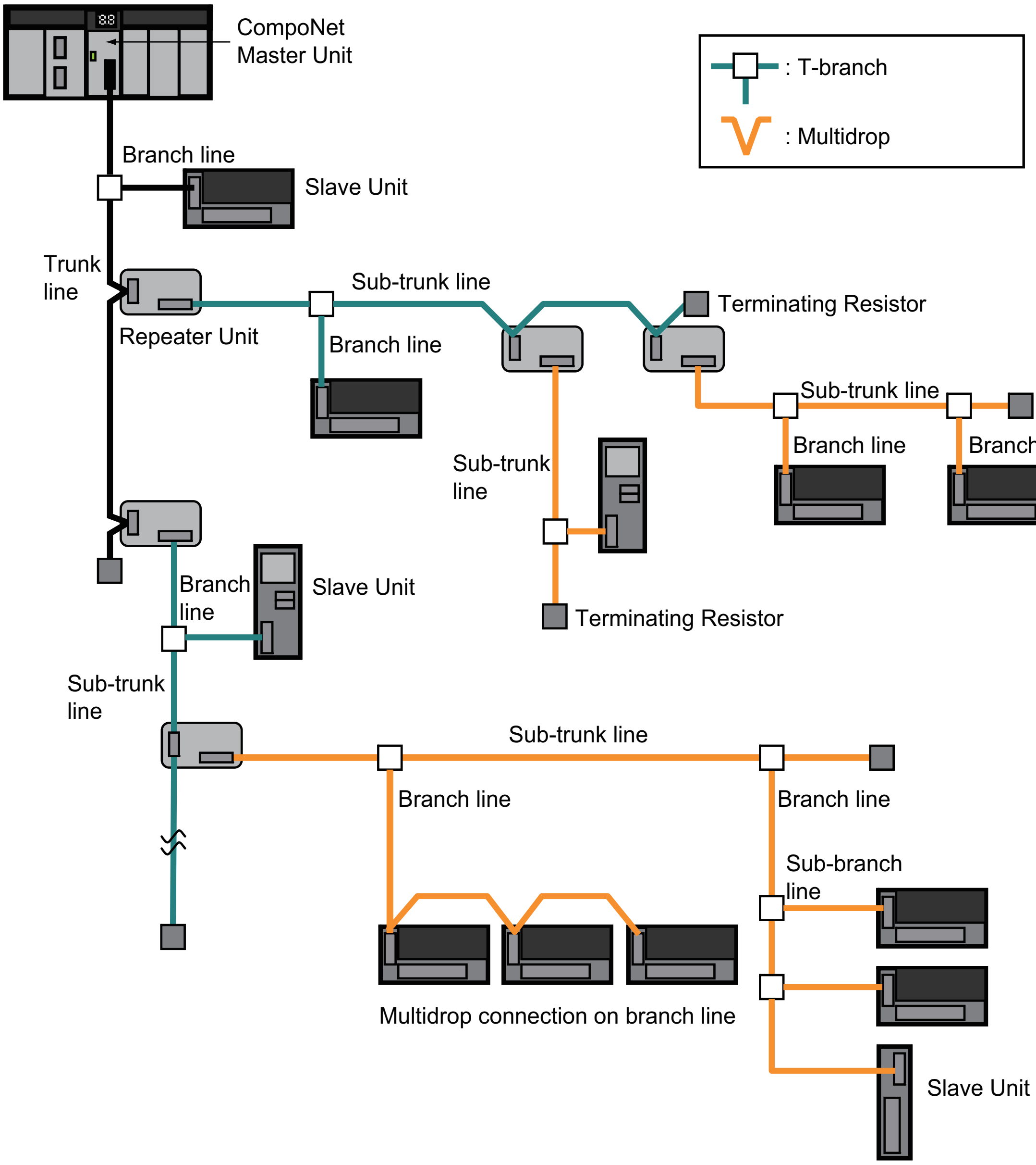
- Slave Unit automatically follows the data rate of Master Unit.
- Rotary switch setting for Slave Unit node addresses.
- The 7-segments indicators on the Master Unit tell communications states all the time.

Easy wiring

- Specialized Flat Cables realize easy wiring.
- General round cables can also be used.
- Use of Repeater Units expands wiring flexibility.

1-2 CompoNet Networks

A system configuration example is shown here.



A CompoNet Network consists of the following elements.

Communications Cables

CompoNet Networks can use round cables I (2-conductor cable), round cables II (4-conductor cable), Flat Cable I (DCA4-4F10 Standard Flat Cable), and Flat Cable II (DCA5-4F10 Sheathed Flat Cable) as communications cables.

CompoNet Master Unit

A CompoNet Master Unit manages the CompoNet Network and transfers I/O data between the PLC and the Slave Units. There is only one Master Unit in a network. The Master Unit must be connected to the trunk line.

Slave Units

There are two types of Slave Units. One is to transmit data entered into the network to the Master Unit. They are the Input Slave Units. The other is to output the data received from the Master Unit through the CompoNet Network to external devices. They are the Output Slave Units. Both are divided into another two kinds according to the I/O capacity.

- A Word Slave Unit is allocated in 16 bits (i.e., 16 I/O points) of the I/O memory of the CPU Unit
- A Bit Slave Unit is allocated in 2 bits (i.e., 2 I/O points) of the I/O memory of the CPU Unit

Repeater Units

Repeater Units can expand a network system in following ways:

- Extending the Communications Cable,
- Increasing the number of nodes (or Units),
- Creating a long-distance T-branch connection from a trunk line or a sub-trunk line * and
- Converting cable types among round cable I, round cable II, Flat Cable I and Flat Cable II.

A sub-trunk line downstream a Repeater Unit can be connected in the same communications specifications (i.e., same distance and same number of Slave Units) as the trunk line. Up to 64 Repeater Units can be connected per network (i.e., per Master Unit). When Repeater Units are connected in series from the Master Unit, up to two layers can be created.

* The physical layer is not connected across a Repeater Unit. T-branch connection is thus different from a branch line connection which is made by dividing a single physical layer.

Terminating Resistors

Terminating Resisters reduces signal bouncing and stabilizes the communications. They ensure the quality of the transmission path. Therefore Terminating Resistors must be provided for every network. A Resistor must be connected at the end of a network, i.e., the furthest end from the Master Unit or a Repeater Unit. With a CompoNet Network, the Master Unit is located at one end of the trunk line. A Terminating Resistor is connected to the other end. In this context, Repeater Units are regarded same as Master Unit. That is, a Terminating Resistor is connected to the most remote end of the sub-trunk line downstream the Repeater Unit.

Trunk Lines and Branch Lines

The trunk lines and branch lines in a CompoNet Network are defined as follows:

- A trunk line is the transmission path between the Master Unit and a Terminating Resistor,
- A sub-trunk line is the transmission path between the Repeater Unit, when one is used, and a Terminating Resistor,
- A branch line is the transmission path created by a T-branch connection on the trunk line or a sub-trunk line,
- A sub-branch line is the transmission path created by a T-branch connection from a branch line. Sub-branch lines cannot have a T-branch connection.

Due to differences in functionality, the same type of cable must be used for the trunk line and its branch lines, for a sub-trunk line and its branch lines, and for a branch line and its sub-branch lines. However, cable types can be different between the trunk line and a sub-trunk line.

Branches

There are two ways to create branch lines.

● T-branch connections

- T-branch connections using commercially available relay terminals (for round cable I and round cable II)
- T-branch connections using Flat Connectors (for Fat Cable I and Flat Cable II)

● Multidrop connections

- Multidrop connections using Open Type Connectors (for round cable I and round cable II)
- Multidrop connections using Flat Connectors and Multidrop Connectors (for Flat Cable I and Flat Cable II)

Flat Connectors can also be used to extend the Communications Cable.

Communications Power Supply

It supplies power for communications and for internal operation of the Units. A commercially available 24-VDC power supply is used. Only one communications power supply can be connected for the trunk line or a sub-trunk line. Communications power is delivered from the Master Unit to the trunk line or from Repeater Units to sub-trunk lines. An identical power supply cannot be used to supply communications power to more than one line. In other words, it cannot supply power to both the trunk line and a sub-trunk line or to two sub-trunk lines.

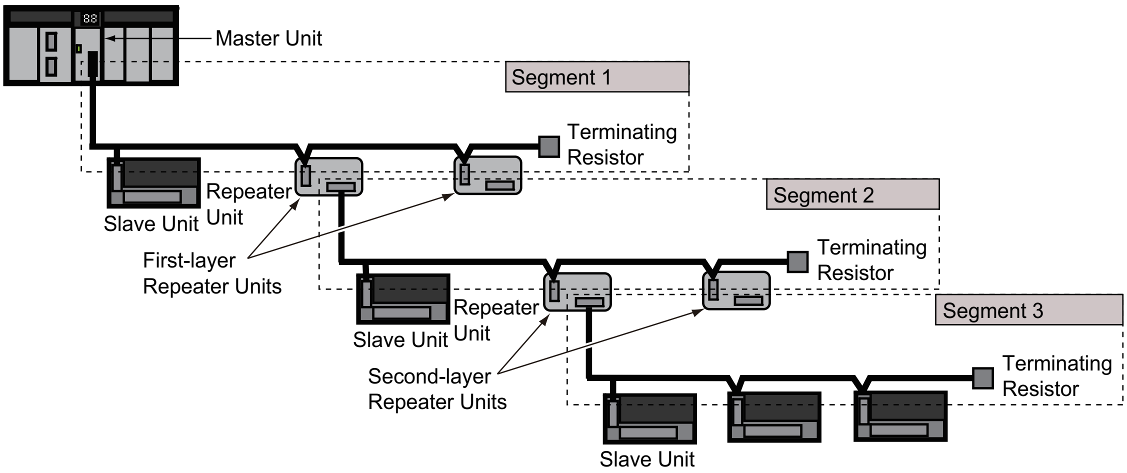
I/O Power Supply

A commercially available 24-VDC power supply is used to power the I/O operations of external I/O devices connected to a Slave Unit. It is connected to the I/O power supply terminal of the Unit.

Additional Information

Segment Layers

A segment is a section in a CompoNet Network divided by a Repeater Unit. Segments consists layers and up to 3 layers can be created in a network. Maximum two Repeater Units can be used to add maximum two segment layers. The segments thus created are called Segment 1, 2, and 3, from the nearest to the Master Unit. Although each segment is connected to the network, it is electrically isolated from others.
Including Repeater Units connected using multidrop connections, a maximum of 64 Repeater Units can be connected in a single network (i.e., to a single Master Unit). A maximum of 32 Slave Units and Repeater Units altogether can be connected in a single segment.

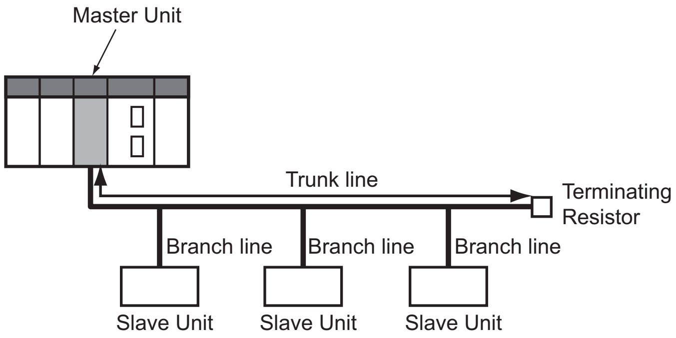


1-3 Wiring Formations

There are two possible wiring formations for a CompoNet Network.

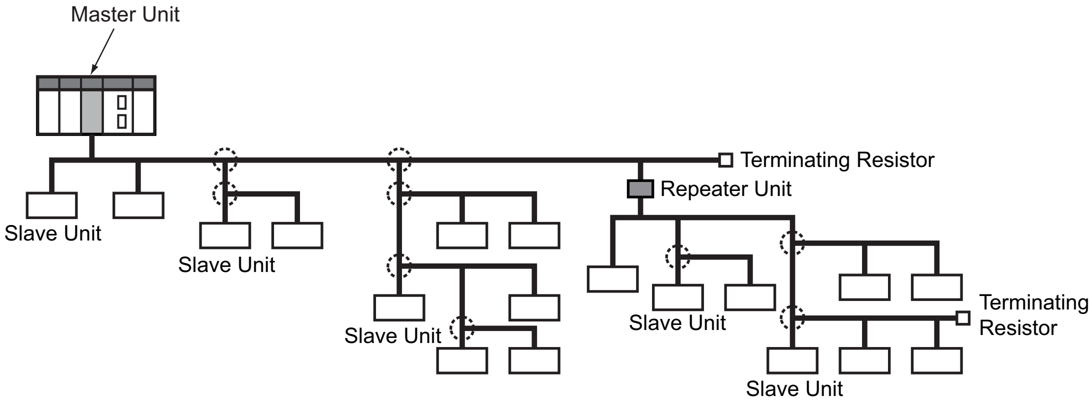
Trunk Line-Branch Line Formation

In this wiring formation, the trunk line is differentiated from branch lines. There are restrictions on the number of branches and the number of connecting Units.



Unrestricted Wiring Formation

In this formation, there is no distinction between the trunk line and branch lines. There are no wiring restrictions as long as the total cable length per segment does not exceed 200 m. There is also no limit in the number of branches.



The formation to be used is determined automatically by the type of cable used and the required data rate.

Cable type	Data rate			
	4 Mbps	3 Mbps	1.5 Mbps	93.75 kbps
Round cable I	Trunk-Branch *	Trunk-Branch	Trunk-Branch	Trunk-Branch
Round cable II Flat Cable I and II	Trunk-Branch *	Trunk-Branch	Trunk-Branch	Unrestricted

* Lines cannot have T-branch connections on the trunk line when the data rate is 4 Mbps. Only multidrop connections can be used.

The following table shows the conditions and restrictions for each formation.

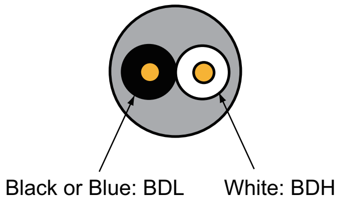
Item	Wiring formation	
	Trunk line-branch line formation	Unrestricted wiring formation
Master Unit location	End of network	Anywhere in network (not necessarily at the end)
Maximum number of Slave Units connectable to a single branched line	1 or 3 depending on the cable type and data rate	No restrictions
Terminating Resistor location	On the opposite end of the trunk line or a sub-trunk line from the Master Unit or a Repeater Unit respectively	On the most remote end from the Master Unit or a Repeater Unit

1-4 Communications Cable

The following four types of cables can be used in a CompoNet network: round cable I, round cable II, Flat Cable I and Flat Cable II.

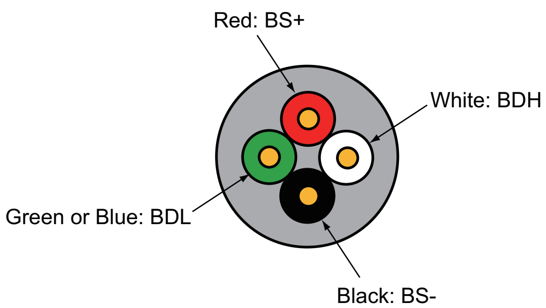
Round cable I (2-conductor cable)

Use commercially available round cables each with two 0.75-mm^2 thick conductors (JIS C3306) that meet CompoNet specifications. Ask cable manufacturers for their applicable products to CompoNet.

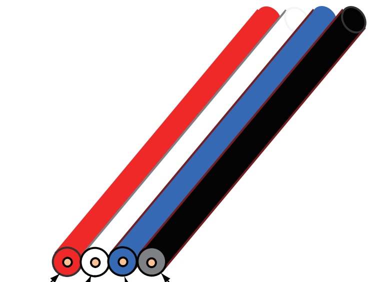


Round cable II (4-conductor cable)

Use commercially available round cables each with four 0.75-mm^2 thick conductors (JIS C3306) that meet CompoNet specifications. Ask cable manufacturers for their applicable products to CompoNet.

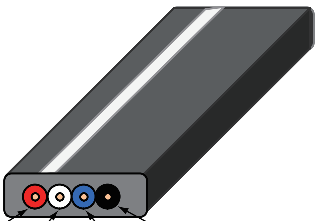


Flat Cable I (DCA4-4F10 Standard Flat Cable)



Conductor No.	Insulation color	Application	Nominal cross-section [mm^2]	Allowable current [A]
1	Red	BS+ (positive side of communications power supply)	0.75	5 max
2	White	BDH (signal high)	0.5	-
3	Blue	BDL (signal low)	0.5	-
4	Black	BS- (negative side of communications power supply)	0.75	5 max

Flat Cable II (DCA5-4F10 Sheathed Flat Cable)



Conductor No.	Insulation color	Application	Nominal cross-section [mm^2]	Allowable current [A]
1	Red	BS+ (positive side of communications power supply)	0.75	5 max
2	White	BDH (signal high)	0.5	-
3	Blue	BDL (signal low)	0.5	-
4	Black	BS- (negative side of communications power supply)	0.75	5 max

Precautions for Correct Use

The characteristics of each conductor in Flat Cable I and Flat Cable II have been adjusted to respective application as listed in the table. Check the line insulator colors, and use them only for the specified application.

1-5 Communications Specifications

Item	Specification
Communications protocol	CompoNet Network protocol
Types of communications	Remote I/O communications, i.e., program-less, constant data sharing with Slave Units; and message communications, i.e., occasional, as required, explicit message communications with Slave Units, and occasional, as required, FINS message communications with PLC
Data rate	4 Mbps, 3 Mbps, 1.5 Mbps, or 93.75 kbps
Modulation	Base-band
Coding	Manchester code
Error control	Manchester code rules, CRC
Communications media *	Round cable I (2-conductor cable) and Round cable II (4-conductor cable), Flat Cable I (DCA4-4F10) and Flat Cable II (DCA5-4F10)
Communications distance and wiring	See Section 2-3-2.
Connectable Master Units	CompoNet Master Units
Connectable Slave Units	CompoNet Slave Units
Maximum I/O capacity	Word Slave Units: 1024 inputs and 1024 outputs, 2048 points in total; Bit Slave Units: 256 inputs and 256 outputs, 512 points in total
Maximum number of nodes	Word Slave Units: 64 input nodes and 64 output nodes; Bit Slave Units: 128 input nodes and 128 output nodes; Repeater Units: 64 nodes
Bits allocated per node address	Word Slave Units: 16 bits; Bit Slave Units: 2 bits
Maximum number of nodes per trunk line or sub-trunk line	32 nodes including Repeater Units
Applicable node addresses	Word Slave Units: IN0 to IN63 and OUT0 to OUT63; Bit Slave Units: BIT IN0 to IN127 and BIT OUT0 to OUT127; Repeater Units: 0 to 63
Condition to use Repeater Units	Up to 64 Repeater Units can be connected per network. Repeater Units can be connected to create maximum 2 segment layers.
Signal lines	Two lines: BDH (communications data high) and BDL (communications data low)
Power lines	Two lines: BS+ and BS- (power for communications and for internal circuits of Slave Unit supplied from the Master Unit or a Repeater Unit)
Connection forms	When a Round cable II or Flat Cable I or II is used at data rate setting in 93.75 kbps: No restrictions; Other cables or other data rates: Trunk line-branch line formation
	Connections for Slave Units and Repeater Units: T-branch or multidrop connections

* Round cable I, round cable II, Flat Cable I, and Flat Cable II are all different in cable type. When two or more of them are to be wired in a network, a Repeater Unit must be used to separate the cable for the trunk line and for a sub-trunk line.

2

Installation and Wiring

2-1 Mounting the Slave Unit to a DIN Track

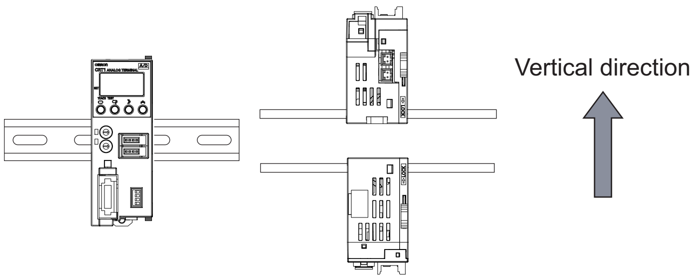
This section explains the procedures to mount a Slave Unit to a DIN Track.

2-1-1 Materials Required for Installation

Name	Model	Description
35-mm DIN Track	PFP-50N	50 cm long
	PFP-100N	100 cm long
	PFP-100N2	100 cm long
End Plate	PFP-M	A Slave Unit requires two End Plates.

2-1-2 Installation Orientation

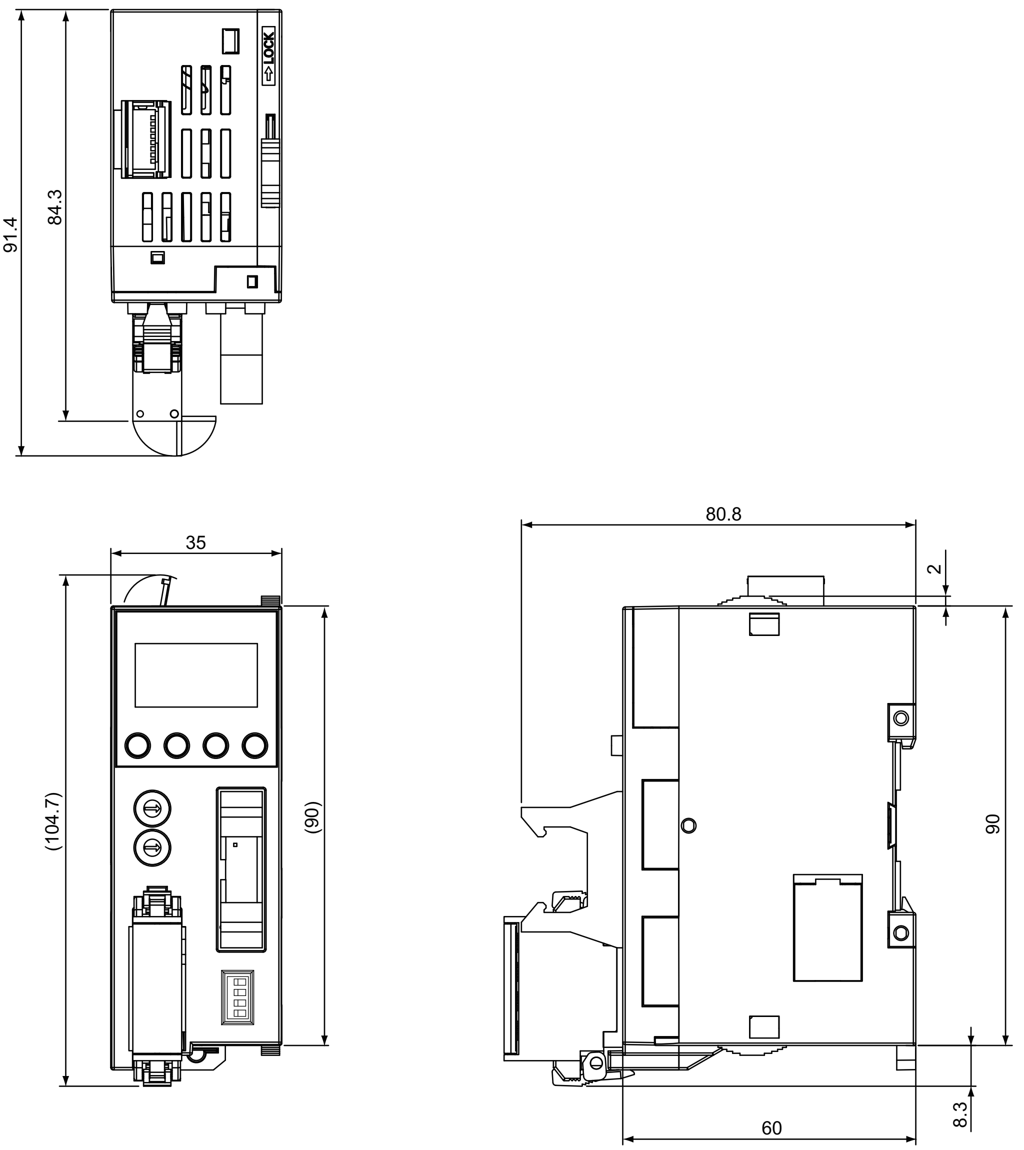
A Slave Unit can be mounted to a DIN Track, in the following three orientations.



2-1-3 Dimensions of a Slave Unit and an Expansion Unit

Analog I/O Slave Unit

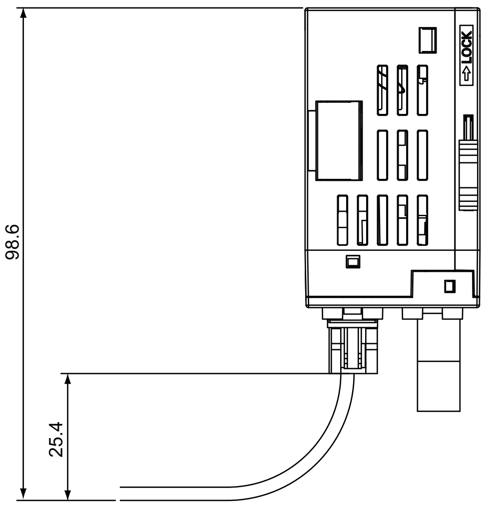
- A Slave Unit with a DCN4-TB4 Open Type Connector



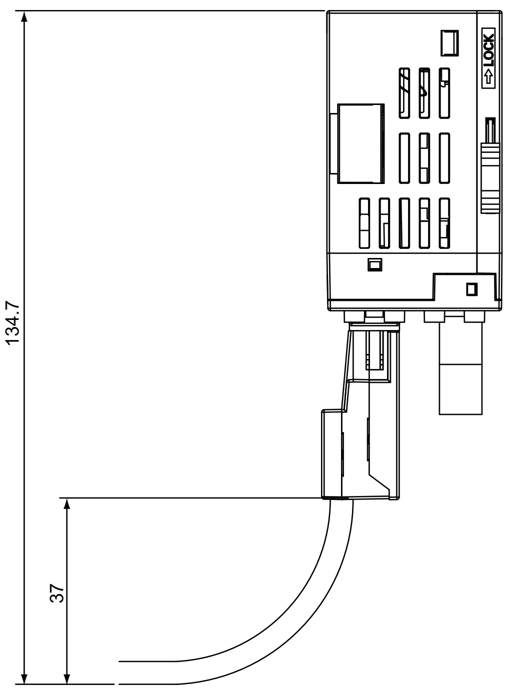
The values in brackets are reference values.
(mm)

- Communications connector area when a connector and a cable are connected

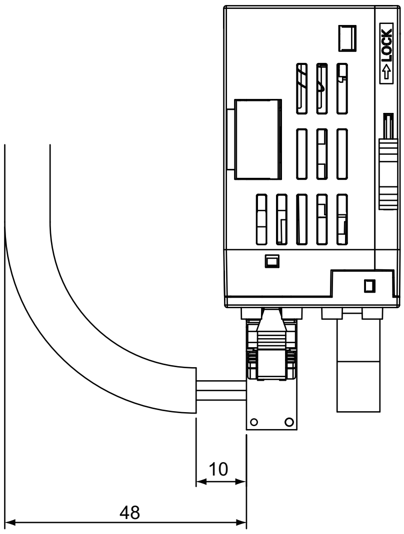
- When a DCN4-BR4 Flat Connector I Plug is attached:



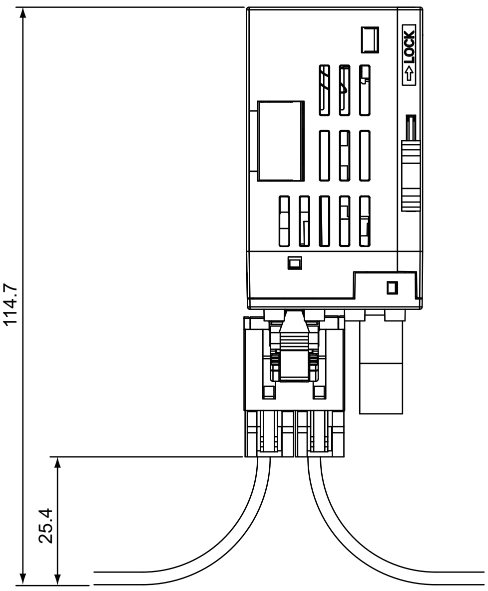
- When a DCN5-BR4 Flat Connector II Plug is attached:



- When a DCN4-TB4 Open Type Connector is attached:



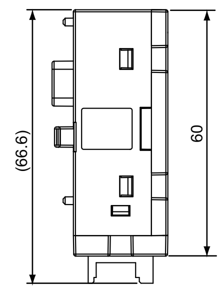
- When a DCN4-MD4 Multidrop Connector is attached:

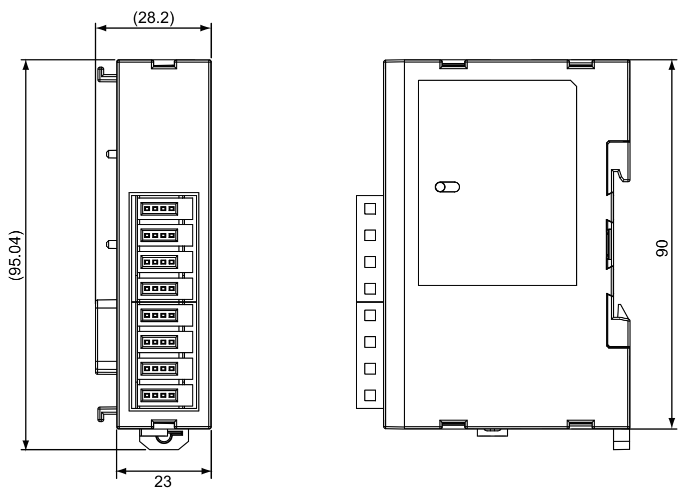


Expansion Unit

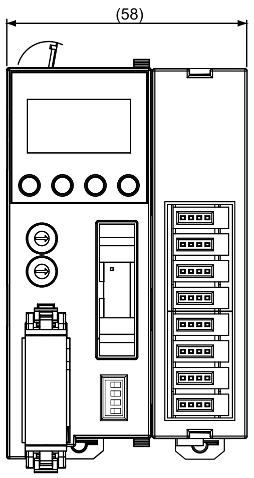
- A 4-input and 4-output Expansion Unit and a 8-output Expansion Unit (e-CON connector type)

XWT-VMD08S (NPN), XWT-VMD08S-1 (PNP), XWT-VOD08S (NPN), and XWT-VOD08S-1 (PNP)





Dimension when it is mounted to a Slave Unit:

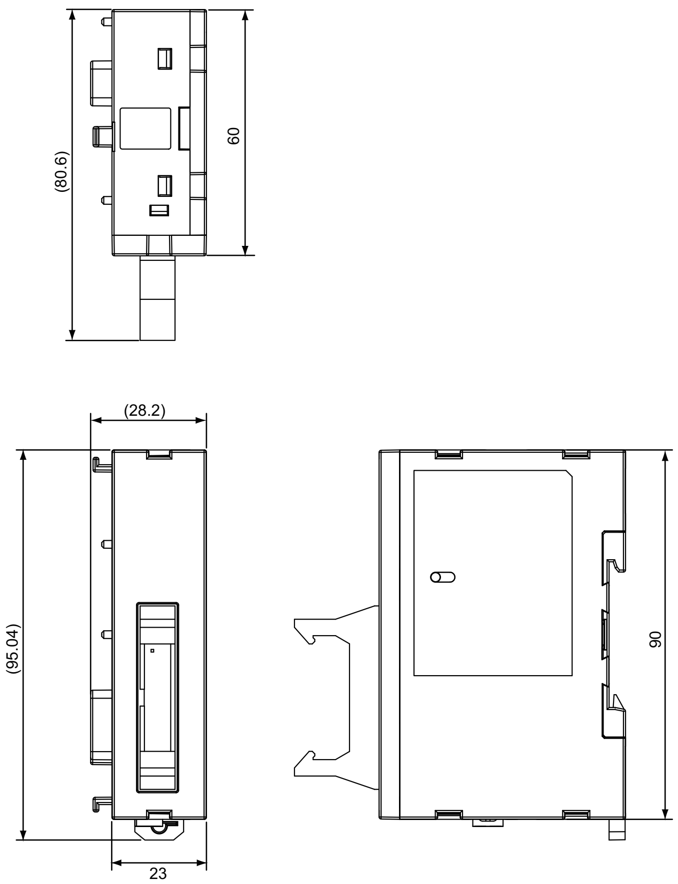


The values in brackets are reference values.

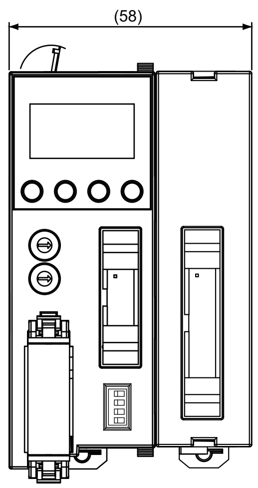
(mm)

- A 8-input and 8-output Expansion Unit and a 16-output Expansion Unit (MIL connector type)

XWT-VMD16ML (NPN), XWT-VMD16ML-1 (PNP), XWT-VOD16ML (NPN), and XWT-VOD16ML-1 (PNP)



Dimension when it is mounted to a Slave Unit:



The values in brackets are reference values.

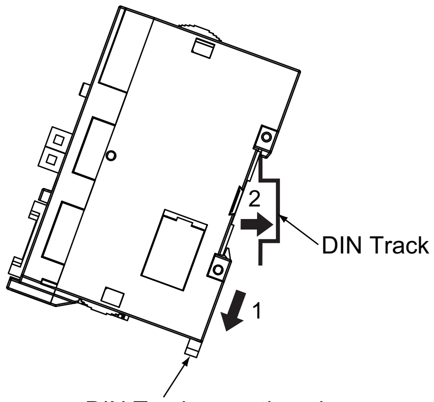
(mm)

2-1-4 Mounting Procedures

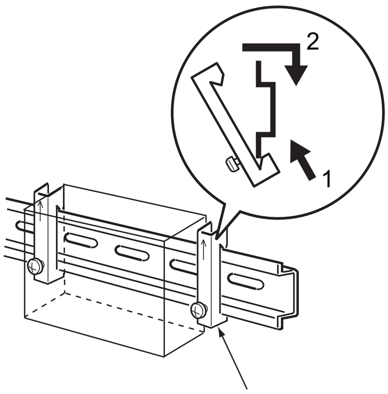
Analog Input or Output Slave Units

An Analog Input or Output Slave Unit is mounted onto a DIN Track in the following procedures.

1. The Unit has a slot on its back. Hook the top of the DIN Track on upper part of the slot. Pull down the DIN Track mounting pin and insert the Track into the bottom part of the slot. Push up the pin and secure the Track.



2. Hook the bottom of an End Plate on the lower part of the DIN Track. Then hook the top.
Attach another End Plate on the other side of the Unit. This way, sandwich the Unit with two End Plates. Tighten the screws to secure them.



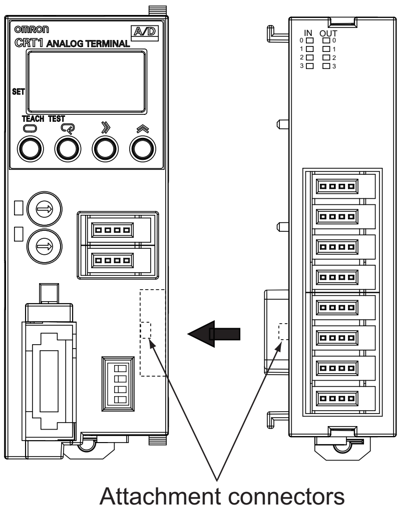
Precautions for Safe Use

Check that the Unit is firmly secured.

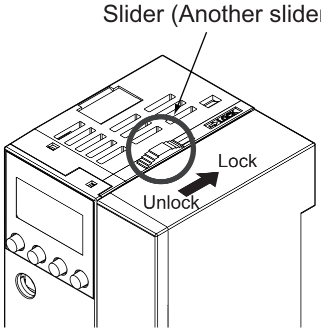
Expansion Units

An Expansion Unit is connected to and mounted on an Analog Input or Output Slave Unit in the following procedures.

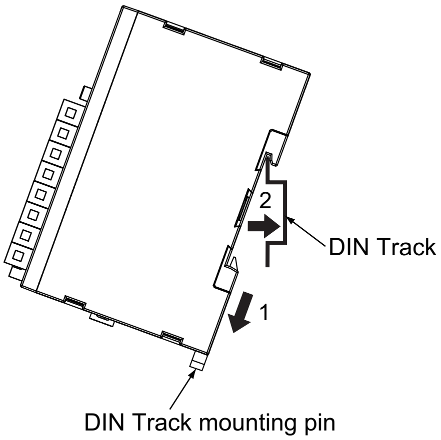
1. Remove the cover over the attachment connector on the right face of the Analog Input or Output Slave Unit. Connect the attachment connector on the side face of the Expansion Unit with the connector of the Slave Unit, to which the Expansion Unit is connected.



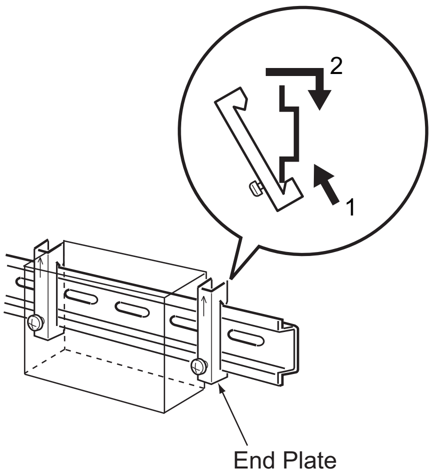
2. Move the sliders on the top and bottom faces of the Slave Unit to “Lock”. This is to lock up the Expansion Unit.



3. The Expansion Unit has also a slot on its back. Hook the top of a DIN Track on upper part of the slot on both the Slave Unit and the connected Expansion Unit. Pull down the DIN Track mounting pins on the Slave Unit and the Expansion Unit and insert the Track into the slots. Push up the pins and fix the Track into the place.



4. Hook the bottom of the End Plate on the lower part of the DIN Track. Then hook the top. In this way, sandwich the Slave Unit and the connected Expansion Unit with two End Plates. Tighten the screws to secure them. Check to make sure that the Unit is firmly secured.



2-1-5 Dismounting Procedures

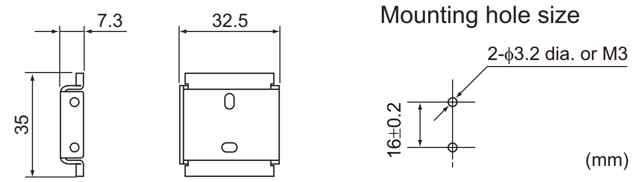
Pull down the DIN Track mounting pin on the Unit to releases the lock, and pull the Unit straight forward from the Track.

2-2 Mounting the Slave Unit on the Panel or on the Wall

This section explains the procedures to mount an Analog Input or Output Slave Unit on a control panel or on the wall by using a special attachment fixture.

2-2-1 Materials required for Installation

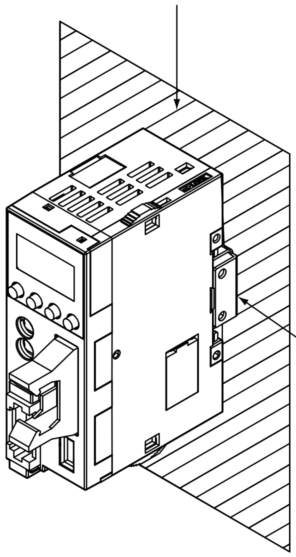
Mounting a Slave Unit on the panel or on the wall requires a following special fixture.

Name	Model	Dimension
Mounting Bracket	SRT2-ATT02	

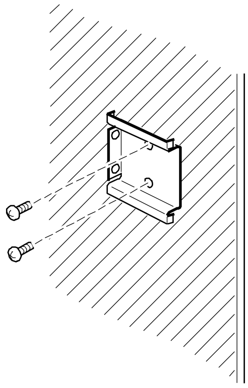
2-2-2 Mounting Procedures

Vertical Mounting

Use a Mounting Bracket to vertically mount a Slave Unit to a panel or on the wall. The back face of the Unit contacts the panel or the wall.



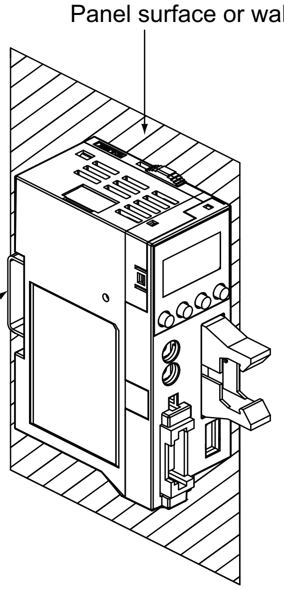
1. Use two Phillips screws and attach the Mounting Bracket to the panel surface or on the wall as illustrated.
See Section 2-2-1 for mounting hole dimensions.



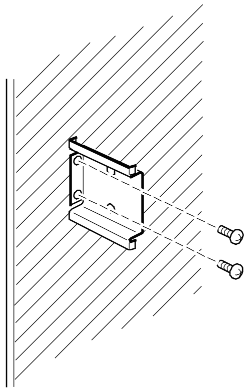
2. Contact the back face of a Slave Unit with the Bracket, and mount the Unit to the Bracket.
The Mounting Bracket shapes same as a DIN Track. Use the same procedures as to mount the Unit to a DIN Track.

Horizontal Mounting

Use a Mounting Bracket to horizontally mount a Slave Unit to a panel or on a wall. A side face of the Unit contacts the panel or the wall.



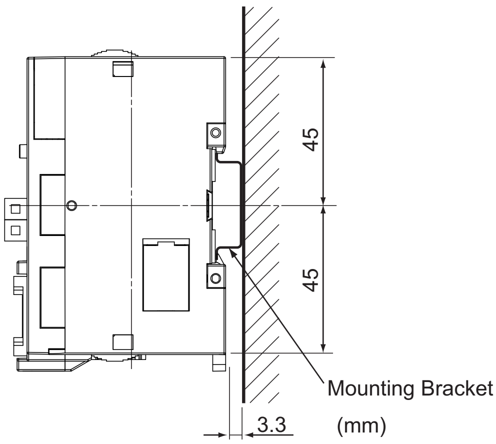
1. Use two Phillips screws and attach the Mounting Bracket to the panel surface or on the wall as illustrated.
   See Section 2-2-1 for mounting hole dimensions.



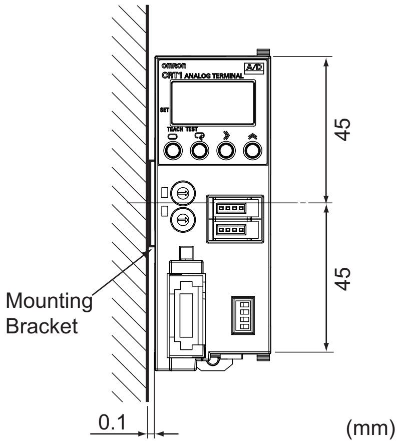
2. Contact the side face of a Slave Unit with the Bracket, and mount the Unit to the Bracket.
   The Mounting Bracket shapes same as a DIN Track. Use the same procedures as to mount the Unit to a DIN Track.

2-2-3 Mounting Dimensions

Vertical Mounting



Horizontal Mounting



2-3 Connecting to the CompoNet Network

In order to connect Slave Units to the CompoNet network, the communications cable is hooked up to the communications connectors of the Slave Units. When plural Slave Units are connected, the communications cable is branched. CompoNet network system provides connectors dedicated to the Slave Units and each type of communications cables. These connectors allow cable branching and extension.
Connection and branching methods differ from communications cable types in use. See the following sections.

- Round cable I   See Section 2-3-5.
- Round cable II   See Section 2-3-6.
- Flat Cable I   See Section 2-3-7.
- Flat Cable II   See Section 2-3-8.

2-3-1 Criteria for Selecting Cables

Selecting Cable Types

Select the cable type to use by the following conditions.

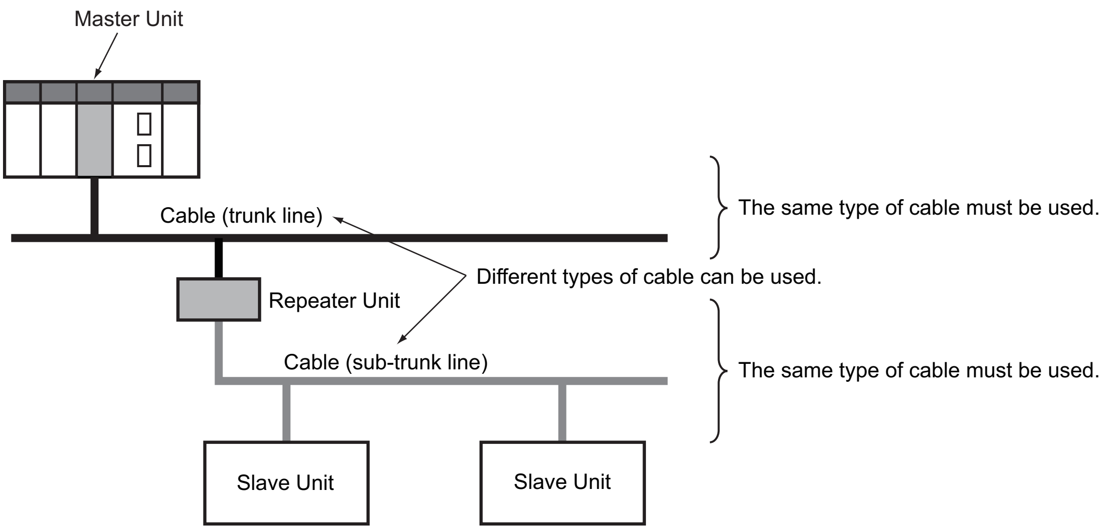
Conditions			Cable type			
			Round cable I	Round cable II	Flat Cable I	Flat Cable II
Intended purpose			- To wire with a commercially available cable. - To supply power separately from the communications power.	- To wire with a commercially available cable. - To use the communications cable to supply the communications power to all Slave Units.	- To use the communications cable to supply the communications power to all Slave Units.	- To use the communications cable to supply the communications power to all Slave Units. - To use in an environment conforming to IP54; splash-proof and drip-proof.
Slave type	Word Slave		Supported			
	Bit Slave		Not supported *	Not supported *	Supported	Not supported
		IP54 Bit Slave			Not supported	Supported
Wiring method for communications power supply			Wired separately from the communications cable.	Supplied via communications cable. (Power is supplied from the Master Unit and Repeater Units.)		
Master Unit location			Only at the end of trunk line.	In data rate of 93.75 kbps: Anywhere in a network, In other data rates: only at the end of trunk line.		

* Bit Slave Units are packaged with Flat Cables. Disconnecting the cable to replace others is not allowed.

Repeater Units and Using Different Cable Types

All cables downstream the Master Unit must be the same type. That means the same type of cable must be used for the trunk line and their branch lines; for sub-trunk lines and their branch lines; and branch lines and their sub-branch lines.

When a Repeater Unit is used, however, cables can be different upstream and downstream the Repeater Unit, i.e., for the trunk line and sub-trunk lines, and for a sub-trunk line and another sub-trunk line. See the illustration below.

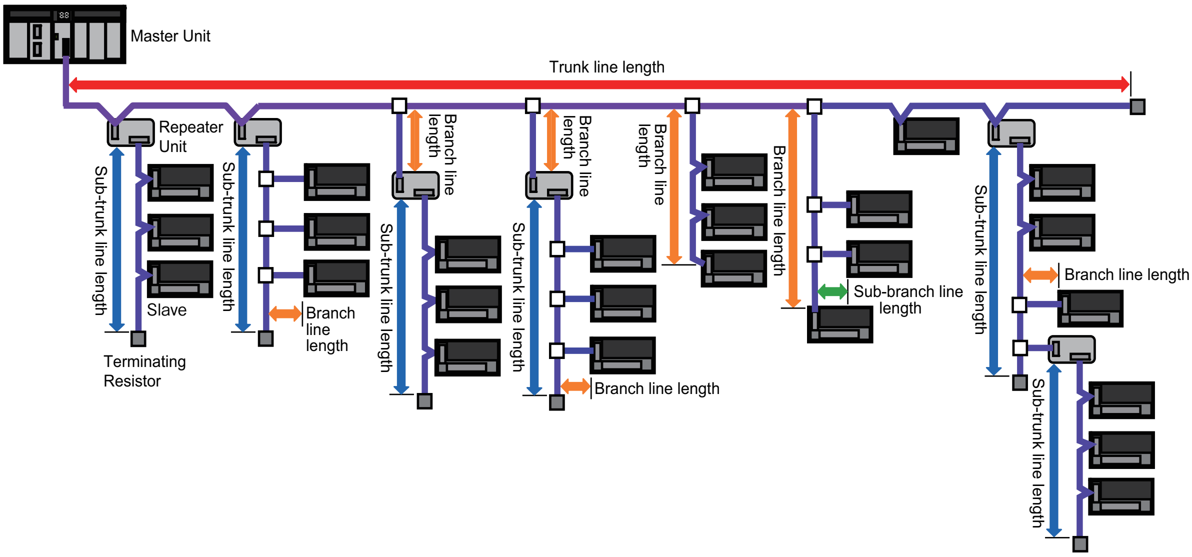


Precautions for Correct Use

- Round cable I, round cable II, Flat Cable I and Flat Cable II are all treated as different types of cables.
- When plural adjacent CompoNet systems use Flat Cables I or II, electrical interference may disturb stable system operation. To prevent it, do not bundle Flat Cables for different CompoNet systems. Instead, separate the Cable for one network for at least 5 mm from the other for another network.

2-3-2 Restrictions on the Usage of Each Type of Communications Cables

There are restrictions on the maximum lengths of each cable and the maximum number of connectable Slave Units. Do not exceed these limits.



In Data Rate of 4 Mbps (No T-branching allowed *)

Item	Round cable I or II	Flat Cable I or II
Length of a trunk line or a sub-trunk line (Maximum length when two Repeater Units are used)	30 m (90 m)	30 m (90 m)
Length of a branch line	No branching from the trunk line is allowed. Only multidrop connections are possible from the trunk line or sub-trunk lines.	
Total length of branch lines		
Branching restriction		
Number of connectable Slave and Repeater Units altogether per trunk line or sub-trunk line	32	32

* Bit Slave Units are packaged and pre-connected with Flat Cables. Thus T-branch connection is not supported in this data rate. The network must consist of only Word Slave Units and multidrop connections, which use DCN4-MD4 Multidrop Connectors for the Flat Cables.

In Data Rate of 3 Mbps

Item	Round cable I or II	Flat Cable I or II
Length of a trunk line or a sub-trunk line (Maximum length when two Repeater Units are used)	30 m (90 m)	30 m (90 m)
Length of a branch line	0.5 m	0.5 m
Total length of branch lines	8 m	8 m
Branching restriction	3 branches/m	3 branches/m
Number of connectable Units and Units per branch line *	1	1
Maximum length of a sub-branch line	Not supported	Not supported
Total length of sub-branch lines	Not supported	Not supported
Number of connectable Slave and Repeater Units altogether per trunk line or sub-trunk line	32	32

* It is the maximum number of Slave and Repeater Units altogether that are connectable to a branch line, by using multidrop connections and/or T-branch connections. T-branching here is to have a sub-branch line.

In Data Rate of 1.5 Mbps

<table>
<tr><th rowspan="2">Item</th><th colspan="2">Round cable I</th><th rowspan="2">Round cable II,
Flat Cable I or II</th></tr>
<tr><th>Without branch lines</th><th>With branch lines</th></tr>
<tr><td>Length of a trunk line or a sub-trunk line (Maximum length when two Repeater Units are used)</td><td>100 m (300 m)</td><td>30 m (90 m)</td><td>30 m (90 m)</td></tr>
<tr><td>Length of a branch line</td><td>Not supported *2</td><td>2.5 m</td><td>2.5 m</td></tr>
<tr><td>Total length of branch lines</td><td>Not supported *2</td><td>25 m</td><td>25 m</td></tr>
<tr><td>Branching restriction</td><td rowspan="4">-</td><td>3 branches/m</td><td>3 branches/m</td></tr>
<tr><td>Number of connectable Units and Units per branch line *1</td><td>3</td><td>3</td></tr>
<tr><td>Maximum length of a sub-branch line</td><td>Not supported</td><td>0.1 m *3</td></tr>
<tr><td>Total length of sub-branch lines</td><td>Not supported</td><td>2 m *3</td></tr>
<tr><td>Number of connectable Slave and Repeater Units altogether per trunk line or sub-trunk line</td><td>32</td><td>32</td><td>32</td></tr>
</table>

*1 It the maximum number of Slave and Repeater Units altogether that are connectable to a branch line, by using multidrop connections or T-branch connections. T-branching here is to have a sub-branch line.

*2 The trunk line does not support T-branch connections. The trunk line and sub-trunk lines support only multidrop connections.

*3 Branch lines support T-branch connections.

In Data Rate of 93.75 kbps

Item	Round cable I	Round cable II, Flat Cable I or II
Length of a trunk line or a sub-trunk line (Maximum length when two Repeater Units are used)	500 m (1500 m)	Unrestricted wiring can be done for a total length of 200 m per segment.
Length of a branch line	6 m	
Total length of branch lines	120 m	
Branching restriction	3 branches/m	
Number of connectable Units and Units per branch line *	1	
Maximum length of a sub-branch line	-	
Total length of sub-branch lines	-	
Number of connectable Slave and Repeater Units altogether per trunk line or sub-trunk line	32	32

* It is the maximum number of Slave and Repeater Units altogether that are connectable to a branch line, by using multidrop connections or T-branch connections. T-branching here is to have a sub-branch line.

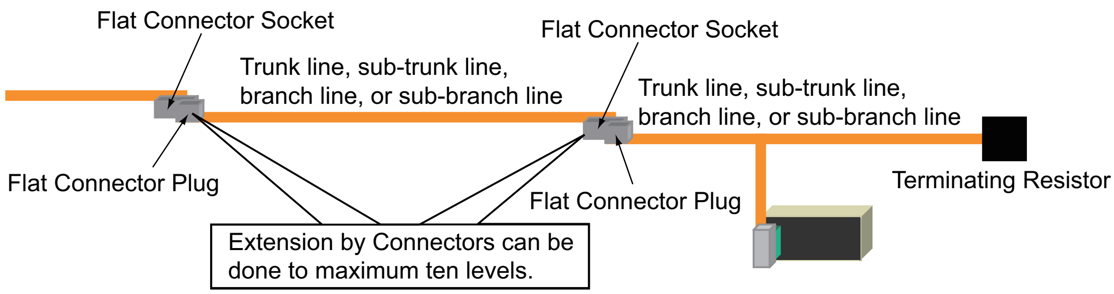
2-3-3 Points to Pay Attention When Connecting to the CompoNet Network

Connecting Cable wires of Round Cable I or II to Terminal Blocks or Terminating Resistors

Attach a M3 crimp terminal to a cable wire, before you connect the wire to a terminal block or a Terminating Resistor.

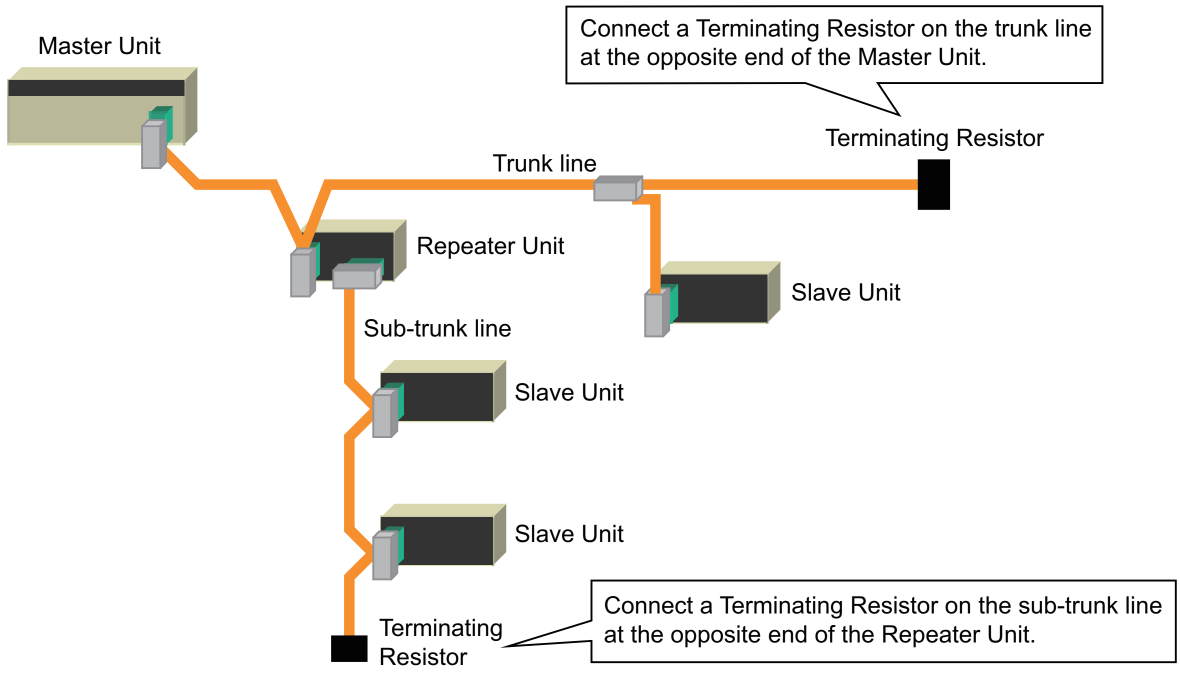
Extending a Flat Cable I or II

The Flat Connectors can be used to extend the cables for the trunk line, sub-trunk lines, branch lines, and sub-branch lines to maximum ten levels. The maximum trunk line length is the upper limit of extension of each type of cable. See Section 2-3-2 for the maximum trunk line length.

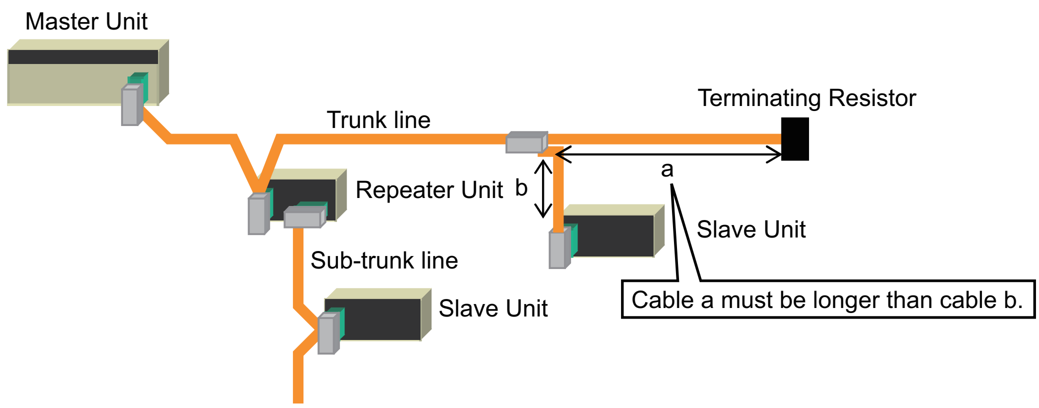


Connecting a Terminating Resistor to a Cable

- A Terminating Resistor must always be connected to the trunk line and each sub-trunk line at the opposite end of the Master Unit or a Repeater Unit. The Resistors shall never be connected on the same sides of the Master Unit or Repeater Units on the trunk line or sub-trunk lines.



- When the cable is branched near the end as shown in the figure below, connect the Terminating Resistor at the end of the line so that the length a is greater than the length b.



2-3-4 Terminal Arrangement on Communications Connectors

A CompoNet Network requires wiring of following lines.

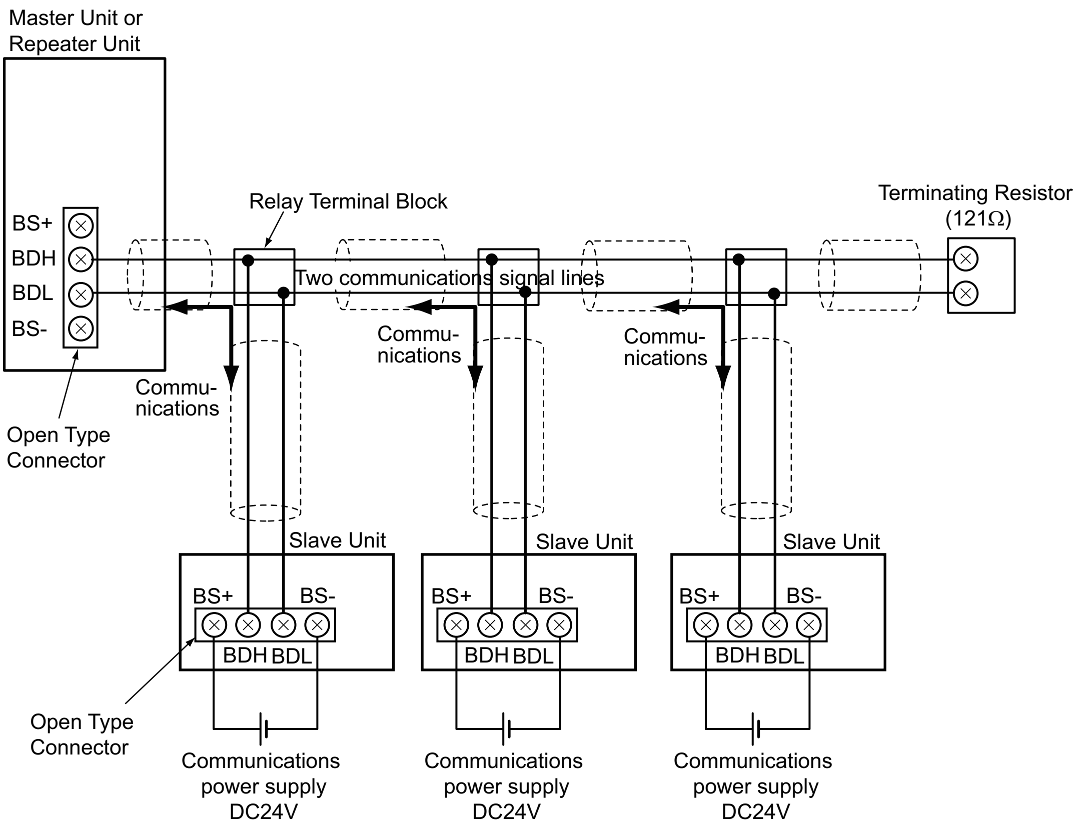
- Two communications signal lines:
  BDH (communications data high) and BDL (communications data low)
- Two communications power supply lines (One for communications, and the other for internal circuits of Slave Units.):
  BS + (+ terminal of communications power supply) and BS - (- terminal of communications power supply)

The terminals of communications connectors are arranged as follows.

BS+	+ terminal of communications power supply
BDH	Communications data high
BDL	Communications data low
BS-	- terminal of communications power

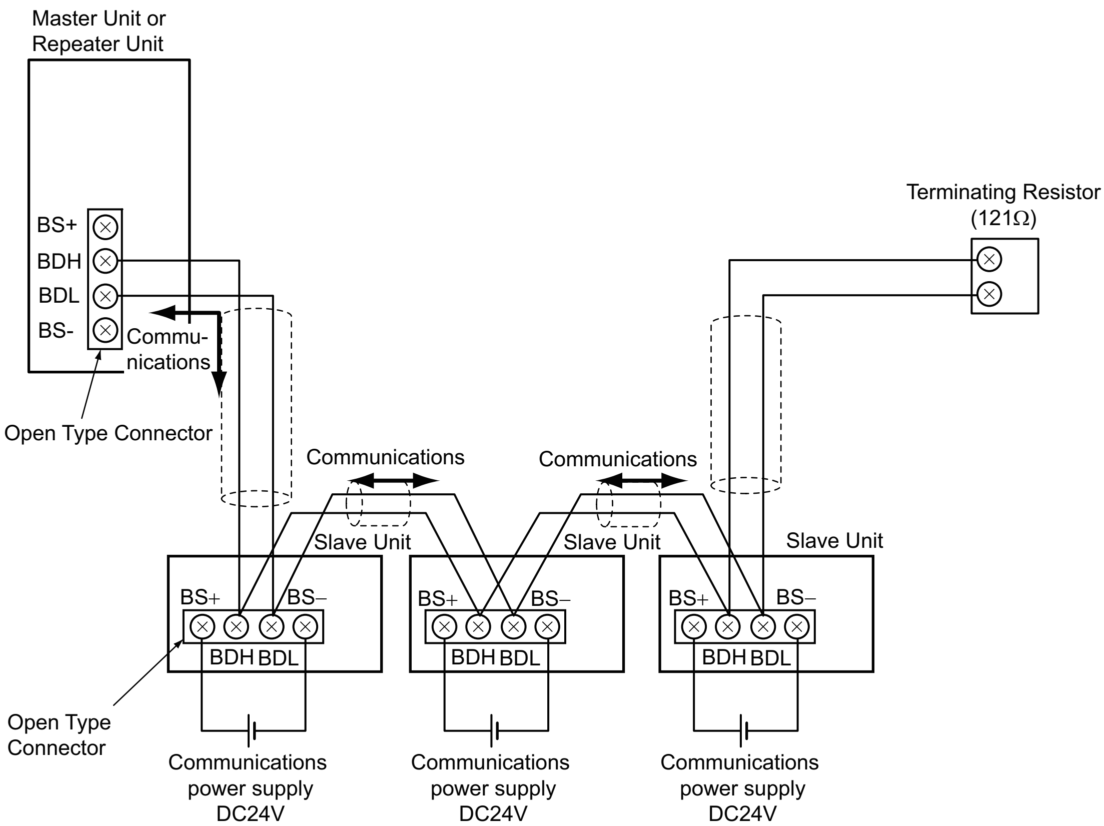
2-3-5 Connection and Branching of Round Cables I

Wiring Example



- The two communications signal lines are connected in parallel between the Master Unit or Repeater Unit and multiple Slave Units.
- A DCN4-TB4 Open Type Connector is used to connect communications cables.
- The two communications power supply lines are connected to each Slave Unit. They are different cables from the communications lines. The communications power supply lines are to supply 24-VDC communications power.
- A DRS1-T Terminating Resistor must be connected at the end of the network.

Multidrop Connectors can also be used to connect the Slave Units in parallel.



Peripheral Devices required for connection and branching

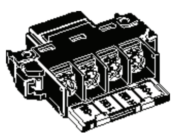
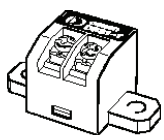
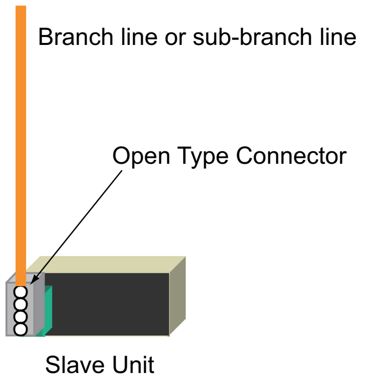
Name	Appearance	Model	Purpose
Open Type Connector		DCN4-TB4	To connect a round cable I with the Unit. It converts the communications connector to a screw terminal block.
Relay Terminal Block	-	commercially available	To make a T-branch connection on a round cable I.
Terminating Resistor		DRS1-T	A terminal block type Terminating Resistor for round cable I. It is connected at the end cables as the trunk line or sub-trunk lines.

Illustration of Round Cable I Connection and Branching

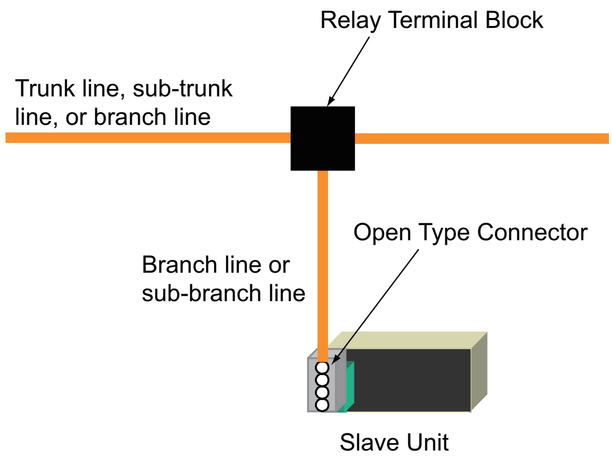
• Connecting the communications cable to a Slave Unit

A DCN4-TB4 Open Type Connector is attached to the communications connector on the Slave Unit. Then the cable, i.e., a branch line or sub-branch line, is connected to the Connector.



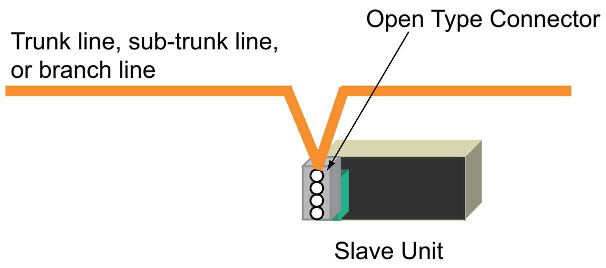
• T-branch connection

By a commercially available relay terminal block, the cable, i.e., the trunk line, sub-trunk line or branch line, is diverged.



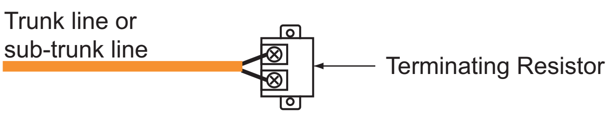
• Multi-drop connection

A DCN4-TB4 Open Type Connector is mounted to the communications connector on the Slave Unit. Then the cable, i.e., the trunk line, sub-trunk line or branch line, is diverged.



- Connecting a Terminating Resistor

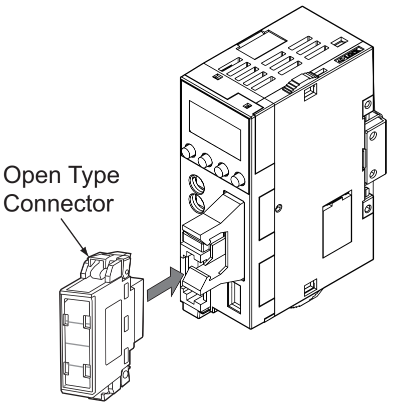
A DRS1-T Terminating Resistor for round cable I is connected to the cable, i.e., the trunk line or sub-trunk line.



Procedures to connect the communications cable

A DCN4-TB4 Open Type Connector is attached to the communications connector on the Slave Unit. This is to convert the communication connector to a M3 screw terminal block. Then the cable wires are connected to the Connector.

1. To mount a DCN4-TB4 Open Type Connector on the communications connector on the Slave Unit, orient the Open Type Connector so that the opening side of its terminal cover is facing to the left. Press in the Connector until it clicks into place.



To remove the inserted Connector, hold the latches on both sides, and pull out the Connector.

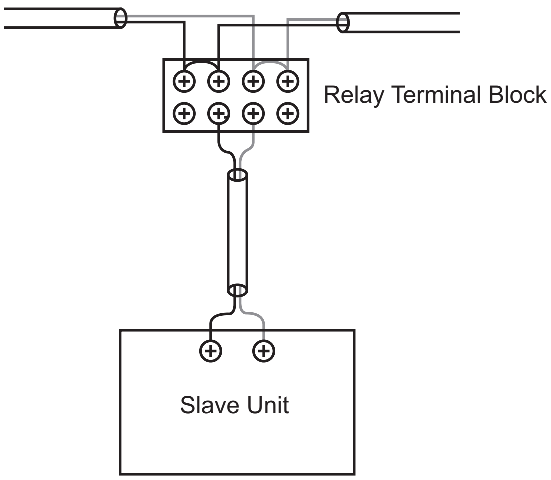
2. Open the terminal cover of the Connector. Connect the cable wires to the BDH terminal or the communications data high, and to the BDL terminal or the communications data low on the terminal block.

Procedures to branch the communications cables

There are two methods to branch the trunk line, sub-trunk lines, and branch lines: T-branch connection and multidrop connection.

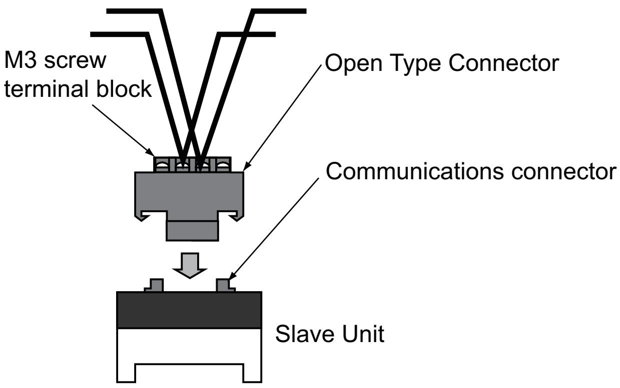
- T-branch connection

Use a commercially available relay terminal block, and connect the cable wires to the block.



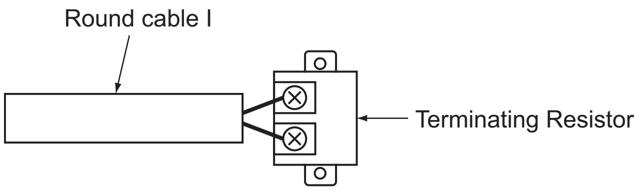
- Multidrop connection

Attach a DCN4-TB4 Open Type Connector to the communications connector on the Slave Unit, and convert the connector to the M3 screw terminal block. Connect the cable wires to the terminals on the block.

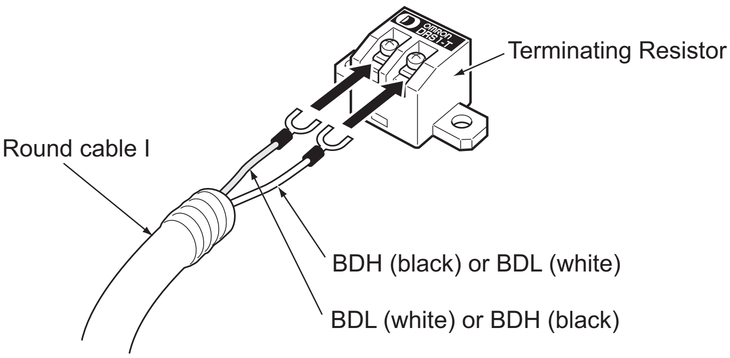


Procedures to connect a Terminating Resistor

A DRS1-T Terminating Resistor is connected to the wires of a round cable as the trunk line or a sub-trunk line.



Connect the cable wires to the Terminating Resistor and tighten the screws.

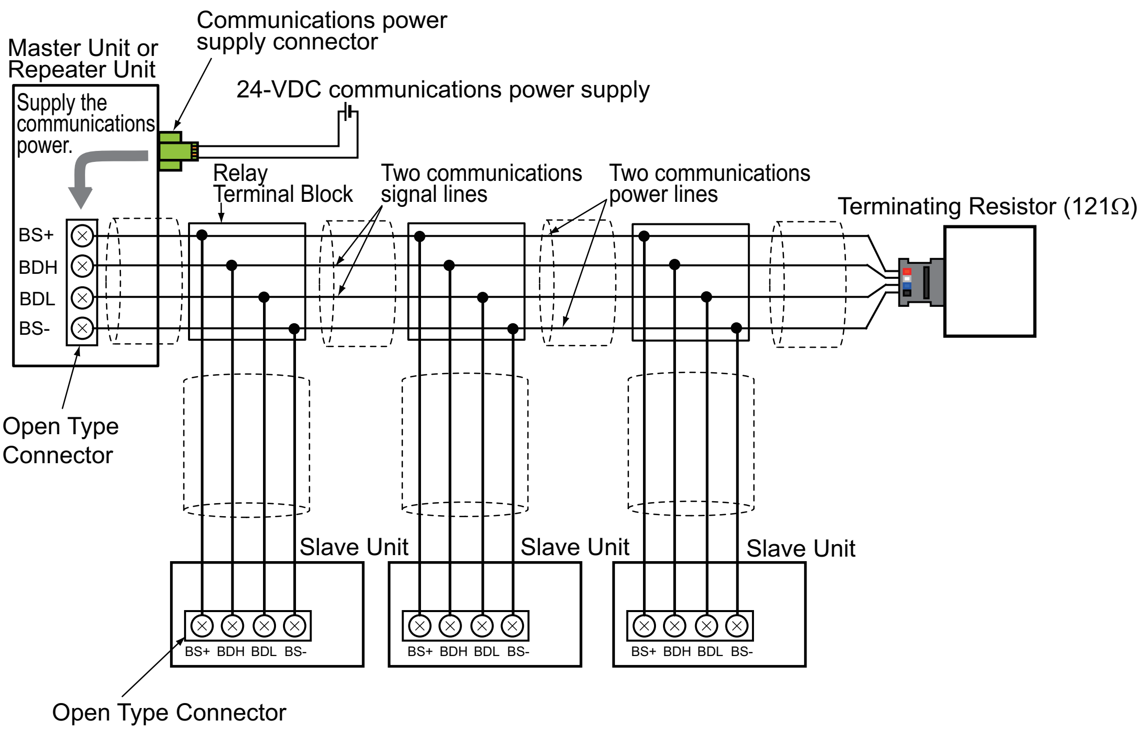


General Information

The Terminating Resistor has no polarity. Either wire can be connected to either terminal regardless of the color.

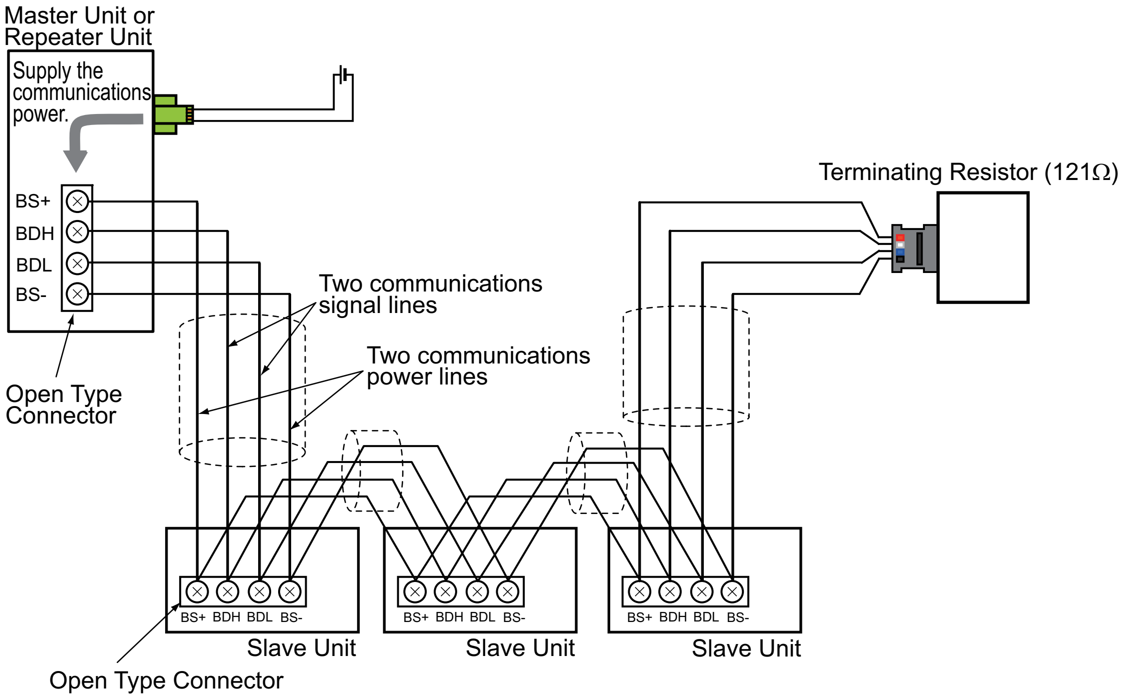
2-3-6 Connection and Branching of Round Cables II

Wiring Example



- The two communications signal lines and the two communications power lines are connected in parallel between the Master Unit or Repeater Unit and multiple Slave Units.
- A DCN4-TB4 Open Type Connector is used to connect the communications cables.
- A 24-VDC communications power supply is connected to the communications power supply connector on the Master Unit or the Repeater Unit.
- At the end of the network line, there must be a DCN4-TM4 Terminating Resistor attached with a DCN4-TR4 Flat Connector I Socket.

Multidrop connection can also be used to connect the Slave Units in parallel.



Peripheral Devices required for connection or branching

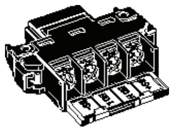
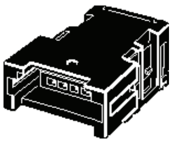
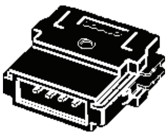
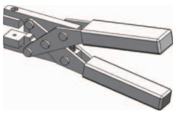
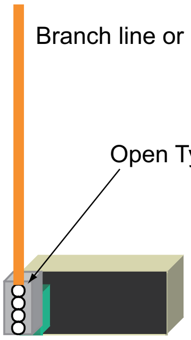
Name	Appearance	Model	Purpose
Open Type Connector		DCN4-TB4	To connect a round cable II with the Unit. It converts the communications connector to a screw terminal block.
Relay Terminal Block	-	commercially available	To make a T-branch connection on a round cable II.
Flat Connector I Socket		DCN4-TR4	It is mounted at the end of a round cable II. It is for attaching a Terminating Resistor.
Terminating Resistor		DCN4-TM4	A connector type Terminating Resistor for round cable II. It is attached to a DCN4-TR4 Flat Connector I Socket at the end of the trunk line or a sub-trunk line.
Special Tool (Pliers)		DWT-A01	A pressure welding tool for DCN4-TR4 Flat Connector I Socket.

Illustration of Round Cable II Connection and Branching

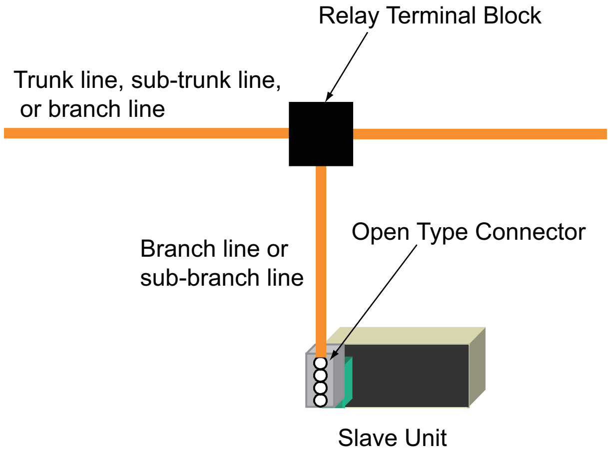
- Connecting the communications cable to a Slave Unit

A DCN4-TB4 Open Type Connector is attached to the communications connector on the Slave Unit. Then the cable, i.e., a branch line or sub-branch line, is connected to the Connector.



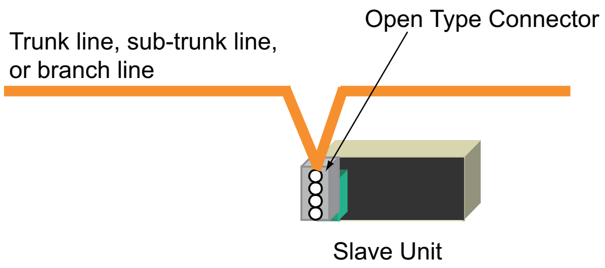
- T-branch connection

By a commercially available relay terminal block, the cable, i.e., the trunk line, sub-trunk line or branch line, is branched.



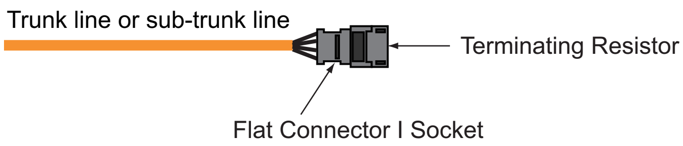
- Multidrop connection

A DCN4-TB4 Open Type Connector is mounted to the communications connector on the Slave Unit. Then the cable, i.e., the trunk line, sub-trunk line or branch line, is branched.



- Connecting a Terminating Resistor

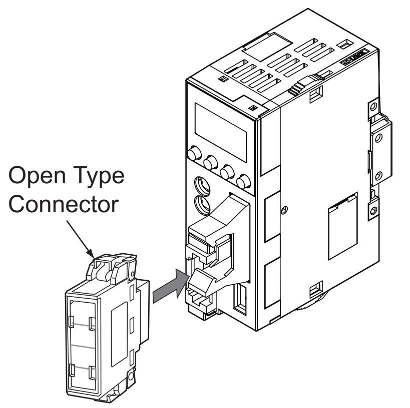
A DCN4-TR4 Flat Connector I Socket is mounted at the end of the cable, i.e., the trunk line or sub-trunk lines. Then a DCN4-TM4 Terminating Resistor for round cable II is attached to the Socket.



Procedures to connect the communications cables

A DCN4-TB4 Open Type Connector is attached to the communications connector on the Slave Unit. This is to convert the communication connector to a M3 screw terminal block. Then the cable wires are connected to the Connector.

1. To mount a DCN4-TB4 Open Type Connector on the communications connector on the Slave Unit, orient the Open Type Connector so that the opening side of its terminal cover is facing to the left. Press in the Connector until it clicks into place.



To remove the inserted Connector, hold the latches on both sides, and pull out the Connector.

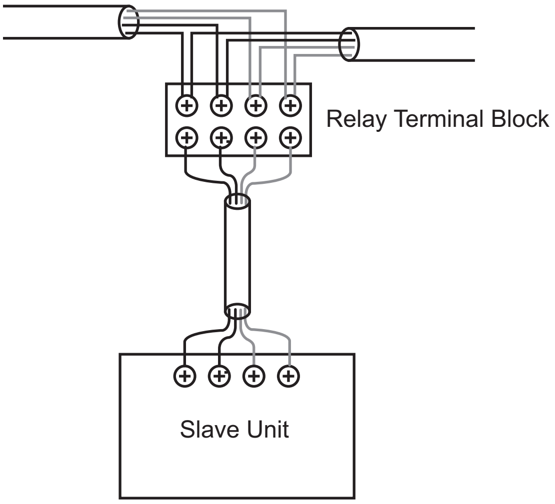
2. Open the terminal cover of the Connector. Connect the cable wires to the BDH terminal or the communications data high, to the BDL terminal or the communications data low, to the BS+ or + terminal of communications power supply, and to the BS- or - terminal of communications power supply on the terminal block.

Procedures to branch the communications cables

There are two methods to branch the trunk line, sub-trunk lines, and branch lines: T-branch connection and multidrop connection.

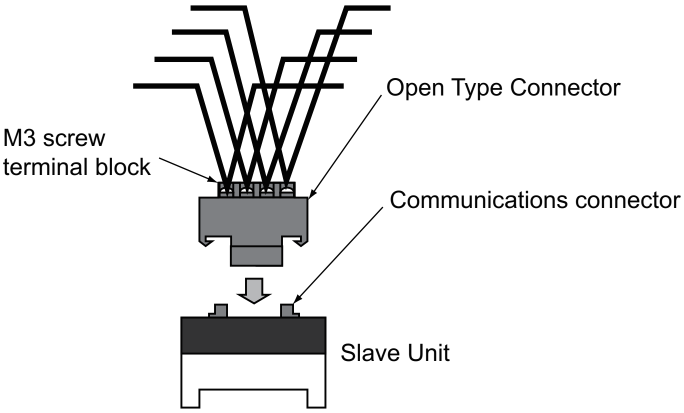
- T-branch connection

Use a commercially available relay terminal block, and connect the cable wires to the block.



- Multidrop connection

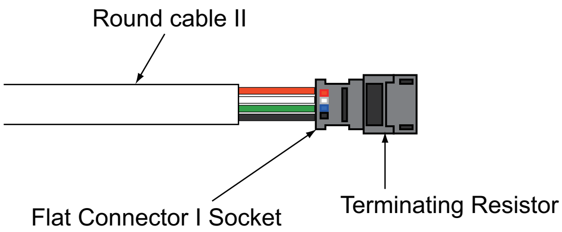
Attach a DCN4-TB4 Open Type Connector to the communications connector of the Unit, and convert the connector to the M3 screw terminal block. Connect the cable wires to the terminals on the block.



Procedures to Connect a Terminating Resistor

Mount a DCN4-TR4 Flat Connector I Socket to the end of the cable, i.e., the trunk line or the sub-trunk line.

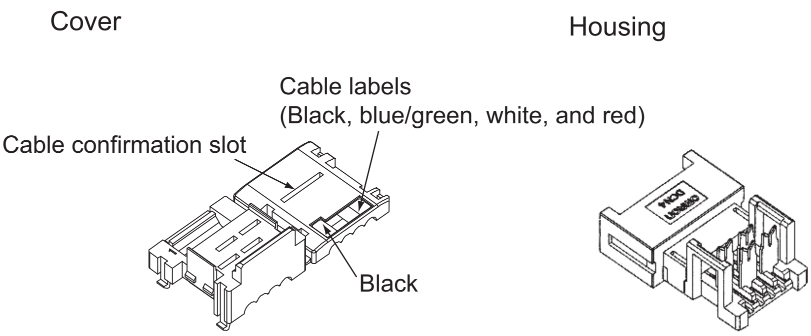
Attach a DCN4-TM4 Terminating Resistor onto the Socket.



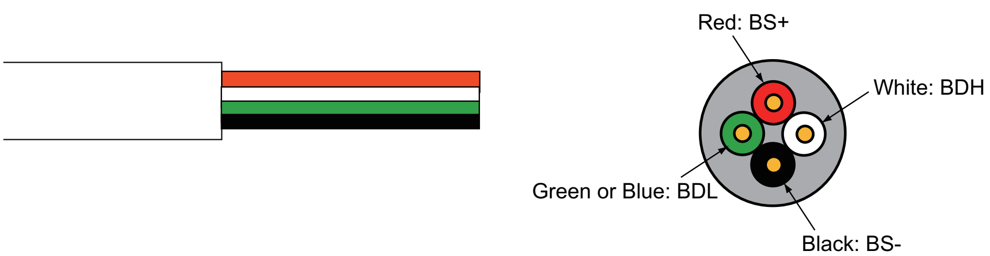
Precautions for Correct Use

- Flat Connectors are not reworkable. Once they are prepared they do not allow rework.
- Hold the Connector body to plug in or pull out the Connector.
- After connecting the Connector, pull it lightly to confirm the connection is secured.

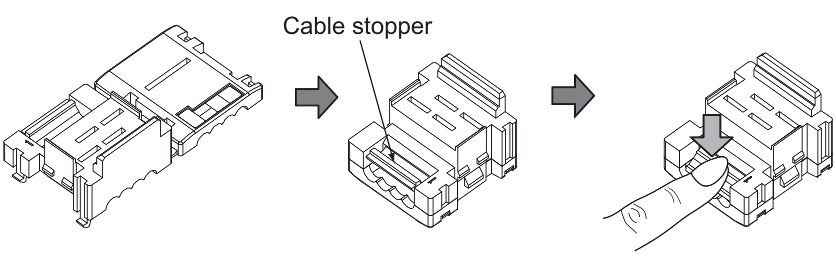
- Component Names of Flat Connector I Socket



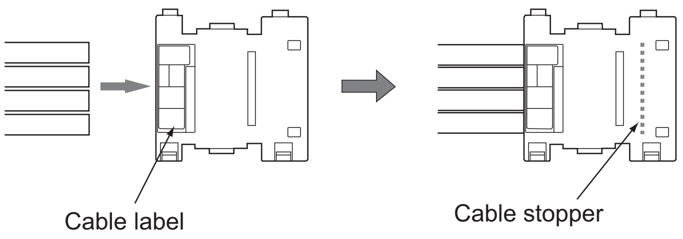
1. At the cable, make a cut line perpendicular to the cable length on the cable sheath, and strip the sheath.



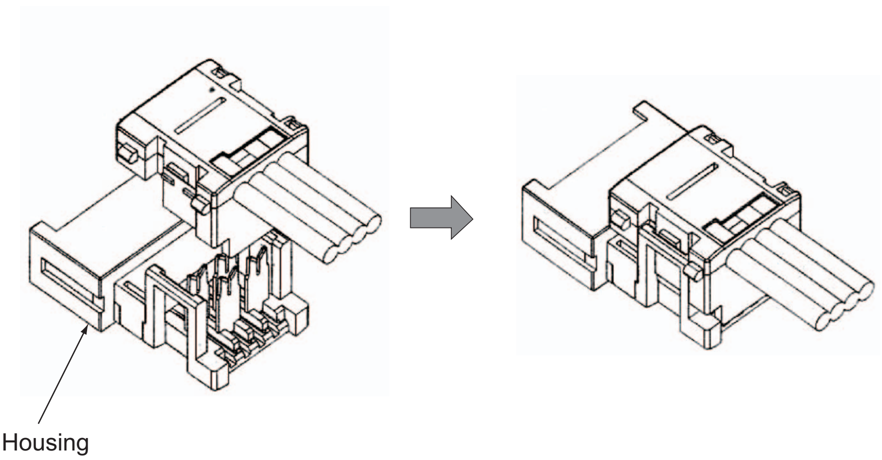
2. Close the cover of Flat Connector I Socket. Secure the hooks. Press down on the cable stopper until it clicks into place.



3. Confirm that the cable wire colors match the cable label colors on the Flat Connector I Socket. Insert the cable wire tips all the way into the cable stopper in the cover.



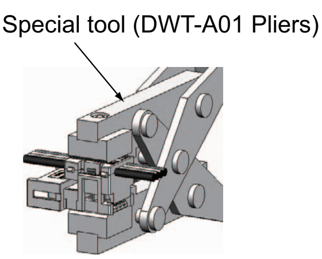
4. Temporarily secure the housing to the cover. Once it is attached, the housing cannot be removed from the cover.

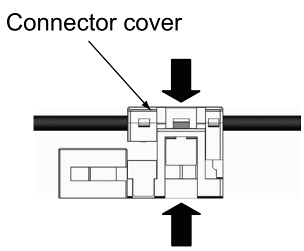


Precautions for Correct Use

If you attempt to remove it forcefully, you may damage the connector.

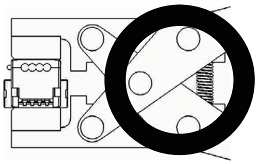
5. Align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A01 Pliers.



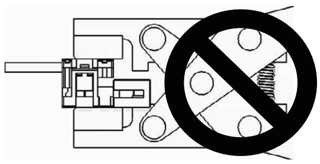


Precautions for Correct Use

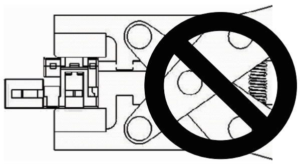
- Do not pressure-weld the connector cover at the edges.
- Do not use the back of pressure-welding block to pressure-weld the connector cover.
- Set the connector in the correct orientation.



OK

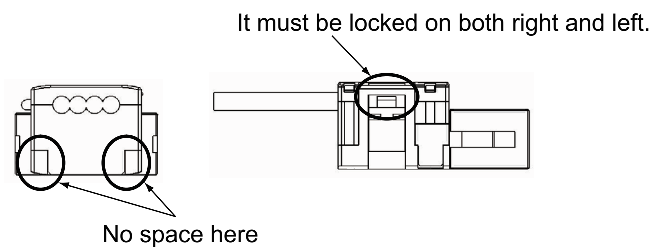


NG

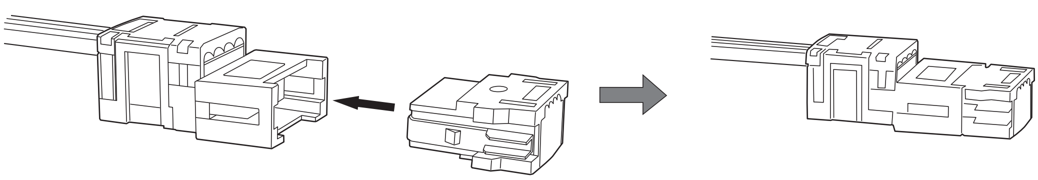


NG

6. Squeeze firmly the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.



7. Mount the DCN4-TM4 Terminating Resistor to the Flat Connector I Socket.

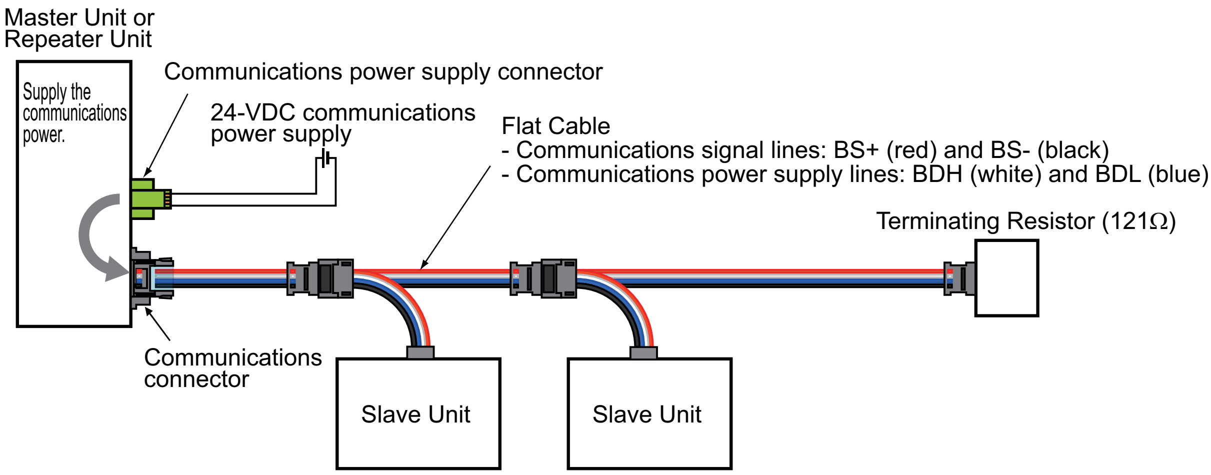


Push it into the Socket until it clicks into the place.

To remove the inserted Resistor, hold the latches on both sides, and pull out the Resistor.

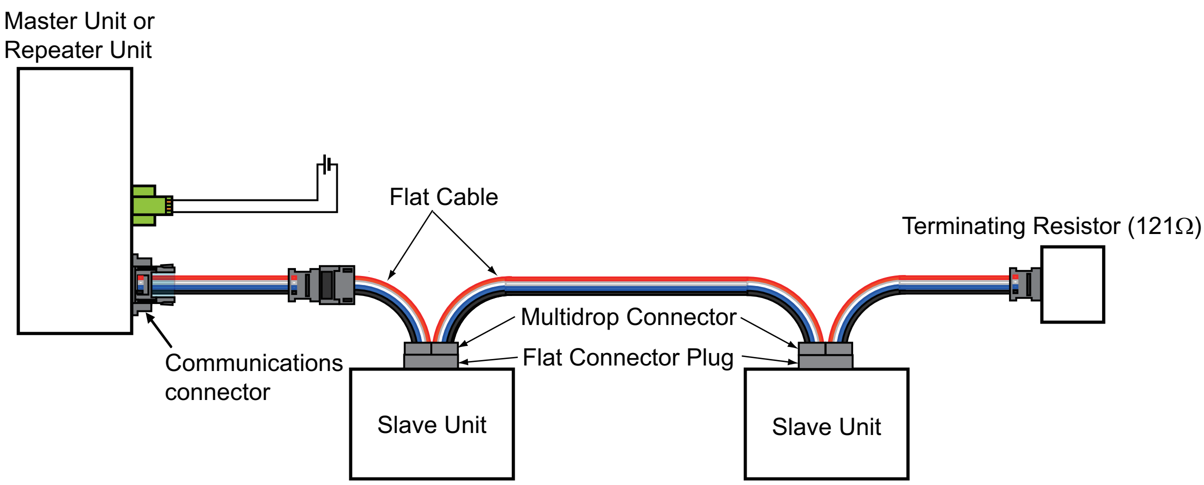
2-3-7 Connection, Branching and Extension of Flat Cable I

Wiring Example



- Flat Cables are used as the two communications signal lines and the two communications power supply lines that connect the Master Unit or a Repeater Unit with the Slave Units.
- A 24-VDC communications power supply is connected to the communications power supply connector on the Master Unit or Repeater Unit.
- At the end of the network line, there must be a DCN4-TM4 Terminating Resistor attached with a DCN4-TR4 Flat Connector I Socket.

Slave Units can be connected in parallel also by multidrop connections. A DCN4-MD4 Multidrop Connector is used for this connection.



Peripheral Devices required for connection, branching and extension

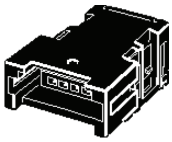
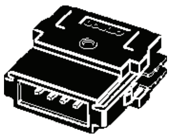
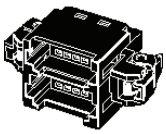
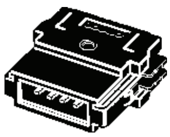
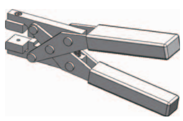
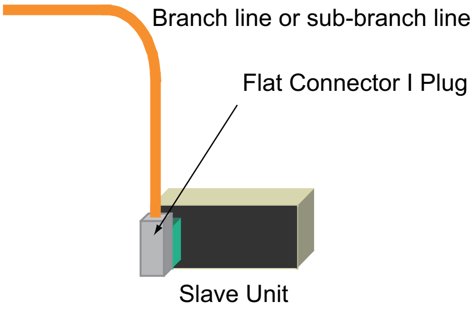
Name	Appearance	Model	Purpose
Flat Connector I Socket		DCN4-TR4	For the following purposes, it is used in combination with a DCN4-BR4 Flat Connector I Plug. - To extend the trunk line or a sub-trunk line. - To have a T-branch connection on the trunk line or a sub-trunk line, and make a branch line. - To have a T-branch connection on a branch line, and make a sub-branch line. It is used alone for the following purpose. - To connect a DCN4-TM4 Terminating Resistor to the trunk line or a sub-trunk line.
Flat Connector I Plug		DCN4-BR4	For following purposes, it is used in combination with a DCN4-TR4 Flat Connector I Socket. - To extend the trunk line or a sub-trunk line. - To have a T-branch connection on the trunk line or a sub-trunk line, and make a branch line. - To have a T-branch connection on a branch line, and make a sub-branch line. It is used alone for the following purposes. - To connect a communications cable to the Slave Unit. - To connect a communications cable to a DCN4-MD4 Multidrop Connector, and have a multidrop connection.
Multidrop Connector		DCN4-MD4	It is used to have a multidrop connection of the Slave Units on the trunk line, a sub-trunk line or a branch line.
Terminating Resistor		DCN4-TM4	A connector type Terminating Resistor for Flat Cable I. It is attached to a DCN4-TR4 Flat Connector I Socket at the end of the trunk line or a sub-trunk line.
Special Tool (Pliers)		DWT-A01	A pressure welding tool for DCN4-TR4 Flat Connector I Socket and a DCN4-BR4 Flat Connector I Plug.

Illustration of Flat Cable I Connection, Branching and Extension

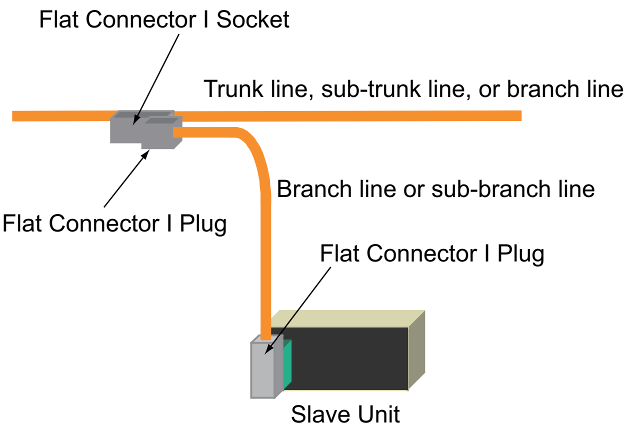
- Connecting cables

A DCN4-BR4 Flat Connector I Plug is attached to a communications cable, i.e., a branch line or a sub-branch line. Then it is connected to a Slave Unit.



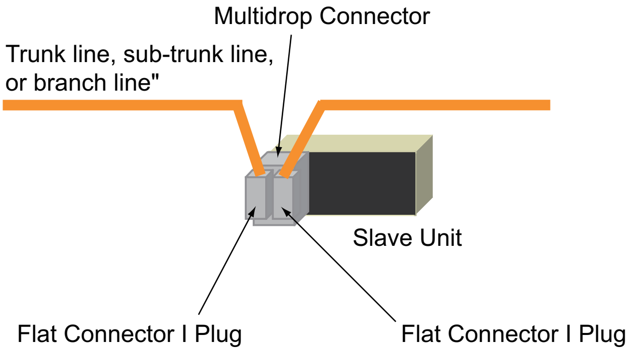
- T-branch connection

A DCN4-TR4 Flat Connector I Socket is mounted on the trunk line, a sub-trunk line or a branch line. A DCN4-BR4 Flat Connector I Plug is mounted on a branch line or a sub-branch line. The Socket and the Plug are connected to have a T-branching.



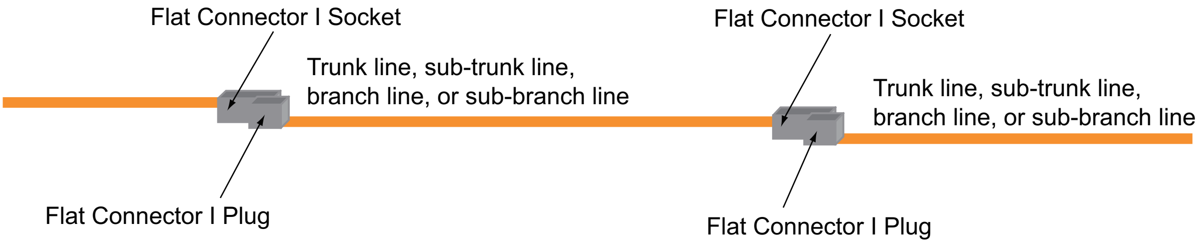
• Multidrop connection

A DCN4-BR4 Flat Connector I Plug is mounted on the trunk line, a sub-trunk line or a branch line. Another DCN4-BR4 Flat Connector I Plug is mounted on the trunk line, a sub-trunk line or a branch line. A DCN4-MD4 Multidrop Connector is attached to the communications connector on the Slave Unit. The two Plugs are connected to the Multidrop Connector to have a multidrop connection.



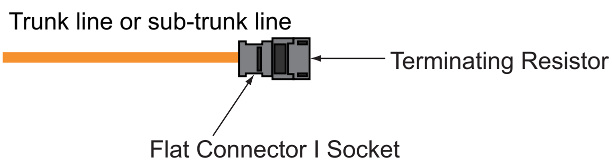
• Extending cables

A DCN4-TR4 Flat Connector I Socket and a DCN4-BR4 Flat Connector I Plug are connected to the trunk line, a sub-trunk line, a branch line, or a sub-branch line to extend the communications line.



• Connecting a Terminating Resistor

A DCN4-TR4 Flat Connector I Socket is mounted at the end of the cable, i.e., the trunk line or a sub-trunk line. Then a DCN4-TM4 Terminating Resistor for Flat Cable I is attached to the Socket.



Preparing and mounting a Flat Connector Socket

Flat Connector Sockets are used to have T-branch connections, to extend the lines and to connect with Terminating Resistors. Preparation and mounting procedure differs from the application purposes.

- To have a T-branch connection

A Flat Connector I Socket is mounted to a place where the communications cable is branched.

- To extend the cable or to mount a Terminating Resistor

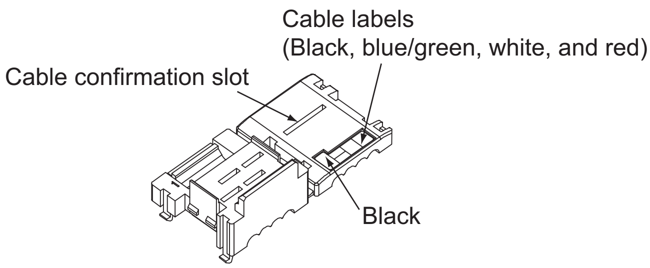
A Flat Connector I Socket is mounted at the end of the communications line.

Precautions for Correct Use

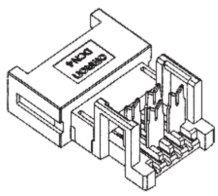
- Flat Connectors are not reworkable. Once they are prepared they do not allow rework.
- Hold the Connector body to plug in or pull out the Connector.
- After connecting the Connector, pull it lightly to confirm the Connection is secured.

- Component Names

Cover

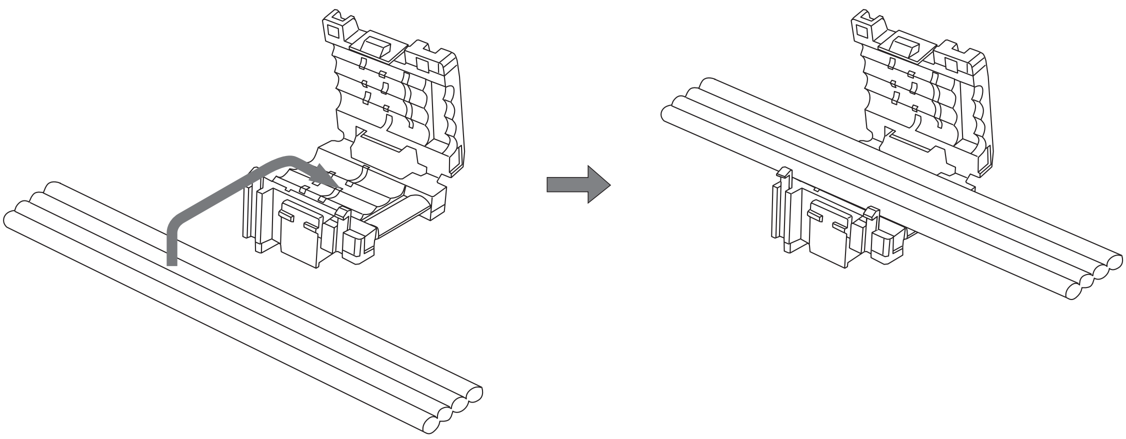


Housing

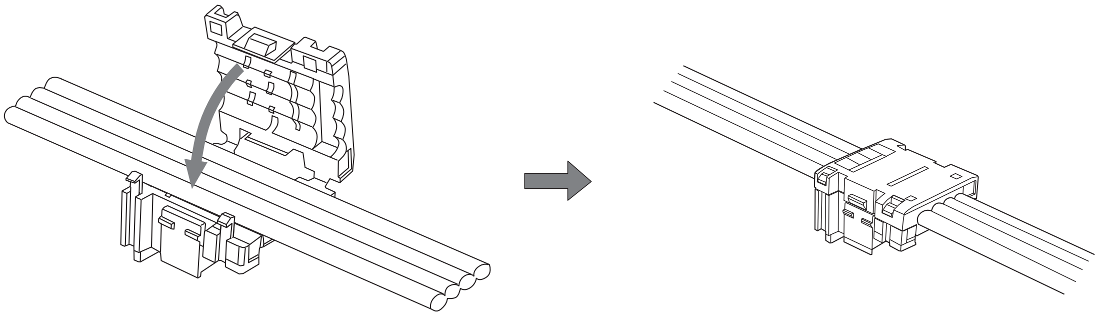


- For T-branch connection

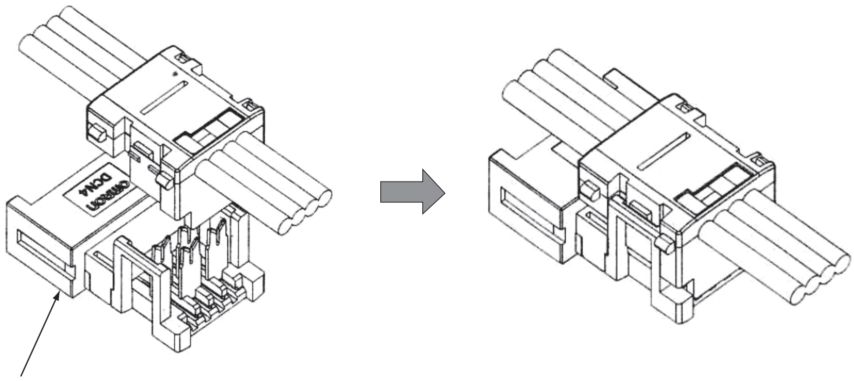
1. Align the cable label colors on the Flat Connector Socket and the cable colors. Place the branching part of cable onto the cover.



2. Hold the cable and secure it with the hooks.



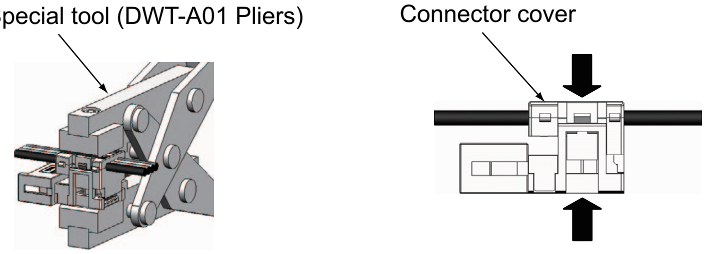
3. Temporarily secure the housing to the cover. Once it is attached, the housing cannot be removed from the cover.



Precautions for Correct Use

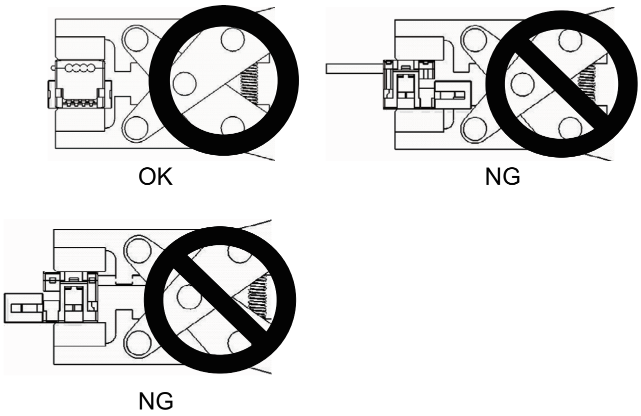
If you attempt to remove it forcefully, you may damage the connector.

4. Align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A01 Pliers.

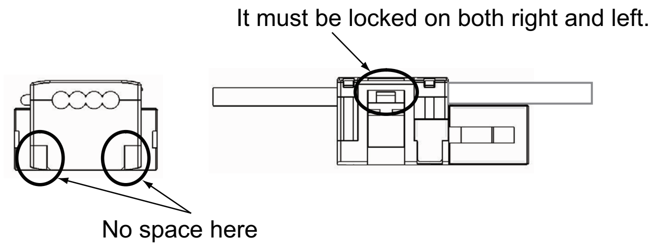


Precautions for Correct Use

- Do not pressure-weld the connector cover at the edges.
- Do not use the back of pressure-weld block to pressure-weld the connector cover.
- Set the connector in the correct orientation.

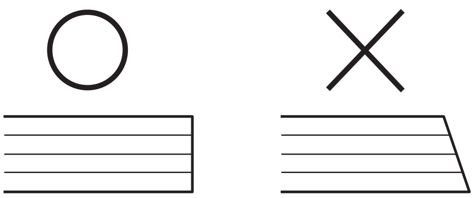


5. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

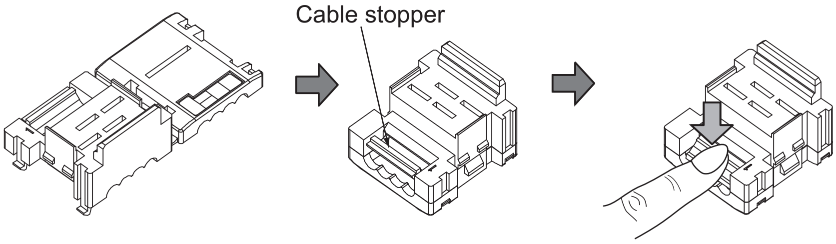


- For extending the cable or connecting it with a Terminating Resistor

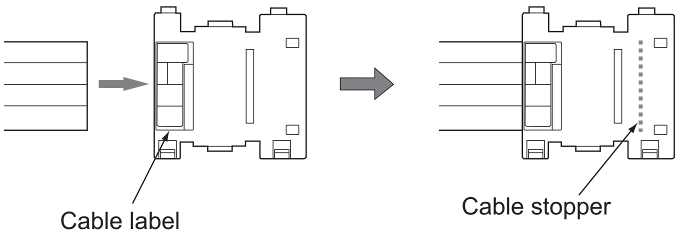
1. At the tip of cable, cut the cable perpendicular to the cable length.
To prevent short, use a sharp cutting tool such as nipper. Confirm there is no remaining wire coming out.



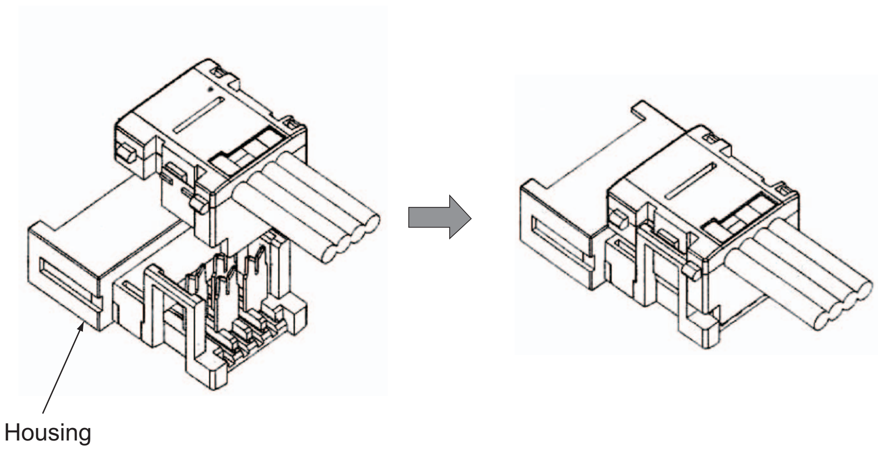
2. Close the cover. Secure the hooks. Press down on the cable stopper until it clicks into place.



3. Confirm that the cable colors match the cable label colors on the Flat Connector Socket. Insert the cable tip all the way into the cable stopper in the cover.



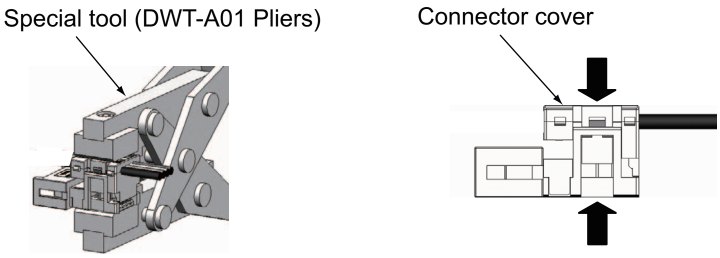
4. Temporarily secure the housing to the cover. Once it is attached, the housing cannot be removed from the cover.



Precautions for Correct Use

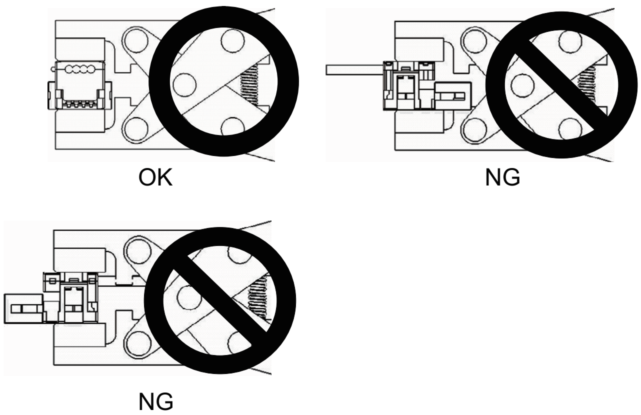
If you attempt to remove it forcefully, you may damage the connector.

5. Align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A01 Pliers.

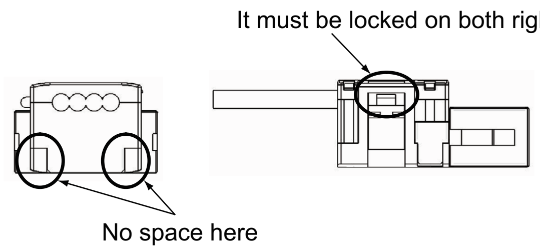


Precautions for Correct Use

- Do not pressure-weld the connector cover at the edges.
- Do not use the back of pressure-weld block to pressure-weld the connector cover.
- Set the connector in the correct orientation.

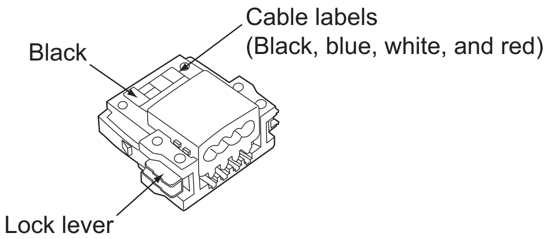


6. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

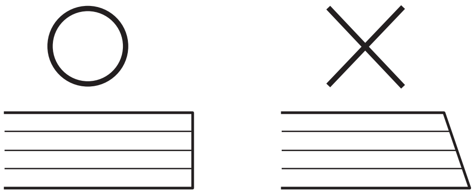


Preparing and mounting a Flat Connector Plug

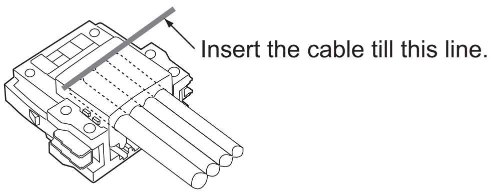
- Component Names



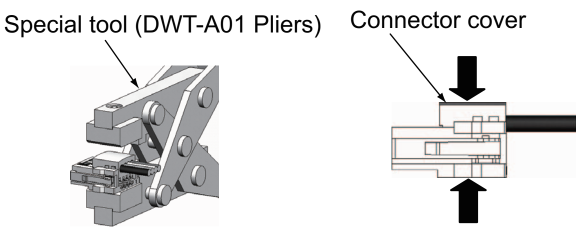
1. At the tip of cable, cut the cable perpendicular to the cable length.
To prevent short, use a sharp cutting tool such as nipper. After cutting, confirm there is no remaining wire coming out.



2. Confirm that the cable colors match the cable label colors on the Flat Connector Plugs. Insert the cable tip all the way into cover until the line shown below.
Through the transparent cover, confirm it is surely inserted all the way into the back.

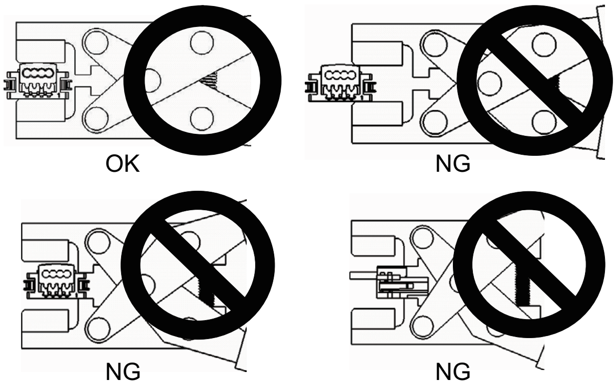


3. Align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A01 Pliers.



Precautions for Correct Use

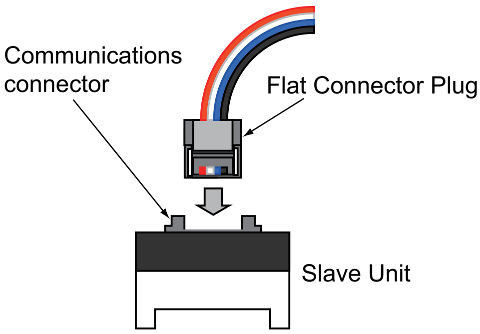
- Do not pressure-weld the connector cover at the edges.
- Do not use the back of pressure-weld block to pressure-weld the connector cover.
- Set the connector in the correct orientation.



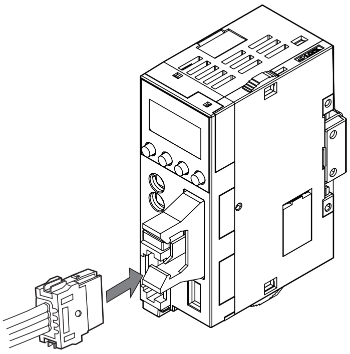
4. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

Connecting the Communications cables

A DCN4-BR4 Flat Connector I Plug which has already been attached to a communications cable is connected to the communications connector of a Slave Unit.



Hold the Connector Plug with its side on which line colors (i.e., red, white, black, and blue) are indicated facing to the left.
Push the Connector Plug into the communications connector until it click into place.



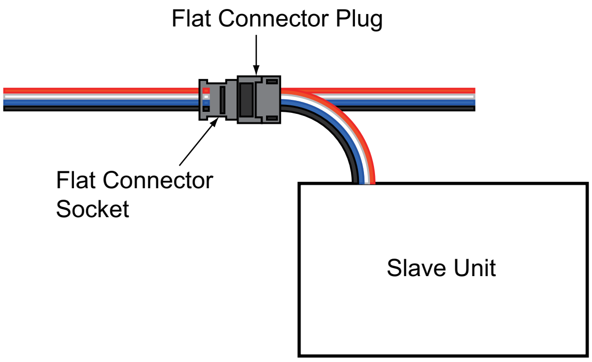
To remove a Connector Plug once it has been attached, hold the latches on both sides of the Connector, and pull out the Connector Plug.

Branching the Communications cables

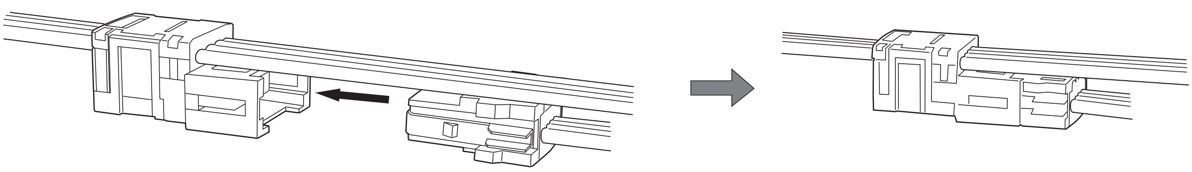
There are two methods to branch the communications cable: T-branch connection and multidrop connections.

- T-branch connection

A DCN4-BR4 Flat Connector I Plug is connected to a DCN4-TR4 Flat Connector I Socket which has already been to attached to a communications cable.

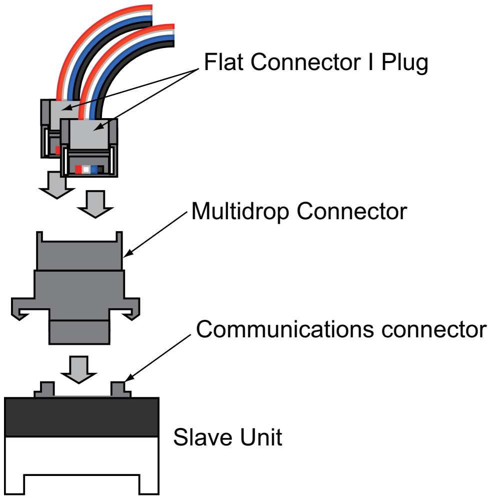


Hold the Flat Connector Plug with its side on which line colors (i.e., red, white, black, and blue) are indicated facing downward.
Push the Connector Plug into the Connector Socket until it clicks into place.

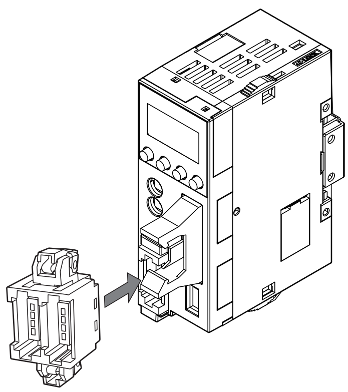


- Multidrop connection

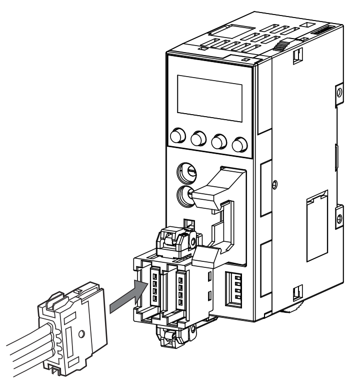
A DCN4-MD4 Multidrop Connector is mounted onto the communications connector on the Slave Unit. Then two DCN4-BR4 Flat Connector I Plugs which have already been attached to the communications cables are mounted onto the Multidrop Connector.



1. Hold the Multidrop Connector with its side on which the number is indicated facing to the left. Push the Connector into the communications connector of the Slave Unit until it clicks into place.

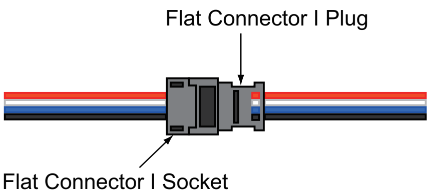


2. Hold a Flat Connector I Plug with its side on which line colors (i.e., red, white, black and blue) are indicated facing to the left. Push the Plug into the Multidrop Connector until it clicks into place.

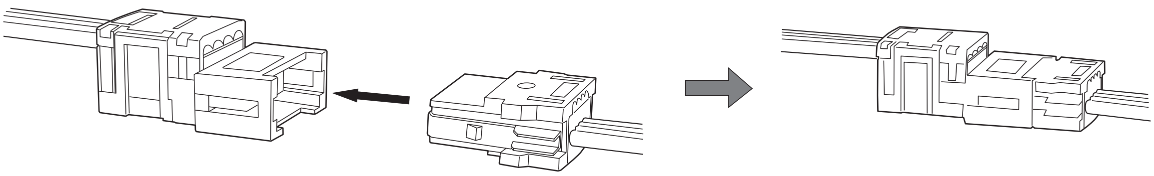


Extending the Communications cables

A DCN4-BR4 Flat Connector I Plug is connected to a DCN4-TR4 Flat Connector I Socket which has already been attached to a communications cable.

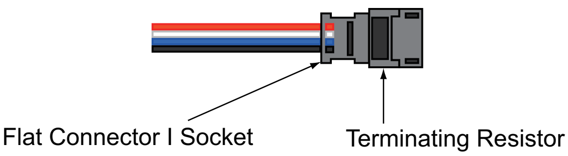


Hold the Flat Connector Plug with its side on which line colors (i.e., red, white, black, and blue) are indicated facing downward. Push the Connector Plug into the Connector Socket until it clicks into place.

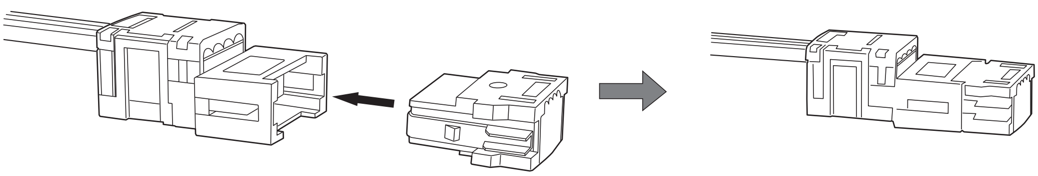


Connecting a Terminating Resistor

Connect a DCN4-RM4 Terminating Resistor to a DCN4-TR4 Flat Connector I Socket which has already been attached to the communications cable.

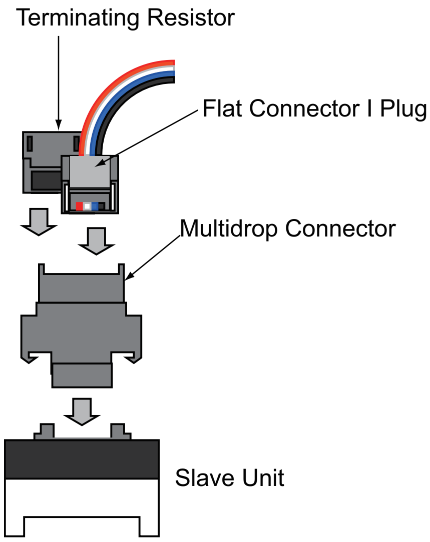


Push the Resistor until it clicks into place.



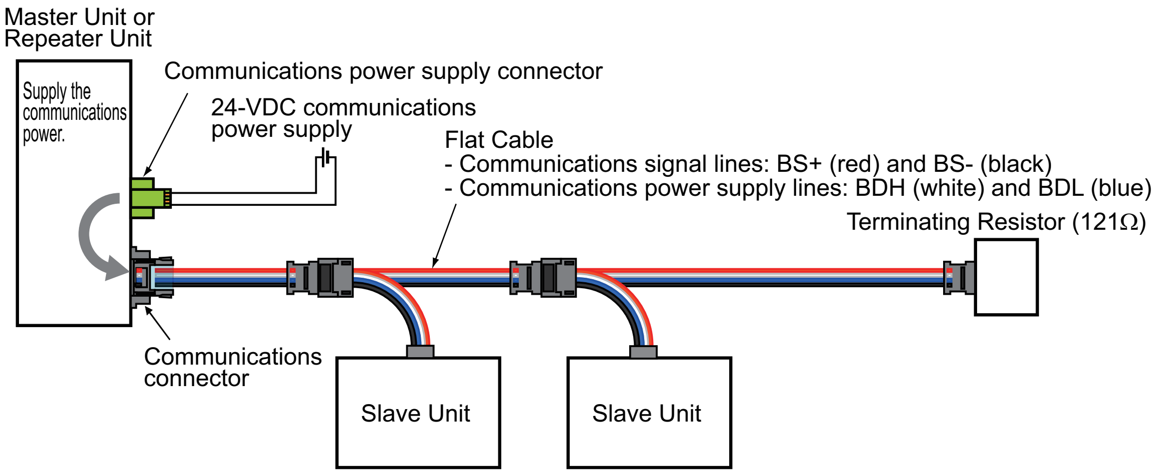
To remove the attached Resistor, hold the latches on both sides of the Resistor and pull out the Resistor.

When the Slave Unit has a multidrop connection, a Terminating Resistor can be mounted directly onto the Multidrop Connector that is attached to the Unit.



2-3-8 Connection, Branching and Extension of Flat Cable II

Wiring Example



- Flat Cables are used as the two communications signal lines and the two communications power supply lines that connect the Master Unit or a Repeater Unit with the Slave Units.
- A 24-VDC communications power supply is connected to the communications power supply connector on the Master Unit or Repeater Unit.
- At the end of the network line, there must be a DCN4-TM4 Terminating Resistor attached to a DCN4-TR4 Flat Connector I Socket.

Precautions for Correct Use

Flat Cable II does not support multidrop connections. It only supports T-branch connection.

Peripheral Devices required for connection, branching and extension

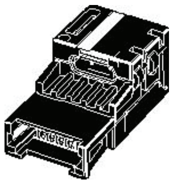
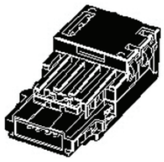
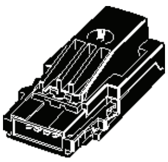
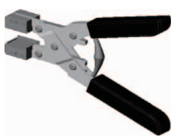
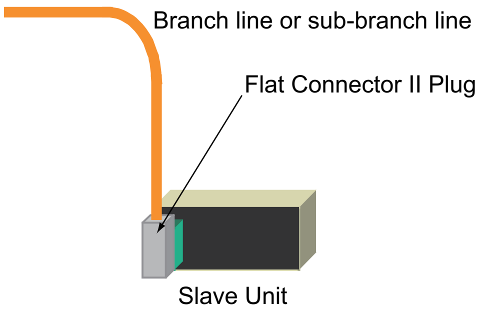
Name	Appearance	Model	Purpose
Flat Connector II Socket		DCN5-TR4	For the following purposes, t is used in combination with a DCN5-BR4 Flat Connector II Plug. - To extend the trunk line or a sub-trunk line. - To have a T-branch connection on the trunk line or a sub-trunk line, and make a branch line. - To have a T-branch connection on a branch line, and make a sub-branch line.
			It is used alone for the following purpose. - To connect a DCN5-TM4 Terminating Resistor to the trunk line or a sub-trunk line.
Flat Connector II Plug		DCN5-BR4	For the following purposes, t is used in combination with a DCN5-TR4 Flat Connector II Socket. - To extend the trunk line or a sub-trunk line. - To have a T-branch connection on the trunk line or a sub-trunk line, and make a branch line. - To have a T-branch connection on a branch line, and make a sub-branch line.
			It is used alone for the following purpose. - To connect a communications cable to the Slave Unit.
Terminating Resistor		DCN5-TM4	A connector type Terminating Resistor for Flat Cable II. It is attached to a DCN5-TR4 Flat Connector II Socket at the end of the trunk line or a sub-trunk line.
Special Tool (Pliers)		DWT-A02	A pressure welding tool for DCN5-TR4 Flat Connector II Socket and a DCN5-BR4 Flat Connector II Plug.

Illustration of Flat Cable II Connection, Branching and Extension

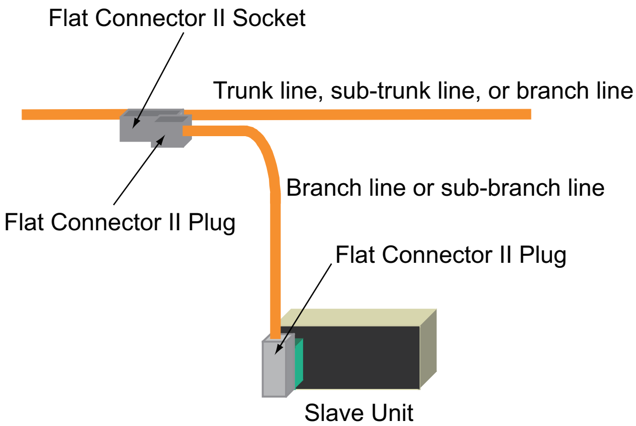
- Connecting cables

A DCN5-BR4 Flat Connector II Plug is attached to a communications cable, i.e., a branch line or a sub-branch line. Then it is connected to a Slave Unit.



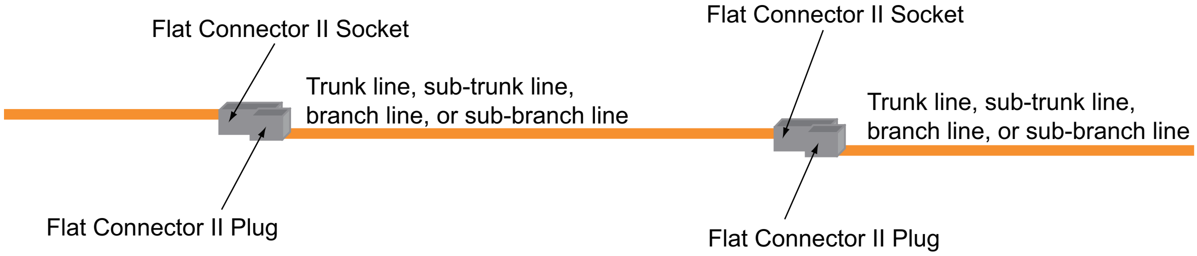
- T-branch connection

A DCN5-TR4 Flat Connector II Socket is mounted on the trunk line, a sub-trunk line or a branch line. A DCN5-BR4 Flat Connector II Plug is mounted on a branch line or a sub-branch line. The both Connectors are connected to make a branching.



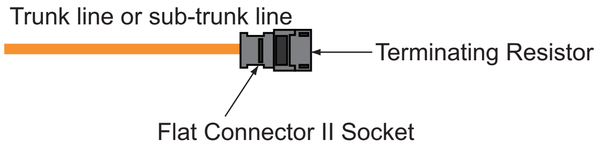
- Extending cables (i.e., the trunk line or a sub-trunk line)

A DCN5-TR4 Flat Connector II Socket and a DCN5-BR4 Flat Connector II Plug are connected to the trunk line, a sub-trunk line, a branch line, or a sub-branch line, to extend the communications line.



- Connecting a Terminating Resistor

A DCN5-TR4 Flat Connector II Socket is mounted at the end of the cable, i.e., the trunk line or a sub-trunk line. Then a DCN5-TM4 Terminating Resistor for Flat Cable II is attached to the Socket.



Preparing and mounting a Flat Connector Socket

Flat Connector Sockets are used to have T-branch connection, to extend the lines, and to connect with a Terminating Resistor. Preparation and mounting procedure differs from the application purposes.

- To have a T-branch connection

A Flat Connector II Socket is mounted to a place where the communications cable is branched.

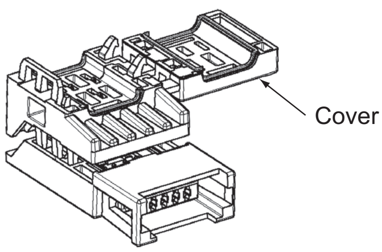
- To extend the cable or to mount a Terminating Resistor

A Flat Connector II Socket is mounted at the end of the communications line.

Precautions for Correct Use

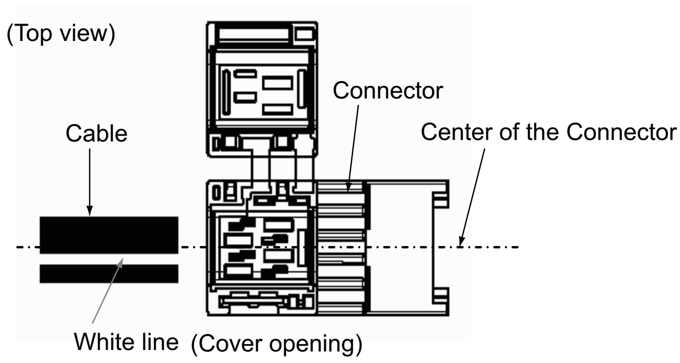
- Flat Connectors are not reworkable. Once they are prepared they do not allow rework.
- Hold the connector body to plug in or pull out the connector.
- After connecting the connector, pull it lightly to confirm the connection is secured.

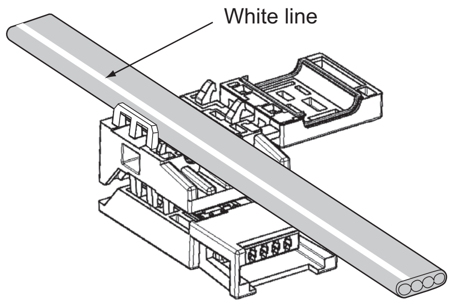
- Component Names



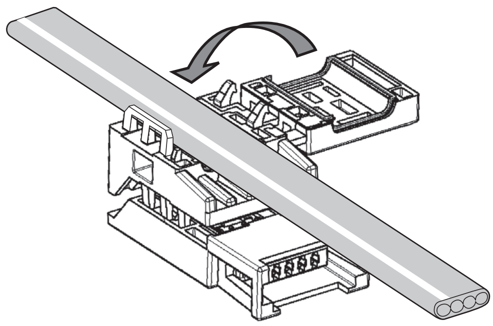
- For T-branch connection

1. Place the cable with its white line facing up and near the cover opening.

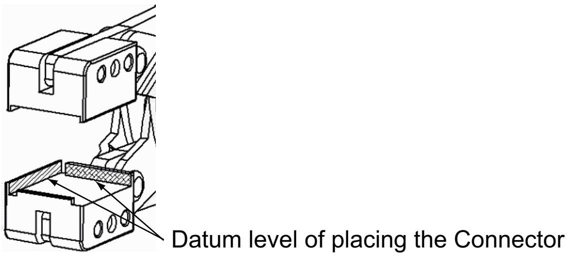


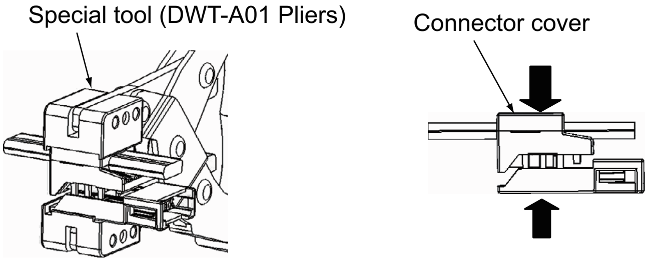


2. Hold the cable to prevent dislocation. Close the cover.

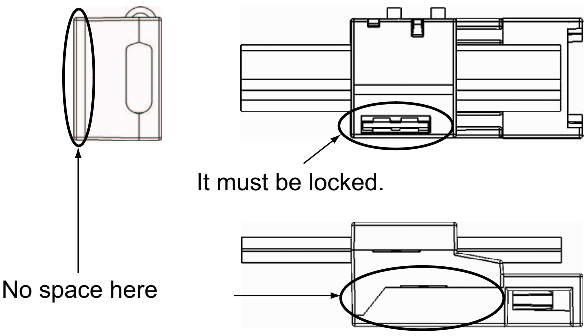


3. On the datum level shown in the illustration, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A02 Pliers.



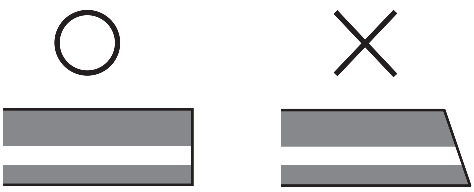


4. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

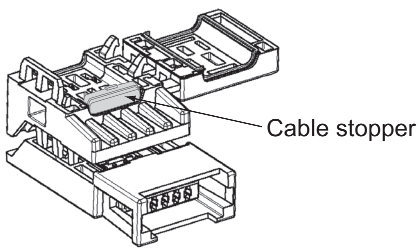


- For extending the cables and connecting a Terminating Resistor

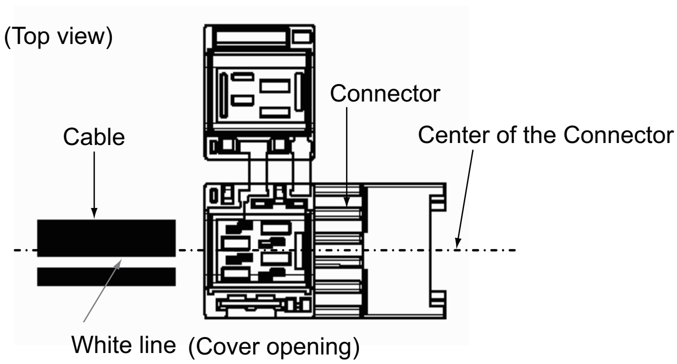
1. At the tip of cable, cut the cable perpendicular to the cable length.
To prevent short, use a sharp cutting tool such as nipper. After cutting, confirm there is no remaining wire coming out.

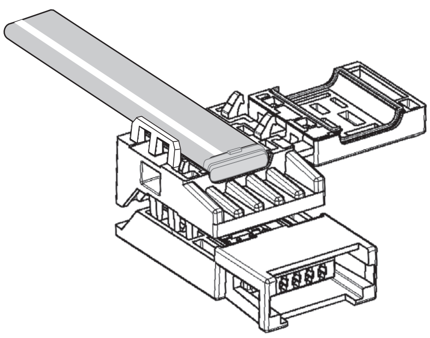


2. Place a cable stopper on the Flat Connector II Socket.

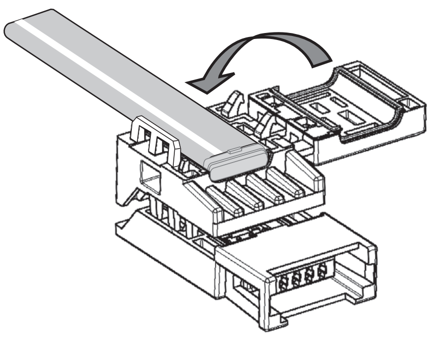


3. Hold the cable with its white line facing up and near the cover opening. Make sure the cable tip touches the cable stopper.

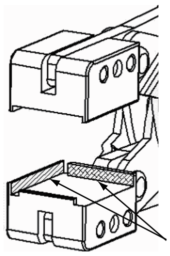


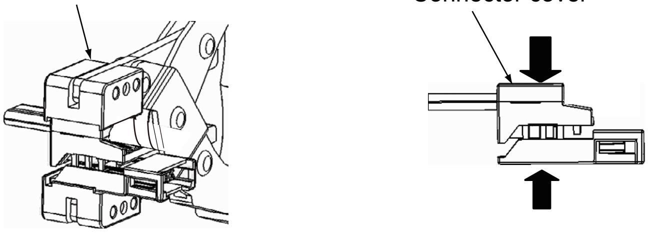


4. Hold the cable to prevent dislocation. Close the cover.

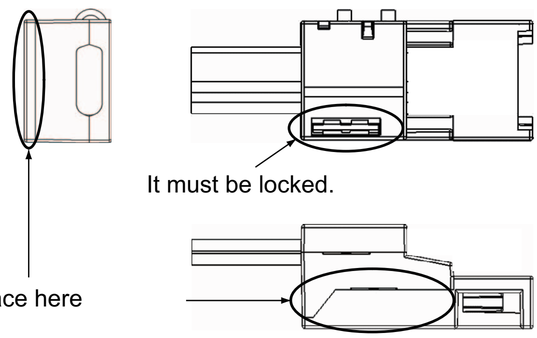


5. On the datum level shown in the illustration, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A02 Pliers.



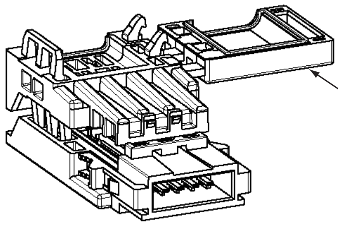


6. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

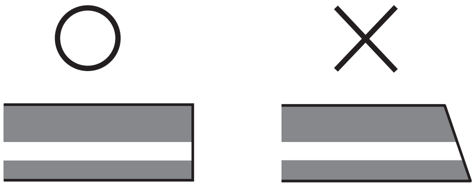


Preparing and mounting a Flat Connector Plug

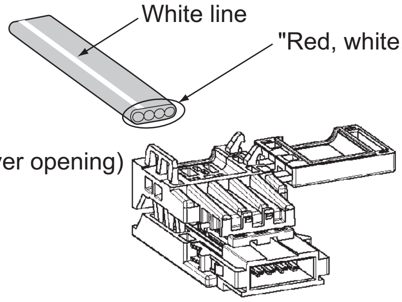
- Component Names



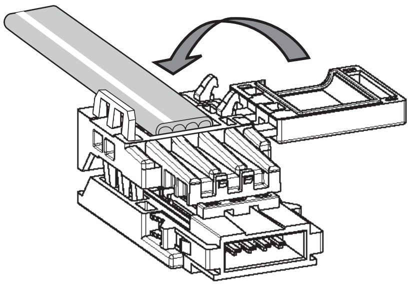
1. At the tip of cable, cut the cable perpendicular to the cable length.
   To prevent short, use a sharp cutting tool such as nipper. After cutting, confirm there is no remaining wire coming out.



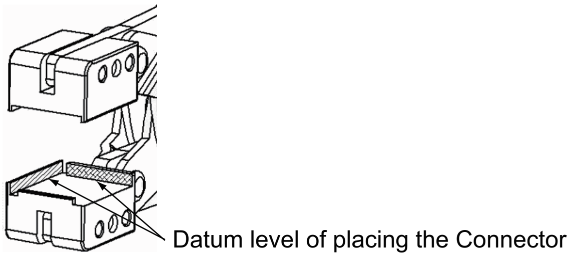
2. Place the cable with its white line facing up and near the cover opening.

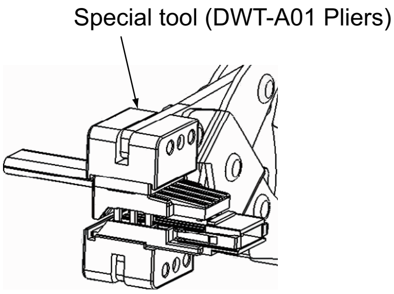


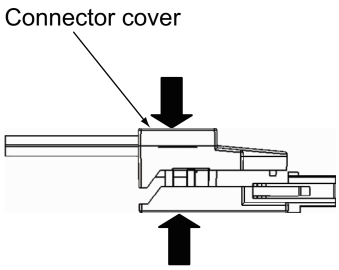
3. Hold the cable to prevent dislocation. Close the cover.



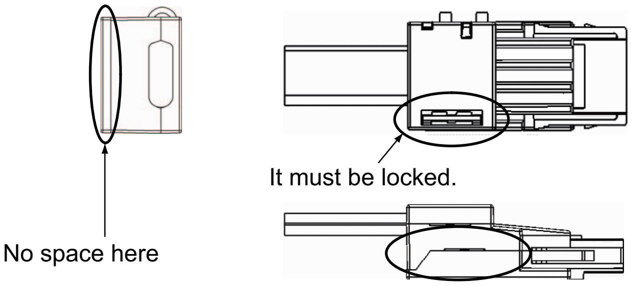
4. On the datum level shown in the illustration, align the center (see arrows) of the connector cover with the center of the pressure-welding block on the DWT-A02 Pliers.





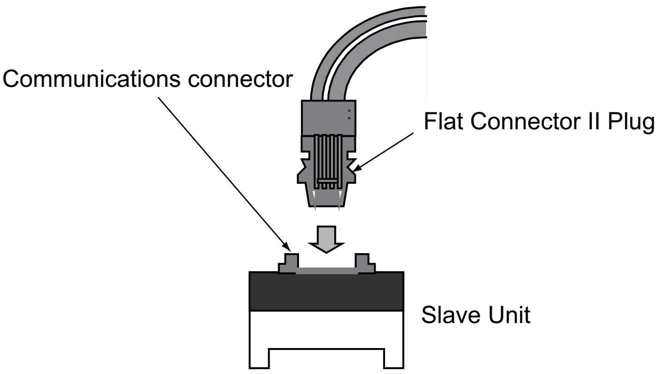


5. Squeeze firmly on the Pliers until the lock on the connector clicks into place.
Confirm that it is properly pressure-welded as shown below.

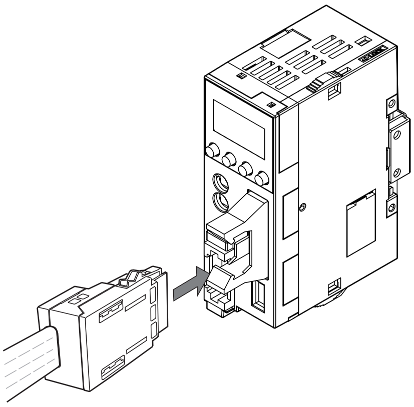


Connecting the Communications cables

A DCN5-BR4 Flat Connector II Plug which has already been attached to a communications cable is connected to the communications connector of a Slave Unit.



Hold the Connector Plug with the white line of the cable facing to the left. Push the Connector Plug into the communications connector until it click into place.

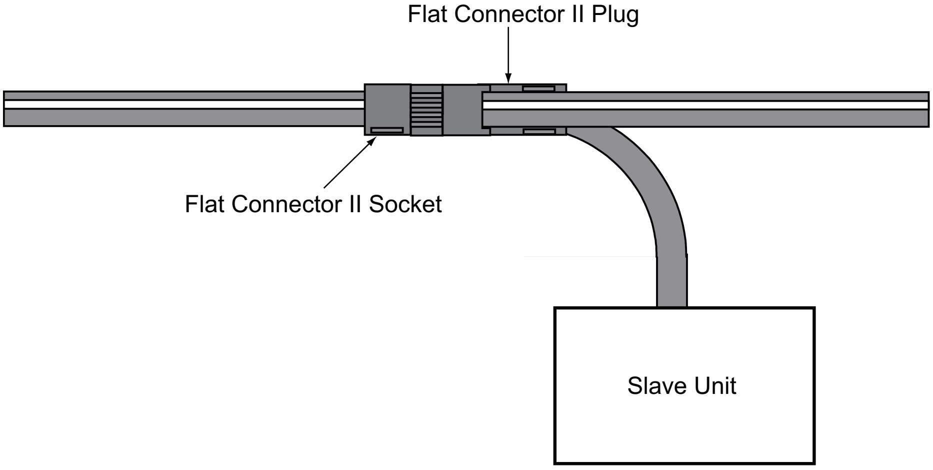


To remove a Connector Plug once it has been attached, hold the latches on both sides of the Connector and pull out the Connector Plug.

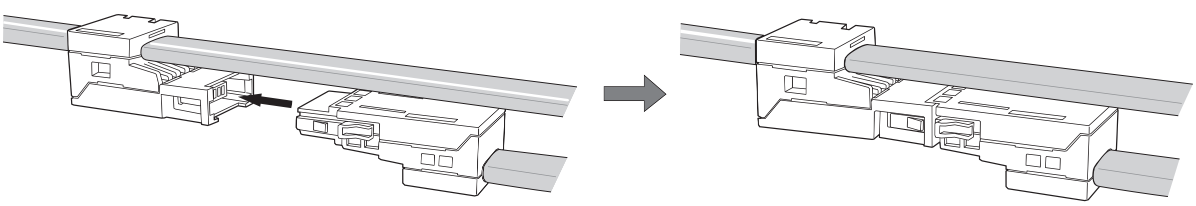
Branching the Communications cables

This cable supports only T-branch connection.

A DCN5-BR4 Flat Connector II Plug is connected to a DCN5-TR4 Flat Connector II Socket which already has a communications cable attached.

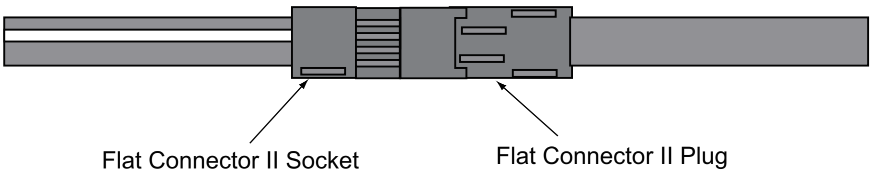


Hold the Flat Connector Plug with the white line of the cable facing down. Push the Connector Plug into the Connector Socket until it clicks into place.

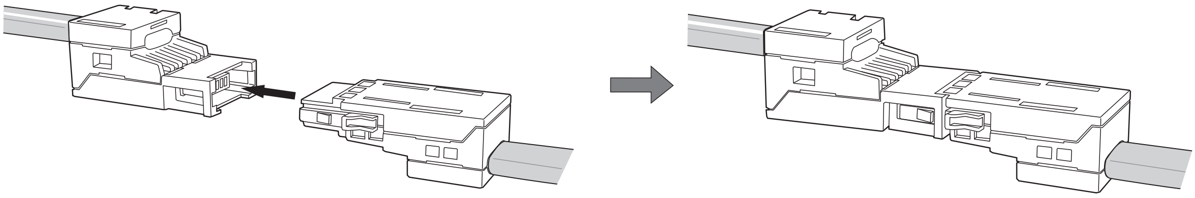


Extending the Communications cables

A DCN5-BR4 Flat Connector II Plug is connected to a DCN5-TR4 Flat Connector II Socket which has already has been attached to a communications cable.

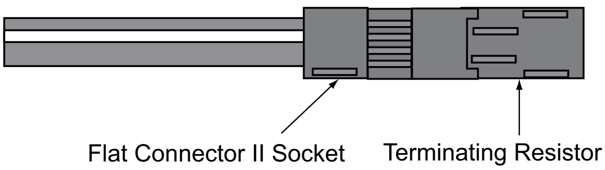


Hold the Flat Connector Plug with the white line of the cable facing to the left. Push the Connector Plug into the Connector Socket until it clicks into place.

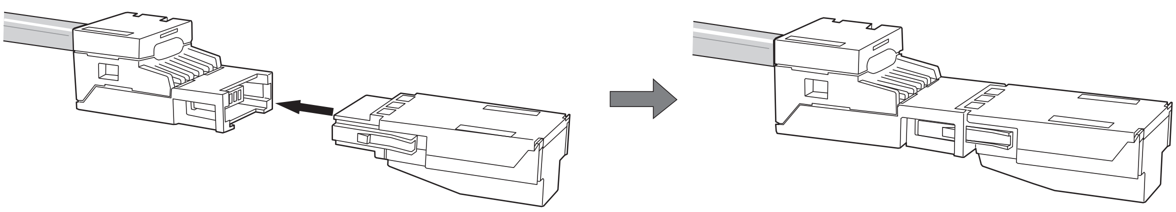


Connecting a Terminating Resistor

Connect a DCN5-TM4 Terminating Resistor to a DCN5-TR4 Flat Connector II Socket which has already been attached to the communications cable.



Push the Resistor until it clicks into place.



To remove the attached Resistor, hold the latches on both sides of the Resistor and pull out the Resistor.

2-4 Connecting the Communications Power Supply

Communications power supply unit provides power to the connected Slave Units and their internal circuits so that the CompoNet Network can operate and the Slave Units can communicate. Power supplying method differs by cable type.

2-4-1 Specification of Communications Power Supply

The communications power supply must meet the following specifications.

Item	Specification
Output voltage	24 VDC ± 10%
Output ripple	600 mVp-p
Output current	Use a power supply that has a capacity equivalent or exceeding the following total current consumption: - The current consumption of all of Word Slave Units and Repeater Units - The current consumption of all of Bit Slave Units and their external I/O devices
Insulation	Commercially available power supply units can be used. An OMRON S82-series Power Supply Unit is recommended, however, as to supply communications power to CompoNet Slave Units.

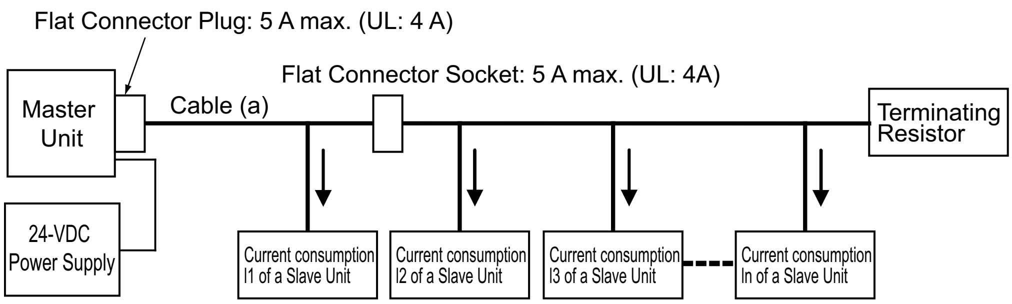
Commercially available power supply units can be used. An OMRON S82-series Power Supply Unit is recommended, however, as to supply communications power to CompoNet Slave Units.

2-4-2 Points to Pay Attention

Attentions should be paid for allowable currents of cables and connections, voltage drop, and capacity and location of power supplies, when the communications power is supplied.

Consideration for Allowable Current Restrictions

The total current consumption of all Slave Units must not exceed the allowable limit for the communications cables and connectors. Otherwise the cables and connectors may have heat or burnout.



- Allowable Currents for Cables

The communications cable must have a larger capacity than the total current consumed by all Slave Units.

Allowable current on the communications cable ≥ $I_1 + I_2 + I_3 + . . . I_n$ (The current for the part “a” on the above diagram)

- Allowable Currents for Connectors

The communications power supply connectors for the Master Unit and Repeater Units, Flat Connector Sockets, Flat Connector Plugs, and Multidrop Connectors have allowable current limits. The current flow on the points where these connectors are used must not exceed the limits.

Connector name	Model	Allowable current limit
Communications power supply connectors on CS/CJ Master Units	CS1W-CRM21	5A (UL: 4A)
	CJ1W-CRM21	
Communications power supply connector on Repeater Units	CRS1-RPT01	
Flat Connector Sockets	DCN4-TR4	
	DCN5-TR4	
Flat Connector Plugs	DCN4-BR4	
	DCN5-BR4	
Multidrop Connectors	DCN4-MD4	

Consideration for Voltage Drop

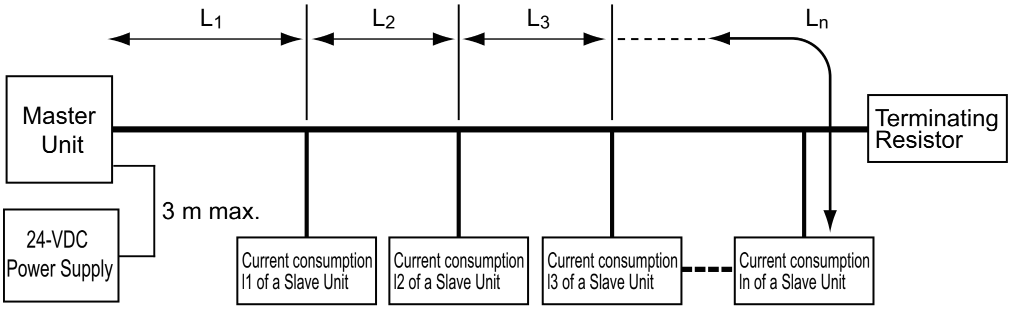
- Cable Voltage Drop

Consideration must be given to voltage drop so that the power voltage on the farthest Slave Unit from the power supply remains within the allowable supply range. The voltage drop is expressed by the following formula.

Voltage drop (V) = Current flow (A) x Cable conductor resistance (Ω/m) x Cable length (m) x 2

If the voltage drop is too large and the power supplied to the farthest Slave Unit exceeds the allowable range, a Repeater Unit must be added and the power must be supplied from the Repeater Unit.

<Calculation Example>



The allowable power supply voltage range for Slave Units is 14.0 to 26.4 VDC. If a 24-VDC power supply is used, the allowable voltage drop is 10 V.
The following formula expresses the relation between the available cables and the permissible cable extension length:

$$10\ (V) \geq \{ (I_1 + I_2 + I_3 + \ldots + I_n) \times R_1 \times L_1 \times 2 \} + \{ (I_2 + I_3 + \ldots + I_n) - R_2 \times L_2 \times 2 \} + \{ (I_3 + \ldots + I_n) \times R_3 \times L_3 \times 2 \} + \ldots + \{ I_n \times R_n \times L_n \times 2 \}$$

Use the following approximation formula if you want to add some margin in the cable selection.

$$10\ (V) \geq \{ (I_1 + I_2 + I_3 + \ldots + I_n) \times R \times L \times 2 \}$$

Where R is the cable conductor resistance, 0.025 Ω/m, for a Flat Cable.

When a Flat Cable is used, the extendable length is:

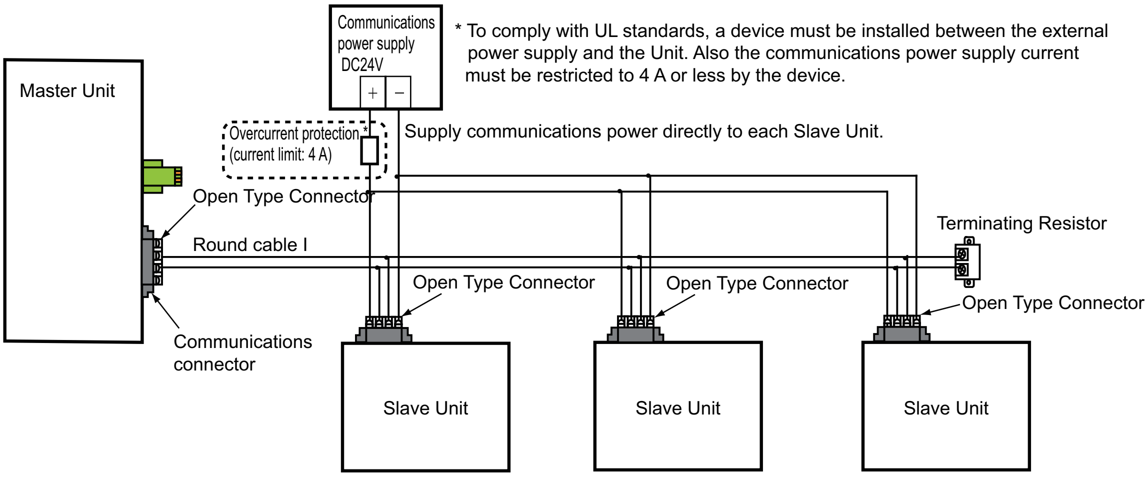
$$L\ (m) \leq 200 \div (I_1 + I_2 + I_3 + \ldots + I_n)$$

Consideration for Power Supply Errors

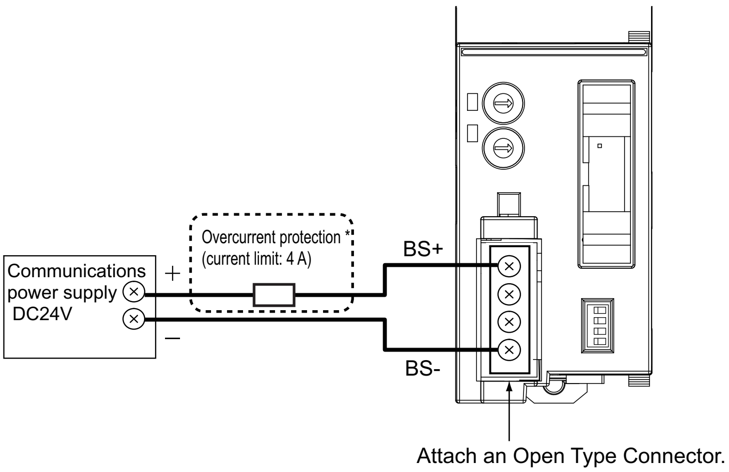
A system can be stopped entirely if a power supply error occurs. When you want to avoid stopping the full system stop to assure the system security, you may consider providing several power supplies in a network, and group the Slave Units with individual power supplies.

2-4-3 When Round Cable I is used

The Communications power cannot be supplied on the communications cable. The power is supplied individually through the power supply terminal of the communications connector provided on each Slave Unit.



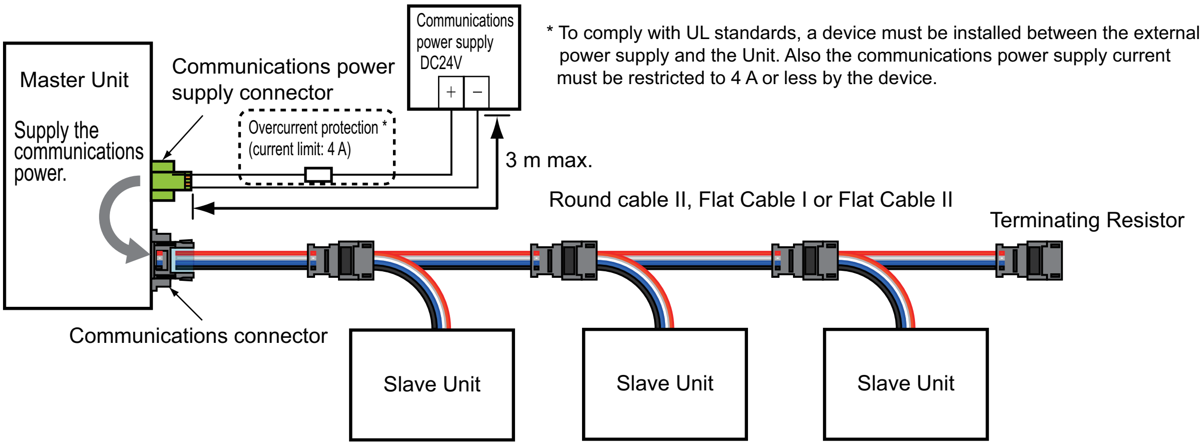
A DCN4-TB4 Open Type Connector is attached to the communications connector to convert the connector to a screw terminal block. Then the power supply line is connected to the block.



"To comply with UL standards, a device must be installed between the external power supply and the Unit. Also the communications power supply current must be restricted to 4 A or less by the device."

2-4-4 When Round Cable II, Flat Cable I or Flat Cable II is used

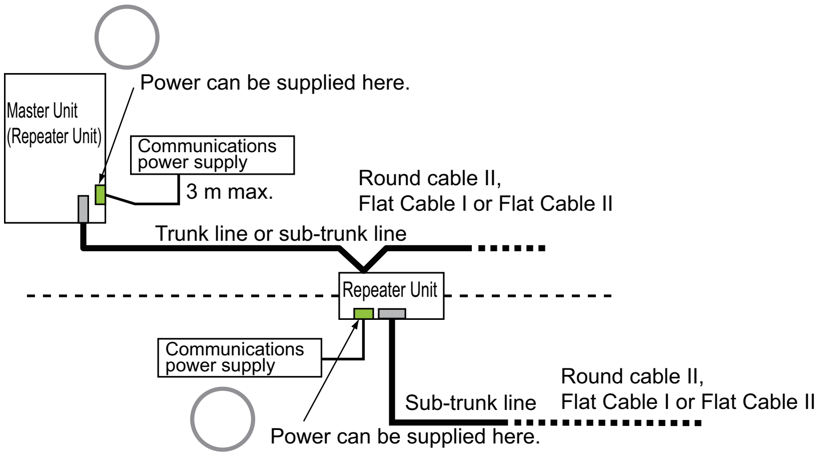
The Communications power is supplied to the communications power supply connectors, i.e., BS+ and BS- terminals, on the Master Unit or the Repeaters Units. It is then supplied directly to all Slave Units connected by round cable II, Flat Cable I or Flat Cable II.

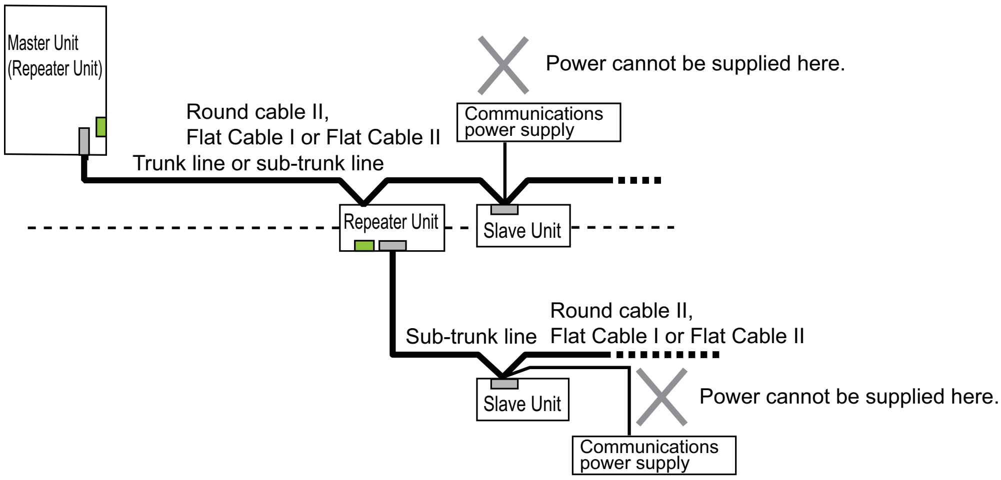


Restrictions

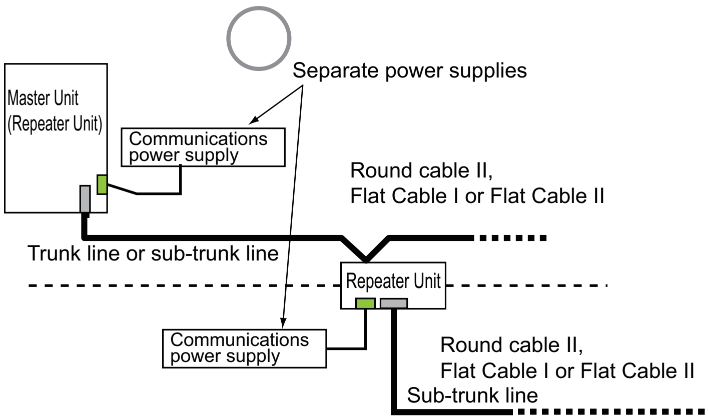
These are the restrictions on the use of round cable I, Flat Cable I or Flat Cable II for supplying communications power. If they are not observed, the quality of communications will decrease and normal communications may not be maintained.

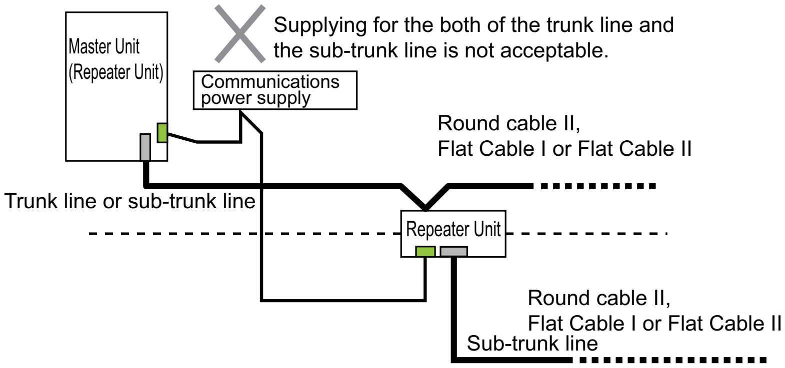
- There must be only one communications power supply for a trunk line or a sub-trunk line. This means a trunk line or a sub-trunk line must not have two or more power supplies, and a power supply must not be used to provide power for more than one trunk line or a sub-trunk line.
- The cable between the communications power supply and the communications power supply connector on the Master Unit must be no longer than 3 m.
- Communications power from the Master Unit to the trunk line can be supplied only through the communications power supply connector on the Master Unit. Communications power from the Repeater Units to sub-trunk lines can be supplied only through the communications power supply connectors on the downstream ports or the Repeater Units. The power must be not supplied from any other connectors than above.





A separate communications power supply must be provided each for the trunk line from the Master Unit or the trunk line upstream the Repeater Unit, and for the sub-trunk line downstream the Repeater Unit.





Master Unit (Repeater Unit)
Supplying for the both of the trunk line and the sub-trunk line is not acceptable.
Communications power supply
Round cable II,
Flat Cable I or Flat Cable II
Trunk line or sub-trunk line
Repeater Unit
Round cable II,
Flat Cable I or Flat Cable II
Sub-trunk line

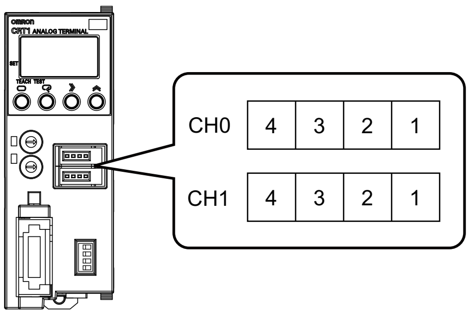
2-5 Connecting to External I/O Devices

This section explains the connection of sensors and other external devices to the I/O connectors on Analog I/O Slave Units. There are e-CON connector and MIL connector types.

2-5-1 Arrangement and Wiring of I/O Connector Terminals

e-CON connector type Analog Input Slave Units, CRT1-VAD02SD

- Terminal Arrangement

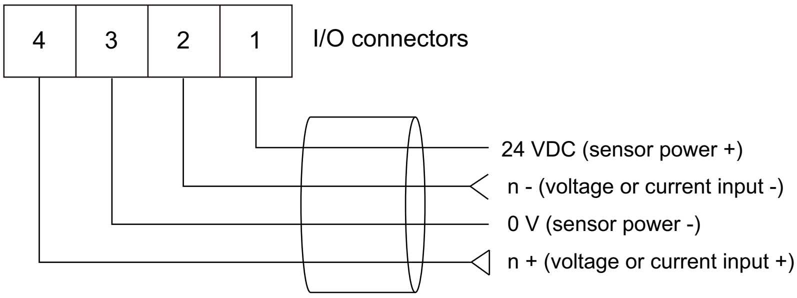


Pin No.	Signal
1	24 VDC (sensor power +)
2	n- (voltage or current input -)
3	0 V (sensor power -)
4	n+ (voltage or current input +)

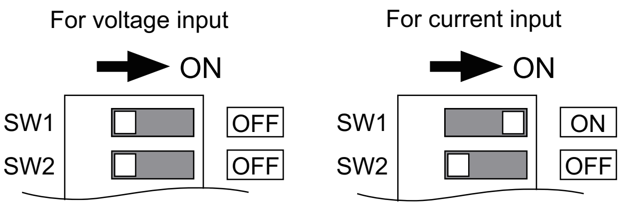
The letter “n” represents the Channel No., i.e., either Channel 0 or Channel 1.

• Wiring and Switch Setting

• 4-wired sensors

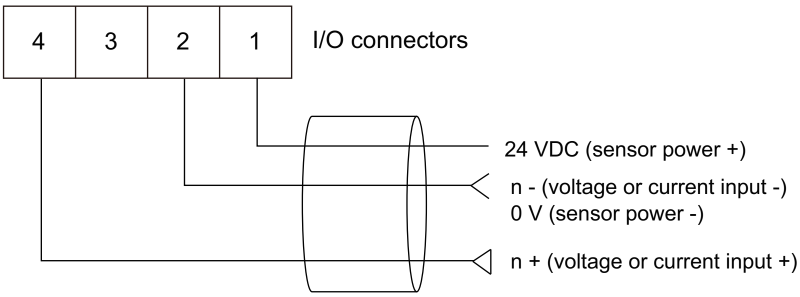


Setting of Mode setting switches (for Channel 0)*

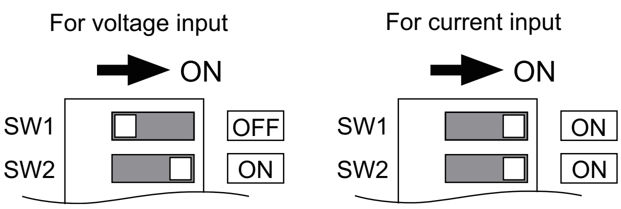


* For Channel 1, Pin No.3 and 4 are to be set in the same manner as Pin No.1 and 2 respectively.

• 3-wired sensors

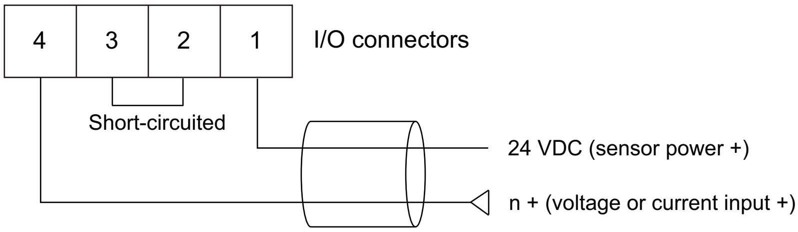


Setting of Mode setting switches (for Channel 0)*

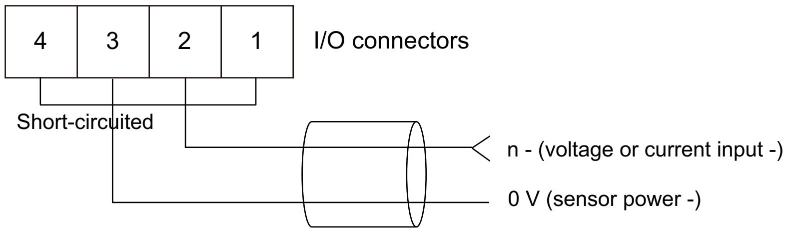


* For Channel 1, Pin No.3 and 4 are to be set in the same manner as Pin No.1 and 2 respectively.

- 2-wired sensors



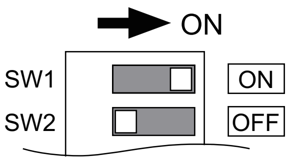
or



Actual wiring may differ by the sensor type to be connected.

Setting of Mode setting switches (for Channel 0) *

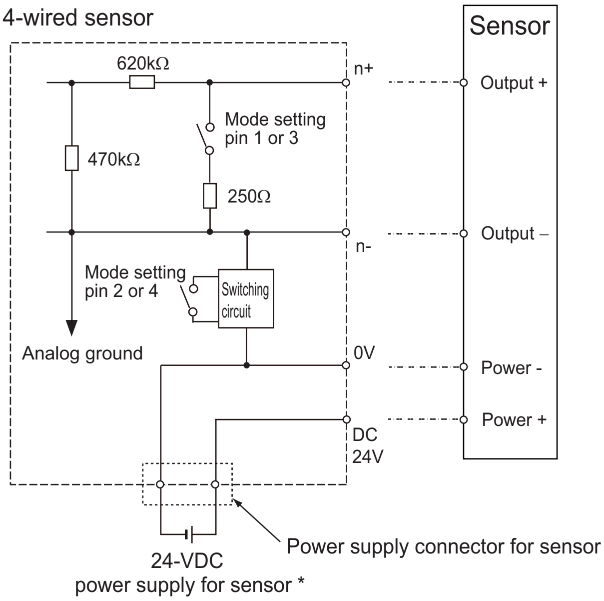
For current input



* For Channel 1, Pin No.3 and 4 are to be set in the same manner as Pin No.1 and 2 respectively.

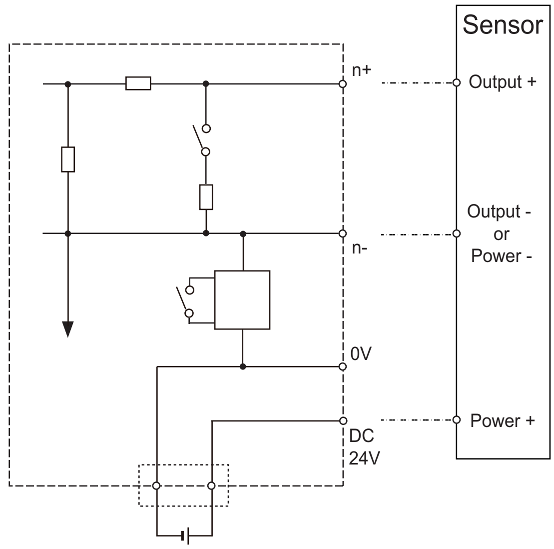
- Internal Circuit and Wire Connection

• 4-wired sensor

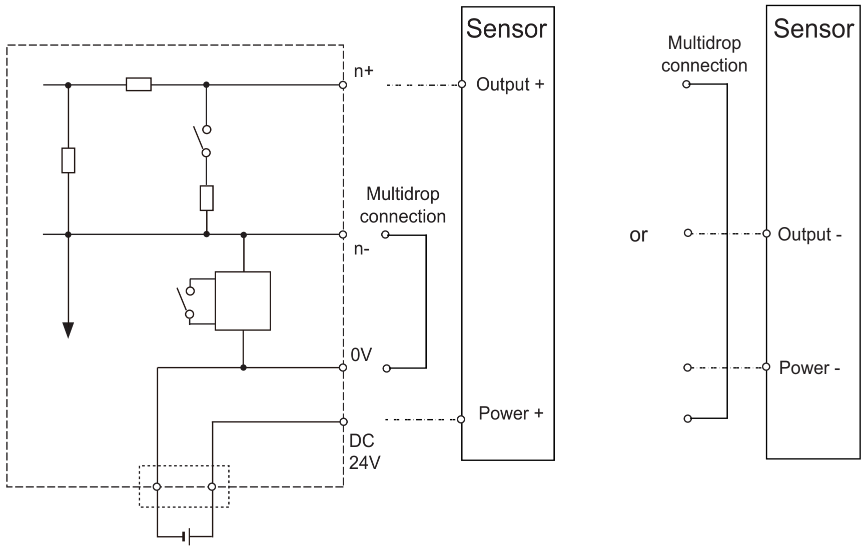


* Power is supplied externally.

• 3-wired sensor

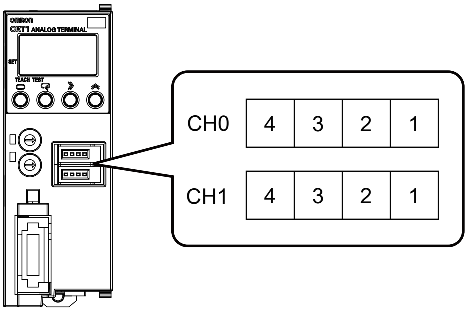


• 2-wire sensor



e-CON connector type Analog Output Slave Units, CRT1-VDA02SD

- Terminal Arrangement

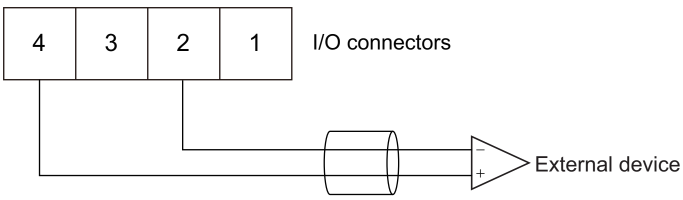


Pin No.	Signal
1	N.C.
2	n- (voltage or current output -)
3	In+ (current output +)
4	Vn+ (voltage output +)

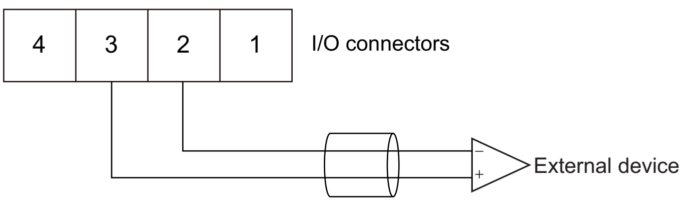
The letter “n” represents the Channel No., i.e., either Channel 0 or Channel 1.

- Wiring

- For voltage output

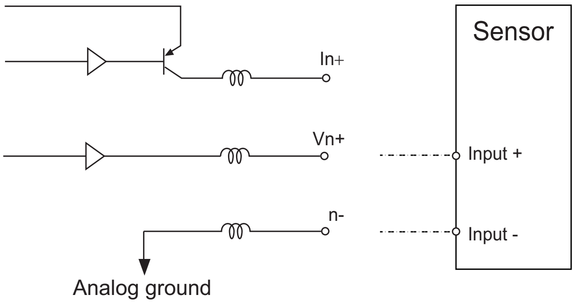


- For current output



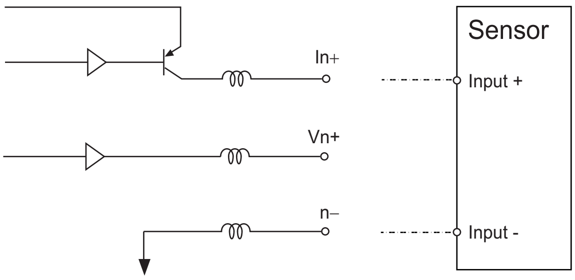
- Internal Circuit and Wire Connection

- For voltage output



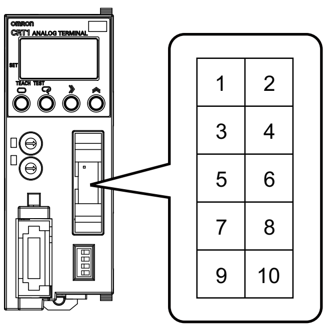
The two minus terminals on Output 0 and 1 are internally connected.

- For current output



MIL connector type Analog Input Slave Units, CRT1-VAD02MLD

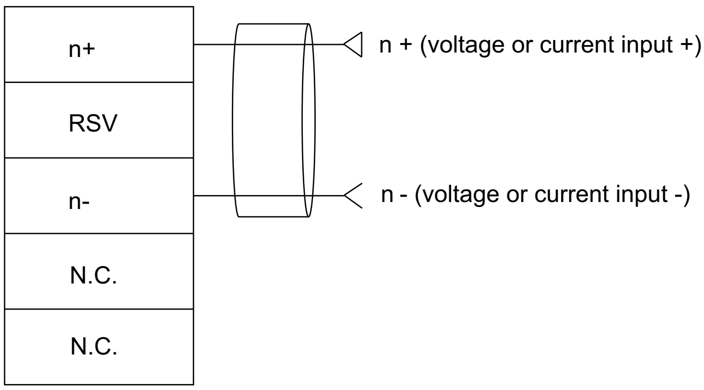
- Terminal Arrangement



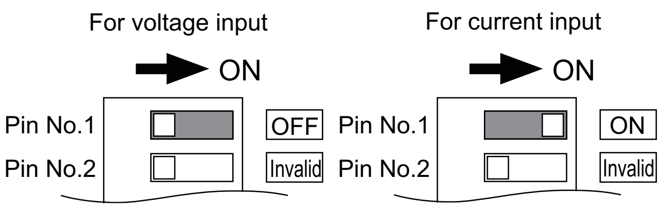
Pin No.	Signal	Pin No.	Signal
1	0+ (voltage or current input +)	2	1+ (voltage or current input +)
3	RSV *	4	RSV *
5	0- (voltage or current input -)	6	1- (voltage or current input -)
7	N.C.	8	N.C.
9	N.C.	10	N.C.

* Do not connect anything to the RSV terminals.

- Wiring and Switch Setting

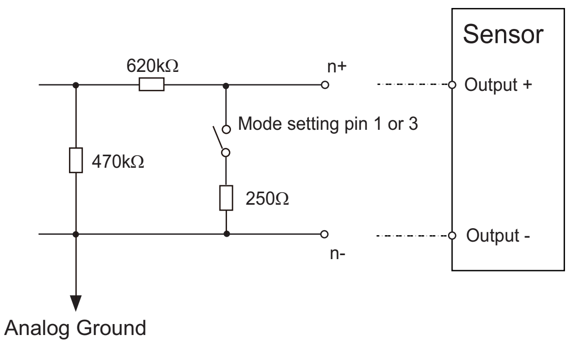


Setting of Mode setting switches (for Channel 0) *



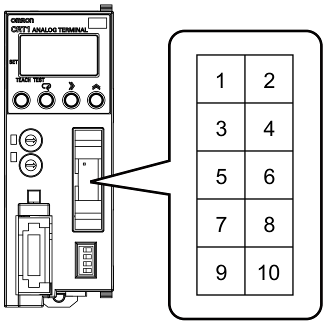
* For Channel 1, Pin No.3 and 4 are to be set in the same manner as Pin No.1 and 2 respectively.

- Internal Circuit and Wire Connection



MIL connector type Analog Output Slave Units, CRT1-VDA02MLD

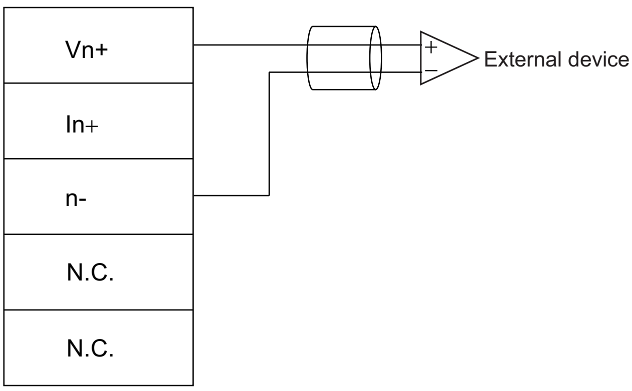
- Terminal Arrangement



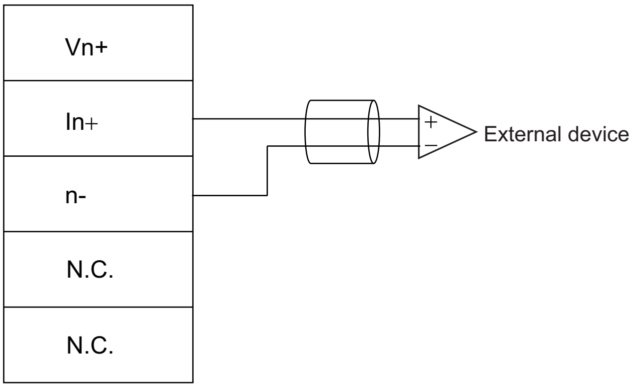
Pin No.	Signal	Pin No.	Signal
1	V0+ (voltage output +)	2	V1+ (voltage output +)
3	I0+ (current output +)	4	I1+ (current output +)
5	0- (voltage or current output -)	6	1- (voltage or current output -)
7	N.C.	8	N.C.
9	N.C.	10	N.C.

- Wiring

- For voltage output

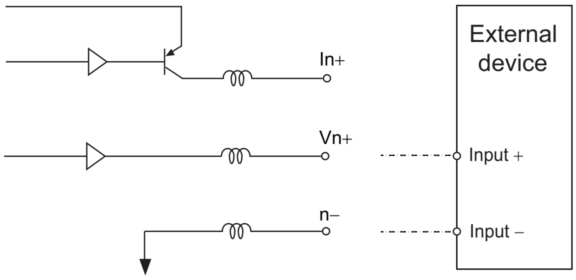


- For current output

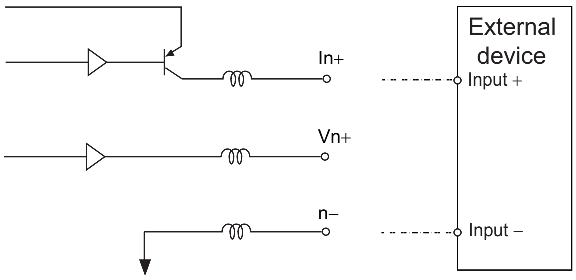


- Internal Circuit and Wire Connection

- For voltage output

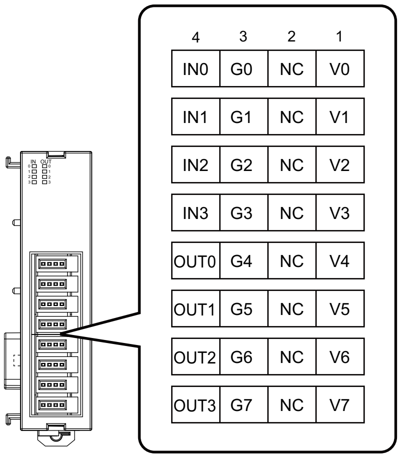


- For current output



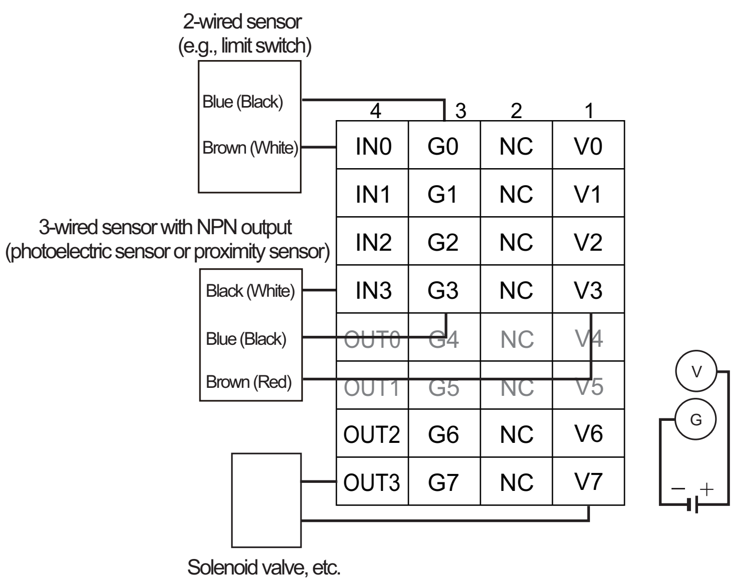
e-CON connector type 4-input and 4-output Expansion Unit (XWT-VMD08S (-1))

- Terminal arrangement

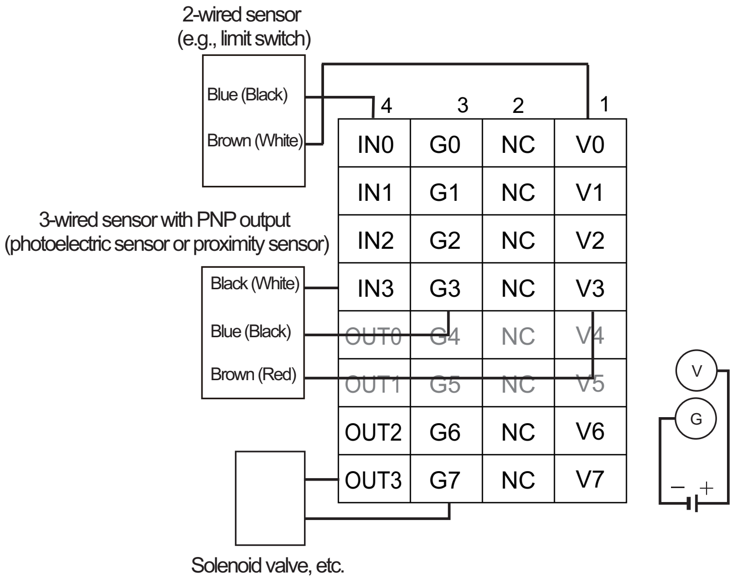


- Wiring

- XWT-VMD08S (NPN)

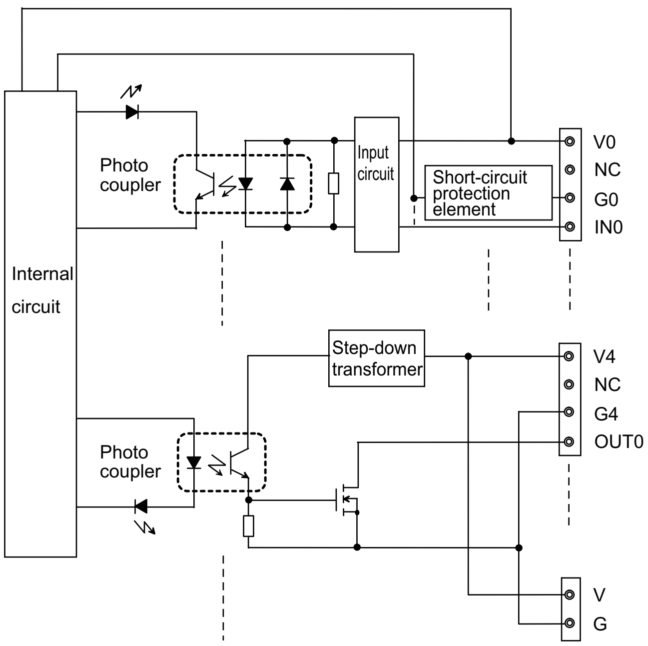


- XWT-VMD08S-1 (PNP)

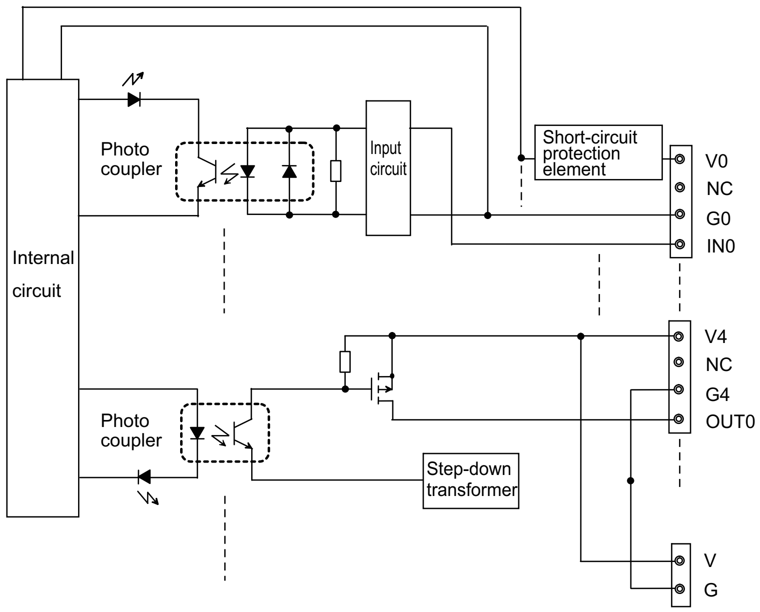


- Internal circuit

- XWT-VMD08S (NPN)

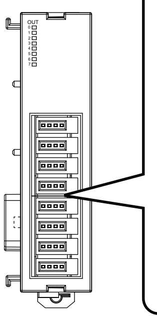


- XWT-VMD08S-1 (PNP)



e-CON connector type 8-output Expansion Unit (XWT-VOD08S (-1))

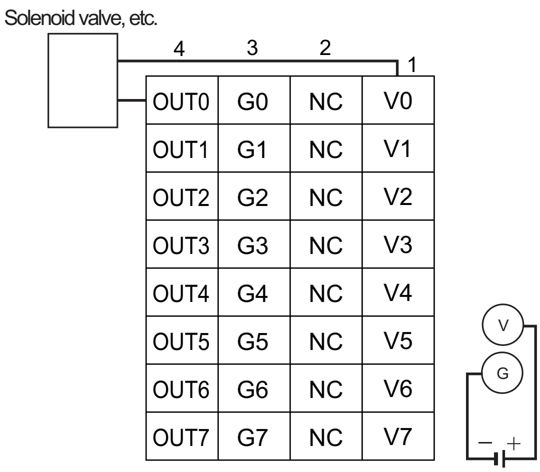
- Terminal arrangement



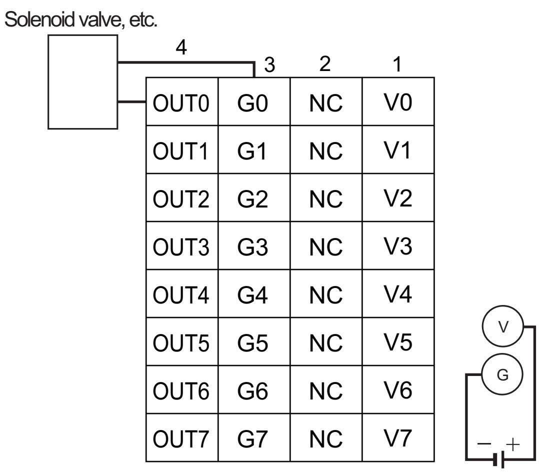
4	3	2	1
OUT0	G0	NC	V0
OUT1	G1	NC	V1
OUT2	G2	NC	V2
OUT3	G3	NC	V3
OUT4	G4	NC	V4
OUT5	G5	NC	V5
OUT6	G6	NC	V6
OUT7	G7	NC	V7

- Wiring

- XWT-VOD08S (NPN)

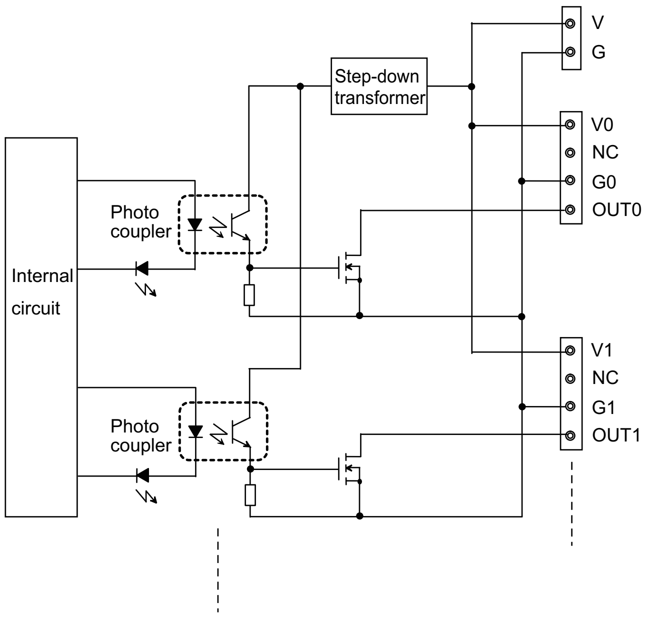


- XWT-VOD08S-1 (PNP)

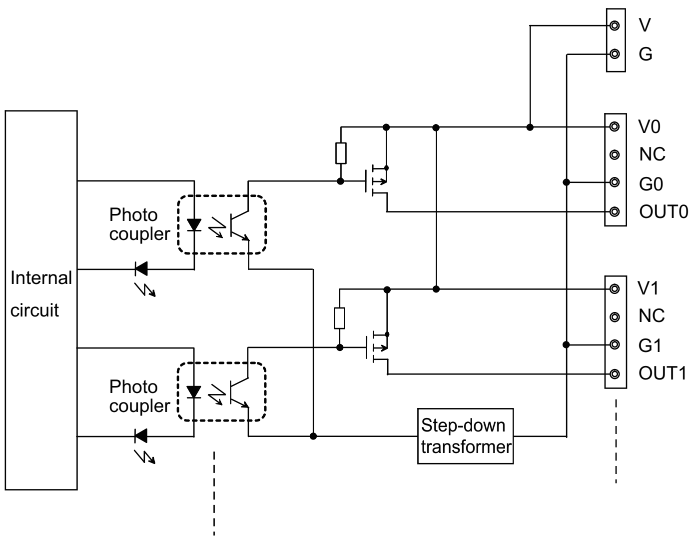


- Internal circuit

- XWT-VOD08S (NPN)

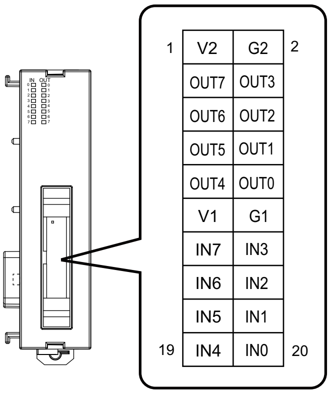


- XWT-VOD08S-1 (PNP)



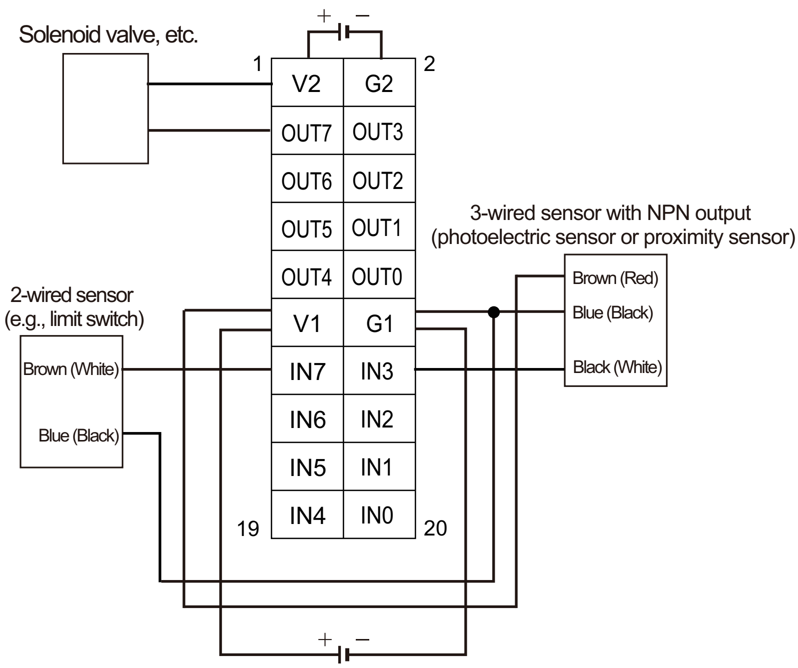
MIL connector type 8-input and 8-output Expansion Unit (XWT-VMD16ML (-1))

- Terminal arrangement

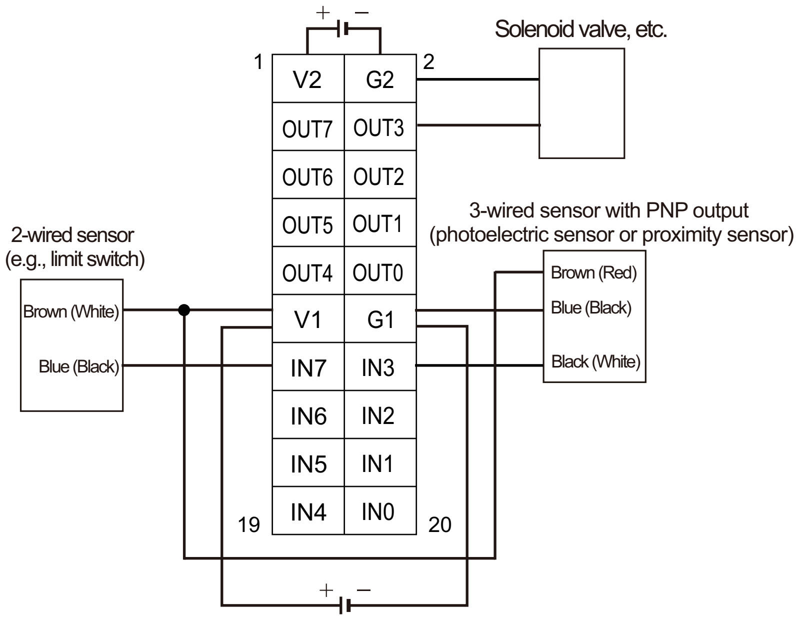


- Wiring

- XWT-VMD16ML (NPN)

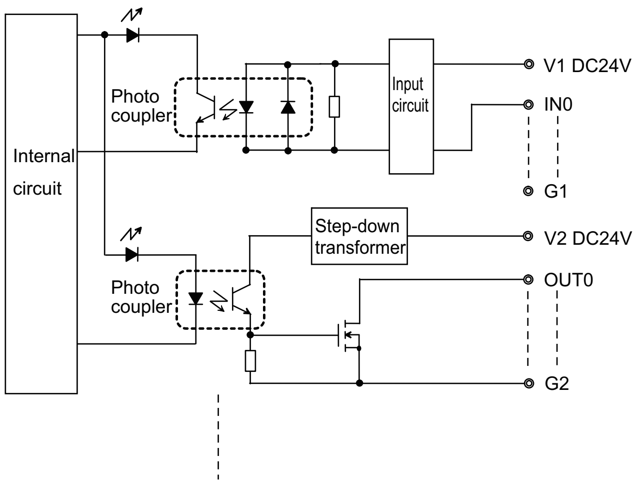


- XWT-VMD16ML-1 (PNP)

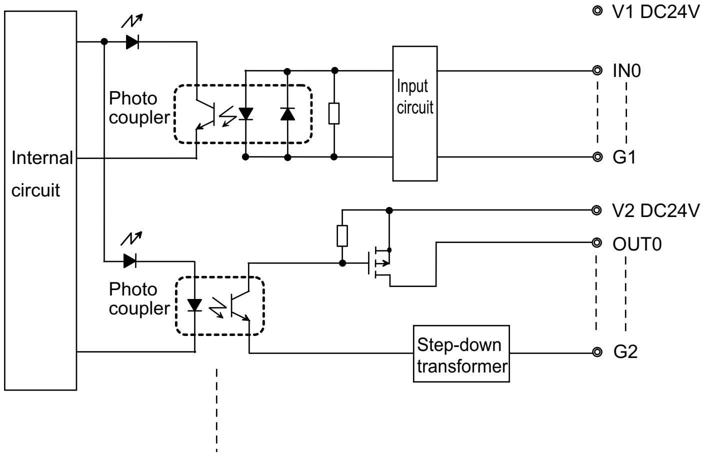


- Internal circuit

- XWT-VMD16ML (NPN)

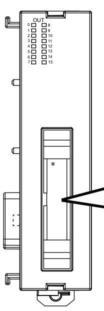


- XWT-VMD16ML-1 (PNP)



MIL connector type 16-output Expansion Unit (XWT-VOD16ML (-1))

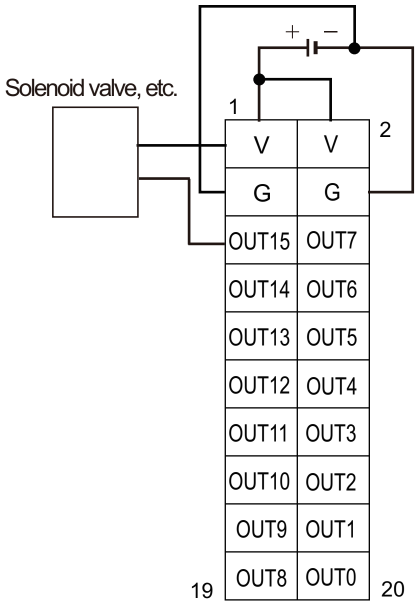
- Terminal arrangement



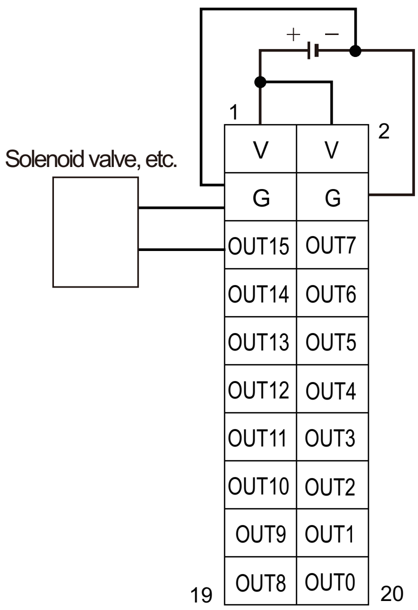
1	V	V	2
	G	G	
	OUT15	OUT7	
	OUT14	OUT6	
	OUT13	OUT5	
	OUT12	OUT4	
	OUT11	OUT3	
	OUT10	OUT2	
	OUT9	OUT1	
19	OUT8	OUT0	20

- Wiring

- XWT-VOD16ML (NPN)

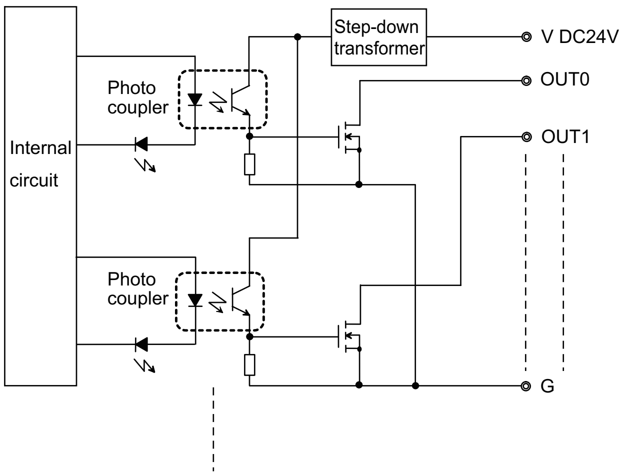


- XWT-VOD16ML-1 (PNP)

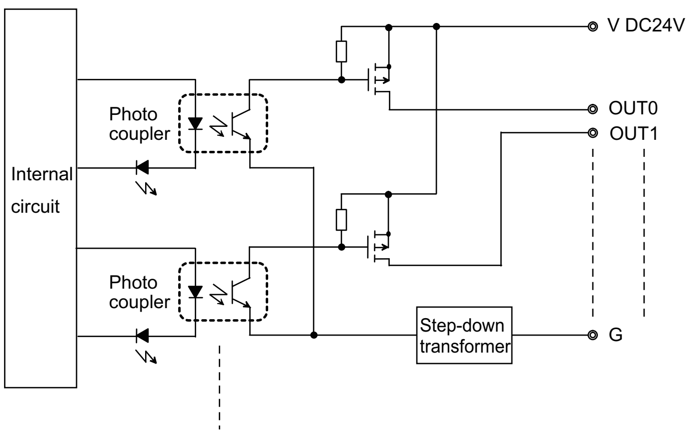


- Internal circuit

- XWT-VOD16ML (NPN)



- XWT-VMD16ML-1 (PNP)

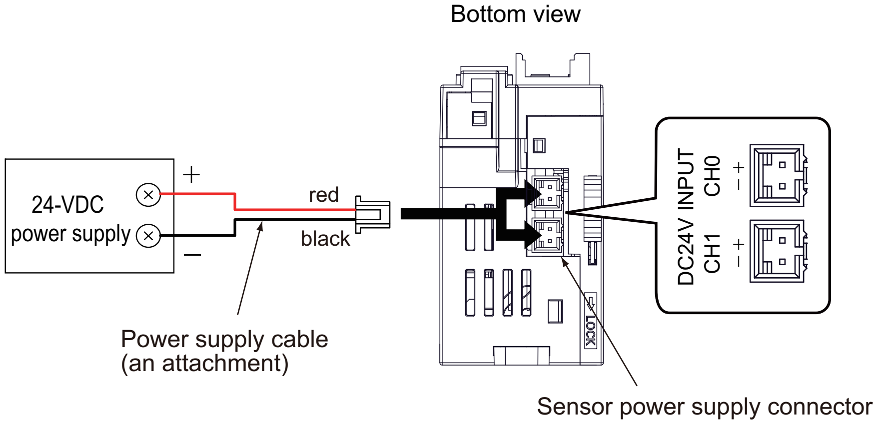


2-5-2 Connecting the Power Supply for External Devices

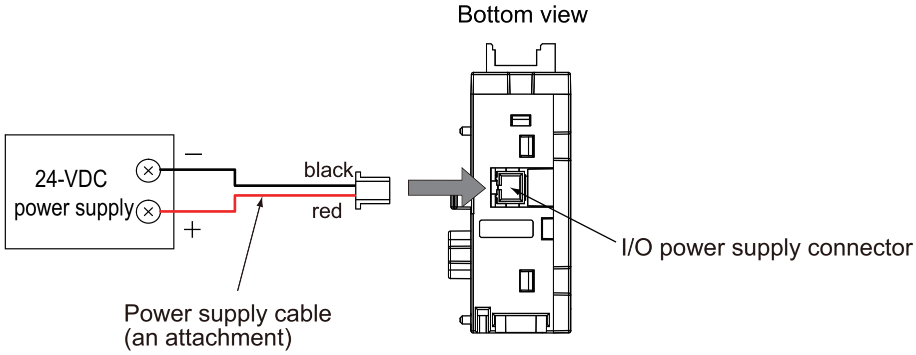
When an e-CON connector type Analog Input Slave Unit or Expansion Unit is used, and the external device power is supplied through the I/O connector, a 24-VDC power supply must be connected to the dedicated power supply connector on the Unit.

Strip the attached power cable of the sheath. Connect the wires of power cable to the terminals of 24-VDC power supply unit. Connect the power cable connector to the sensor power supply connector provided on the bottom face of the Slave or Expansion Unit.

- Analog Input Slave Unit (CRT1-VAD02SD)



- Expansion Unit (XWT-VMD08S (-1) or XWT-VOD08S (-1))



2-5-3 Connecting to I/O Connectors (with e-CON Connectors)

A dedicated cable connector of e-CON connector type is attached to the cable of external device to be connected to a Slave Unit.

Confirming E-CON connector type and Applicable Cable Wire Size

The applicable wire size and sheath diameter of the external device cables differ from the cable connector types. The table below must be used to see the conformity.

- Connectors made by Tyco Electronics AMP

Model	Housing color	Applicable wire size of cable	
3-1473562-4	Orange	Sheath outer diameter ϕ 0.6 - 0.9 mm	Cross-sectional area : 0.08 - 0.5 mm^2
1-1473562-4	Red	Sheath outer diameter ϕ 0.9 - 1.0 mm	
1473562-4	Yellow	Sheath outer diameter ϕ 1.0 - 1.15 mm	
2-1473562-4	Blue	Sheath outer diameter ϕ 1.15 - 1.35 mm	
4-1473562-4	Green	Sheath outer diameter ϕ 1.35 - 1.60 mm	

- Connectors made by Sumitomo 3M

Model	Housing color	Applicable wire size of cable
37104-3101-000FL	Red	AWG26 (0.14 mm^2) - AWG24 (0.2 mm^2) Sheath outer diameter ϕ 0.8 - 1.0 mm
37104-3122-000FL	Yellow	AWG26 (0.14 mm^2) - AWG24 (0.2 mm^2) Sheath outer diameter ϕ 1.0 - 1.2 mm
37104-3163-000FL	Orange	AWG26 (0.14 mm^2) - AWG24 (0.2 mm^2) Sheath outer diameter ϕ 1.2 - 1.6 mm
37104-2124-000FL	Green	AWG22 (0.3 mm^2) - AWG20 (0.5 mm^2) Sheath outer diameter ϕ 1.0 - 1.2 mm
37104-2165-000FL	Blue	AWG22 (0.3 mm^2) - AWG20 (0.5 mm^2) Sheath outer diameter ϕ 1.2 - 1.6 mm
37104-2206-000FL	Gray	AWG22 (0.3 mm^2) - AWG20 (0.5 mm^2) Sheath outer diameter ϕ 1.6 - 2.0 mm

- Connectors made by Panasonic

Model	Housing color	Applicable wire size of cable
AXF12142	Blue	AWG22 (0.3 mm^2) - AWG20 (0.5 mm^2) Sheath outer diameter ϕ 1.2 - 2.0 mm
AXF12146	Red	AWG28 (0.08 mm^2) - AWG24 (0.2 mm^2) Sheath outer diameter ϕ 0.7 - 1.2 mm

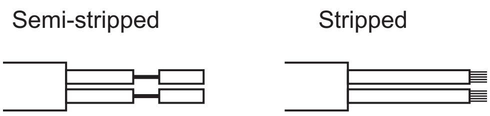
- Connectors made by Omron

Model	Type	Applicable wire size of cable
XN2A-1430	Spring clamp	AWG28 (0.08 mm^2) - AWG20 (0.5 mm^2) Sheath outer diameter ϕ 1.5 mm max

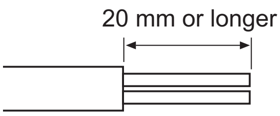
Preparing Cables for connecting with External Devices

- Using a connector made by Tyco Electronics AMP, Sumitomo 3M, or Panasonic:

The cables of sensors and other external devices are normally semi-stripped or stripped.

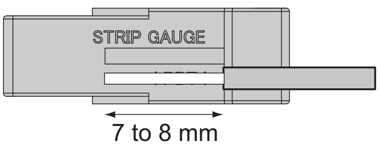


They are not yet ready to have the cable connectors attached. Cut the cable sheath on the tip, and stripped off the cable sheath. Do not strip the sheaths of the wires.



- Using a connector made by OMRON:

Align the cable on the STRIP GAUGE label written on the side of the connector. Remove the wiring sheath for 7 to 8 mm. Twist the exposed wires several times.



Inserting the Cable Wires into the Cable Connector

The wires of connected device cable are inserted into and connected with the cable connector. Wire colors differ by the devices to be connected. See the catalogue for the particular device.

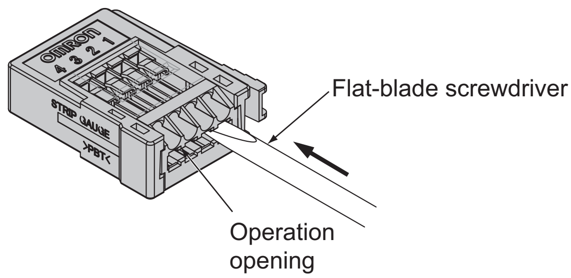
- Using a connector made by Tyco Electronics AMP, Sumitomo 3M, or Panasonic:

1. Insert each cable wire all the way into the opening on the cable connector cover.

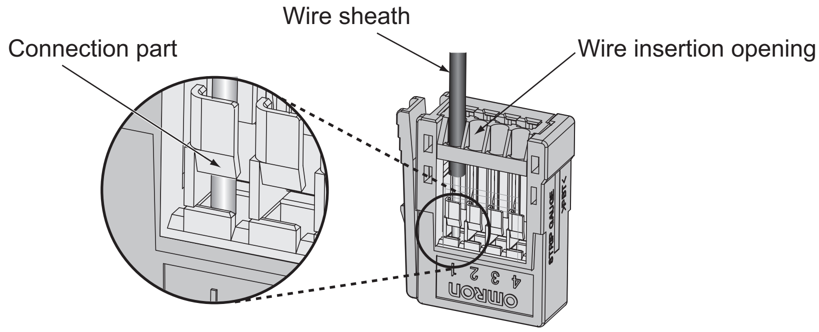
2. Use tools, such as pliers, to push the cover straight inward the body until the cover is parallel to the body.

- Using a connector made by OMRON:

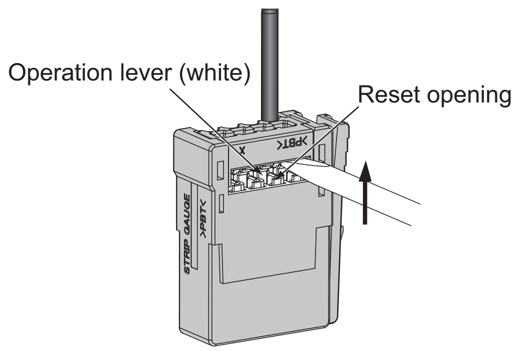
1. Insert a flat-blade screwdriver into the operation opening on the connector, and push the operation lever inside until it locks.



2. Insert the wire all the way into the back of the wire insertion opening.
   After you insert it, check that the wire sheath is inserted deeper into the wire insertion opening, and that the conductor tip passes through the connection part.



3. Insert a flat-blade screwdriver into the reset opening, and pull back the lever lightly.
   The operation lever sounds click and returns to its normal position.



4. Lightly pull the wire to confirm that it is connected properly.

Precautions for Correct Use

For removing the wire, Push the operation lever into the operation opening, and confirm the operation lever is locked. Then pull out the wire. After removing the wire, always return the operation lever to its normal position.

2-5-4 Connecting to I/O Connectors (with MIL Connectors)

A connection cable is prepared by one of the following two methods. It is then hooked to the I/O connector of the Unit.

- Pressure-welding a Flat Cable to a MIL type Socket, and
- Pressure-welding a hard-wiring cable to a MIL Connector.

Pressure-welding a Flat Cable to a MIL type Socket

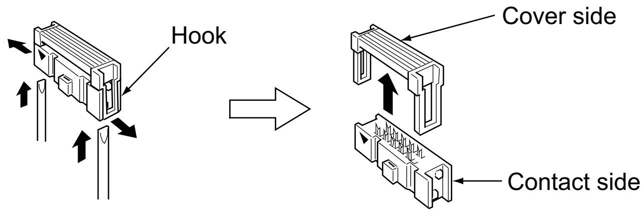
A Flat Cable is pressure-welded to a MIL type Socket as listed in the table below, and prepared to be a connection cable. See the Connectors Group Catalog, Cat. No. G015, for the details of each component.

- Required components

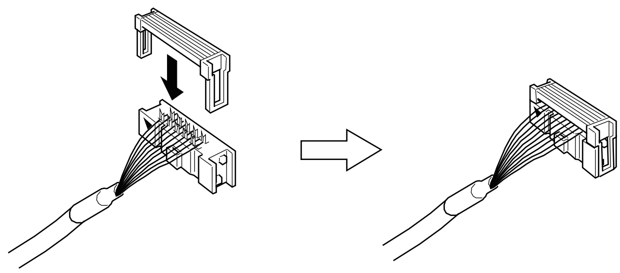
Product	Specification		Model	Remark
MIL type Socket	No strain relief	Not polarity guided	XG4M-1031	Strain relief model, XG4T-1004 (sold separately)
		Polarity guided	XG4M-1030	
	Accompanied by a strain relief	Not polarity guided	XG4M-1031-T	-
		Polarity guided	XG4M-1030-T	

- Preparation procedure

1. Use a fine flat-bladed screwdriver, and open the hooks at both ends of the MIL Connector Socket. Separate the Socket into the contact side and the cover side. There are two latches at each end of the contact side of Socket.
Altogether there are four latches. Release the bottom latches on both sides at the same time, then the upper two. Do not attempt to release two latches on one side without releasing any latches on the other side.

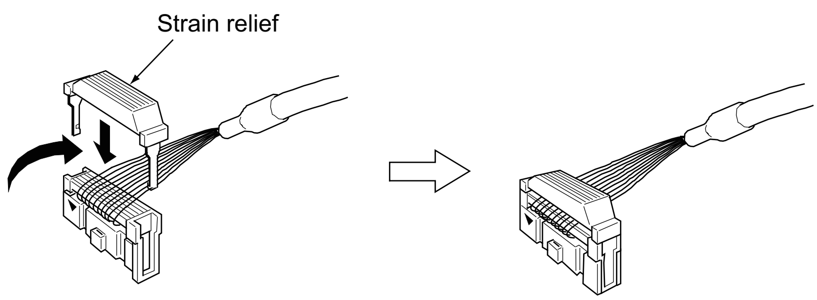


2. Align the Flat Cable on the contact side, and line up with the contacts. Place the cover side over the contact side, and align their position. Lock them in place.
Use a tool such as a vise to firmly press the both sides together until they mesh with the latches.



Applicable wires for pressure-welding: 1.27-mm pitch Flat Cable (7 stranded wires)
UL2651 (Standard cable)
UL20012 (Folding cable)
UL20028 (Color-coded cable)

3. Bend back the cable as required, insert a Strain Relief, and lock the cable in place.



Pressure-welding a Hard-wire Cable to a MIL Connector

Follow these procedures to pressure-weld a hard-wire cable to a MIL Connector, and prepare a connection cable.

Choose applicable components, form the table below, for the cable wire size in use. Assemble them to make a connector. See the Connectors Group Catalog, Cat. No. G015, for the details of each component.

Component		Wire size AWG24	Wire size AWG28 to 26
Socket	Not polarity guided	XG5M-1031-N	XG5M-1034-N
	Polarity guided	XG5M-1032-N	XG5M-1035-N
Semi-cover *		XG5S-0501	

* Two Semi-covers are required per Connector.

3

General Specifications

3-1 General Specifications

Items	Specifications
Communications power voltage	14.0 to 26.4 VDC
Noise immunity	Conform to IEC61000-4-4, 2 kV (power line)
Vibration resistance	10 to 150 Hz, double amplitude 0.7 mm or 50 m/s^2
Shock resistance	150 m/s^2 (three times each in 6 directions of 3 axes)
Dialectic resistance	500 VAC (between insulated circuits)
Insulation resistance	20 MΩ min (between insulated circuits)
Ambient operating temperature	-10 to +55 °C
Ambient operating humidity	25 to 85 % (with no condensation)
Ambient operating atmosphere	No corrosive gas
Storage temperature	-25 to +65 °C
Storage humidity	25 to 85 % (with no condensation)
Installation method	DIN Track 35mm or Mounting Bracket (for Expansion Units excluded)

4

Features of Analog Input and Output Slave Units

4-1 Feature of Analog Input and Output Slave Units

Analog I/O Slave Units are equipped with a variety of functions. In addition to AD and DA conversion of analog input and output data, supported functions include scaling and peak/bottom hold. Also Analog Input Slave Units, in particular, can internally perform math operation on analog input values, which previously required ladder programming at the high level PLC.
In addition, the data calculated using these functions can be selected as “Analog Data”. They are allocated to I/O memory on the Master Unit, in combination with status information. Function setting, data allocation and monitoring can be easily performed on the Slave Unit or by CX-Integrator.

4-1-1 Main Features

CompoNet Analog I/O Slave Units have these features.

- Thin and Compact

With the use of I/O connectors, the size of an Analog I/O Slave Unit is reduced to 35 mm in width. Thus the Unit can be installed even in a narrow space, and consequently can downsize the device size.

- Easy Data Monitoring and Parameter Setting on the Unit

The numerical indicator provided on the Unit body allows on-site data monitoring and parameter setting. No bothersome operation of testers or support software is required. Data can also be entered into and retrieved from the Unit itself.

- Bit-level Distribution

The Units have just a few I/O points. This allows bit-level distribution of I/O points. The application can be flexibly constructed to match the space and capacity requirements.

- Channel Insulation (Analog Input Slave Units)

Each input or output channel is insulated. Thus no isolator is required. This reduces cost and space requirements.

- Directly Connectable e-CON Connectors

An industry standard sensor connector, i.e., e-CON connector, enables direct connections of the Slave Unit with external devices such as sensors. It can reduce wiring and maintenance man-hours.

- MIL Connectors with Less Wiring Labor

MIL connectors, widely used in the electronic components and semiconductor industries, help reduce wiring requirements. It also expands options of compatible I/O interfaces to include direct connections with external devices, and connection with terminal block conversion units.

- Automatic Baud Rate Detection

The Analog I/O Slave Unit automatically follows the data rate set on the Master Unit.

4-1-2 Main Functions

CompoNet Analog I/O Slave Units have following Smart functions. See Section 7 and 9 for details.

- Setting the Number of Channels to have AD Conversion (Analog Input Slave Units)

The AD conversion cycle can be shortened by reducing the number of channels to be converted or the number of available channels, if these channels are not used.

- Moving Average (Analog Input Slave Units)

It calculates the moving averages of the last eight inputs. This is to produce stable input values for conversion even if actual inputs make small fluctuations.

- Scaling (Analog Input and Output Slave Units)

In default scaling, the AD or DA converted data is scaled to values between 0 and 6000. You can also change the scaling value to a specific value used in your industry. This is called user scaling in contract to the default scaling. It reduces the ladder program operations by the Master Unit. Scaling also supports the offset function to compensate for errors in scaled values.

- Peak/Bottom Hold (Analog Input Slave Units)

The function is to hold the maximum (or peak) or minimum (or bottom) values entered to the Unit. It also compares the held value with the preset thresholds to determine an alarming or warning status. This comparison function is called comparator.

- Top/Valley Hold (Analog Input Slave Units)

The function is to hold the top value (or the value of a mountain top) or the valley value (or the value of a valley between adjacent two mountains) among all values entered to the Unit. It also compares the held value with the preset thresholds to determine an alarming or warning status. This comparison function is called comparator.

- Rate of Change Calculations (Analog Input Slave Units)

The function is to calculate the rate of change among the analog values entered to the Units for each preset sampling cycle.

- Comparator (Analog Input Slave Units)

It compares the analog values entered to the Unit or the calculated values with the preset thresholds, i.e. high high limit (HH), high limit (H), low limit (L), and low low limit (LL). If either is over the thresholds, the corresponding Alarming or Warning Status Flag or an analog status flag turns ON to indicate the status.

- Disconnected Line Detection (Analog Input Slave Units)

If a voltage or current input line of an Analog Input Unit is disconnected, the Disconnected Line Detection Flag or an analog status flag turns ON to indicate the status. This function is supported only when the set range is between 1 and 5 V for voltage input or between 4 and 20 mA for current input respectively.

- User Adjustment (Analog Input and Output Slave Units)

If input or output values have deviance, due to nature of connected external devices or to connecting conditions, the User Adjustment function offsets the deviation to adjust the input or output values.

- Cumulated Count (Analog Input and Output Slave Units)

The function is to calculate the integral time for analog input and output values, and to compare the results with the preset thresholds. If the calculated result exceeds the threshold, the warning status flag turns ON to indicate the status.

- Communications Error Output Setting (Analog Output Slave Units)

This function is to set a value to output when a communications error occurs. It can be set for each channel on an Analog Output Unit. The function is called Fault Action.

- Unit Conduction Time (or Power ON Time) Monitor (Analog Input and Output Slave Units)

It records the total time while the internal circuit of the Unit has had constant power distribution. A threshold can be set in the Unit, so that the warning status flag will be ON when the total time goes over the threshold.

- Naming the Unit (Analog Input and Output Slave Units)

A user can set a specific name to the Unit, and keep the name recorded in the Unit.

- Naming the Connected Devices (Analog Input and Output Slave Units)

A user can set a specific name to each channel on a Unit with which I/O devices such as sensors and valves are connected. The set names are recorded in the Unit.

- Network Power Voltage Monitor (Analog Input and Output Slave Units)

The function is to monitor the present, maximum or minimum value on network power supply voltage. It can also compare these values with the preset thresholds. If the voltage drops below the thresholds, the warning status flag turns ON to indicate the status.

- Communications Error History Monitor (Analog Inputs and Outputs Slave Units)

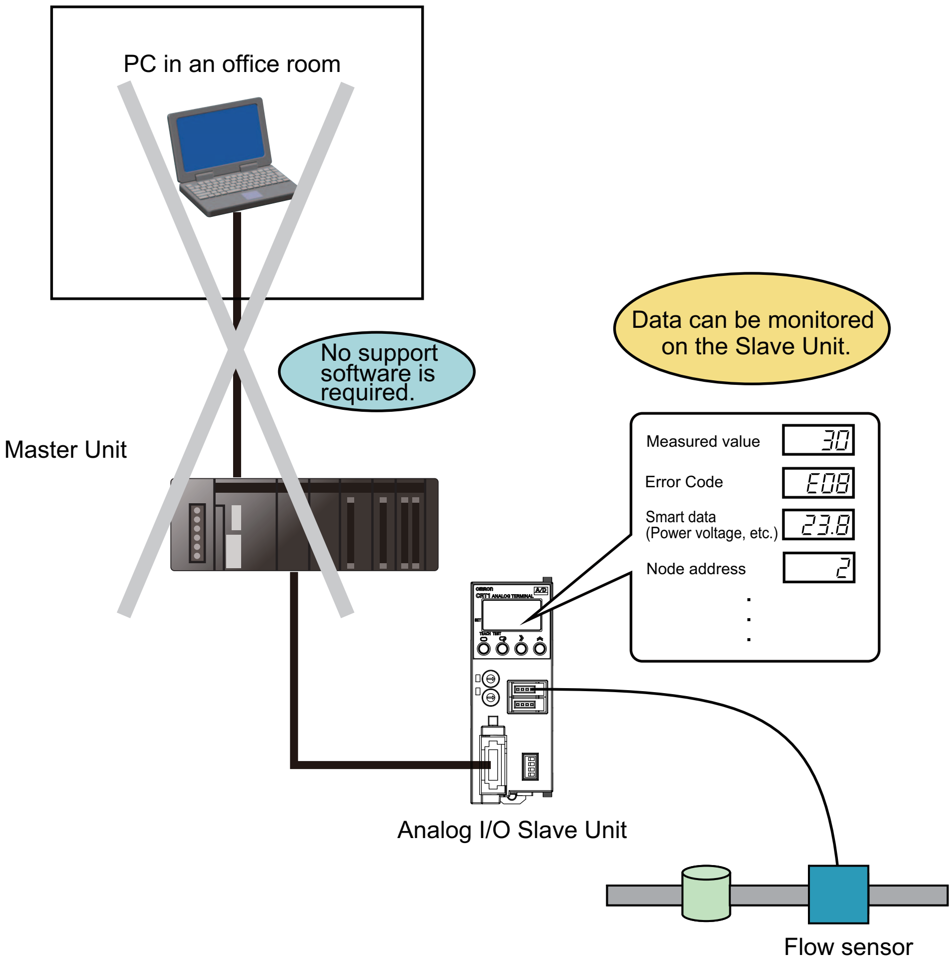
The Communications error log in the Unit can hold contents of the four most recent communications errors.

- Last Maintenance Date (Analog Input and Output Slave Units)

The most recent date on which maintenance was performed can be written in the Unit.

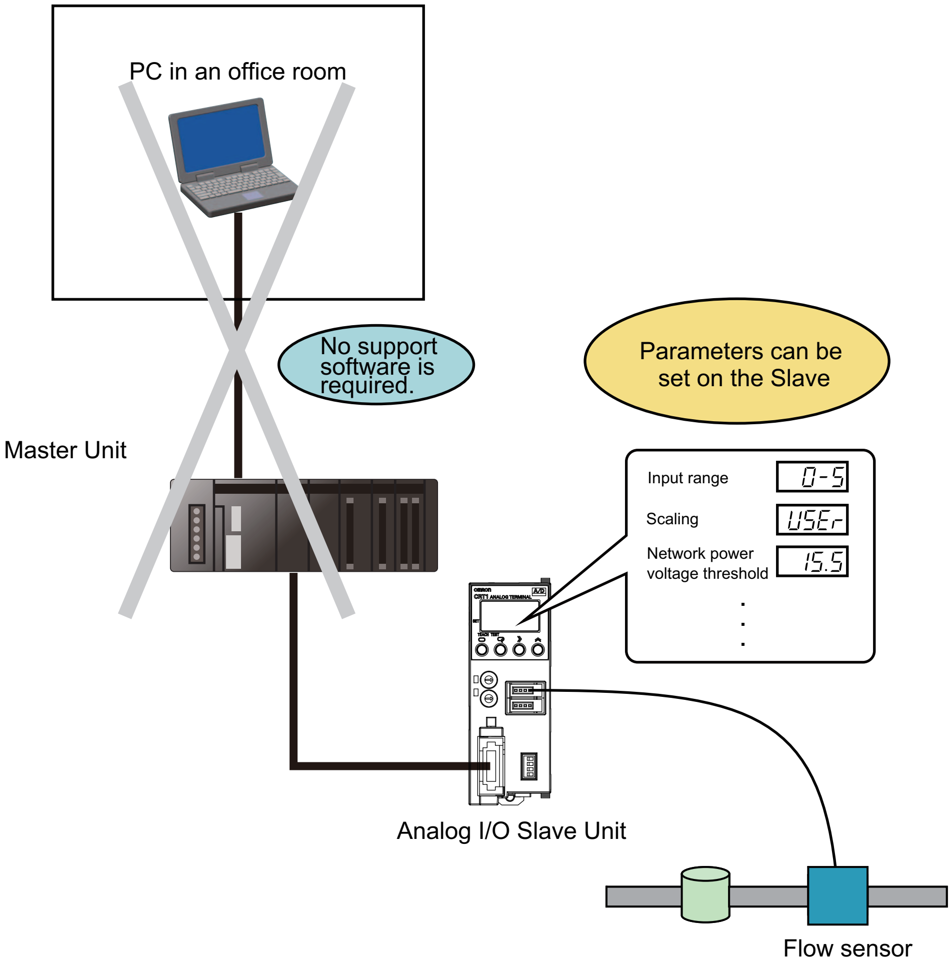
Monitoring Function

An Analog I/O Slave Unit is equipped with the numerical indicator. It is to monitor network power voltage, I/O values, Unit status, and error status. Thus no testers or configuration software such as CX-Integrator is required. These values and status can be monitored by simple operation of the indicator. See Section 6.



Parameter Setting

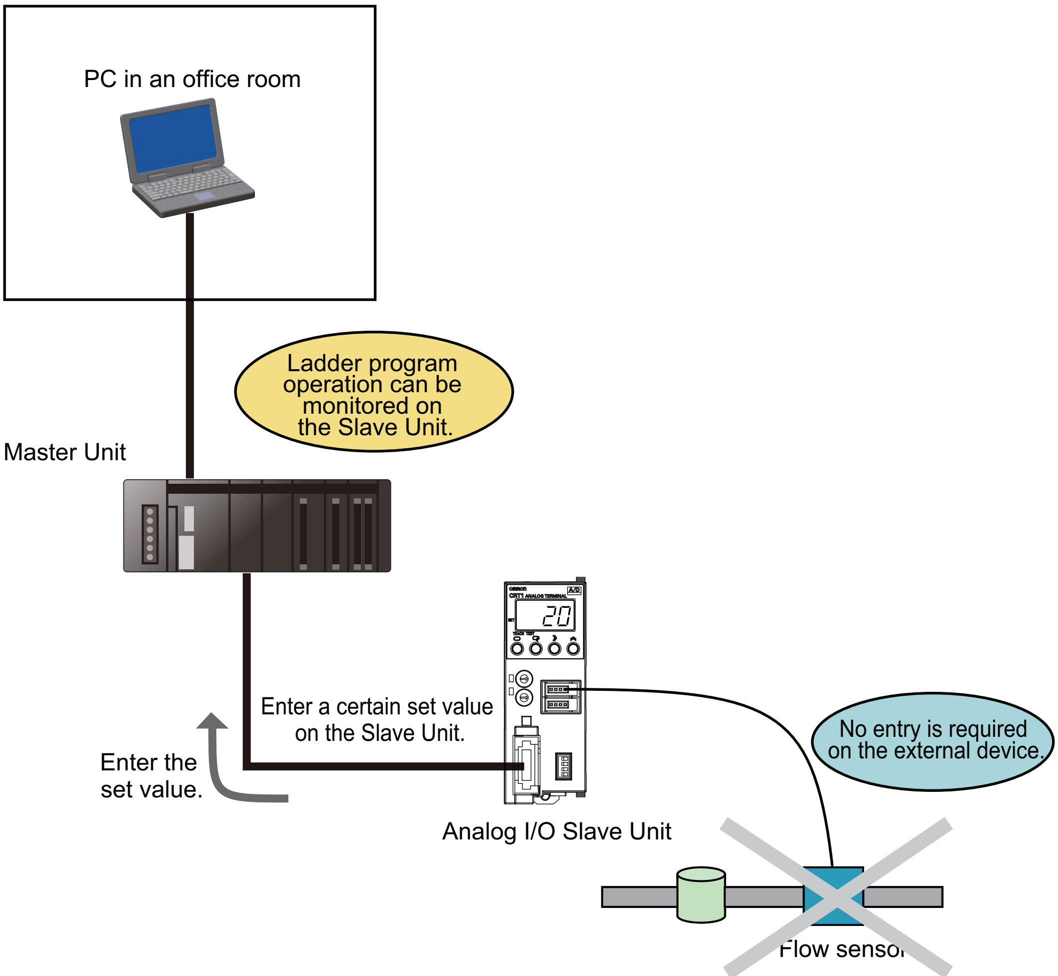
The numerical indicator mounted on the Analog I/O Slave Unit is also used to set the parameters for the Unit functions, which previously were allowed only by configuration software such as CX-Integrator. See Section 6.



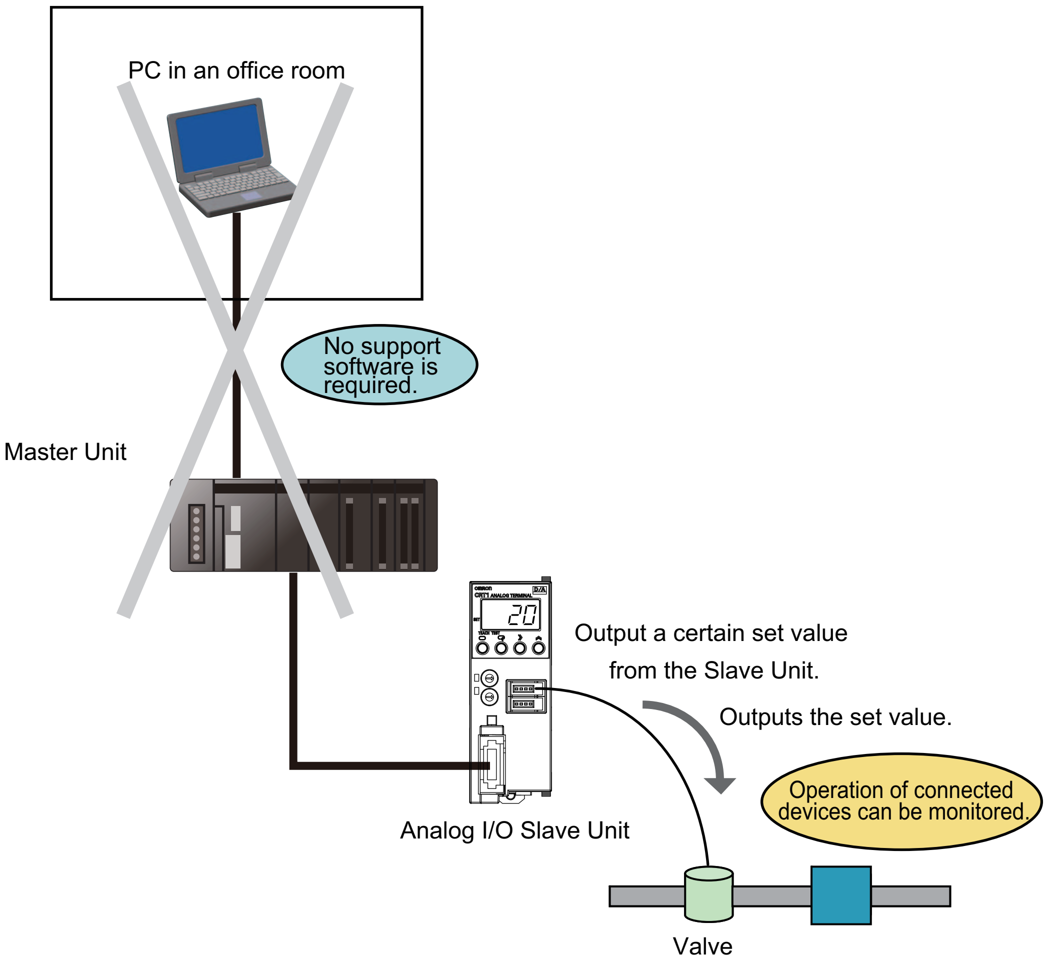
I/O Test Function

The numerical indicator mounted on the Analog I/O Slave Unit is also used to enter or get the desired data into and from the Unit. The function allows monitoring the ladder program and the external device operation, even when the host PLC or the external device is not connected or not in operation. See Section 7-9.

- Inputting values

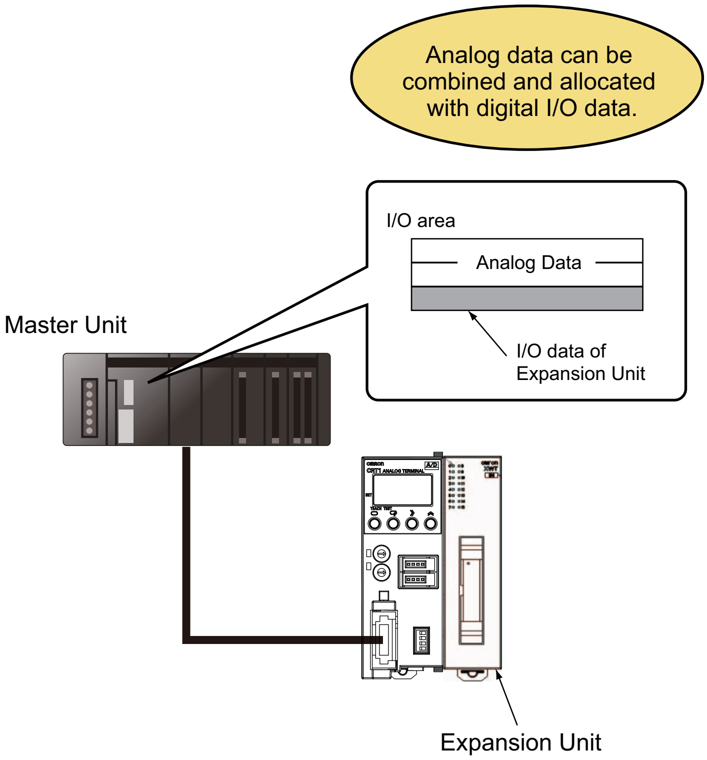


- Outputting values



Expansion Functions

A dedicated Digital Input or Output Expansion Unit can be mounted on an Analog I/O Slave Unit. Thus, in addition to the analog data and the status flags of the Analog I/O Slave Unit, the digital I/O data of the Expansion Unit can be allocated to the I/O memory of the Master Unit. Also the Comparator function of the Analog Input Slave Unit can be combined with the digital output of the Expansion Unit to enable I/O control. The combination also supports the I/O test by the Expansion Unit. See Section 11.



4-2 Overview of Analog Input Slave Units

Analog Input Slave Units convert analog input signals such as voltage of 1 to 5 V and current of 4 to 20 mA into digital data, i.e., binary values, and store them in the Master Unit. The conversion is analog to digital, or AD, conversion. This section elaborates the Analog Input Slave Units.

4-2-1 Specifications of a 2-point Analog Input Slave Unit

Item		Specification and Performance	
		Voltage input	Current input
Input range (signal)		0 to 5 V 1 to 5 V 0 to 10 V -10 to +10 V	0 to 20 mA 4 to 20 mA
Maximum signal input		±15 V	±30 mA
Input impedance		1MΩ min	approx. 250 Ω
Resolution		1/6000 (full scale)	
Overall accuracy	25 °C	±0.3%FS	±0.4%FS
	-10 to + 55°C	±0.6%FS	±0.8%FS
Conversion cycle		2 ms per two points	
AD conversion data		-10 to +10 V range: F448 to 0BB8 hex full scale (-3000 to +3000) Others: 0000 to 1770 hex full scale (0 to 6000) AD conversion range: ±5 % FS of the above data range.	
Insulation method		Photocoupler isolation (between inputs and communications lines or input signals)	
Communications power consumption		70 mA max. for 24-VDC power supply 105 mA max. for 14-VDC power supply	
Weight		CRT1-VAD02SD: 109 g CRT1-VAD02MLD: 113 g	

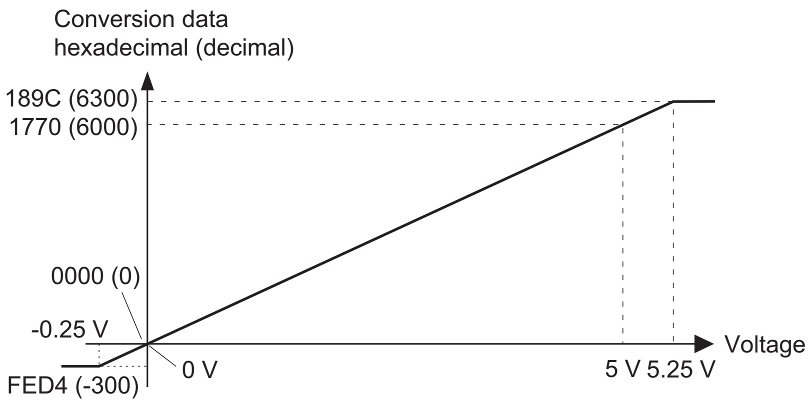
4-2-2 Input Range and Conversion Data

The entered analog data is converted to digital data according to the set input range. If an entry exceeds the upper limit of convertible input range, the conversion data is fixed to the upper limit. If it goes below the lower limit of the range, the conversion is fixed to the lower limit.

Input Range and Conversion Data

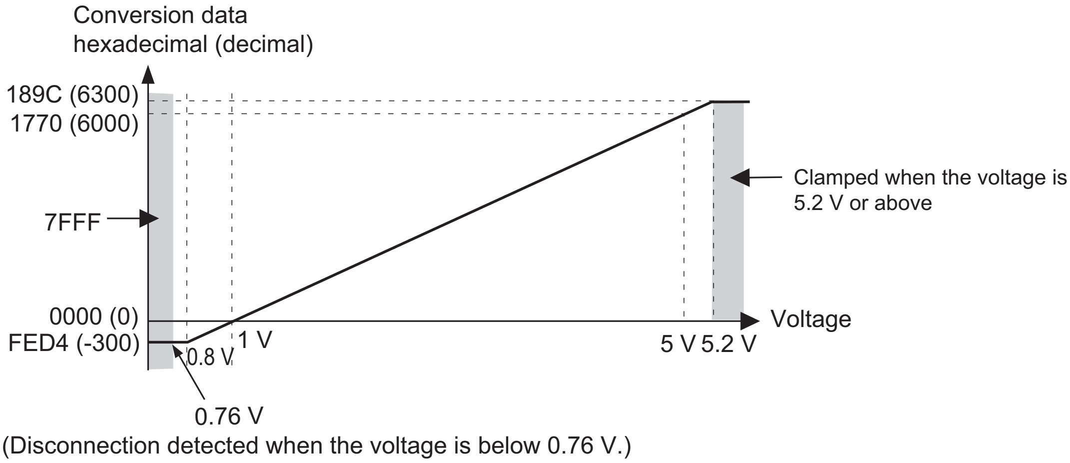
- Input Range: 0 to 5 V

The voltage range 0 to 5 V corresponds to data range 0000 to 1770 hex (0 to 6000 decimal). The convertible input data range is -0.25 to +5.25 V. The output data rage for this case is FED4 to 189C hex (-300 to 6300 decimal). Negative voltages are expressed as two's complements (hex). When a disconnection occurs, the data equivalent to 0 V input will be the output (0000 hex).



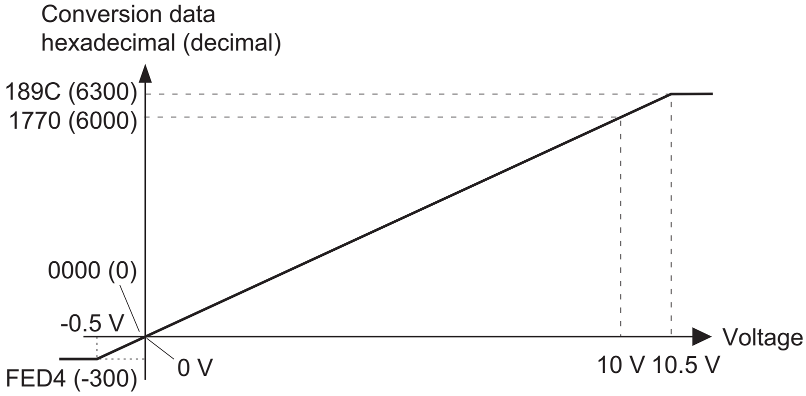
- Input Range: 1 to 5 V

The voltage range 1 to 5 V corresponds to data range 0000 to 1770 hex (0 to 6000 decimal). The convertible input data range is 0.8 to 5.2 V. The output data rage for this case is FED4 to 189C hex (-300 to 6300 decimal). If an input voltage falls below the input range, i.e., if an input voltage is less than 0.76 V, due to a disconnection or others, the disconnection detection function works, and the data is set to 7FFF hex.



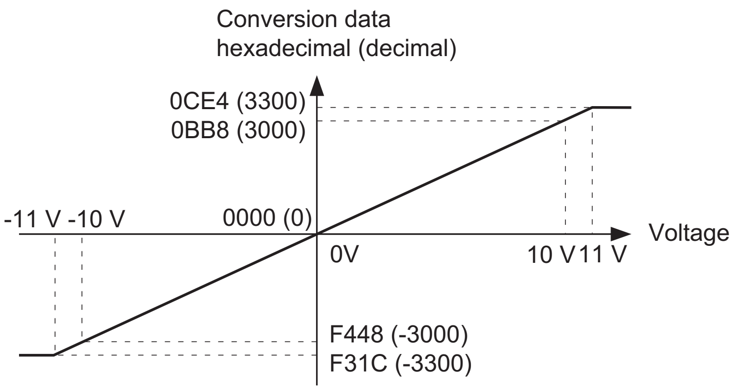
- Input Range: 0 to 10 V

The voltage range 0 to 10 V corresponds to data range 0000 to 1770 hex (0 to 6000 decimal). The convertible input data range is -0.5 to +10.5 V. The output data range for this case is FED4 to 189C hex (-300 to 6300 decimal). Negative voltages are expressed as two's complements (hex). When a disconnection occurs, the data equivalent to 0 V input will be the output (0000 hex).



- Input Range: -10 to 10 V

The voltage range -10 to 10 V corresponds to data range F448 to 0BB8 hex (-3000 to 3000 decimal). The convertible input data range is -11 to +11 V. The output data range for this case is F31C to 0CE4 hex (-3300 to 3300 decimal). Negative voltages are expressed as two's complements (hex). When a disconnection occurs, the data equivalent to 0 V input will be the output (0000 hex).



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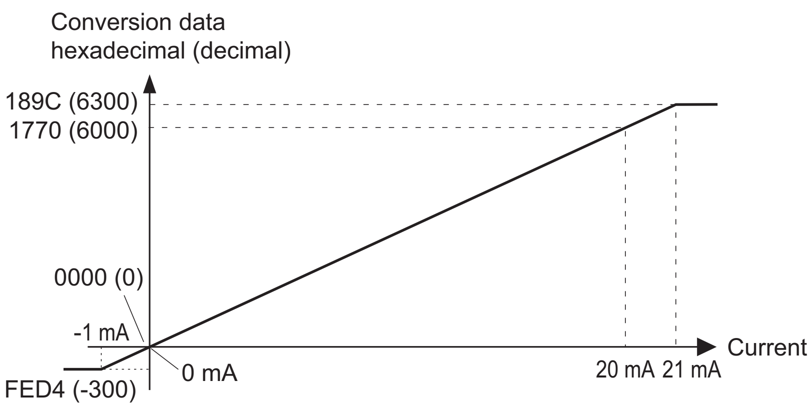
4-2-2 Input Range and Conversion Data

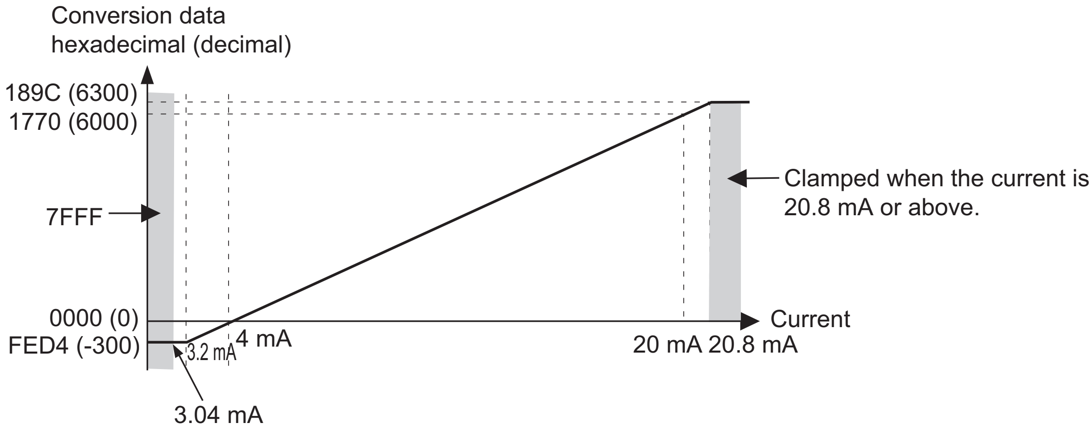
- Input Range: 0 to 20 mA

The current range 0 to 20 mA corresponds to data range 0000 to 1770 hex (0 to 6000 decimal). The convertible input data range is -1 to +21 mA. The output data range for this case is FED4 to 189C hex (-300 to 6300 decimal). Negative currents are expressed as two's complements (hex). When a disconnection occurs, the data equivalent to 0 mA input will be the output (0000 hex).



- Input Range: 4 to 20 mA

The current range 4 to 20 mA corresponds to data range 0000 to 1770 hex (0 to 6000 decimal). The convertible input data range is 3.2 to 20.8 mA. Then the output data range is FED4 to 189C hex (-300 to 6300 decimal). If an input current falls below the input range, i.e., if an input current is less than 3.04 mA, due to a disconnection or others, the disconnection detection function works, and the data is set to 7FFF hex.



(Disconnection detected when the current is below 3.04 mA.)

Negative AD Conversion Data

Negative AD conversion data is expressed as two's complements. The NEG command (or two's complement conversion) can be used to obtain the absolute value of the two's complement.

4-2-3 Arithmetic processing and selection of input data

Arithmetic processing of Analog Input Values

Analog Input Slave Units can internally perform following math operations for analog input values obtained from external devices. Then the results can be allocated to I/O memory on the Master Unit.

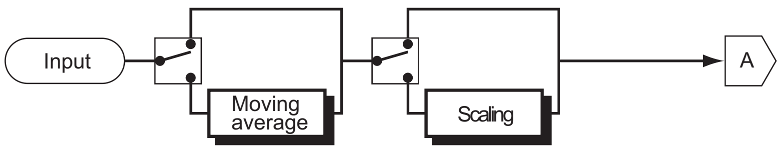
- Scaling to a desired industry-specific unit,
- Taking moving averages

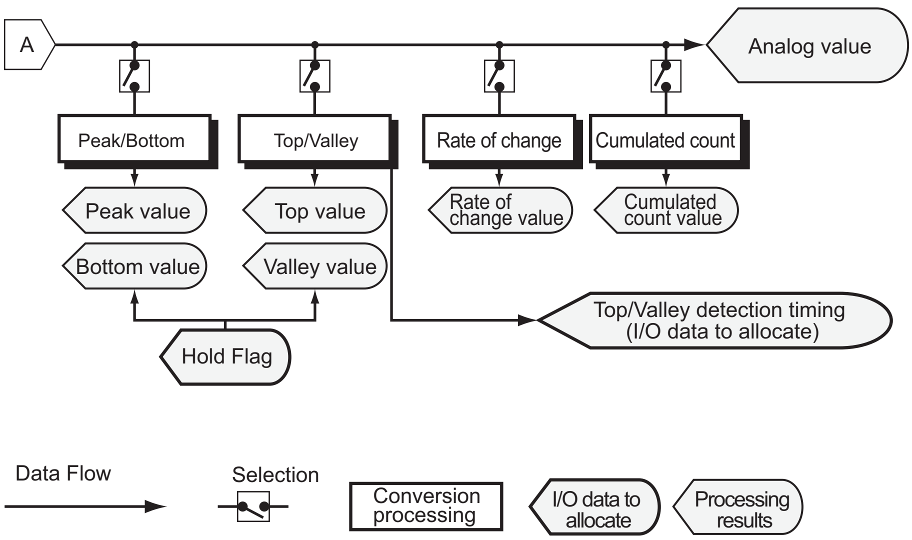
The above results can be further processed for these four calculations.

- Peak/Bottom operation
- Top/valley operation
- Rate of change operation
- Cumulated count operation

The operation results are called “Peak Value”, “Bottom Value”, “Top Value”, “Valley Value”, “Rate of Change”, and “Cumulated Count Value” respectively.

This is the data processing flow.



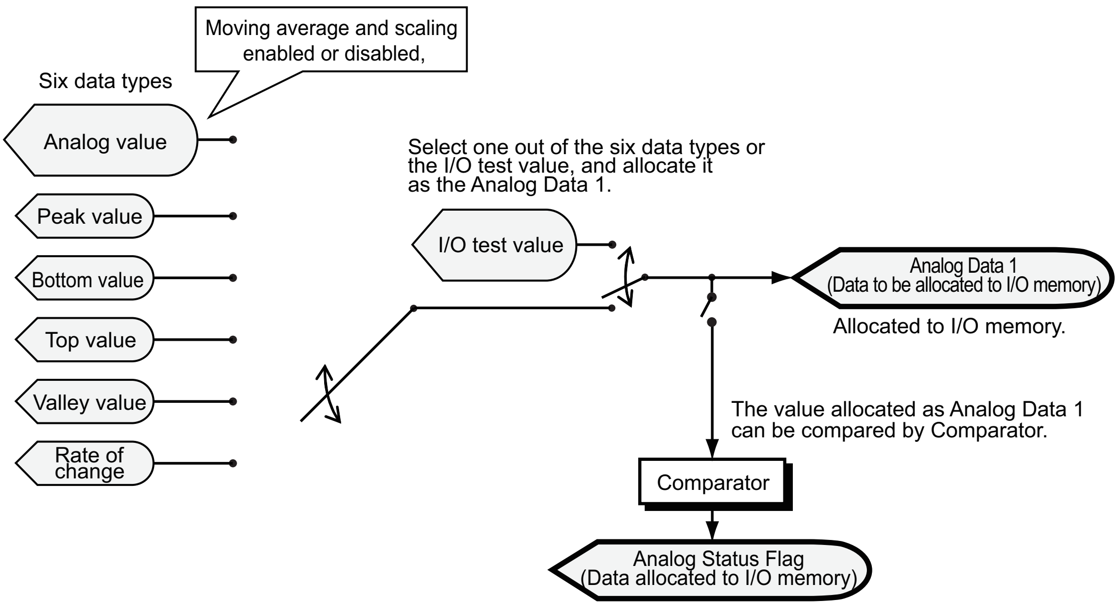


Selecting data to allocate

After the math operations, select one out of six calculated results or from the I/O test value as the data to allocate to I/O memory in the Master Unit. The six results are "analog value (or raw data)", "peak value", "bottom value", "top value", "valley value", and "rate of change". In default, the "analog value (or raw data)" is selected.

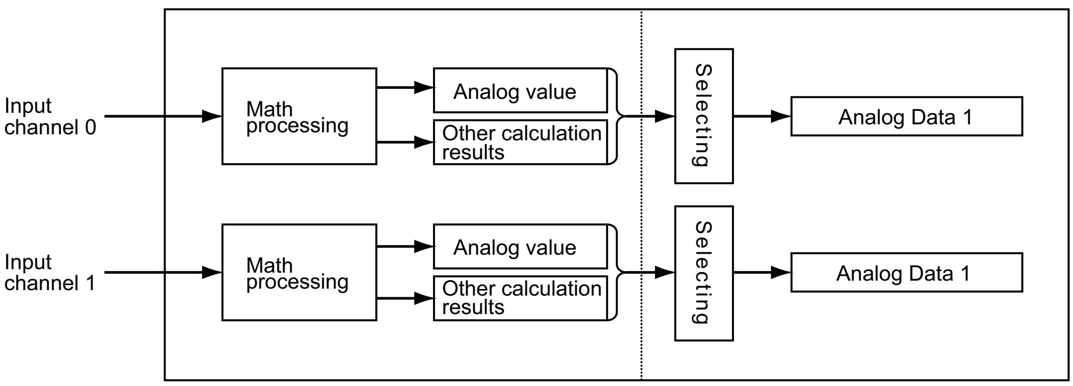
Once selected, the data is referred to as "Analog Data 1". It is allocated in the Master Unit individually or in combination with Status Flags. The selection of data to allocate can be done by the CX-Integrator or on the Slave Units. The I/O test values, however, can be set on the Salve Units only. See Section 9-23.

The allocated Analog Data 1 can be compared with four thresholds: high high limit (HH or Alarm Trip Point High), high limit (H or Warning Trip Point High), low limit (L or Warning Trip Point Low), and low low limit (LL or Alarm Trip Point High). See Section 7-8 for Comparator function.



If no particular setting is made, the analog value (raw data) is allocated to the I/O memory as the Analog Data 1.

The Analog Data 1 for the Input channel 0 can be different from one for the Input channel 1.



4-2-4 I/O Data Types and Allocation

I/O Data Types

Analog Input Slave Units have the following four types of input data, and one type of output data. You can allocate them selectively to I/O memory on the Master Unit. Data allocation can be done by CX-Integrator.

- Input Data

- Analog Data 1 (4 bytes equivalent to 2 words)

It is allocated to monitor analog data.
Select one type of data from the analog value, peak value, bottom value, top value, valley value, and rate of change. Default is the analog value. The allocated value can be processed by the Comparator function. Thresholds can be set in advance and used to compare with the allocated data. If the input value that is allocated is over one of these thresholds, a warning or alarming output tells the situation. The function is called the Comparator.

The data is allocated in two's components. The data is allocated to I/O memory in this format.

Offset	15 bit ... 0 bit
0	Analog Data in Input channel 0
+1	Analog Data in Input channel 1

- Top/Valley Detection Timing Flags (SHOT Status) (2 bytes equivalent to 1 word)

When the top or valley is detected by Top/Valley hold function, the flag becomes on for a one-shot time. The flag is allocated together with the top or valley value in order to identify the timing for the Master Unit to capture the top or valley hold value.

The data is allocated to I/O memory in this format.

Offset	15 bit ... 8 bit	7 bit ... 0 bit
0	Top Detection Timing Flag	Valley Detection Timing Flag

Valley Detection Timing Flag in details

7 bit	6 bit	5 bit	4 bit	3 bit	2 bit	1 bit	0 bit
0	0	0	0	0	0	V_ST1	V_ST0

Top Detection Timing Flag in details

15 bit	14 bit	13 bit	12 bit	11 bit	10 bit	9 bit	8 bit
0	0	0	0	0	0	T_ST1	T_ST0

Bit	Abbre-viation	Name	Description
0 (Channel 0) 1 (Channel 1)	V_STx	Valley Detection Timing Flag	It turns to 1 (on) when the valley is detected by Top/Valley Hold function, and turns to 0 (off) after one-shot period * passes.
8 (Channel 0) 9 (Channel 1)	T_STx	Top Detection Timing Flag	It turns to 1 (on) when the top is detected by Top/Valley Hold function, and turns to 0 (off) after one-shot period * passes.

The symbol x represents the channel number.

* One-shot period is changeable. Any value can be set by the CX-Integrator. See Section 9-14.

- Analog Status Flag (2 bytes equivalent to 1 word)

The flag can be allocated to a bit either to monitor the Comparator result or the Top/valley detection timing, or to detect a disconnection. In other words, every bit is allocated with the Comparator Result Flag, the Top/Valley Detection Timing Flag, or the Disconnected Line Detection Flag.

The data is allocated to I/O memory in this format.

Offset	15 bit ... 8 bit	7 bit ... 0 bit
0	Analog Status Flag in Channel 1	Analog Status Flag in Channel 0

Channel 0 Analog Status Flag in details

7 bit	6 bit	5 bit	4 bit	3 bit	2 bit	1 bit	0 bit
BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0

Channel 1 Analog Status Flag in details

15 bit	14 bit	13 bit	12 bit	11 bit	10 bit	9 bit	8 bit
BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1

Bit	Abbre-viation	Name		Description
0 (Channel 0) 8 (Channel 1)	LLx	Com-parator result flag	Low low limit alarming flag	It turns to 1 (on) while the value allocated to Analog Data 1 goes below the low low limit (LL).
1 (Channel 0) 9 (Channel 1)	Lx		Low limit alarming flag	It turns to 1 (on) while the value allocated to Analog Data 1 goes below the lower limit (L).
2 (Channel 0) 10 (Channel 1)	PSx		Normal flag (pass signal)	It turns to 1 (on) only when the value allo-cated to Analog Data 1 does not exceed any of four warning and alarming flags.
3 (Channel 0) 11 (Channel 1)	Hx		High limit warning flag	It turns to 1 (on) while the value allocated to Analog Data 1 goes over the high limit (H).
4 (Channel 0) 12 (Channel 1)	HHx		High high limit alarming flag	It turns to 1 (on) while the value allocated to Analog Data 1 goes over the high high limit (HH).
5 (Channel 0) 13 (Channel 1)	V_STx	Top/val-ley de-tection timing flag	Valley detection timing flag	It turns to 1 (on) when the valley is detect-ed by Top/Valley Hold function, and turns to 0 (off) after one-shot period passes.
6 (Channel 0) 14 (Channel 1)	T_STx		Top detection Timing Flag	It turns to 1 (on) when the top is detected by Top/Valley Hold function, and turns to 0 (off) after one-shot period passes.
7 (Channel 0) 15 (Channel 1)	BWx	Disconnection detection flag		It turns to 1 (on) while a line disconnection is detected.

* The symbol x represents the channel.

- Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) (6 bytes equivalent to 3 words)

The Top/Valley Detection Timing Flag (2 bytes equivalent to 1 word) is allocated subsequent to the Analog Data 1 (4 bytes equivalent to 2 words).

The data is allocated to I/O memory in this format.

Offset	15 bit … 8 bit	7 bit … 0 bit
0	Analog Data in Input channel 0	
+1	Analog Data in Input channel 1	
+2	Top Detection Timing Flag	Valley Detection Timing Flag

See the Top/Valley Detection Timing Flags for the details of the top and valley detection timing flags.

- Output Data

- Hold Value (2 bytes equivalent to 1 word)

The flag is used with the Peak/bottom hold function or the Top/valley hold function. It is allocated for the Master Unit to control the timing to execute the hold functions.

The data is allocated to I/O memory in this format.

Offset	15 to 2 bit	1 bit	0 bit
0	Reserved	HD1	HD0

Bit	Abbre-viation	Name	Description
0	HD0	Hold Flag for Input channel 0	The Hold function works for analog input values while the flag is on. When the flag turns to 0 (off), the Hold function stops. The last value is retained.
1	HD1	Hold Flag for Input channel 1	

Precautions for Correct Use

There is a transmission delay from the time when the Hold flag turns to 1 on the Master Unit until it is notified to the Slave Unit.

4-3 Overview of Analog Output Slave Units

Analog Output Slave Units convert digital data to analog data. It is DA conversion. The Units convert digital data, or binary values, that are stored in the Master Unit into analog signals such as voltage of 1 to 5 V and current of 4 to 20 mA. This section elaborates the functions of Analog Output Slave Units.

4-3-1 Specification of a 2-point Analog Output Slave Unit

Item		Specification and Performance	
		Voltage output	Current output
Output range (signal)		0 to 5 V 1 to 5 V 0 to 10 V -10 to +10 V	0 to 20 mA 4 to 20 mA
External output permissible load resistance		5 kΩ min	600 Ω max
Resolution		1/6000 (full scale)	
Overall accuracy	25 °C	±0.4%FS	±0.4%FS *
	-10 to + 55°C	±0.8%FS	±0.8%FS *
Conversion cycle		2 ms per two points	
DA conversion data		-10 to +10 V range: F448 to 0BB8 hex full scale (-3000 to +3000) Others: 0000 to 1770 hex full scale (0 to 6000) DA conversion range: ±5% FS of the above data range.	
Insulation method		Photocoupler isolation (between output and communications lines) No isolation between output signal wires	
Communications power consumption		125 mA max. for 24-VDC power supply 195 mA max. for 14-VDC power supply	
Weight		CRT1-VDA02SD: 106 g CRT1-VDA02MLD: 112 g	

* In current input mode of 0 to 20 mA, accuracy below 0.2 mA is not assured.

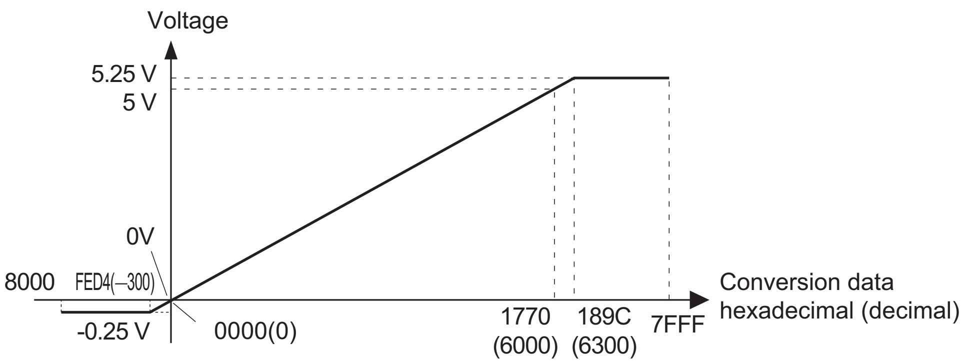
4-3-2 Output Range and Conversion Data

The outputted digital data is converted to analog data according to the preset output range. When the value exceeds the convertible output range, the DA conversion result is fixed to the upper limit. When it goes below the range, the conversion is fixed to the lower limit.

Output Range and Conversion Data

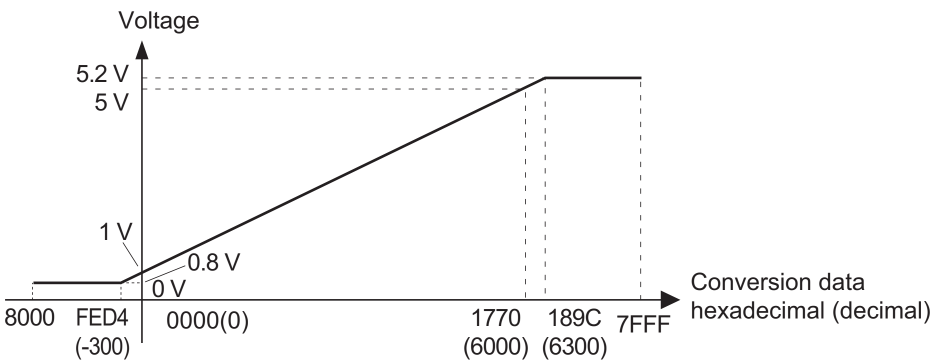
- Output Range: 0 to 5 V

The values 0000 to 1770 hex (0 to 6000 decimal) are converted to the voltage range 0 to 5 V. The convertible output data ranges FED4 to 189C hex (-300 to +6300 decimal). Then the output range is -0.25 to +5.25 V.



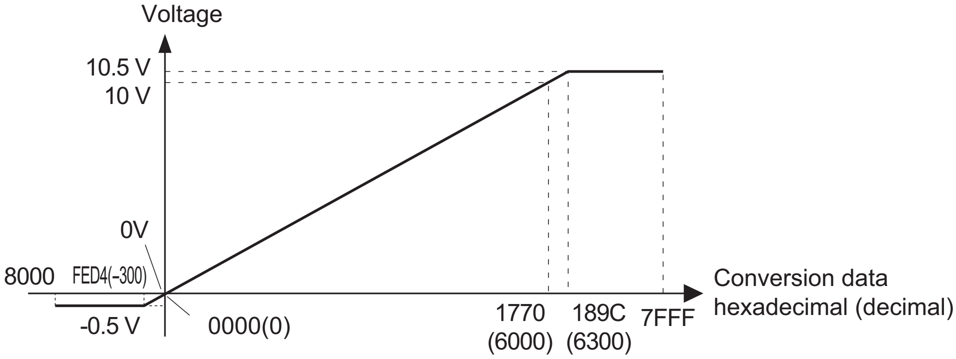
- Output Range: 1 to 5 V

The data 0000 to 1770 hex (0 to 6000 decimal) are converted to the voltage range 1 to 5 V. The convertible output data ranges FED4 to 189C hex (-300 to +6300 decimal). Then the output range is 0.8 to 5.2 V.



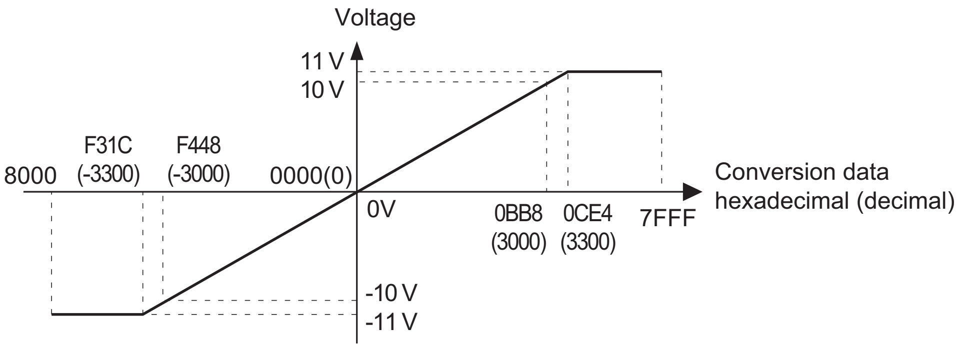
- Output Range: 0 to 10 V

The data 0000 to 1770 hex (0 to 6000 decimal) are converted to the voltage range 0 to 10 V. The convertible output data ranges FED4 to 189C hex (-300 to +6300 decimal). Then the output ranges is -0.5 to +10.5 V.



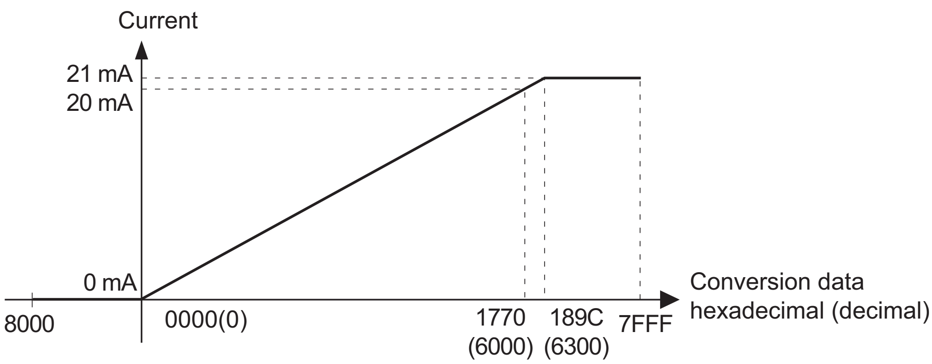
- Output Range: -10 to 10 V

The data F448 to 0BB8 hex (-3000 to 3000 decimal) are converted to the voltage range -10 to +10 V. The convertible output data ranges F31C to 0CE4 hex (-3300 to +3300 decimal). Then the output range is -11 to +11 V. Negative voltages are specified as two’s complements (16 bits).



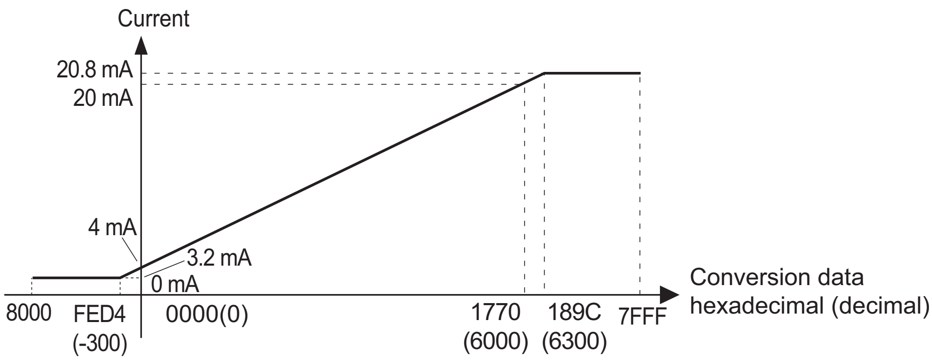
- Output Range: 0 to 20 mA

The data 0000 to 1770 hex (0 to 6000 decimal) are converted to the current range 0 to 20 mA. The convertible output data ranges 0000 to 189C hex (0 to 6300 decimal). Then the output range is 0 to 21 mA.



- Output Range: 4 to 20 mA

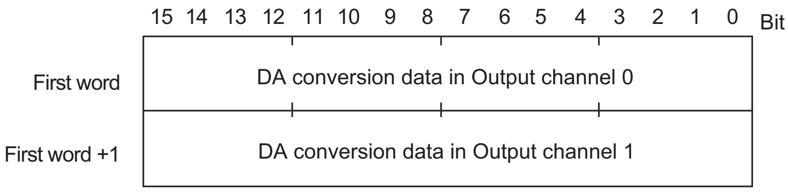
The data 0000 to 1770 hex (0 to 6000 decimal) are converted to the current range 4 to 20 mA. The convertible output data ranges FED4 to 189C hex (-300 to +6300 decimal). Then the output range is 3.2 to 20.8 mA.



DA Conversion Data

DA conversion data is outputted from the Master Unit as shown in the following diagram.

.



To output negative voltages, specify the DA conversion data as two's complements. The NEG instruction can be used to obtain two's complements from absolute values.

4-3-3 I/O data types and allocation

I/O Data Types

Analog Output Slave Units have the following output data.

- Output Data (4 bytes equivalent to 2 words)

The Analog Output Slave Unit has the output data allocated by default. No setting is required. The data is allocated as two's complements to I/O memory in this format.

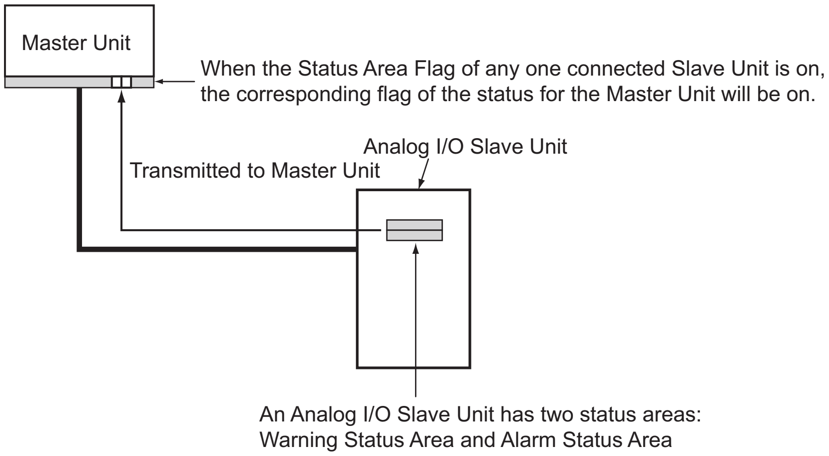
Offset	15 bit ... 0 bit
0	Analog output value in Output channel 0
+1	Analog output value in Output channel 1

4-4 Status Areas

An Analog I/O Slave Unit has two status areas: the Warning Status Area and the Alarm Status Area. The status flags in these areas are turned ON and OFF based on the comparison results with the thresholds set for each function in the Unit.

If any flag in the Warning/Alarm Status Areas in Analog I/O Slave Units turns ON, the corresponding status flag in the Master Unit to which the Slave Unit is connected turns ON. Bit 12 in the Master Unit corresponds to the representing Warning Status Flag and Bit 13 corresponds to the representing Alarm Status Flag.

The Analog I/O Slave Unit's status area information can be read by the CX-Integrator or explicit messages.



General Information

The status area data cannot be allocated to the I/O area.

4-4-1 Warning Status

The Warning Status Area contains following 16 bits. These bits indicate minor errors in the Unit.

Bit	Content	Description
0	Reserved	-
1	Reserved	-
2	Network Power Voltage Drop Flag 0: Normal 1: Error	Turns ON when the voltages drops below the threshold set for the network power voltage monitor function.
3	Unit Conduction Time Exceeded Flag 0: Normal 1: Error	Turns ON when the threshold set for the Unit Conduction Time Monitor function is exceeded.
4	Reserved	-
5	Reserved	-
6	Reserved	-
7	Reserved	-
8	Analog Input Slave Units: Analog Range Exceeded Flag 0: Within range 1: Out-of-range	Turns ON when the analog data exceeds the displayable range or when the threshold set for the Comparator function is exceeded.
	Analog Output Slave Units: Error Output Flag 0: Normal 1: Error	Turns ON while the value set by the Fault Action is outputted due to a communication error.
9	Cumulated Counter Over Flag 0: Within range 1: Out-of-range	Turns ON when the cumulated count value exceeds the threshold set by the Cumulated Count function.
10	Unit Start-up Error Flag 0: Normal 1: Error	Turns ON when an error occurs during the Unit start-up.
11	Reserved	-
12	Reserved	-
13	Reserved	-
14	Network Setting Flag 0: Network setting prohibited 1: Network setting allowed	Turns ON when the network setting by explicit message is allowed.
15	I/O Test Level Flag 0: Other levels 1: I/O Test Level	Turns ON when the Unit is set in the I/O Test Level.

4-4-2 Alarm Status

The Alarm Status Area contains following 16 bits. These bits indicate critical errors in the Unit.

Bit	Content	Description
0	Reserved	-
1	EEPROM Data Error Flag 0: Normal 1: Error	Turns ON when there is an error with the EEPROM data.
2	Reserved	-
3	Reserved	-
4	Reserved	-
5	Reserved	-
6	Reserved	-
7	Reserved	-
8	Disconnected Line Detection Flag (Analog Input Unit only) 0: Normal 1: Disconnected line detected	Turns ON when a line disconnection, due to wiring mistake or failure on any connected devices is detected.
9	Unit Reset Flag 0: Normal 1: Reset occurred	Turns ON when the Unit is reset due to an error.
10	Reserved	-
11	Reserved	-
12	Reserved	-
13	Reserved	-
14	Expansion Unit I/O Power Supply 1 Flag	Turns ON when the I/O power supply for inputs on the Expansion Unit is off.
15	Expansion Unit I/O Power Supply 2 Flag	Turns ON when the I/O power supply for outputs on the Expansion Unit is off.

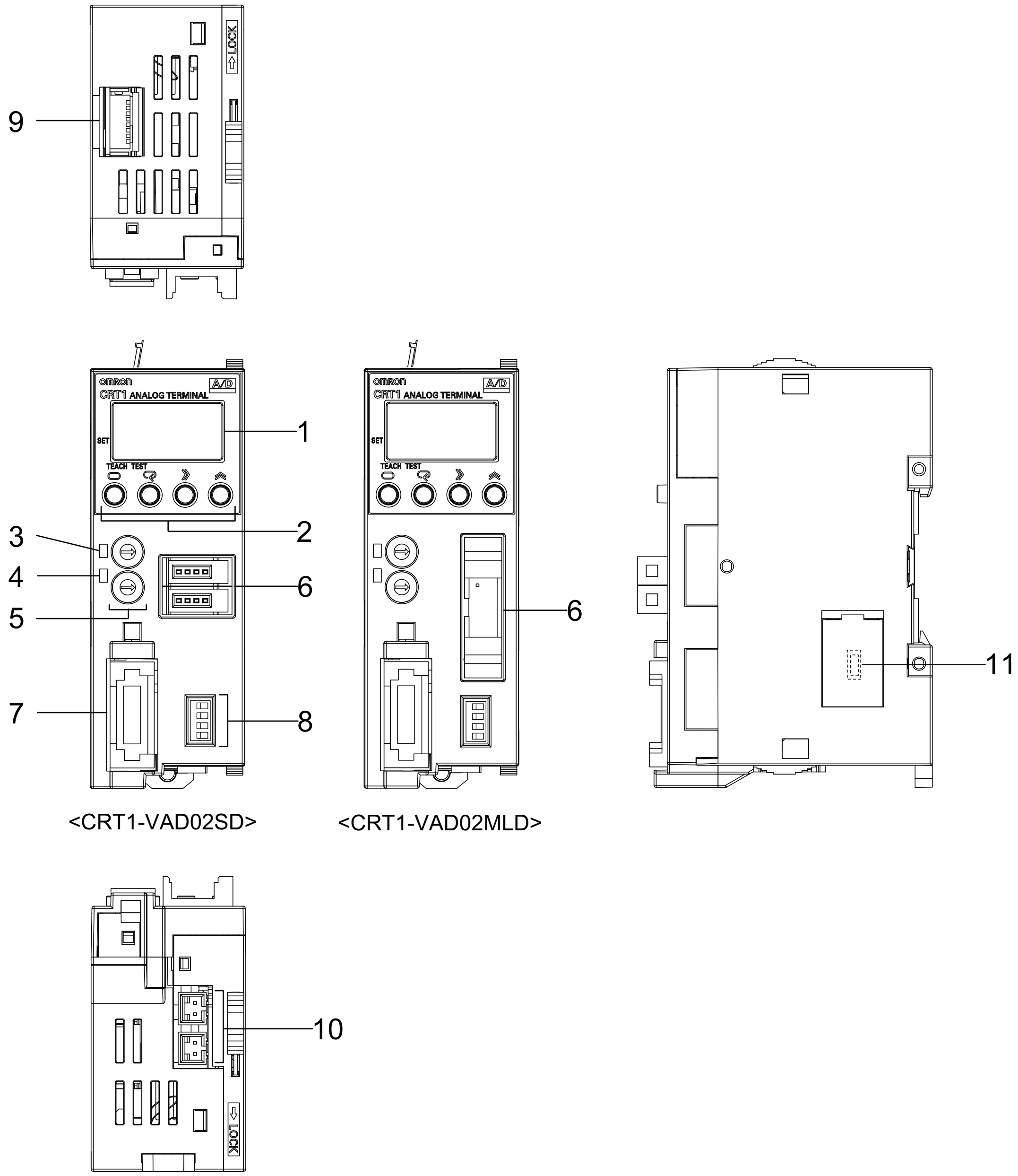
5

Unit Component Names and Functions

5-1 Unit Component Names and Functions

This section explains names and functions of components that constitute an Analog I/O Slave Unit.

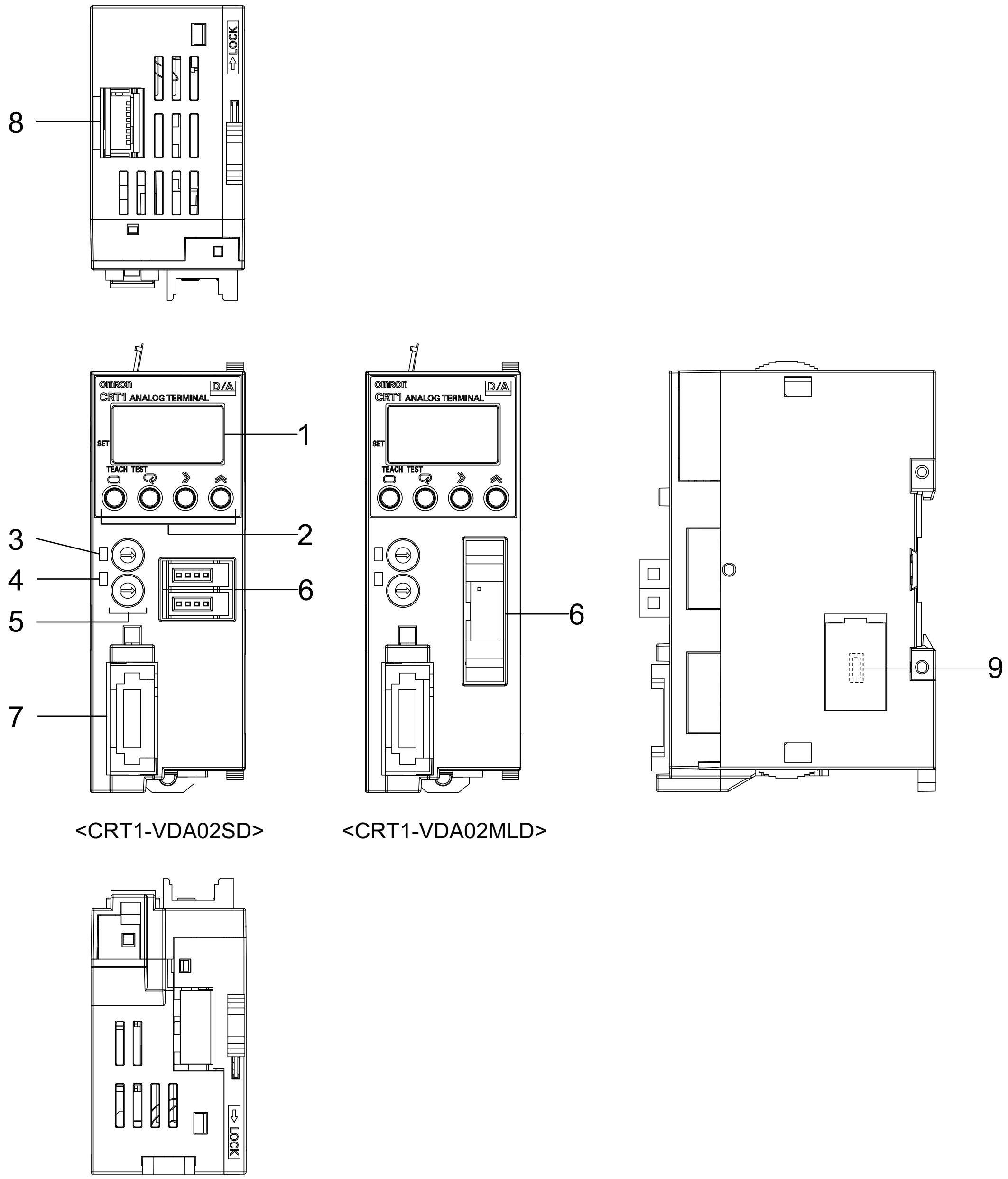
5-1-1 Analog Input Slave Unit



No.	Name	Function
1	Numerical indicator	Indicates monitored value, parameter set values, and I/O test set values.
2	Entry buttons	Operates the Numerical indicator.
3	MS indicator	Indicates status of an Analog I/O Slave Unit.
4	NS indicator	Indicates communications state of the Slave Unit with CompoNet network.
5	Node address setting switches	Sets node addresses.
6	I/O connector	Hooks up external input devices. CRT1-VAD02SD: e-CON Connector CRT1-VAD02MLD: MIL Connector
7	Communications connector interface	Hooks up communications cable of CompoNet network.
8	Mode setting pins	Pin 1 is to select the input type between current and voltage for Channel 0. Pin 3 is to select the input type between current and voltage for Channel 1. Pin 2 is to select the sensor power supply mode for Channel 0.* Pin 4 is to select the sensor power supply mode for Channel 1.*
9	Input range setting pins (with a protection cover)	Sets the input range for each channel.
10	Sensor power supply connectors (for CRT1-VAD02SD only)	Hooks up a power cable to supply power to external connected devices.
11	Expansion Unit connector (with a protection cover)	Hooks up a dedicated Expansion Unit.

* Pin 2 and Pin 4 are not used on the CRT1-VAD02MLD.

5-1-2 Analog Output Slave Unit



<CRT1-VDA02SD> <CRT1-VDA02MLD>

No.	Name	Function
1	Numerical indicator	Indicates monitored value, parameter set values, and I/O test set values.
2	Entry buttons	Operates the Numerical indicator.
3	MS indicator	Indicates status of an Analog I/O Slave Unit.
4	NS indicator	Indicates communications state of the Slave Unit with CompoNet network.
5	Node address setting switches	Sets node addresses.
6	I/O connector	Hooks up external output devices. CRT1-VDA02SD: e-CON Connector CRT1-VDA02MLD: MIL Connector
7	Communications connector interface	Hooks up communications cable of CompoNet network.
8	Output range setting pins (with a protection cover)	Sets the output range for each channel.
9	Expansion Unit connector (with a protection cover)	Hooks up a dedicated Expansion Unit.

5-2 Indication Functions

This section explains functions of the Indication part of the Slave Unit.

5-2-1 MS indicator

The MS LED indicator represents the present state of the Unit. The two-colored indicator lights, flashes or becomes unlit, and tells the state.

Color	Status		Meaning
Green		Light	The Unit is in normal operation.
Red		Light	Fatal error has occurred: - Unit hardware error. - Time-out of Watchdog Timer.
		Flash	Non-fatal error has occurred: - Abnormal switch setting. - EEPROM sum value error.
-		Unlit	Power is off or in preparation: - Unit power is off. - Unit is in resetting. - Initializing.

5-2-2 NS indicator

The NS LED indicator represents present communications state of the Unit with CompoNet network. The two-colored indicator lights, flashes or becomes unlit, and tells the state.

Color	Status		Meaning
Green		Light	The Unit is online and has participated. - Communications is in normal state.
		Flash	The Unit is online but has not participated yet. - Communications is in normal state. The Unit is preparing to participate.
Red		Light	Fatal communications error has occurred: - Address duplication is detected. - A set address was out of settable range.
		Flash	Non-fatal communications error has occurred: - Polling timeout - Network timeout
-		Unlit	Power is off, or the data rate has not yet determined.

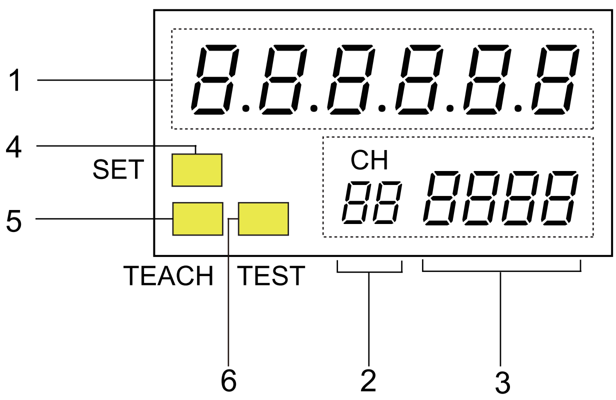
General Information

The indicators flash in 0.5 second interval, i.e., they light for 0.5 second and become unlit for another 0.5 second.

5-2-3 Numerical indicator

The Numerical indicator shows monitor values, parameter set values, and I/O test set values. The part is operated by the Entry buttons.

Numerical Indicator



1. Indicator No.1

It indicates monitored values and parameter set values.
It consists of 6 digits of 7-segment indicator figures and a decimal point in between the digits.
In normal state, it lights green or red, as determined by setting. It turns to red at errors. See Section 7-18.

2. Channel indicator

It indicates which channel the parameter shown in the Indicator No.1 is for.

0 : The indication is the parameter for Channel 0 (CH0).
1 : The indication is the parameter for Channel 1 (CH1).
None : The indication is the parameter for entire Unit.

Nothing is shown in the left digit.

3. Indicator No.2

It shows the name, in abbreviation, of parameter shown in Indicator No.1.
It consists of 4 digits of 7-segment indicator figures without decimal points.
By changing the setting, the Indicator No.2 can show the parameter No. See Section 7-17.

General Information

The table below denotes the characters shown by the 7-segment indications on the Numerical indicator and the corresponding numeric and alphabetic character meanings. The characters in blank are not used.

Numbers and alphabets in meaning	0	1	2	3	4	5	6	7	8	9
Indication on the Numerical indicator	0	1	2	3	4	5	6	7	8	9
Numbers and alphabets in meaning	A	B	C	D	E	F	G	H	I	J
Indication on the Numerical indicator	A	b	C	d	E	F	G	H	i	j
Numbers and alphabets in meaning	K	L	M	N	O	P	Q	R	S	T
Indication on the Numerical indicator	K	L	n̄	n	ō	P		r	S	t
Numbers and alphabets in meaning	U	V	W	X	Y	Z	-	.		
Indication on the Numerical indicator	U	u	ū	ū	y		-	.		

The characters in blank are not used.

4. SET indicator

It lights when Setting Level or Special Function Setting Level is selected.

Color	State		Meaning
Yellow		Light	Setting Level or Special Function Setting Level is selected.
-		Unlit	Other Level is selected.

5. TEACH indicator

It lights when the parameter shown allows teaching: Scaling teaching or User adjustment.

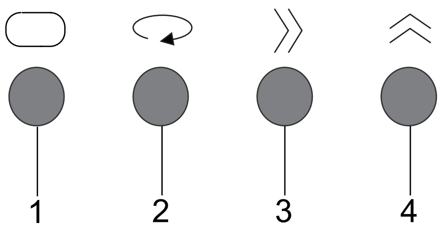
Color	State		Meaning
Yellow		Light	The parameter shown allows teaching.
		Flash	The parameter shown is in teaching process.
-		Unlit	The parameter shown does not allow teaching.

6. TEST indicator

It lights when the Unit is at I/O Test Level.

No.	State		Description
Yellow		Light	I/O Test Level is selected.
-		Unlit	Other Level is selected.

Entry buttons



No.	Name	Description
1	LEVEL button	To select a level to operate.
2	MODE button	To switch the parameter.
3	SHIFT button	To shift the state between Monitoring and Changing, and to move the digit during Changing state. For some parameters, the button is also used to change the set value.
4	UP button	To change the parameter setting, to switch the channel to indicate, and to have a teaching.

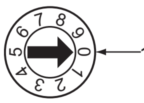
5-3 Setting Switches

This section explains the functions of switches provided on the Slave Unit.

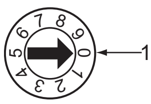
5-3-1 Node Address Setting Switches

Two rotary switches are used to set the node address of the Unit on the CompoNet network. The switches represent decimal numbers. The upper one represents the 10s digit, while the lower one the 1s digit.
The setting ranges are:

- 0 to 63 for Analog Input Unit, and
- 0 to 62 for Analog Output Unit.



10s digit of node address



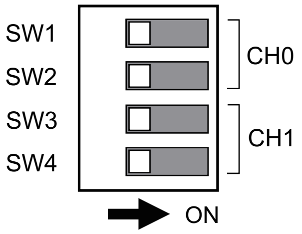
1s digit of node address

General Information

- The setting on the rotary switches is read when power is turned ON.
- A configuration error occurs and the operation stops if a node addresses is duplicated, or if any setting attempted is out of the permissible range. The NS indicator turns on red, to indicate the erroneous situation.
- Factory setting is all 0.

5-3-2 Mode Setting Switches (Analog Input Slave Unit only)

The switches are to select the analog input type between current and voltage, and the sensor power supply mode among 4-wired, 3-wired and 2-wired types. See Section 10-3-2 for selecting the input type, and Section 10-3-3 for selecting the sensor power supply mode.



CRT1-VAD02SD (e-CON connector type)

Channel	Pin No.	Function	Specification
0	1	To switch the input type.	OFF: Voltage input ON: Current input
	2	To switch the sensor power supply mode.	OFF: 4-wired or 2-wired sensor power supply ON: 3-wired sensor power supply
1	3	To switch the input type.	OFF: Voltage input ON: Current input
	4	To switch the sensor power supply mode.	OFF: 4-wired or 2-wired sensor power supply ON: 3-wired sensor power supply

CRT1-VAD02MLD (MIL connector type)

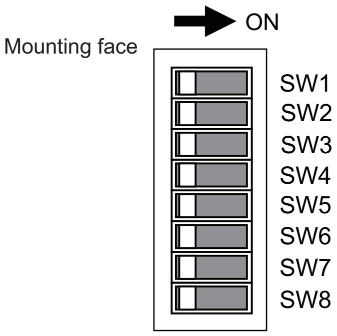
Channel	Pin No.	Function	Specification
0	1	To switch the input type.	OFF: Voltage input ON: Current input
	2	Not used.	
1	3	To switch the input type.	OFF: Voltage input ON: Current input
	4	Not used.	

General Information

All pins are off by factory setting.

5-3-3 Input and Output Range Setting Switches

The switches are to set the input or output range. The Pin No. 8 must be ON, in order to enable the settings by these switches.



Pin No.	Function	Specification
1	To set input or output range for Input Channel 0 or Output Channel 0.	To set input or output range for Input Channel 0 or Output Channel 0. Settable by Pins' ON-OFF combinations. (See the table "Setting for Input channel 0 and output channel 0" below.)
2		
3		
4	To set input or output range for Input Channel 0 or Output Channel 1.	To set input or output range for Input Channel 1 or Output Channel 1. Settable by Pins' ON-OFF combinations. (See the table "Setting for Input channel 1 and output channel 1" below.)
5		
6		
7	Fixed to OFF.	-
8	To select the setting method.	OFF: Set the range on the Numerical indicator or by CX-Integrator. ON: Enable the setting by these I/O Range Setting Switches.

Precautions for Correct Use

- The Pin No.7 must always be OFF.
- The Pin No. 8 must be ON, in order to enable all settings made by the I/O range setting switch. When it is OFF, no setting by these switches is activated.

General Information

- The setting made by the I/O range setting switch is read when the power is turned on.
- All pins are off by factory setting.

Switch setting for input or output ranges

The input or output range for the specific channel is determined by the ON-OFF combinations of the setting pins.

- Settings for Input channel 0 and Output channel 0

Input and Output range	Switch setting		
	Pin No.1	Pin No.2	Pin No.3
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
-10 to +10 V	ON	ON	OFF
0 to 20 mA	ON	OFF	ON
4 to 20 mA	OFF	OFF	ON

- Settings for Input channel 1 and Output channel 1

Input and Output range	Switch setting		
	Pin No.4	Pin No.5	Pin No.6
0 to 5 V	OFF	OFF	OFF
1 to 5 V	ON	OFF	OFF
0 to 10 V	OFF	ON	OFF
-10 to +10 V	ON	ON	OFF
0 to 20 mA	ON	OFF	ON
4 to 20 mA	OFF	OFF	ON

Precautions for Correct Use

Do not attempt to set the pins in any other ways than specified in the table above.

6

Numerical Indicator

6-1 Levels

The parameters of the Analog I/O Slave Units are classified by their functions and contents. The parameter set is referred to as a Level with a certain name. The Levels are grouped in a bigger category by their purposes. They are referred to as Level Group. See the tables in Section 6-1-1 for each level and level group.
The Level indication is changeable and the parameters are settable by entry buttons equipped below the Numerical Indicator.

6-1-1 Levels and Level Groups

Level	Function	Remarks
Standard	To indicate the present value, the node address, and the network power voltage. When an Expansion Unit is mounted, it also indicates the present value of the Unit.	-
Option	To indicate the maximum or minimum value of input or output data, Comparator results, and the status.	-
Comparator Setting (provided only on Analog Input Slave Units)	To set parameters required for Comparator: high high limit (HH), high limit (H), low limit (L), low low limit (LL), and OFF delay.	Indicates only when the Comparator function is in use.
Error Code	To indicate error codes.	Indicates only when an error occurs. If an error occurs during one of the above three levels, the indication automatically shifts to this level.
Initial Setting	To set the analog data types: the number of available channels, and input or output range.	-
Scaling	To set the values for Scaling.	Indicates only when the Scaling function is in use.
Special Function Setting	To initialize the parameters or to set the time required to shift to the Protection state.	-
User Adjustment	To perform the User adjustment.	-
I/O Test	To conduct I/O tests.	On an Analog Input Slave Unit, a certain value you set is sent to the Master Unit. On an Analog Output Slave Unit, a certain value you set is output to a connected device. When an Expansion Unit is mounted, digital I/O data of the Expansion Unit is inputted and outputted.

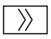
Level Group

Level Group	Purpose	Levels in this Level Group
Monitor	To monitor parameters.	Standard Level Option Level Comparator Setting Level Error Code Level
Setting	To make parameter settings on the Unit.	Initial Setting Level Scaling Level
Special Function Setting	To set key parameters such as initializing. Access to this level requires a password entry.	Special Function Setting Level User Adjustment Level
I/O Test	To conduct I/O Tests.	I/O Test Level

6-1-2 Entry Buttons and Level Shift

Switching over a level or a level group is referred to as Level Shift or a level transition. Entry buttons are used to make a shift.

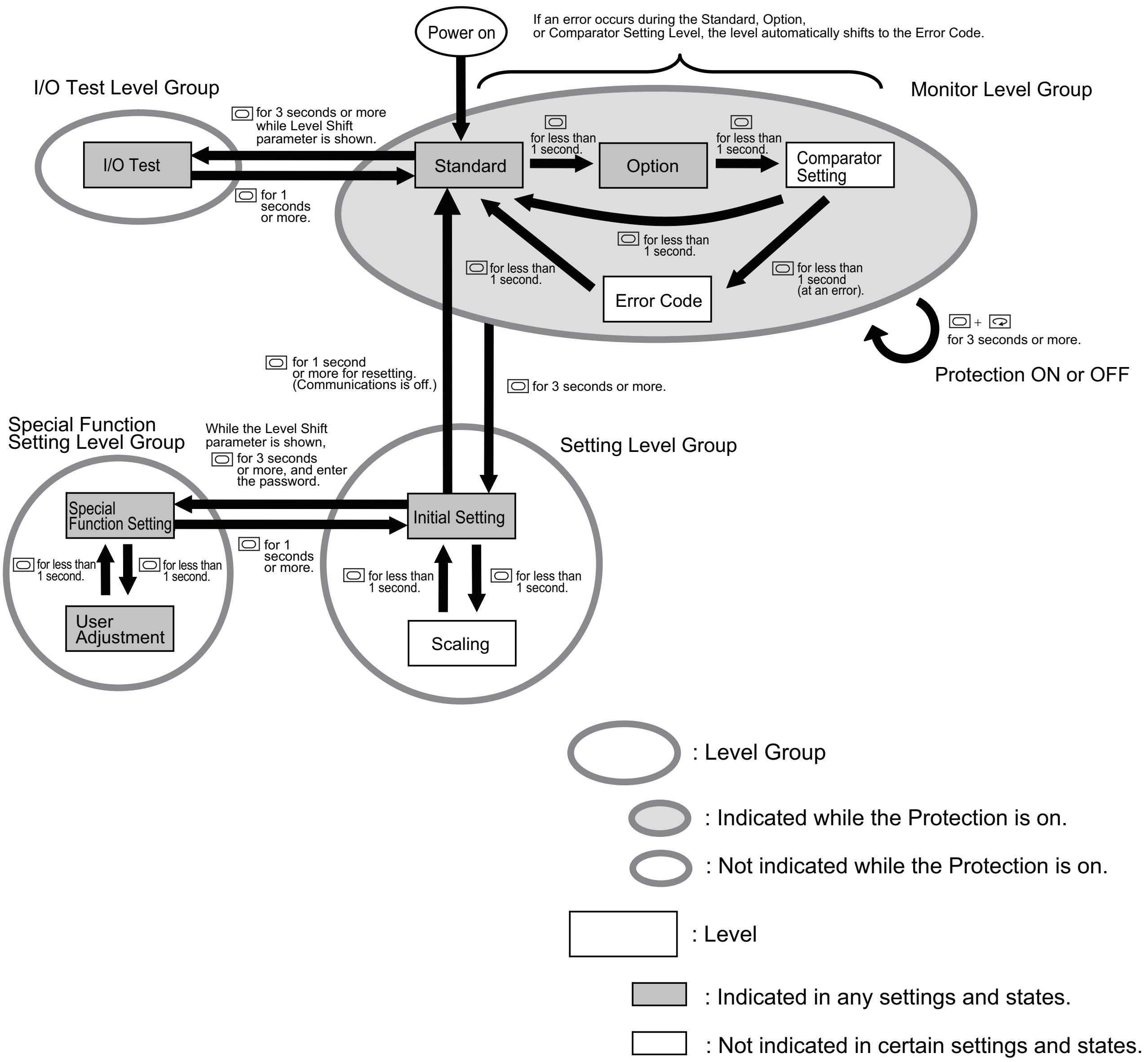
Entry buttons

Symbol on the Button	Button Name	Function	Reference
	LEVEL	To shift the level. Pressing duration changes the level to indicate. - Press it for less than 1 s. - Press it for more than 1 s but less than 3 s. - Press it for more than 3 s.	See Section 6-2.
	MODE	To switch the parameters. Releasing the pressed button instantly changes the parameter to indicate.	See Section 6-3
	SHIFT	To shift the state between Monitoring and Changing. Also it moves the digit during Changing state. You can change the set values for some parameters. Pressing duration changes the indication to show. - Press it for less than 1 s. - Press it for more than 1 s.	See Section 6-4 through Section 6-7
	UP	To change the parameter settings, to switch the channel to indicate, or to have a teaching *. Pressing duration changes the indication to show. - Press it for less than 1 s. - Press it for more than 1 s.	

* Teaching is enabled while the scaled value is set, and while the upper or lower limit is set by User Adjustment.

Button Operation and Level Shift

The illustration below outlines the button operations and corresponding level or level group changes. Section 6-3 elaborates the level shift procedures.



Indications on the Numerical Indicator and Level Shift

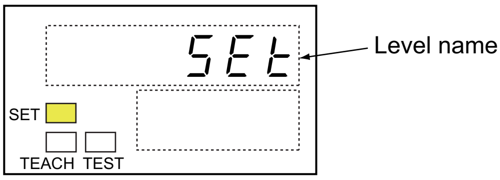
The table below outlines the level indications and the corresponding level shift procedures. See Section 6-2.

Level Group	Indication		Level	Indication No.1 after a Shift	Shift from Other Level	
	SET	TEST			Original Level	Button operation
Monitor			Standard	Stndrd	- The Level when power is on.	
					Other level within Monitor →	Press the button for less than 1 second.
					Setting →	Press the button for more than 1 second.
					I/O Test →	Press the button for more than 1 second.
			Option	oPtion	Other level within Monitor →	Press the button for less than 1 second.
			Comparator Setting	CmPr	- Only when Comparator function is in use.	
					Other level within Monitor →	Press the button for less than 1 second.
			Error Code	ErrCd	- Having an error automatically shifts to this level.	
					Other level within Monitor →	Press the button for less than 1 second.
Setting			Initial Setting	SEt	A level within Monitor →	Press the button for more than 3 second.
					Scaling level (Only when Scaling is in use)	Press the button for less than 1 second.
					Special Function Setting level →	Press the button for more than 1 second.
			Scaling	SCALE	- Only when Scaling is in use	
					Initial Setting →	Press the button for less than 1 second.
Special Function Setting			Special Function Setting	HFUnC	- Press the button for more than 3 seconds when Level Shift parameter is shown at Initial Setting.	
					User Adjustment →	Press the button for less than 1 second.
			User Adjustment	AdJUSt	Special Function Setting →	Press the button for less than 1 second.
I/O Test			I/O Test	tESt	- Press the button for more than 3 seconds when Level Shift parameter is shown at Standard level.	

Indication Change at Level Shifts

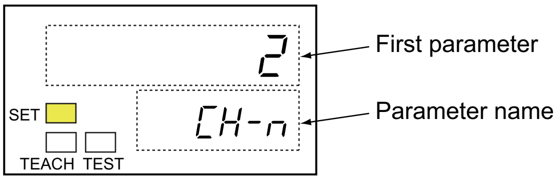
1. After a Level Shift completes, the new Level name is displayed for 1 second on the Indication No.1.

   E.g. Shifting to the Initial Setting Level;



2. After 1 second, the Indication No. 1 shows the set value for the first parameter of the Level, and the Indication No. 2 shows the name, in abbreviation, of the parameter.

   E.g. Indicating the set value for the first parameter of the Initial Setting Level. In this case it shows the number of available channels.



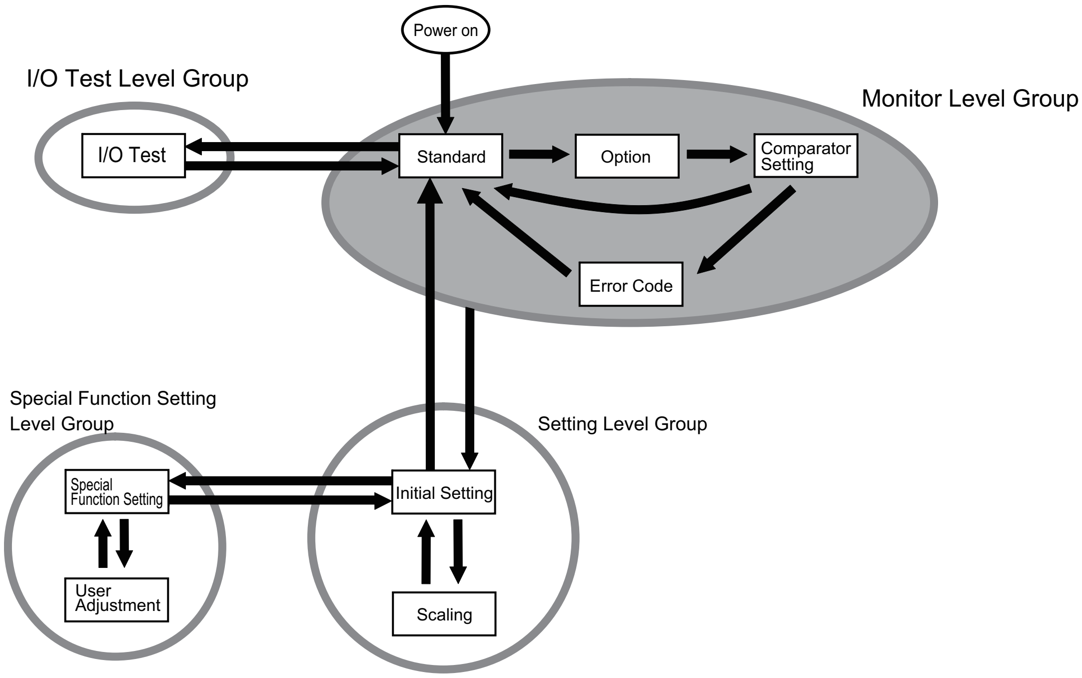
General Information

- If you press the button before 1 second passes since a new level name is displayed, the first parameter still shows up.
- The Indication No.2 can show a parameter No. instead of a parameter name. See Section 7-17.
- See Section 6-3 and Appendix 2 for the parameter names and the parameter Nos.

6-2 Transition among Levels and Level Groups

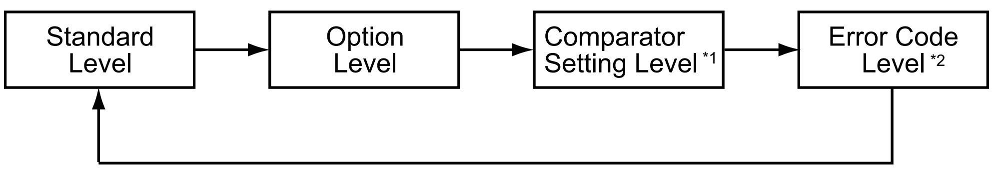
This section explains Level Shift within a Level Group and between them.

6-2-1 Level Shift within the Monitor Level Group



The level changes every time you press the button at the Standard Level of the Monitor Level Group. It changes in the certain order as specified in below. A certain level is skipped, however, depending on the conditions whether the Comparator function is in use and whether there is an error.

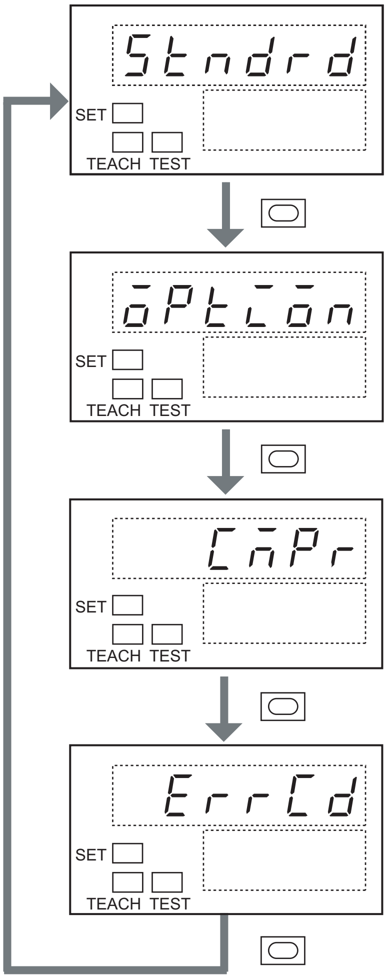
Level Transition Order



*1 The level is skipped on the Analog Output Slave Unit or when an Analog Input Slave Unit does not use the Comparator function. In these cases, the Comparator parameter of the Initial setting level shows “oFF”.

*2 The level is skipped when no error is occurring.

Button operations and Indication changes



1 Standard Level

2 Press the button.

3 The Indication transits to the Option Level

4 Press the button.

5 The indication transits to the Comparator Setting Level.
It is effective only when the Comparator function is in use.

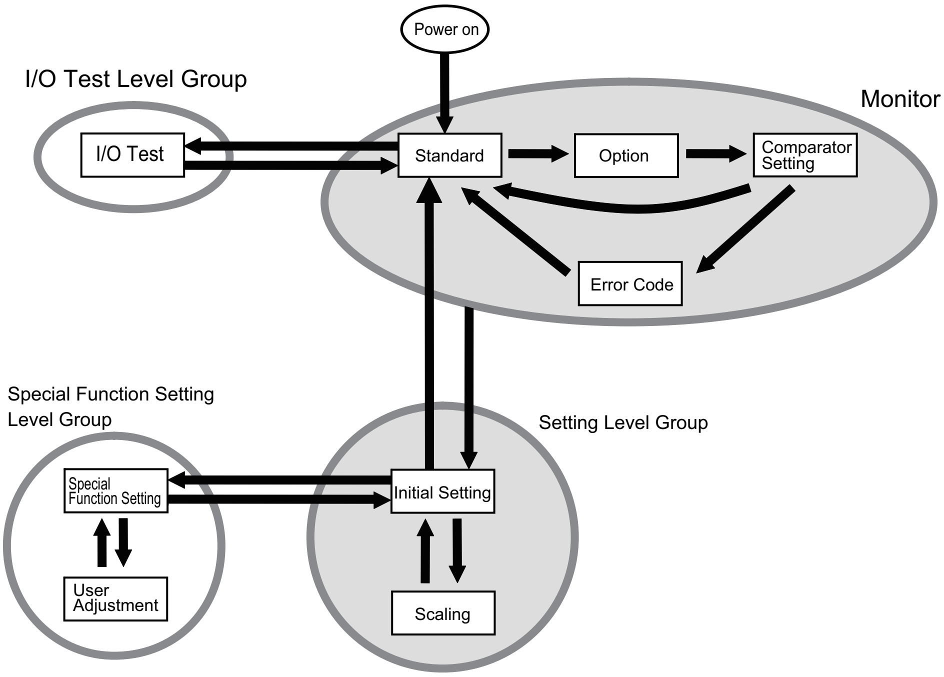
6 Press the button.

7 The indication transits to the Error Code Level.
It is effective only during an error occurs.

General Information

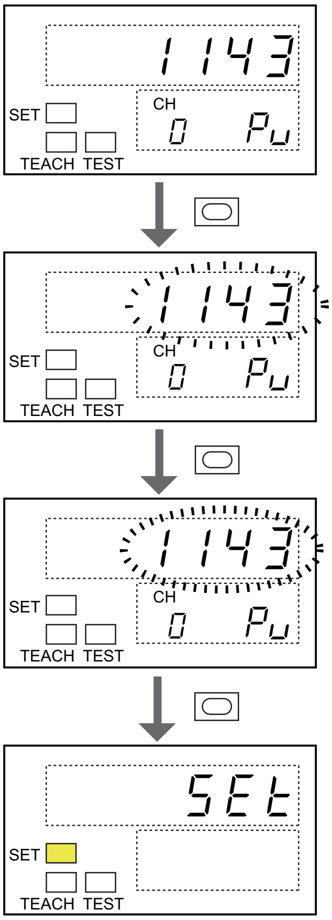
When there is an error, the level changes automatically to error code level.

6-2-2 Level Shift from the Monitor to the Setting Level Group



The level changes to the first level, i.e., the Initial Setting Level, of the Setting Level Group, when you press the [button icon] button for more than 3 seconds while any level in the Monitor Level Group is shown.

Button operations and Indication changes



1 It is in Monitor Level Group, while any level in this Group is monitored,

2 Press the button for more than 1 second.

3 The Indication No.1 flashes.

4 Keep pressing the button for another 1 second.

5 The Indication No.1 flashes faster.

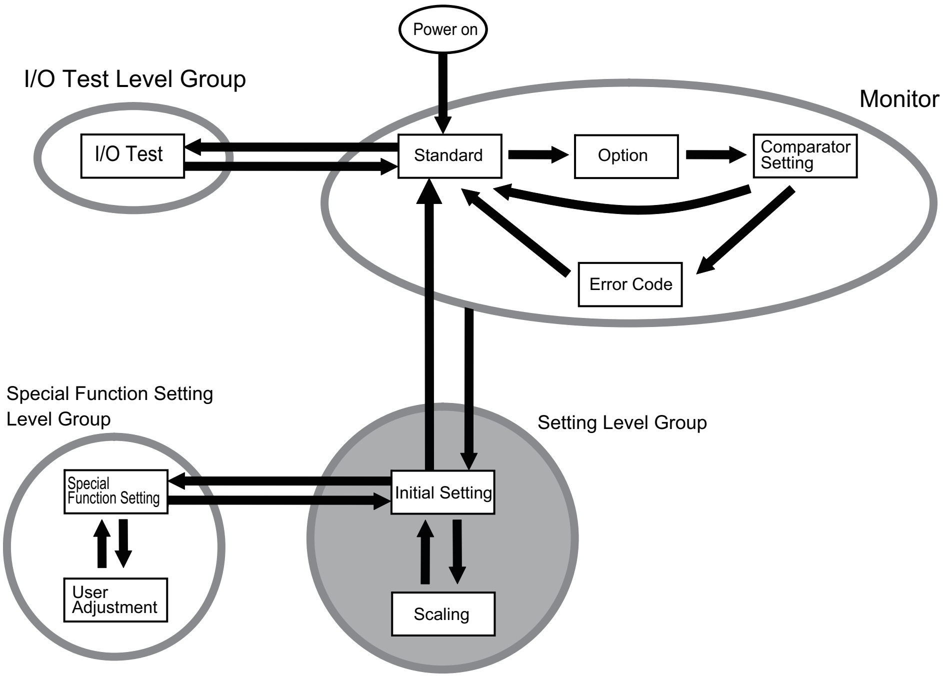
6 Keep pressing the button for another 1 second.

7 The indication transits to the Initial Setting Level of the Setting Level Group.

General Information

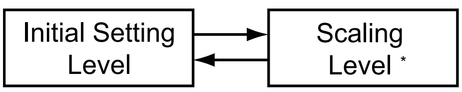
When you press the button for more than 1 second at the Initial Setting Level, the indication turns off once and the level returns to the Standard.

6-2-3 Level Shift within the Setting Level Group



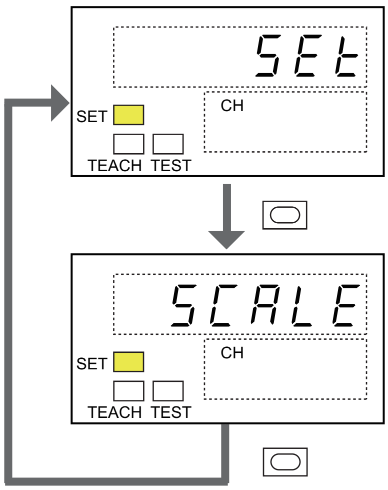
The level changes to the Scaling, when you press the button once on the Initial Setting Level of the Setting Level Group.
A Scaling Level is skipped when the Scaling function is not in use. In this case, the Scaling parameter at the Initial setting level shows “oFF”. Therefore pressing the button does not shift the level. The level remains at the Initial Setting level.

Level Transition Order



* The level is skipped when the Scaling function is not in use.

Button operations and Indication changes

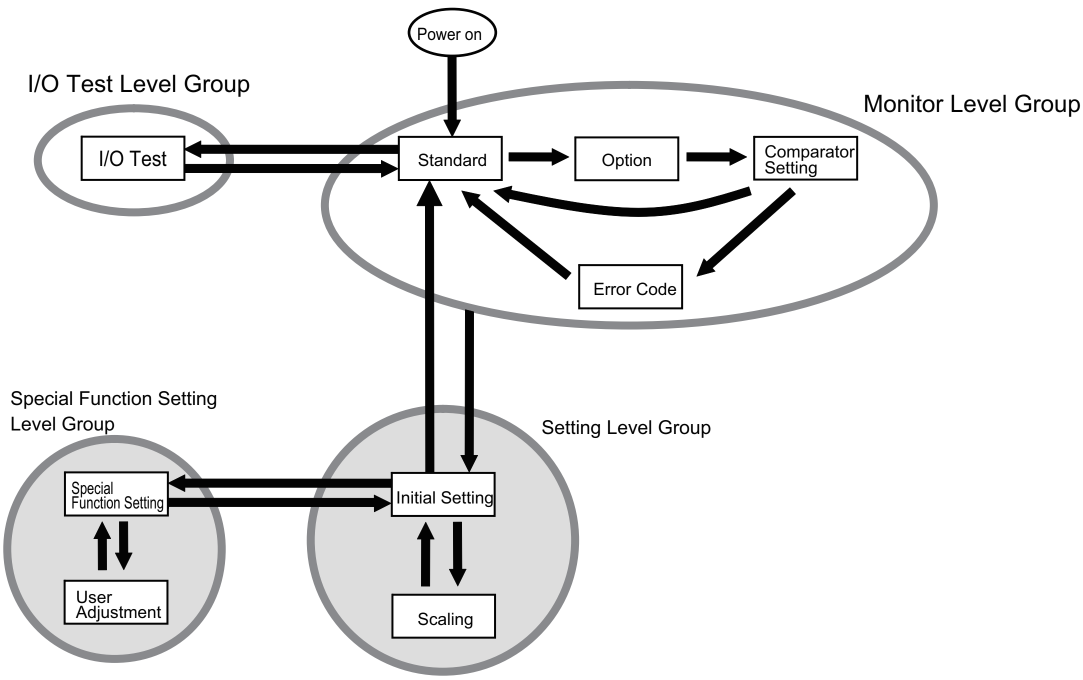


1 It is in Initial Setting level.

2 Press the button.

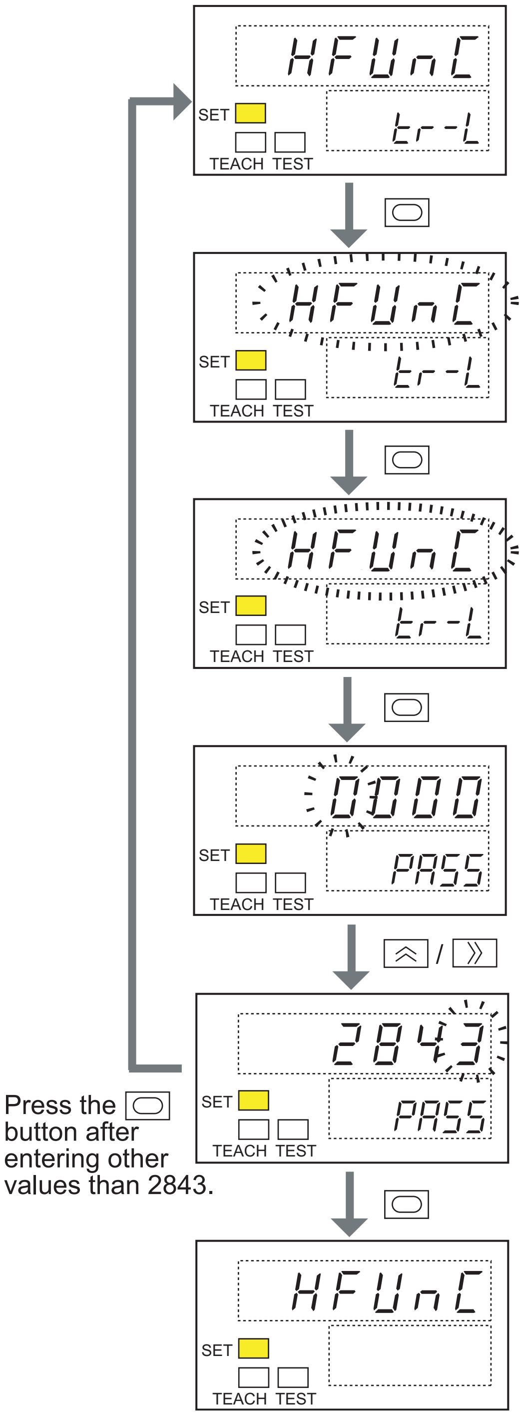
3 The Indication transits to the Scaling Level.
It is effective only when the Scaling function is in use.

6-2-4 Level Shift from the Setting to the Special Function Setting Level Group



The Special Function Setting Level Group contains parameters critical to initializing and adjustment. Therefore a shift to this level group requires different steps from others, such as a password entry. The transition procedure starts from the Level Shift parameter of the Initial Setting Level of the Setting Level Group.

Button operations and Indication changes



1 In the Standard Level, press the button several times to show the Level Shift parameter.

2 Press the button for more than 1 second.

3 The Indication No.1 flashes.

4 Keep pressing the button for another 1 second.

5 The Indication No.1 flashes faster.

6 Keep pressing the button for another 1 second.

7 Four digits of 0 are indicated. The leftmost digit flashes.
It means that it is waiting for a password entry.

8 Use the button to change numbers, and the button to move between the digits.
Enter the password “2843” .

9 The password is set.

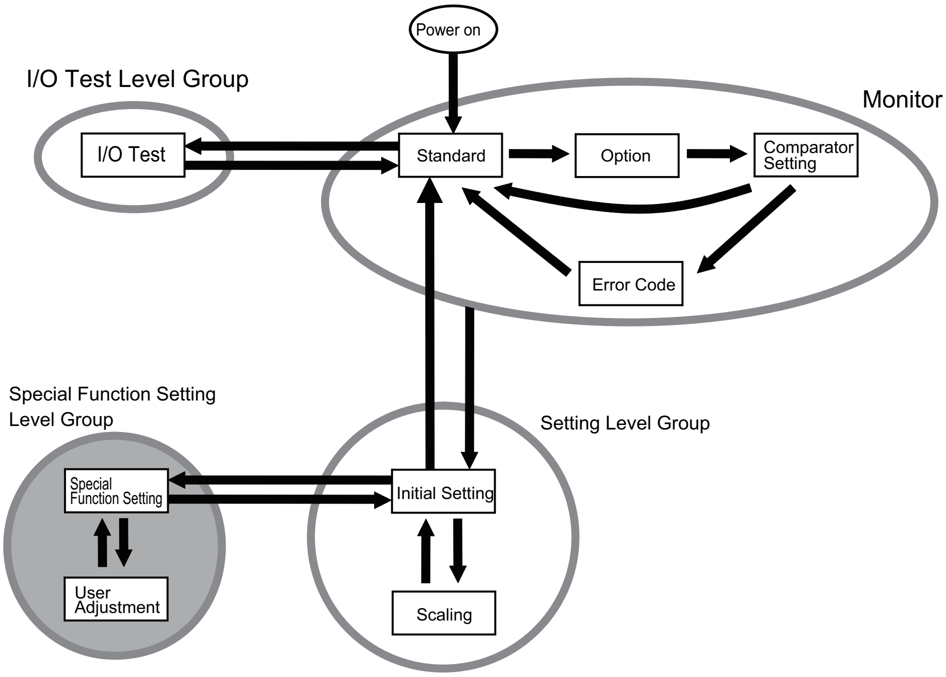
10 Press the button.

11 The indication transits to the Special Function Setting Level of the Special Function Setting Level Group.

General Information

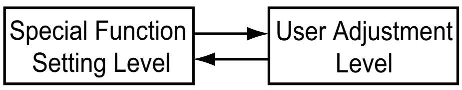
- When you press the button for more than 1 second at the Special Function Setting Level, the indication turns off once, and the level returns to the Initial Setting level.
- The password cannot be changed from ”2843”.

6-2-5 Level Shift within the Special Function Setting Level Group

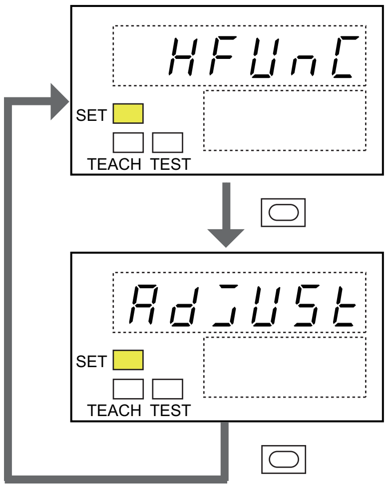


When the button is pressed once on the Special Function Setting Level of the Special Function Setting Level Group, the level changes to the User Adjustment level.

Level Transition Order



Button operations and Indication changes

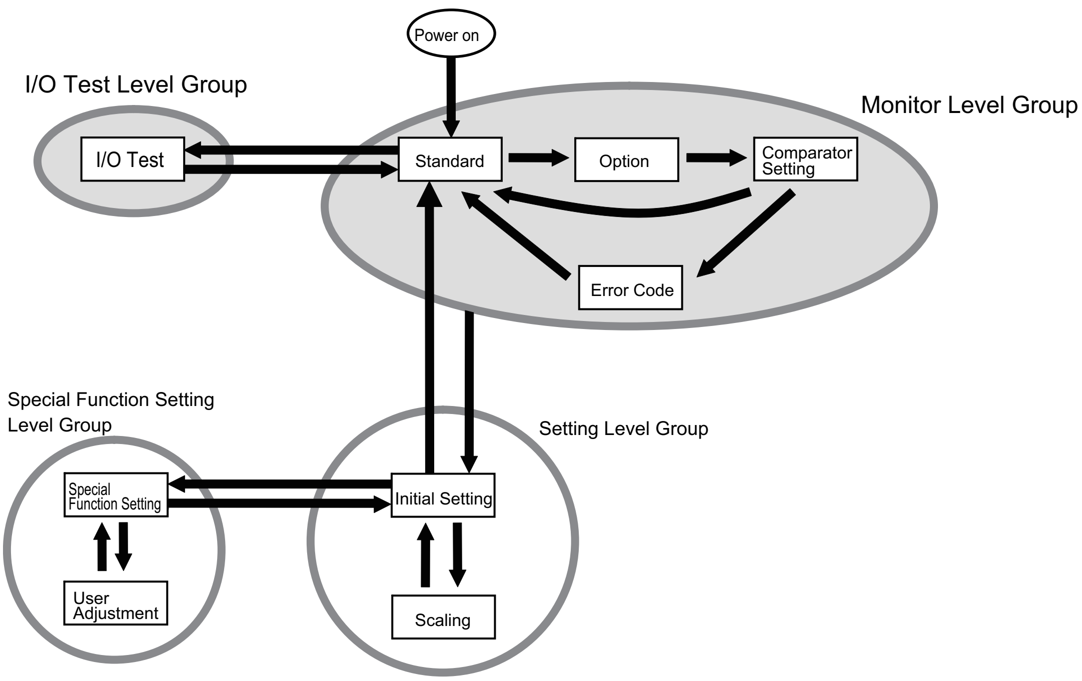


1 It is in the Special Function Setting level.

2 Press the button.

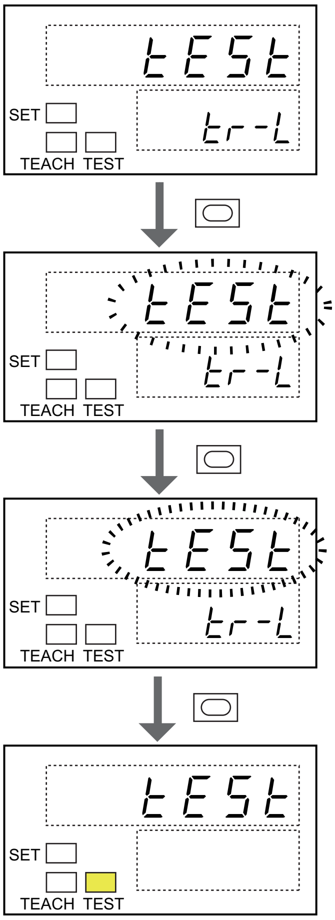
3 The Indication transits to the User Adjustment Level.

6-2-6 Level Shift from the Monitor to the I/O Test Level Group



The level changes to the I/O Test Level, when you press the button for 3 seconds or longer while the parameter is for Level Transition of the Standard Level of the Monitor Level Group.

Button operations and Indication changes



1 In the Standard Level, press the button several times to show the Level Shift parameter.

2 Press the button for more than 1 second.

3 The Indication No.1 flashes.

4 Keep pressing the button for another 1 second.

5 The Indication No.1 flashes faster.

6 Keep pressing the button for another 1 second.

7 The indication transits to the I/O Test Level of the I/O Test Level Group.

General Information

When you press the button for more than 1 second at the I/O Test Level, the indication turns off once, and the level returns to the Standard.

6-3 Parameter Setting

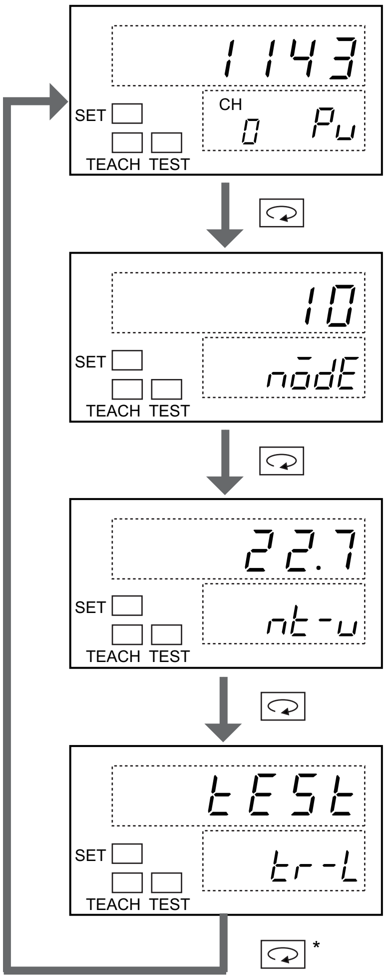
This section explains the procedures to shift the parameter indications, and to set and change the parameters.

6-3-1 Switching a Parameter to Indicate

After moving to a Level to operate, use the button to switch the parameter to indicate. The parameter indication changes every time you press it.

The Indication No.1 shows the parameter set value, while the Indication No.2 shows the parameter name or the number.

This is an example procedure to switch the parameter indication at Standard Level.



1 It shows the present value.

2 Press the button once.

3 It shows the node address.

4 Press the button again.

5 It shows the network power voltage.

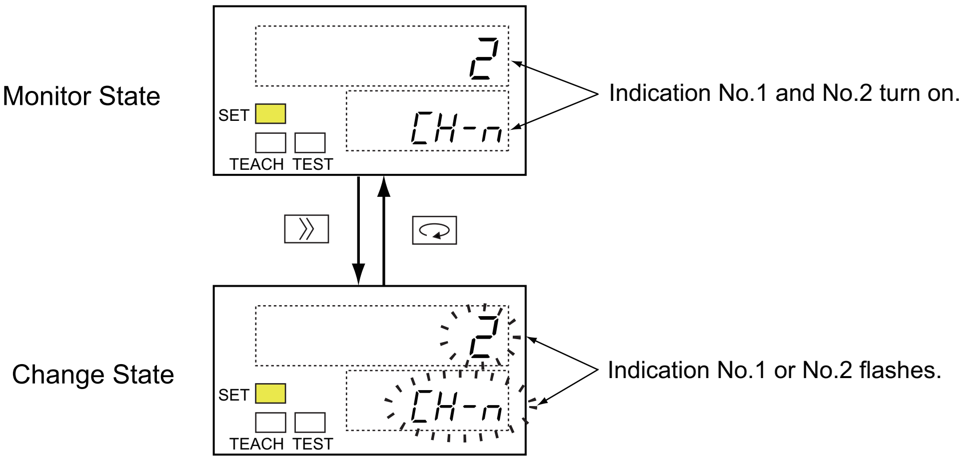
6 Press the button again.

7 It is in Level transition state.

6-3-2 Monitor State and Change State

The parameter indication has two states. One is the Monitor state to monitor the parameter set values. The other is the Change state to change the set values.

Use the button to shift from the Monitor state to the Change state, and the button to switch reversely.



6-3-3 Changing the Parameter Set Values

The parameter set values are changed in the following procedures.

1. At the Monitor State, show the parameter to change.
2. Press the button once to switch over to the Change State.
3. Use the button and the button to have a desired value for the parameter set.
4. Press the button to return to the Monitor State.
5. Press the button to move on to the next parameter indication.

General Information

- If you do not operate anything for 5 seconds at step 3, the value shown is set. The state automatically returns to the Monitor level.
- If you press the button at step 4, the parameter setting is instantly finalized.

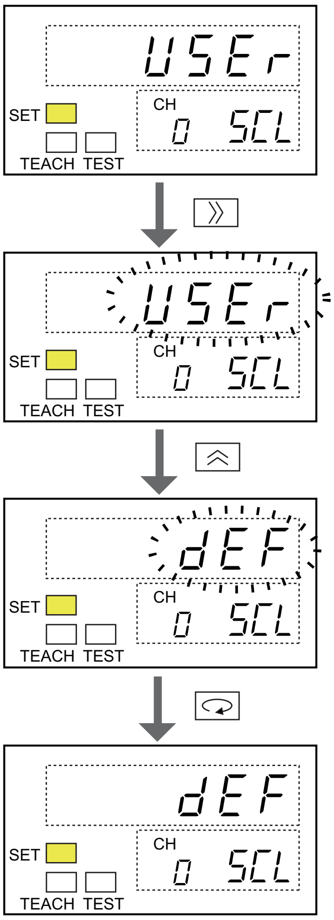
There are three ways to change the parameter setting values.

- Use the button to select a parameter setting value,
- Use the button to move the digit to change, and button to increment the value,
- Use the button to decrement the value, and the button to increment it.

Each procedure is exemplified below.

- ## Using the button to select a parameter set value

E.g. The Scaling parameter of the Initial Setting Level



1 It is the Initial Setting Level in the Monitor State.

2 Press the button.

3 The Indication No.1 flashes. It is in the Change State.

4 Use the button to have a desired value to set.

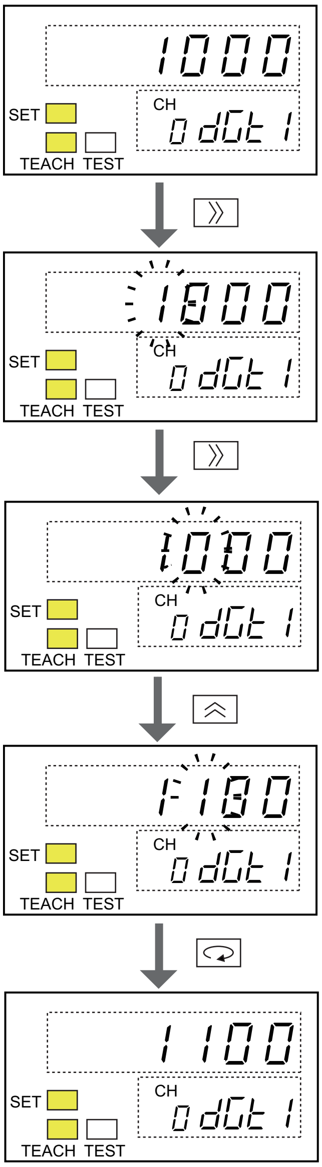
5 It indicates the state after the parameter setting value is changed.

6 Press the button.

7 The indication stops flashing and becomes solid.
The parameter set value is settled.
It returns to the Monitor State.

- Using the button to move the digit, and the button to increment the value

E.g. The parameter of Digital value 1 in the Scaling Level



1 It is the Scaling Level in the Monitor State.

2 Press the button.

3 The leftmost digit flashes. It is in the Changing state.

4 Press the button.

5 The flashing moves on to nearest right digit. *1

6 Press the button.

7 The value in the flashing digit changes. *2 *3

8 Press the button.

9 The indication stops flashing and becomes solid.
The parameter setting value is settled.

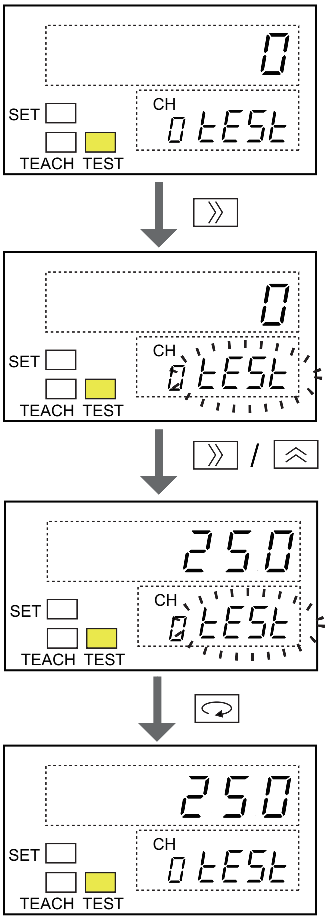
*1 If you press the button while the rightmost digit is flashing, the flashing moves back to the leftmost digit.

*2 If you press the button while the maximum value is indicated, the indication returns to the minimum value.

*3 It is only a value within pre-determined parameter range that you can select and change by the button.

- Using the button to decrement the value, and the button to increment it

E.g. Test input or output value in I/O Test Level



1 It is the I/O Test Level in Monitor State.

2 Press the button.

3 The Indication No.2 flashes. It is in the Changing State.

4 Use the button to decrement the value,
and the button to increment it.

5 It is the state where the input or output value is changed.

6 Press the button.

7 The indication stops flashing and becomes solid.
The input or output value is settled.
It changes to the Monitor State level.

General Information

If you press the or button for more than 1 second instead of setting a value at Step 4, the value setting is skipped.

6-3-4 Switching Channels

A channel to indicate can be switched only when the indication is in the Monitor State. It cannot be switched during it is in the Change State. If it is the parameter for entire Unit, the Channel (CH) indicator does not show anything, and channel switching is not available, either.

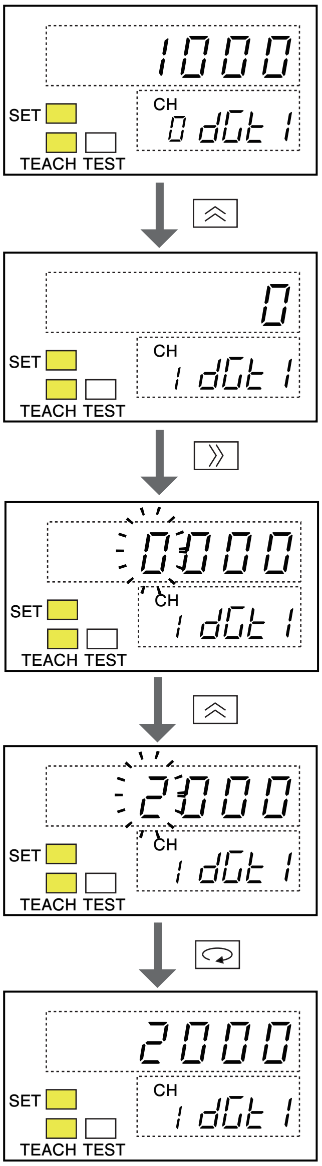
The channel is switched in the following procedures.

1. In the Monitor State, show a parameter of which the channel is switched.

2. Press the button once to switch the channel.

3. If you attempt to change the parameter subsequently, press the button. The state shifts to the Change State.

E.g. This is the case to switch the channel and to change the parameter, when the parameter for Digital value 1 of the Scaling Level is shown.



1 It is the Scaling Level in the Monitor State.

2 Press the button.

3 The channel is switched.

4 Press the button.

5 The leftmost digit flashes. It is in the Change state.

6 Press the button.

7 The parameter for the channel is changed, but not the channel itself.

6 Press the button.

9 The indication stops flashing and becomes solid. The parameter setting value is settled.

6-4 Switching the Indications of Parameters in Monitor Level Group

The Monitor Level Group contains four levels. They are the Standard, the Option, the Comparator Setting and the Error Code. This part of the section explains how to indicate and change parameters in these levels.

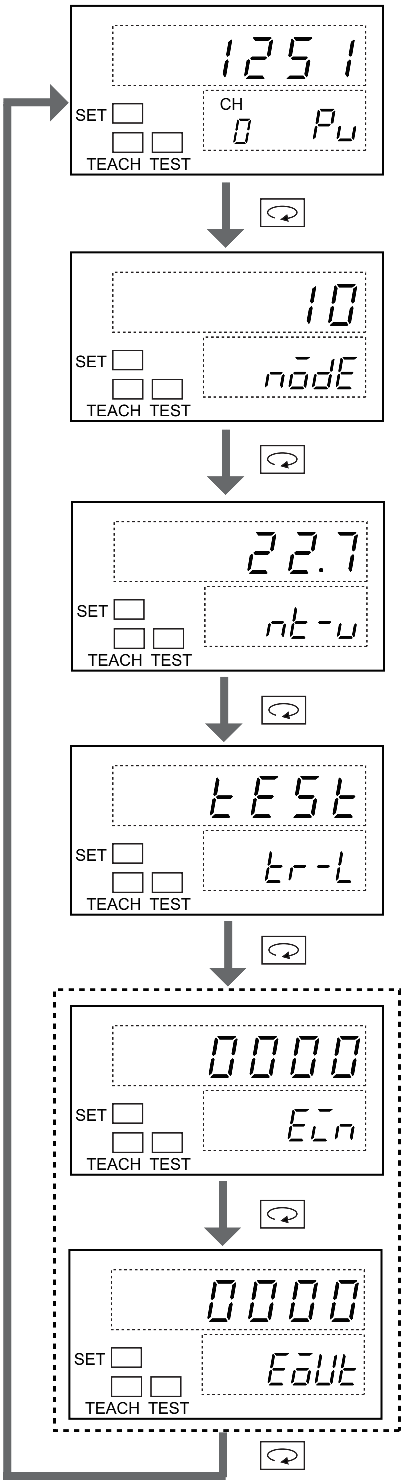
6-4-1 Standard Level

The Standard Level is to monitor the present value and settings. You cannot change the parameter in this level.
These are the parameters in the Standard Level.

Parameters

Indicator No.2	Parameter name	Description
Pu	Present value	Indicates a value between -5% and 105%. Over the upper limit (out of displayable range): 「ɔɔɔɔ」、 Under the lower limit (out of displayable range): 「cccc」
nodE	Present node address	-
nt-u	Present network power voltage	-
tr-L	Level transition	To make a transit to the I/O Test Level.
Ein	Present value on the Expansion Input Unit	It is indicated only when an Expansion Unit is mounted.
EoUt	Present value on the Expansion Output Unit	It is indicated only when an Expansion Unit is mounted.

Switching the Parameter Indication



1 It shows the present value.

2 Press the button once.

3 It shows the node address.

4 Press the button.

5 It shows the network power voltage.

6 Press the button.

7 It is in Level transition state.

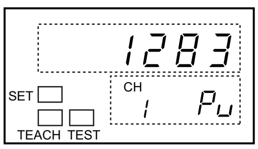
8 Press the button.

9 It shows the present value on the Expansion Input Unit, when it is mounted.

10 Press the button.

11 It shows the present value on the Expansion Output Uni when it is mounted.

When you press the button while the present value (Pu) is displayed, the same parameter for the next channel is shown.



6-4-2 Option Level

The Option Level is to monitor the present values. You cannot change the parameter in this level. These are the parameters in the Option Level.

Parameters

- Analog Input Unit

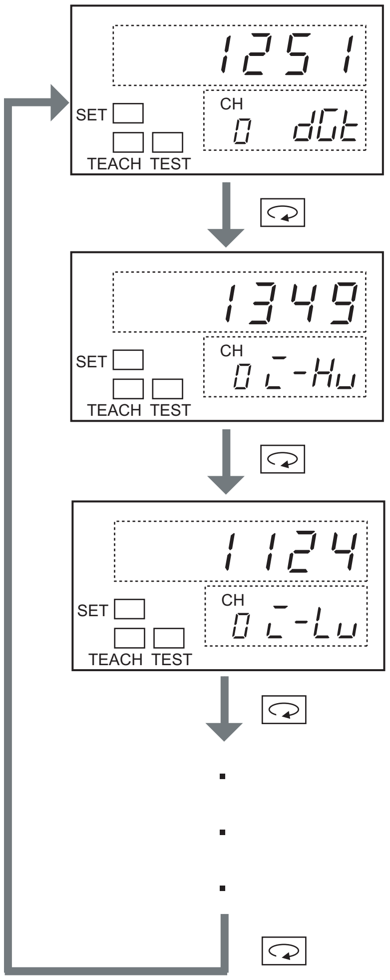
Indicator No.2	Parameter name	Description
dGt	Digital value	Indicates a value between -5 % and 105 %.
i-Hu	Maximum input	-
i-Lu	Minimum input	-
nt-H	Maximum network power voltage	-
nt-L	Minimum network power voltage	-
CmPr	Comparator result	Effective only when the Comparator function is in use. Alarm Trip Point High (high high limit, HH), Warning Trip Point High (high limit, H), Warning Trip Point Low (low limit, L), Alarm Trip Point Low (low low limit, LL), or PASS
Stts	Status flag	Switches between and indicates one of Network Power Voltage Drop Flag, Unit Conduction Time Exceeded Flag, Cumulated Counter Over Flag, Scaling Overflow Flag, Scaling Underflow Flag, or Extended Unit I/O Power Error Flag, which is on.

- Analog Output Unit

Indicator No.2	Parameter name	Description
dGt	Digital value	Indicates a value between -5 % and 105 %.
nt-H	Maximum network power voltage	-
nt-L	Minimum network power voltage	-
Stts	Status flag	Switches between and indicates one of Network Power Voltage Drop Flag, Unit Conduction Time Exceeded Flag, Cumulated Counter Over Flag, Error Output Flag or Extended Unit I/O Power Error Flag, which is on.

Switching the Parameter Indication

E.g. Analog Input Unit



1 It shows the digital value.

2 Press the button.

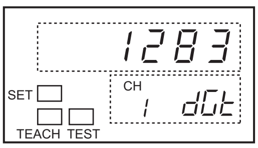
3 It shows the maximum input.

4 Press the button.

5 It shows the minimum input.

6 Press the button.

When you press the button while one of the Option Level parameters is displayed, the same parameter for the next channel is shown.



6-4-3 Comparator Setting Level

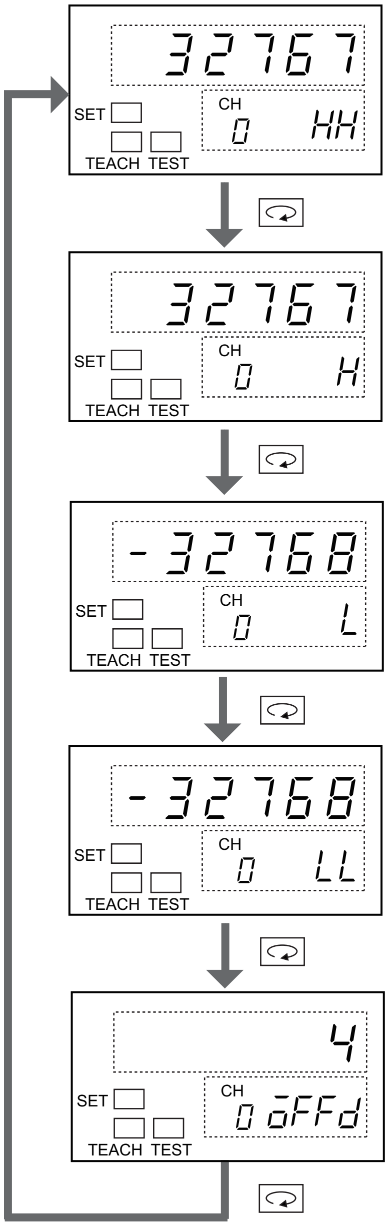
The parameters for the Comparator Setting Level are shown only when the Comparator function is in use on an Analog Input Unit. The parameter setting can be changed in the Changing State of the Indicator. It does not require restarting the Unit, and the change is instantly reflected. See Section 6-9-1.

These are the parameters in the Comparator Setting Level.

Parameters

Indicator No.2	Parameter name	Description
HH	Alarm Trip Point High (high high limit, HH)	-
H	Warning Trip Point High (high limit, H)	-
L	Warning Trip Point Low (low limit, L)	-
LL	Alarm Trip Point Low (low low limit, LL)	-
oFFd	OFF delay value	-

Switching the Parameter Indication



1 It shows the high high limit (HH, Alarm Trip Point High).

2 Press the button.

3 It shows the high limit (H, Warning Trip Point High).

4 Press the button.

5 t shows the low limit (L, Warning Trip Point Low).

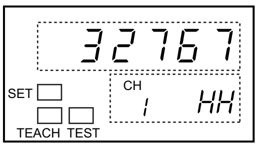
6 Press the button.

7 It shows the (LL, Alarm Trip Point Low).

8 Press the button.

9 It shows the OFF delay value.

When you press the button while one of the Comparator Setting Level parameters is displayed, the same parameter for the next channel is shown.



6-4-4 Error Code Level

The parameters for the Error Code Level are shown only when an error occurs. If an error occurs while any Level in the Monitor Level Group, i.e., Standard, Option or Comparator Setting, is shown, the indication automatically changes to show the Error Code Level. Once the error is resolved, it automatically changes to the Standard Level.
These are the parameters in the Error Code Level.

Parameters

- Analog Input Unit

Indicator No.2	Parameter No. display *	Parameter name	Indication range	
			Numerical value	Character value
E01	E01	EEPROM sum value error	-	EEP.S
E21	E21	EEPROM hardware error	-	EEP.H
E08	E08	Disconnection detected	-	S.Err
E09	E09	Analog hardware error	-	HArdA
E29	E29	Expansion Unit hardware error	-	HArd.E
E10	E10	Connection timeout	-	t.oUt
E11	E11	Duplicated address or Repeater configuration error	-	Addr
E12	E12	Initialization error	-	InIErr
E13	E13	WDT error	-	WdtErr
E14	E14	Parameter error	-	PrmErr
E15	E15	SW setting error	-	SWErr
nodE	E99	Node address	00 to 63	-

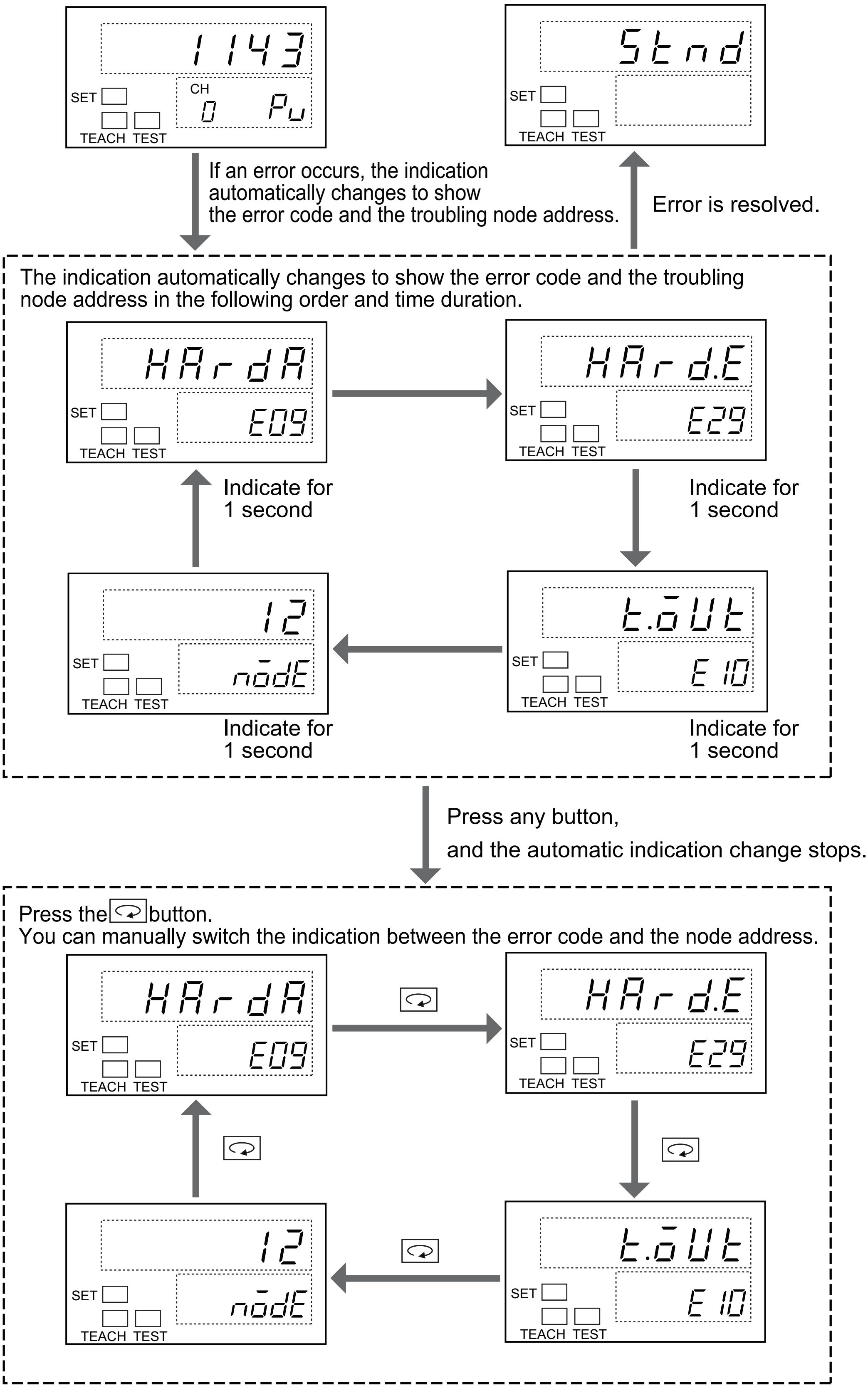
- Analog Output Unit

Indicator No.2	Parameter No. display *	Parameter name	Indication range	
			Numerical value	Character value
E01	E01	EEPROM sum value error	-	EEP.S
E21	E21	EEPROM hardware error	-	EEP.H
E09	E09	Analog hardware error	-	HArdA
E29	E29	Expansion Unit hardware error	-	HArd.E
E10	E10	Connection timeout	-	t.oUt
E11	E11	Duplicated address or Repeater configuration error	-	Addr
E12	E12	Initialization error	-	InIErr
E13	E13	WDT error	-	WdtErr
E14	E14	Parameter error	-	PrmErr
E15	E15	SW setting error	-	SWErr
nodE	E99	Node address	00 to 63	-

* The Indicator No.2 can display either the parameter name or the parameter No. They are switchable. See Section 7-17.

Switching the Parameter Indication

If an error occurs, the indication automatically changes to show the error code and the troubling node address.



General Information

When an error that causes the Unit operation stops occurs, the indication is not switched automatically from the error code to node address, but it keeps showing the error code.

6-5 Switching the Indications of Parameters in Setting Level Group

The Setting Level Group contains two levels. They are the Initial Setting and the Scaling. This part of the section explains how to indicate and change parameters in these levels.

6-5-1 Initial Setting Level

The parameters for the Initial Setting Level can be changed while the indicator is in the Changing State. The setting change becomes effective after the Unit is restarted or when level returns to the Standard Level.
These are the parameters in the Initial Setting Level.

Parameters

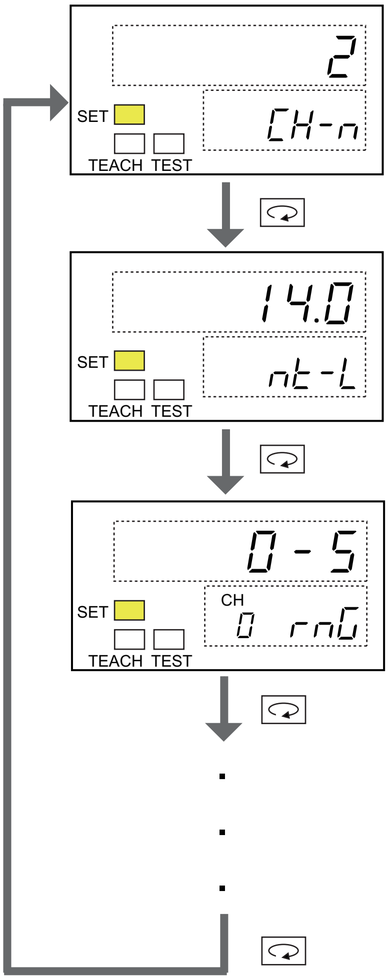
- Analog Input Unit

Indicator No.2	Parameter name	Description
CH-n	Available channels	-
nt-L	Values on Network power voltage monitor	-
rnG	Input range	Effective only when the input range setting pin No. 8 on the Unit is off.
Aur	Moving average	Not used or Used
SCL	Scaling	Off, Default scaling, or User scaling
CmPr	Comparator	Not used or Used
PdSP	Parameter indication style	Parameter name, or Parameter No.
CoLr	Color of Indicator No.1	Red, or Green
ntSt	Network setting	Network setting, or Local setting
tr-L	Level transition	Makes a transit to Special Function Setting Level
LCLC	Local control	Effective only when an Expansion Unit is connected. Digital I/O Expansion, or Local Control

- Analog Output Unit

Indicator No.2	Parameter name	Description
CH-n	Available channels	-
nt-L	Values on Network power voltage monitor	-
rnG	Output range	Effective only when the output range setting pin No. 8 on the Unit is off.
SCL	Scaling	Off, Default scaling, or User scaling
FAUL	Fault action	Low Limit, High Limit, Hold Last State, Specified Value
IdLE	Idle action	Low Limit, High Limit, Hold Last State, Specified Value
PdSP	Parameter indication style	Parameter name, or Parameter No.
CoLr	Color of Indicator No.1	Red, or Green
ntSt	Network setting	Network setting, or Local setting
tr-L	Level transition	Makes a transit to Special Function Setting Level

Switching the Parameter Indication



1 It shows the available channels.

2 Press the button.

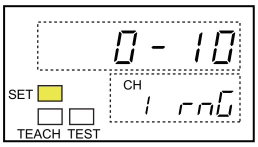
3 It shows the value on the network power voltage monitor.

4 Press the button.

5 It shows the input range.

6 Press the button.

When you press the button while one of the Initial Setting Level parameters is displayed, the same parameter for the next channel is shown. This is only for the parameters which indicate the channel No.



6-5-2 Scaling Level

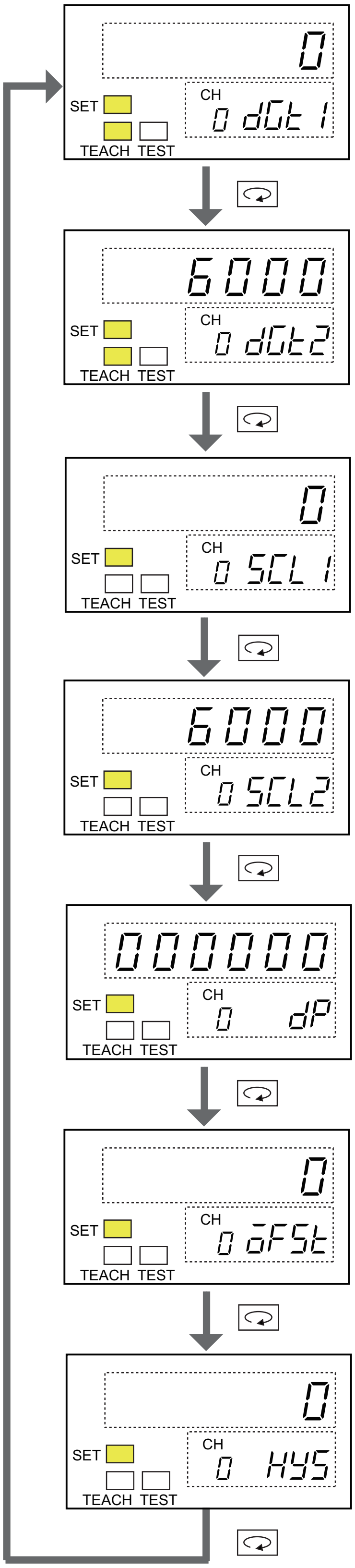
The Scaling Level can be used when the Scaling function in the Initial Setting Level is not set in Off, but set either in Default scaling or User scaling. The parameters for the Scaling Level can be changed while the indicator is in the Changing State. The setting change becomes effective after the Unit is restarted or when level returns to the Standard Level. These are the parameters in the Scaling Level.

Parameters

Indicator No.2	Parameter name	Description
dGt1	Digital value 1	Teaching available *
dGt2	Digital value 2	Teaching available *
SCL1	Scaling value 1	-
SCL2	Scaling value 2	-
dP	Position of decimal point	Moves the decimal point.
oFSt	Scaling offset	-
HYS	Hysteresis	Effective only on Analog Input Units

* See Section 7-5 for teaching.

Switching the Parameter Indication



1 It shows the Digital value 1.

2 Press the button.

3 It shows the Digital value 2.

4 Press the button.

5 It shows the Scaling value 1.

6 Press the button.

7 It shows the Scaling value 2.

8 Press the button.

9 It shows the position of decimal point.

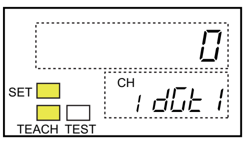
10 Press the button.

11 It shows the Scaling offset

12 Press the button.

13 It shows the hysteresis.

When you press the button while one of the Scaling Level parameters is displayed, the same parameter for the next channel is shown.



6-6 Switching the Indication of Parameters in Special Function Setting Level Group

The Special Function Setting Level Group contains two levels. They are the Special Function Setting and the User Adjustment. This part of the section explains how to indicate and change parameters in these levels.

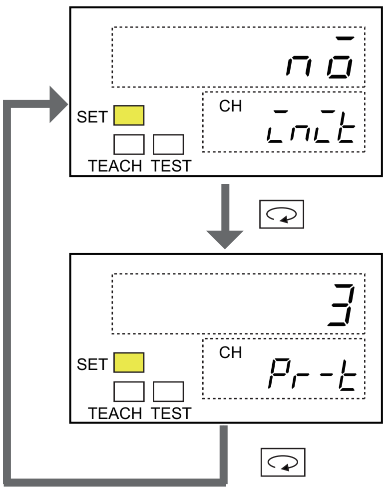
6-6-1 Special Function Setting Level

The parameters for the Special Function Setting Level can be changed while the indicator is in the Changing State. The setting change becomes effective after the Unit is restarted or when level returns to the Standard Level. These are the parameters in the Special Function Setting Level.

Parameters

Indicator No.2	Parameter name	Description
init	Initializing	Initialize, or Not initialize
Pr-t	Time to shift to protect	3 - 10 s

Switching the Parameter Indication



1 It is in initializing.

2 Press the button.

3 It shows the Time to shift to protect.

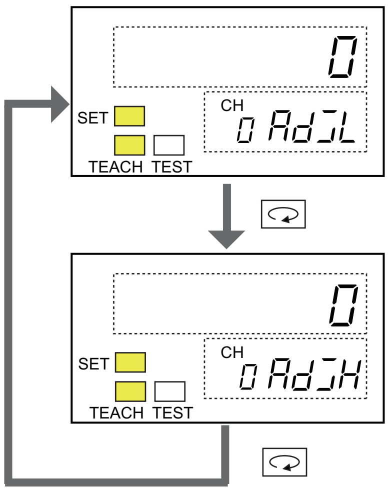
6-6-2 User Adjustment Level

The setting change becomes effective after the Unit is restarted or when level returns to the Standard Level. These are the parameters in the User Adjustment Level.

Parameters

Indicator No.2	Parameter name	Description
AdJL	Lower Adjusting Value	-
AdJH	Upper Adjusting Value	By CX-Integrator, you can adjust in any points in addition to 100 %.

Switching the Parameter Indication

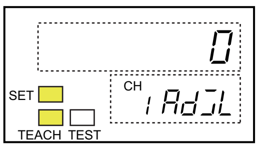


1 It shows the Lower Adjusting Value.

2 Press the button.

3 It shows the Upper Adjusting Value.

When you press the button while one of the Initial Setting Level parameters is displayed, the same parameter for the next channel is shown.



6-7 Switching the Indications of Parameters in I/O Test Level Group

The I/O Test Level Group contains just one level: the I/O Test Level. This part of the section explains how to indicate parameters.

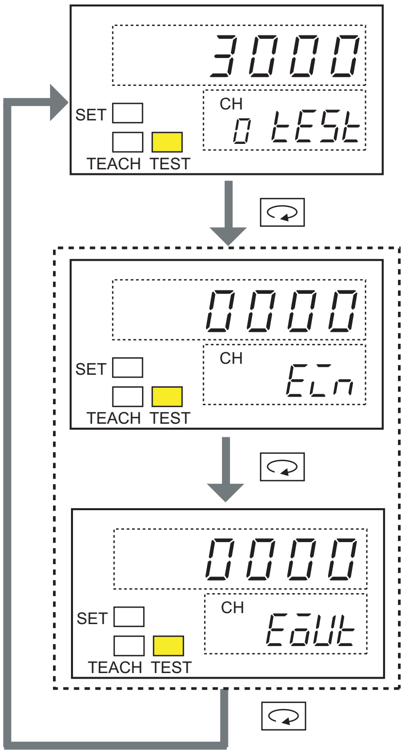
6-7-1 I/O Test Level

The Level shifts to the I/O Test Level, when you press the button for 3 seconds or longer while the Standard Level shows the Level Transition parameter. See Section 6-2-6.
This is the parameter in the I/O Test Level.

Parameters

Indicator No.2	Parameter name	Description
tESt	Analog I/O Test	-
Ein	Expansion Input Test	It is indicated only when an Expansion Unit is mounted.
EoUt	Expansion Output Test	It is indicated only when an Expansion Unit is mounted.

Switching the Parameter Indication



1 It shows the value from Analog I/O test.

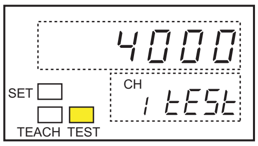
2 Press the button.

3 It shows the value from Expansion Input test.
(only when an Expansion Unit is mounted.)

4 Press the button.
(only when an Expansion Unit is mounted.)

5 It shows the value from Expansion Output test.
(only when an Expansion Unit is mounted.)

When you press the button while the Analog I/O Test, the next channel is shown.



6-8 Protection Function

The Protection Function is to protect the above parameter settings from accidental and illegal changes by any third party. During the protection, the parameters in the Monitor Level Group can be seen. However, the level cannot shift from the Monitor level group to the Setting Level Group or the I/O Test Level Group.
The time to shift to protection is changeable among 3 to 10 seconds. The time can be changed by the parameter for the Time to Shift to Protection in the Special Function Setting Level. See Section 6-6-1.

Setting Procedure

- Setting the Protection

1. Show any level of the Monitor Level Group.

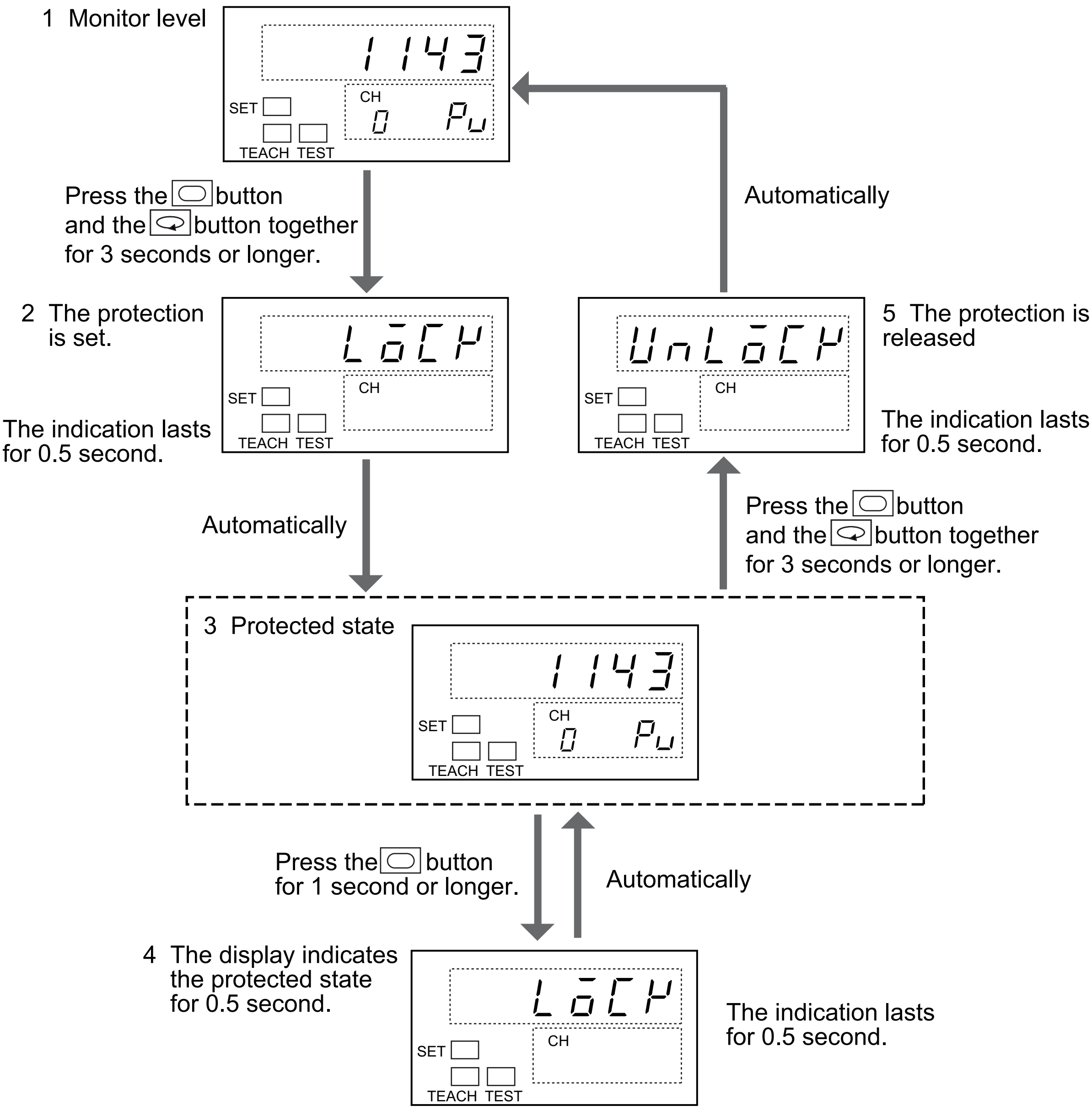
2. Press the button and the button together for 3 seconds or longer.
The protection function works. The display shows the protection setting indication "LoCK" for 0.5 second. Then it returns to the original indication.

To confirm the protection setting, press the button for 1 second or longer. If the protection function works, the display shows the indication "LoCK".

- Releasing the Protection

1. During the protected state, press the button and the button together for 3 seconds or longer.
The protection function is released. The display shows the releasing indication "UnLoCK" for 0.5 second. Then it returns to the original indication.

The procedures are illustrated here.



6-9 Points to Pay Attentions to When Using the Numerical indicators

This section describes the items that you should keep in mind when you use an Numerical Indicator.

6-9-1 Timing to Reflect the Parameter Setting to the Units

The timing when the parameter setting is reflected to the Units differs from the parameter types. There are two types as in below table.

Reflecting timing	Description	Corresponding parameter
Instant reflecting	The parameter setting finalized by pressing the button is immediately reflected to the Unit.	Comparator results (HH, H, L, and LL) OFF delay value
Reflection by restart	The parameter setting is reflected when the Unit is restarted up or when the level returns to the Standard.	Others

If a parameter is changed several times before the reflection timing, the last setting becomes effective at the reflecting timing.

6-9-2 Indication at Data Overflow and Underflow

Data overflow and underflow occur if the input or output data exceeds the specified indication range or the capacity. The below table explains the cases and the indications.

Data state	Description	Indication
Out of specified indication range	An input or output data exceeds the specified range of scaled indication, i.e., -32768 to +32766	The display keeps showing the upper or lower limit. (The Indicator No.2 shows ”ɔɔɔɔ” as the upper limit or ”cccc” as the lower limit.)
Out of input capacity	The input data is within the specified indication range. But the data size itself exceeds the input capacity.	The input range is fixed to 0% or 100%.

6-9-3 If Any Setting for the Network Competes with the Unit Setting

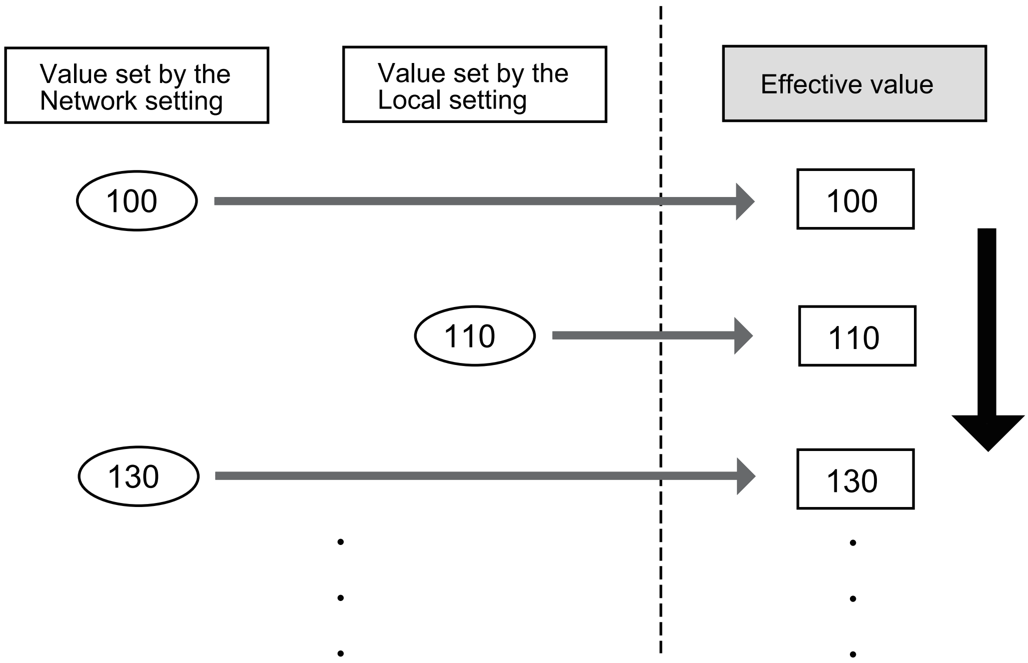
Compete with Setting

When any parameters for the network are set by the Explicit Messaging or the Network setting, they may compete with the setting of the Unit or the Local setting.

These are the cases when the both settings may compete.

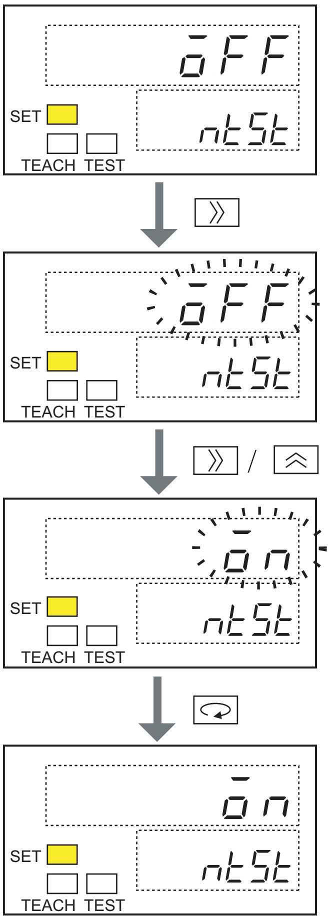
- When the parameter is settable both on the Unit and by the Network, i.e., when the Unit is at initial state.
- The Network setting is possible. But the parameter, except for the Comparator values, is protected.

In any cases, the setting made at last is effective, regardless whether it is the Network setting or the Local setting.
See Section A-2 for the Explicit Messaging.



Prohibit the Network Setting

You can prohibit the Network setting or the setting by Explicit Messaging by the Local setting on the Numerical Indicator.



1 Show the Network setting parameter of the Initial Setting Level.

2 Press the button.

3 The Indicator No.1 flashes.

4 Use the button and the button, and select the indication of “off” .

5 The setting was changed.

6 Press the button.

7 The indication stops flashing and becomes solid.
The parameter is set.

The setting change becomes effective after the Unit is restarted or when level returns to the Standard Level.

7

Functions and Settings operable on the Body of Slave Units

7-1 Functions operable on the Numerical Indicator

Various data and parameters can be seen and set by operating the Numerical Indicator on the Slave Unit.
These are the functions available on the Numerical Indicator.

Purpose	Input or Output Unit	Available Function	
		Content	Relevant
To confirm the present input or output data	Input and Output	7-2 Confirming the present values	7-2
To confirm the present setting of node address	Input and Output	7-3 Confirming the present node address	7-6
To confirm the present network power voltage	Input and Output	7-4 Confirming the present network power voltage	7-7
To set the scale	Input and Output	7-5 Setting the scale	7-8
To confirm the maximum or minimum input data value	Input and Output	7-6 Confirming the maximum or minimum input or output value	7-21
To confirm the maximum or minimum network power voltage	Input and Output	7-7 Confirming the maximum or minimum network power voltage	7-23
To use the Comparator	Input	7-8 Using the Comparator	7-25
To input or output a certain value to or from the Slave Unit	Input and Output	7-9 Conducting the I/O tests	7-30
To confirm the status	Input and Output	7-10 Confirming the status	7-35
To confirming the error content	Input and Output	7-11 Confirming the error code	7-37
To protect the button operation	Input and Output	7-12 Restricting the button operation	7-38
To skip the operation of unused channels	Input	7-13 Restricting the number of available channels	7-39
To monitor the network power voltage	Input and Output	7-14 Monitoring the network power voltage	7-41
To change the input or output range	Input and Output	7-15 Changing the input or output range	7-43
To take moving averages of the inputs	Input	7-16 Taking the moving average of the inputs	7-45
To change the parameter indication style	Input and Output	7-17 Changing the parameter indication style	7-47
To change the indication colors	Input and Output	7-18 Changing the indication colors	7-49
To prohibit the setting by explicit messages	Input and Output	7-19 Restricting the network settings	7-51
To set the output during idle	Output	7-20 Setting the idle action	7-53
To set the output at communications failures	Output	7-21 Setting the Fault action	7-55
To reset the parameters	Input and Output	7-22 Resetting the parameters	7-57
To set the time till the button operation is protected	Input and Output	7-23 Changing the Time to Shift to Protection	7-59
To adjust the values	Input and Output	7-24 Using the User Adjustment	7-62

7-2 Confirming the present values

7-2-1 Function overview

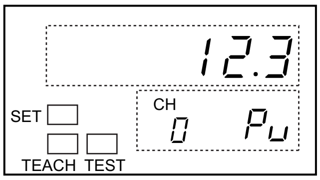
You can confirm the present and the digital values for inputs or outputs. When an Expansion Unit is mounted, you can also confirm the present value (ON or OFF) of the Unit.

7-2-2 Operation procedure

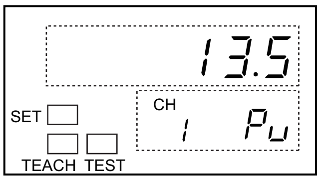
Confirming the present value

- On Analog Input or Output Slave Units

1. Move to the Standard Level.
After 1 second, the Indicator No.2 shows the first parameter, i.e., the Present value (Pu). The Indicator No. 1 shows the analog data.

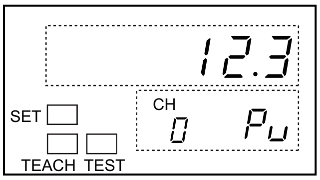


To change the channel, press the [^] button. Every press switches the channel.



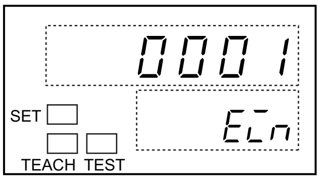
- On Expansion Input Units

1. Move to the Standard Level.
After 1 second, the Indicator No.2 shows the first parameter, i.e., the Present value (Pu). The Indicator No.1 shows the analog data.



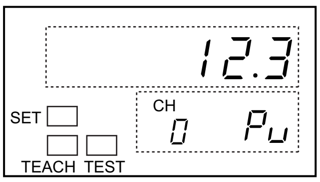
2. While the Indicator No.2 shows the first parameter, press the button four times to show the present value of the Expansion Input Unit.

Then the Indicator No.1 shows the present value of Expansion Input Unit (Ein).
The data is expressed in hexadecimal ("0000" to "FFFF"). See the following pages.



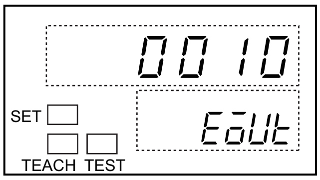
- On Expansion Output Units

1. Move to the Standard Level.
After 1 second, the Indicator No.2 shows the first parameter, i.e., the Present value (Pu). The Indicator No.1 shows the analog data.



2. While the Indicator No.2 shows the first parameter, press the button several times to show the present value of the Expansion Output Unit.

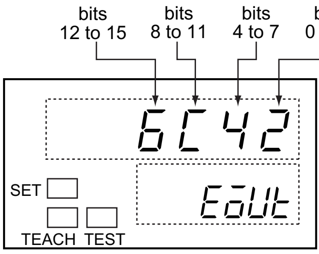
Then the Indicator No.1 shows the present value of Expansion Output Unit (EoUt). The data is expressed in hexadecimal ("0000" to "FFFF").



Additional Information

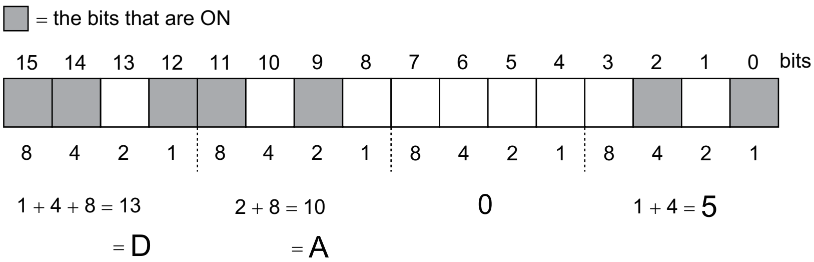
ON-OFF indication for Expansion Units

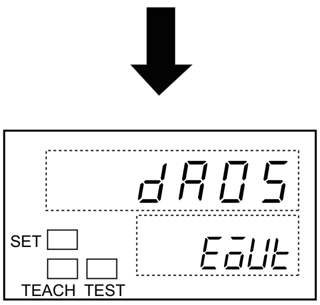
On the Numerical indicator, the ON-OFF status of bits for an Expansion Unit is indicated in a 4-digit hexadecimal figure. This is done in the following procedure. See the example.



[In case of a XWT-VOD16ML 16-point Expansion Output Unit]

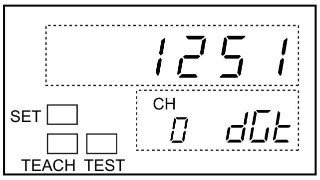
The 16 bits of an Expansion Unit are divided into four parts of four bits. Each of the four parts represents one of the 4-digit hexadecimal figures in the high-low order. The ON-OFF status of each bit is turned to a decimal figure. The four figures in a part are summed up. The four sum figures are turned to four hexadecimal figures, and shown on the Indicator No.1.



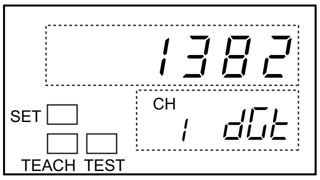


Confirming the digital value

1. Move to the Standard Level. Press the button once to make a shift to Option Level.
After 1 second, the Indicator No.2 shows the first parameter, i.e., the Digital value (dGt). The Indicator No.1 shows the digital value.



To change the channel, press the button. Every press switches the channel.



Additional Information

- If the Indicator No.1 shows “S.Err”, a disconnection is detected.
- The decimal point to indicate is changeable. See the setting of decimal point position in Section 7-5.

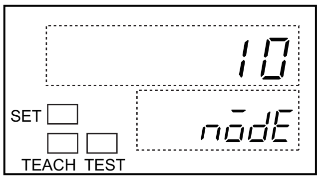
7-3 Confirming the present node address

7-3-1 Function overview

You can confirm the node address that is currently set to the Slave Unit.

7-3-2 Operation procedure

1. When the Indicator No.2 shows the first parameter, i.e., the Present value (Pu), of the Standard Level, press the button once to indicate the parameter for Present node address (nōdE). Then the Indicator No.1 shows the present node address.



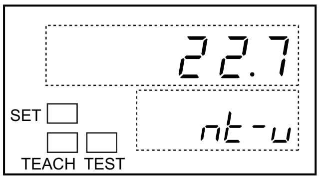
7-4 Confirming the present network power voltage

7-4-1 Function overview

You can confirm the present network power voltage.

7-4-2 Operation procedure

1. When the Indicator No.2 shows the first parameter, i.e., the Present value (Pu), of the Standard Level, press the button twice to indicate the parameter for Present network power voltage (nt-u).
Then the Indicator No.1 shows the present network power voltage.



7-5 Setting the scale

7-5-1 Function overview

Normally, if you do not set anything, the input and output values are AD or DA converted between 0 as minimum to 6000 as maximum. You can set the scaling for input or output range in a certain range.

Scaling type

There are two types of scaling: default scaling and user scaling.

- Default scaling

You can scale the input and output values to values among pre-determined voltage or current ranges. The units used for this purpose are mV for voltage and μA for current.

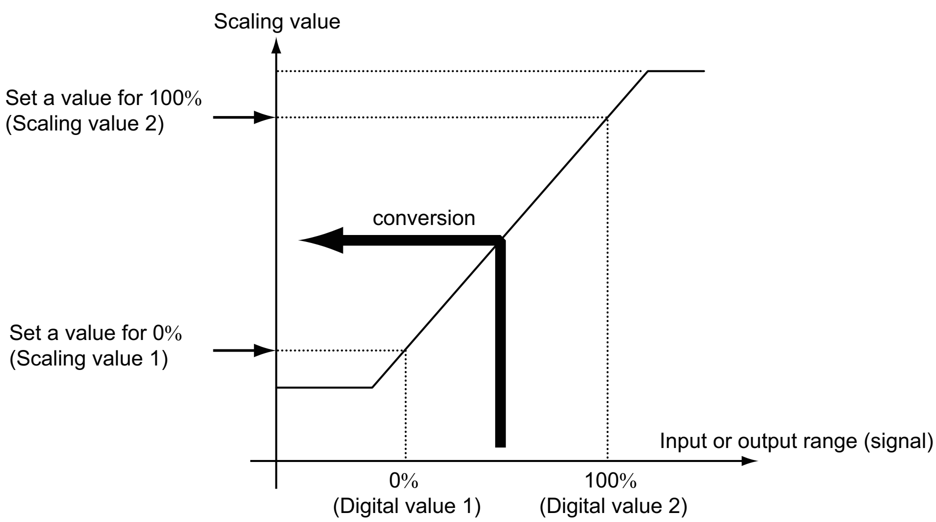
The table below is the pre-determined scaling ranges for input and output values.

Input/Output range	0 to 5 V	1 to 5 V	0 to 10 V	-10 to +10 V	0 to 20 mA	4 to 20 mA
100%	5000 mV	5000 mV	10000 mV	+10000 mV	20000 μA	20000 μA
0%	0 mV	1000 mV	0 mV	-10000 mV	0 μA	4000 μA
Value when a disconnection is detected (only for Input Units)	- *	7FFF hex	- *	- *	- *	7FFF hex

* No disconnection is detectable.

- User scaling

You can set any voltage and current ranges, and scale the input or output values into the ranges. The values to be set are the upper and the lower limits of scaling for 100% and 0% respectively.

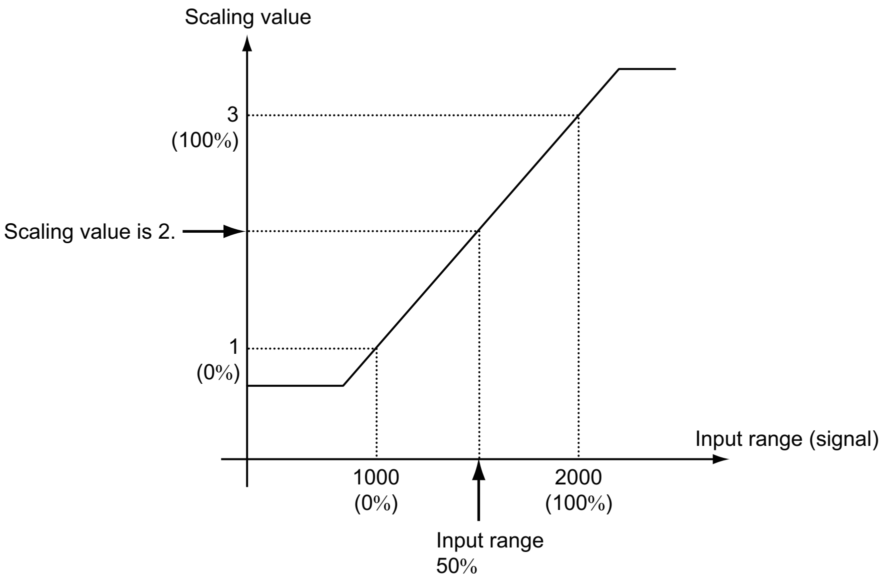


Scaling value

Input/Output range	0 to 5 V	1 to 5 V	0 to 10 V	-10 to +10 V	0 to 20 mA	4 to 20 mA
100%	Set on the Scaling value 2 parameter (SCL2)					
0%	Set on the Scaling value 1 parameter (SCL 1)					
Value when a disconnection is detected (only for Input Units)	- *	7FFF hex	- *	- *	- *	7FFF hex

* No disconnection is detectable.

[Example]
Where each parameter is set as follows: 1000 for Digital value 1, 2000 for Digital value 2, 1 for Scaling value 1, and 3 for Scaling value 2. When the Input range is 50% or 1500, the scaling value is 2.



Scaling setting parameters

These are the parameters for setting the scale.

Indicator No.2	Parameter	Description
dGt 1	Digital value 1	To set the default value for 0% of input or output range.
dGt2	Digital value 2	To set the default value for 100% of input or output range.
SCL 1	Scaling value 1	To set a specific value for 0% of input or output range.
SCL2	Scaling value 2	To set a specific value for 100% of input or output range.
dP	Position of decimal point	To move the position of decimal point.
oFSt	Scaling offset	To set the offset value of scaling.
HYS (only for Analog Input Slave Units)	Hysteresis	To set the hysteresis for Comparator output.

Setting the Digital values and the Scaling values

The Digital value refers to the conversion of an input or output signal to a numerical value between 0 as minimum and 6000 as maximum. The Scaling value refers to the user specific values set between -32000 as minimum and +32000 as maximum.

The parameters for both values are set in the following procedures.

- Digital value parameter (“dGt 1” / “dGt2”)
- Numerical value input: Enter the pre-determined values manually.
- Scaling Teach: Input the actual voltage or current, and set the values then.

- Scaling value parameter (“SCL 1” / “SCL2”)
- Numerical value input: Enter the pre-determined value manually.

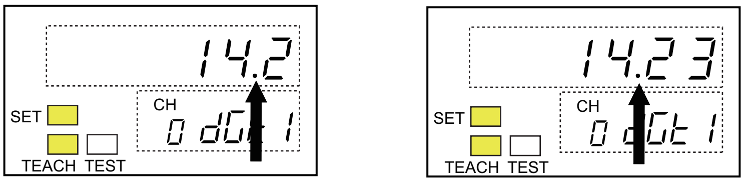
General Information

Any setting where the 0% scaling is greater than the 100 % scaling is also supported. This is called a reverse scaling.

Setting the decimal point

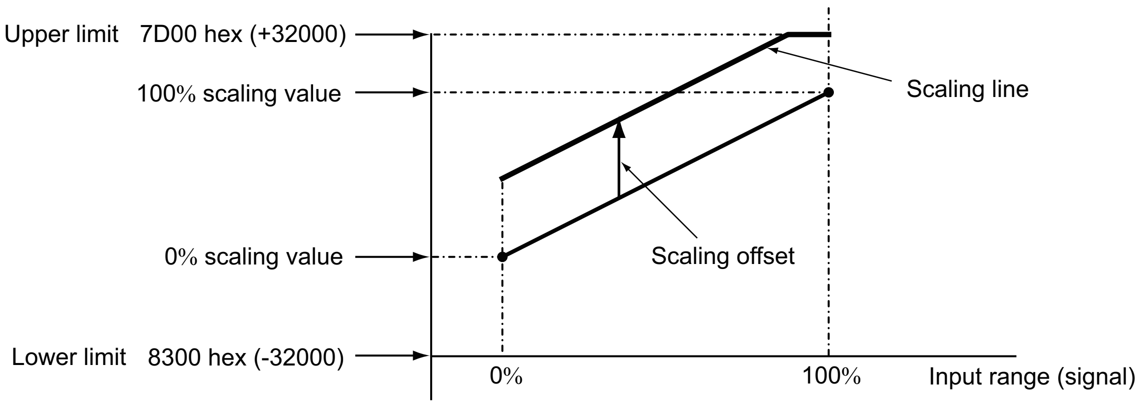
You can move the decimal point of the number indicated in the Indication No.1.

<Indicate one place of decimals.> <Indicate two place of decimals.>



Setting the scaling offset

You can compensate inaccuracy of scaling due to errors during a sensor attachment. Add the amount of error, and make the scale line as in the below drawing.



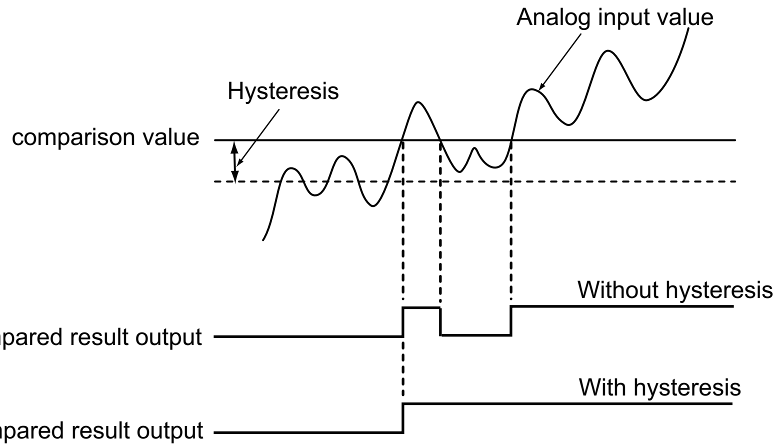
The scaling offset amount can range between -32000 and +32000. The upper limit, however, is 7D00 hex or +32000, and the lower limit is 8300 hex or -32000. You must prevent data overflow or underflow.

General Information

Both the default scaling and the user scaling support setting the scaling offset values.

Setting the comparator output hysteresis (only for the Analog Input Slave Units)

When the inputs make minor but frequent fluctuations, comparison of the inputs with the preset reference value results in repeated on and off. Setting the hysteresis can prevent such occurrence.



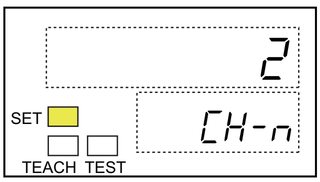
7-5-2 Operation procedure

Setting the scaling type

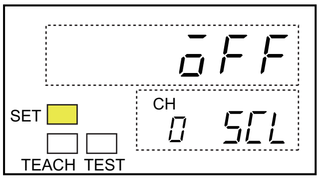
At first, select the scaling type to use from the followings.
Initially, it is set to "ōFF" , i.e. No scaling.

Indication No.1	Scaling type
ōFF	No scaling
dEF	Default scaling
USEr	User scaling

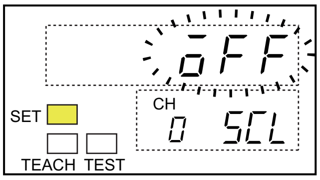
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.
See Section 6-2-2 for the level transition.



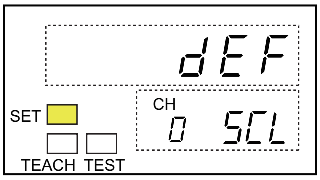
2. Press the [button] button several times to show the Scaling function parameter (SCL).



3. Press the [»] button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the [^] button. Select the scaling type. Press the [button] button.



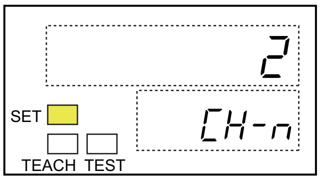
Setting the Digital value 1 and Digital value 2

Then enter numeric values or use the scaling teach, and set the parameters for Digital value 1 and Digital value 2. These are the acceptable setting ranges.

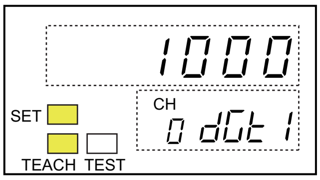
Indicator No.2	Parameter	Settable range	Initial setting
dGt 1	Digital value 1	0 to 5999	0
dGt2	Digital value 2	1 to 6000	6000

- Entering numeric values

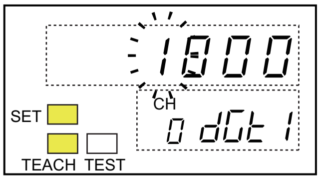
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



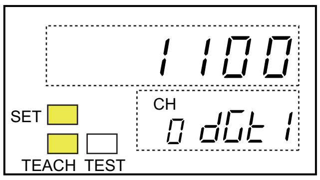
2. Press the button to transit to the Scaling level.
Then the display shows the first parameter of the Scaling level, i.e., the Digital value 1 (dGt 1).



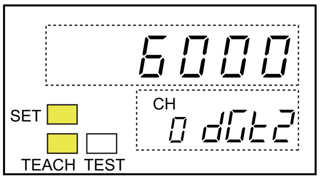
3. Press the button.
Then the leftmost digit of the Indicator No.1 flashes to tell it waits for setting.



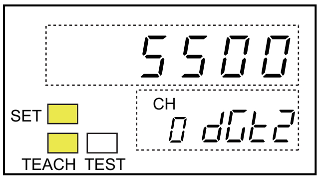
4. Use the button to select a number and the button to move the digit, and enter a value to set. Press the button.
Then the flashing stops to tell the setting is finalized.



5. Press the button to move onto the Digital value 2 parameter (dGt2).



6. Repeat steps 3 and 4 to set the parameter.



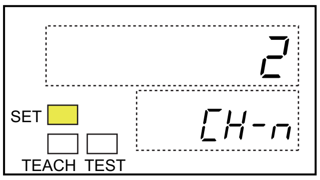
General Information

In step 4, if you set any value outside the settable range, the flashing does not stop. The value you entered is changed automatically to the maximum or the minimum value among the settable range.

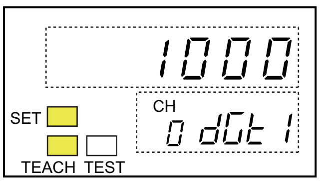
- If the value entered is 0 or lower, or 1 or lower, it is changed to 0 or 1 respectively.
- If the value entered is 5999 or higher, or 6000 or higher, it is changed to 5999 or 6000 respectively.

- Using the scaling teach

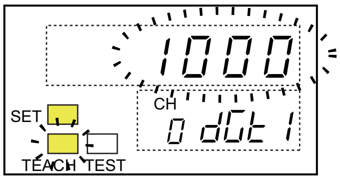
1. On any indication of the MONITOR level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the SETTING level group.



2. Press the button to transit to the Scaling level.
Then the display shows the first parameter of the Scaling level, i.e., the Digital value 1 (dGt 1).

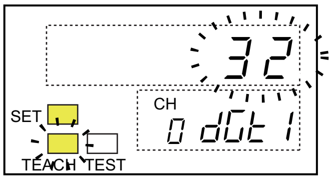


3. Press the [»] button for 1 second or longer.
Then the Indicator No.1 and the TEACH indicator flash to tell it waits for a value entry for voltage or current.

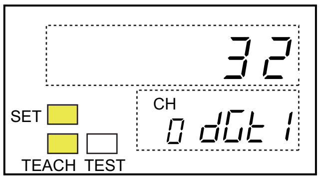


4. Enter a voltage or current value for the Digital value 1.

5. Press the [⌃] button.
Then the entered voltage or current value is shown.



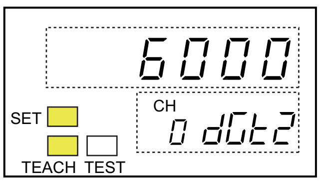
6. Press the [↩] button.
Then the flashing stops to tell the setting is finalized.



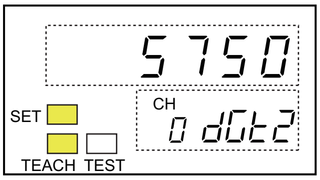
Precautions for Correct Use

If the voltage or current input exceeds the acceptable range, the flashing does not stop and the setting is not finalized. Enter a correct voltage or current value.

7. Press the [↩] button to move on to the Digital value 2 parameter (dGt2).



8. Repeat steps 3 through 6 to set the parameter.



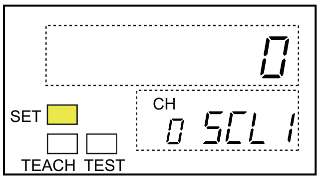
Go on to setting parameters for Scaling value 1 and 2.

Setting the Scaling value 1 and Scaling value 2

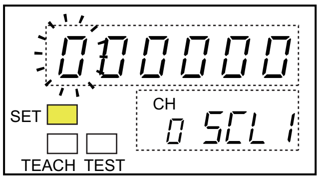
Set the parameters for Scaling value 1 and Scaling value 2. These are the acceptable setting ranges.

Indicator No.2	Parameter	Settable range	Initial setting
SCL 1	Scaling value 1	-32000 to +32000	0
SCL2	Scaling value 2		6000

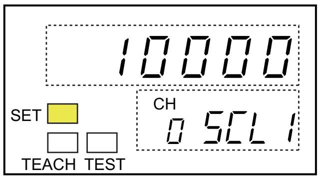
1. Press the button to move on to the Scaling value 1 parameter (SCL 1).



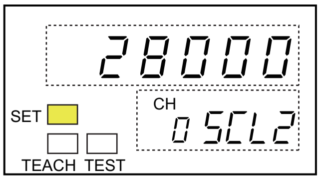
2. Press the button.
Then all digits in the left of the top digit of the present set value turn to "0". The leftmost digit flashes.



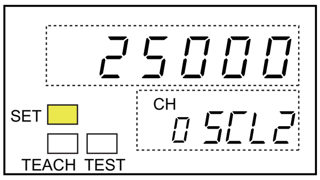
3. Use the button to select a number and the button to move the digit, and enter a value to set. Press the button.
Then the flashing stops to tell the setting is finalized.



4. Press the button to move onto the Scaling value 2 parameter (SCL2).



5. Repeat steps 2 and 3 to set the parameter.



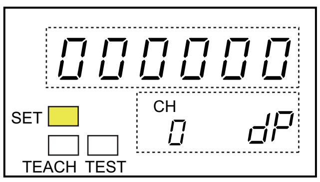
General Information

In step 3, if you set any value outside the settable range, the flashing does not stop. The value you entered is changed automatically to the maximum or the minimum value among the settable range.

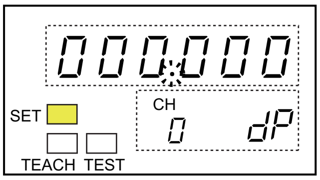
- Any entered values below -32000 are modified to -32000.
- Any entered values over +32000 are modified to +32000.

Setting the position of decimal point

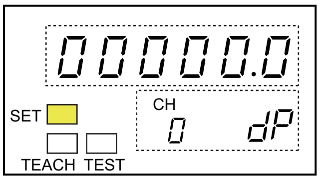
1. Press the button to move on to the Position of decimal point parameter (dP).



2. Press the button.
Then the decimal point flashes at the presently set location.



3. Press the button to select a position of decimal point. Press the button.
Then the flashing stops to tell the setting is finalized.

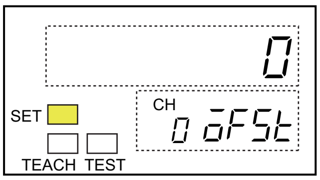


General Information

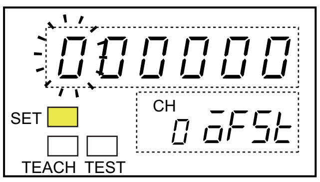
If you press the button when the decimal point is at the rightmost position, it moves back to the leftmost position.

Setting the Scaling offset

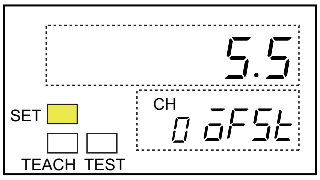
1. Press the button to move on to the Scaling offset parameter (oFSt).



2. Press the button.
Then all digits above the top digit of presently set value turn to “0”, and the leftmost digit flashes.

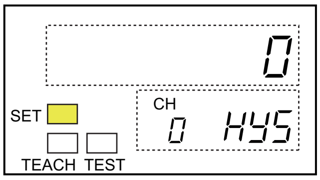


3. Use the button to select the number and the button to move the digit, and enter a value to set. Press the button.
Then the flashing stops to tell the setting is finalized.

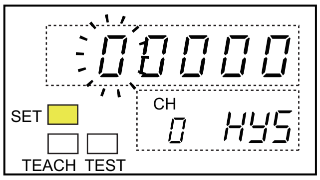


Setting the Comparator Output Hysteresis (only for the Analog Input Slave Units)

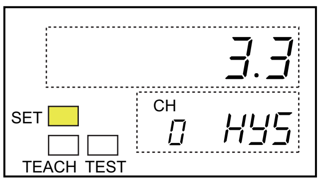
1. Press the button to move on to the Hysteresis parameter (HYS).



2. Press the button.
Then all digits above the top digit of presently set value turn to “0”, and the leftmost digit flashes.



3. Use the button to select the number and the button to move the digit, and enter a value to set. Press the button.
Then the flashing stops to tell the setting is finalized.



7-6 Confirming the maximum or minimum input or output value

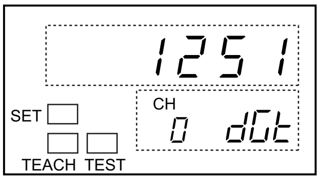
7-6-1 Function overview

You can monitor the maximum and minimum values among the inputs made so far.

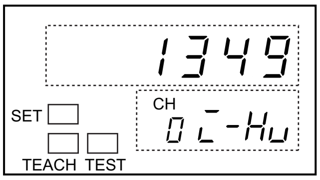
7-6-2 Operation procedure

Confirming the maximum value

1. In the Standard level, press the button to move on to the Option level.

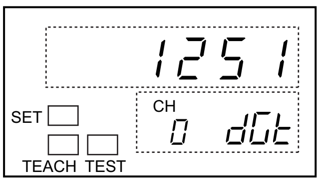


2. Press the button to show the Maximum Input parameter (L-Hu).
Then the Indicator No.1 shows the maximum input data value.

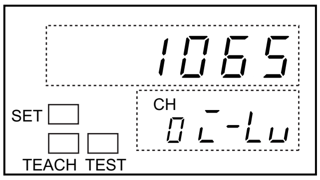


Confirming the minimum value

1. In the Standard level, press the button to move on to the Option level.



2. Press the button twice to show the Minimum Input parameter (ī-Lu).
Then the Indicator No.1 shows the minimum input data value.



General Information

- The maximum and minimum values of analog data are cleared, when you turn off the Unit power or reset the Unit.
- You can change the position of decimal point. See Section 7-5.

7-7 Confirming the maximum or minimum network power voltage

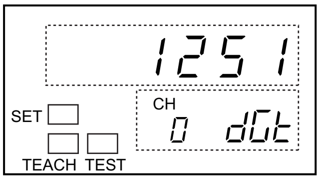
7-7-1 Function overview

You can monitor the maximum and minimum values among the network communication power voltages that the Slave Unit received so far.

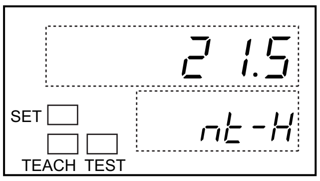
7-7-2 Operation procedure

Confirming the maximum value

1. In the Standard level, press the button once to move on to the Option level.

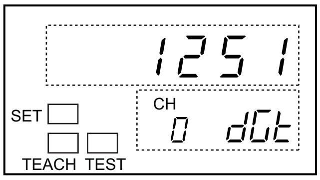


2. Press the button several times to show the Maximum network power voltage parameter (nt-H).
Then the Indicator No.1 shows the maximum network power voltage.

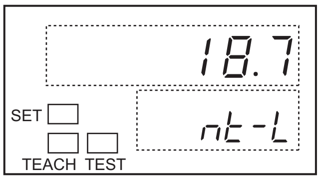


Confirming the minimum value

1. In the Standard level, press the button once to move on to the Option level.



2. Press the button several times to show the Minimum network power voltage parameter (nt-L).
Then the Indicator No.1 shows the minimum network power voltage.



General Information

- The maximum and minimum values of network power voltage are cleared, when you turn off the Unit power or reset the Unit.
- You can change the position of decimal point. See Section 7-5.

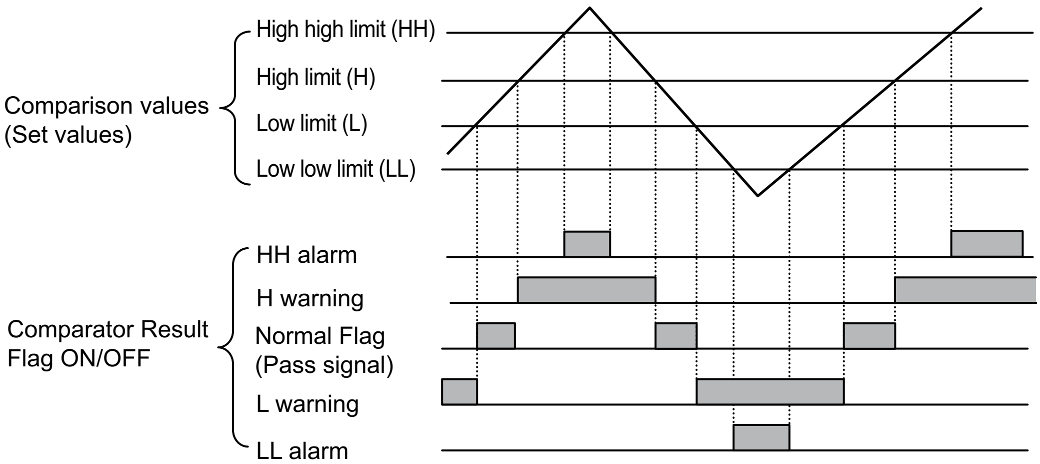
7-8 Using the Comparator

7-8-1 Function overview

You can set in advance four thresholds: the high high limit (HH), the high limit (H), the low limit (L) and the low low limit (LL) as limits to be compared with analog input data. If an input goes beyond these limits, the alarm will tell the situation.

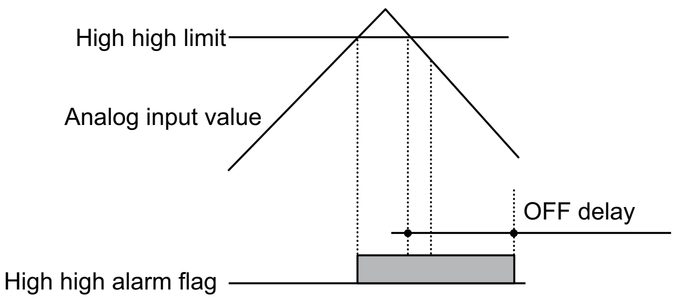
Comparator

This function is to compare input values with the values allocated to the Analog Data. If an input is exceeds the comparison values or the thresholds, the Comparator Result Flag in the analog status flags becomes on. The Comparator Result Flag remains on as long as the situation continues. When the input value is acceptable against the comparison values, the Normal Flag or Pass signal is on. See Section 4-2-4 for the Comparator Result Flags.



OFF delay value

You can set the time duration from when the Comparator Result Flag becomes on until it turns to off. This is to retain the state where the flag is ON, even if the input once goes over the limit and instantly returns to normal. The time set for this purpose is called the OFF delay value. It can be set same as the Comparison values.

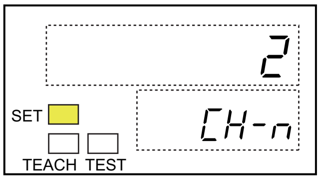


7-8-2 Operation procedure

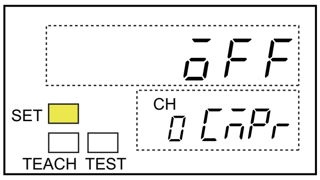
Setting the Comparator Function

Setting the Comparator Function

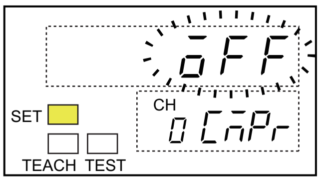
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



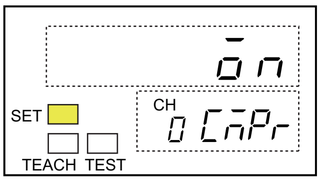
2. Press the button several times to show the parameter of Comparator (CMPr).



3. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the button. Then the Indicator No.1 shows "on". Press the button.

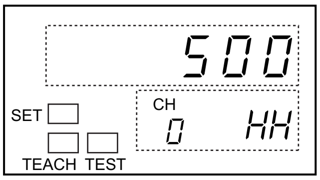


Setting the Comparison values and OFF delay value

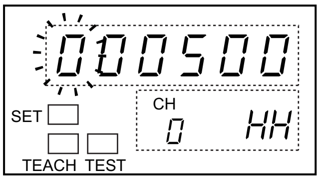
These are the settable ranges.

Indicator No.2	Parameter	Settable range	Initial setting
HH	High high limit	-32768 to +32766	32767
H	High limit		32767
L	Low limit		-32768
LL	Low low limit		-32768
oFFd	OFF delay	0 to 65535 ms	4

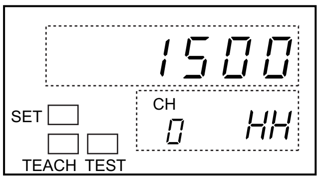
1. In the Standard level, press the button twice to move on to the Comparator level.
The first parameter of the Comparator level, i.e., the high high limit (HH), is shown.



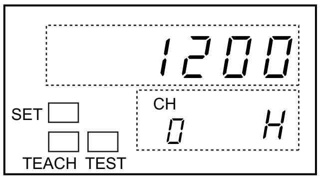
2. Press the button.
Then all digits in the left of the top digit of present set value turn to "0". The leftmost digit flashes.



3. Use the button to select a number and the button to move the digit, and enter a value to set. Press the button.
Then the flashing stops to tell the setting is finalized.



4. Press the [button] button to move onto the next parameter. Repeat steps 2 through 3 to set the remaining parameters, i.e., H, L, LL and Off delay.



Precautions for Correct Use

The four comparison values must observe the following rule:
High high limit (HH) > High limit (H) > Low limit (L) > Low low limit (LL)

General Information

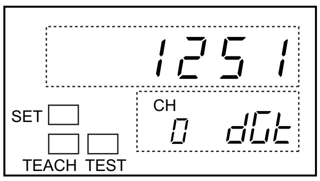
In step 3, if you set any value outside the settable range, the flashing does not stop. The value you entered is changed automatically to the maximum or the minimum value among the settable range.

In case of the comparison values;
- Any entered values below -32768 are modified to -32768.
- Any entered values over +32766 are modified to +32766.

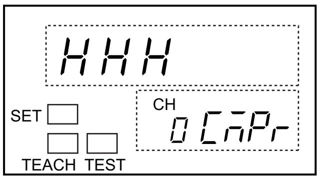
In case of the OFF delay parameter values;
- Any entered values below 0 are modified to 0.
- Any entered values over 65535 are modified to 65535.

Confirming the Comparator result

1. In the Standard level, press the [button] button to move on to the Option level.



2. Press the button five times to show the Comparator result parameter (CnPr).
The Indicator No.1 shows the comparator result.



When several comparison values are set, the results of all comparison are shown at the same time.

Status	Comparison result
The present input does not exceed any of comparison values.	PASS
The present input is greater than the high high limit.	HHH
The present input is greater than the high limit.	H
The present input is smaller than the low limit.	L
The present input is smaller than the low low limit.	LLL

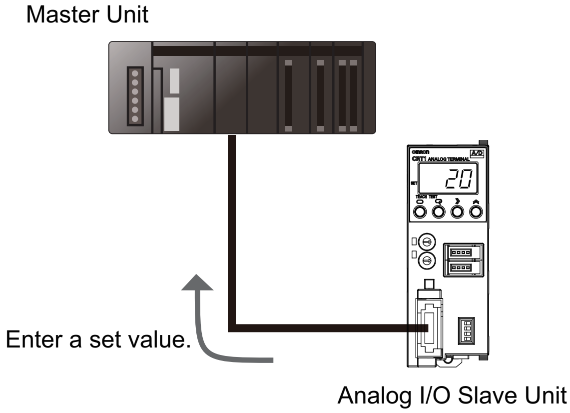
7-9 Conducting the I/O tests

7-9-1 Function overview

You can input and output any values to and from the Slave Units. This function is useful to confirm operation at system start-up.

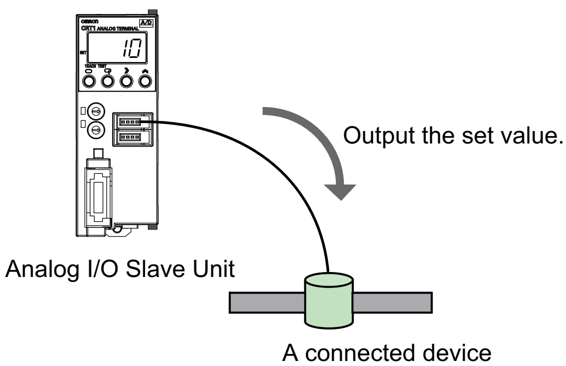
Input values

Without having any actual inputs from the connected devices, you can transfer a pseudo input from a single Slave Unit to the upstream system.



Output values

Without operating the upstream network system, you can output a pseudo value from a single Slave Unit.



An I/O test is started as soon as the level transits to the I/O Test.

The input and output values given at the I/O test differ from the following conditions.

	Analog inputs (Values transferred to Master Unit)		Analog outputs (Values output to connected devices)		
	Not communicating	In I/O communication	Not communicating	In I/O communication	At errors
Initial setting	The value obtained immediately when the level transits to I/O Test		The value for 0	The value obtained immediately when the level transits to I/O Test	The value at error output
When test inputs and outputs are set at I/O Test level	Test input value		Test output value		

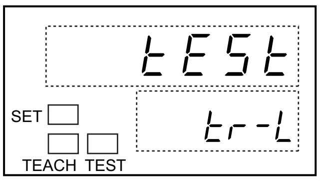
Digital inputs and outputs can have the I/O tests, even when an Expansion Unit is mounted.

7-9-2 Operation procedure

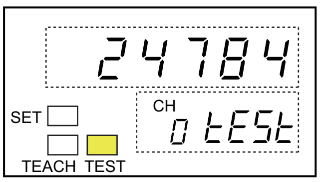
Starting the I/O test

- On an Analog Input or Output Slave Unit

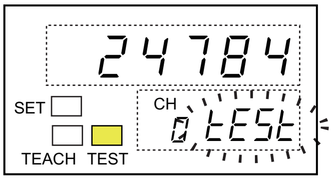
1. In the Standard level, press the button three times to show the Level transition parameter (tr-L).



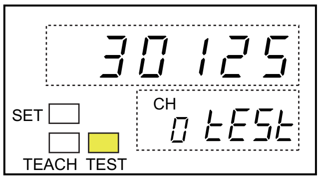
2. Press the button for 3 seconds or longer to move on to the I/O test level.



3. Press the [»] button.
Then the Indicator No.2 flashes to tell it waits for setting.

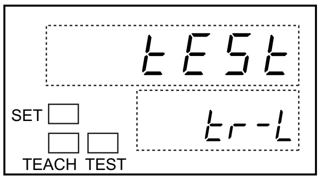


4. Use the [︽] button to increment the number and the [»] button to decrement it, and enter a value to set. Press the [↵] button.
Then the flashing stops to tell the setting is finalized.

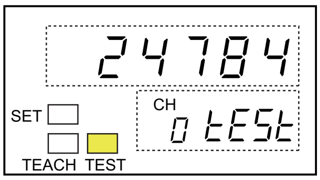


- On an Expansion Unit

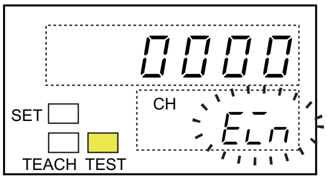
1. In the Standard level, press the [↵] button three times to show the Level transition parameter (tr-L).



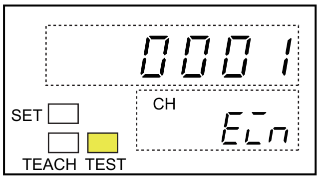
2. Press the [⬭] button for 3 seconds or longer to move on to the I/O test level.



3. Press the button. Then the Indicator No.2 flashes to tell it waits for setting (Eīn).
Then the Indicator No.2 flashes to tell it waits for setting (Eīn).



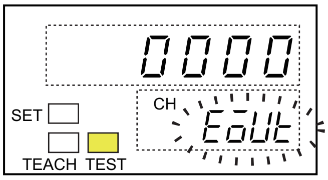
4. Use the button to increment the number and the button to decrement it, and enter a value to set in hexadecimal. Press the button.
Then the flashing stops to tell the setting is finalized.



Additional Information

See Section 7-2 for the ON-OFF indication of the Expansion Unit by the Numerical Indicator.

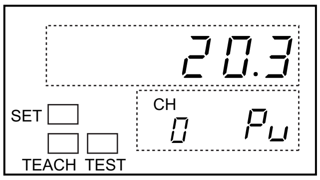
5. Press the button again, if you go on to the I/O test for outputs.
Then the Indicator No.2 flashes to tell it waits for setting (EōUt).



6. Repeat the step 4 and enter the set value.

Ending the I/O test

1. Press the ▭ button for 1 second or longer. Then the I/O test stops, and the level returns to Standard.



General Information

When the level goes back to Standard, the test input and output values are automatically cleared. At the Standard level, normal values are indicated.

7-10 Confirming the status

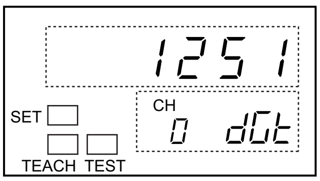
7-10-1 Function overview

You can confirm the status of the Status Flags of the Slave Unit.
The Flag has these states for confirmation. See Section 4-4 for the status in details.

Indication	Status
oFF	All status flags are off.
nt-u	The Network Power Voltage Drop Flag is on.
rUn-t	The Unit Conduction Time Exceeded Flag is on.
C-Cnt	The Cumulated Count Over Flag is on.
ouEr (Analog Input Slave Unit only)	The Scaling Overflow Flag is on. The Scaling Underflow Flag is on.
EroUt (Analog Output Slave Unit only)	The Error Output Flag is on.
E-Cou	The Expansion Unit I/O Power Error Flag is on.

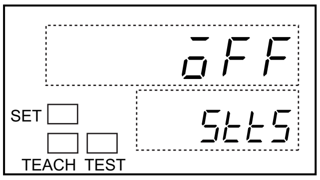
7-10-2 Operation procedure

1. In the Standard level, press the button once to move on to the Option level.

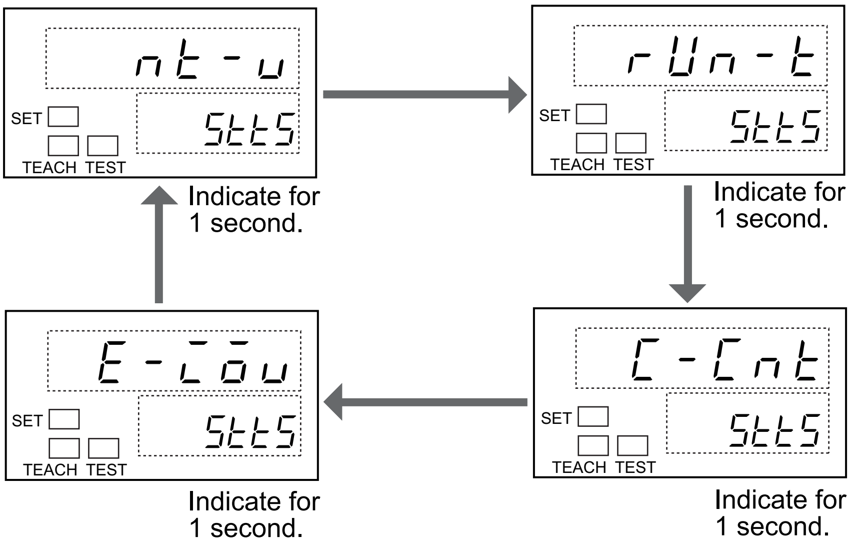


2. Press the [button] button several times to show the Status flag parameter (Stts).

- When all status flags are off, the Indicator No.1 shows “oFF”.



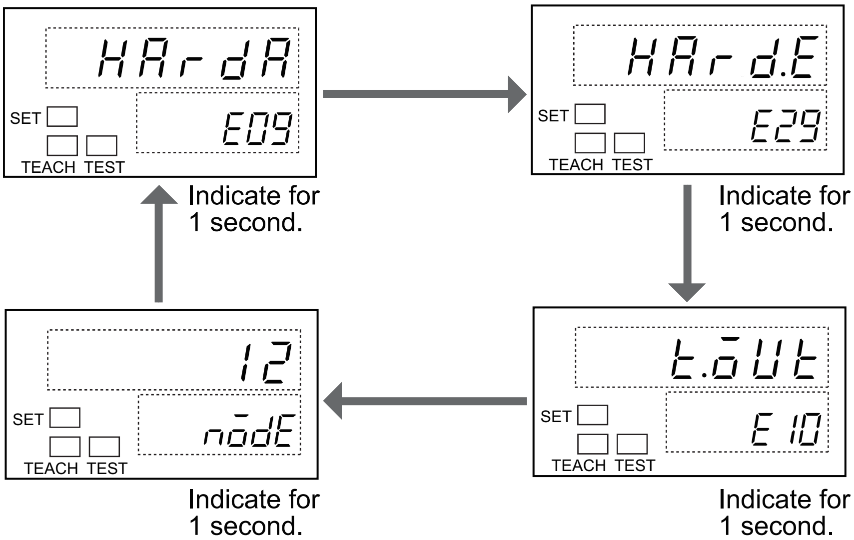
- When one or more status flag is on, all names of status flags which are on are shown one by one by switching every second.



7-11 Confirming the error code

7-11-1 Function overview

You can confirm the error state. If an error occurs while any level of Monitor level group is indicted, the level automatically shifts to show the error code. The indicator shows the node address of erroneous Unit and the error code alternatively. The indication automatically goes back to the Standard level, once the error is resolved. See Section 6-4-4.



These are the supported error codes.

Indicator No.1	Indicator No.2	Error
EEP.S	E01	EEPROM sum value error
EEP.H	E21	EEPROM hardware error
S.Err (Analog Input Slave Units only)	E08	Disconnection detected
HArdA	E09	Analog hardware error
HArd.E	E29	Expansion Unit hardware error
t.oUt	E 10	Connection timeout
Addr	E 11	Duplicated address or Repeater configuration error
InIErr	E 12	Initialization error
WdtErr	E 13	Watchdog Timer (WDT) error
PrmErr	E 14	Parameter error
SWErr	E 15	Switch (SW) setting error
00 ～ 63	node	Node address

7-12 Restricting the button operation

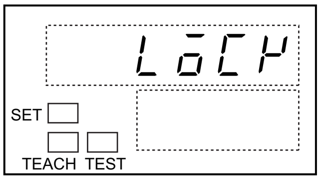
7-12-1 Function overview

You can restrict the scope of button operation, and prevent unnecessary or accidental button operation that may results in any setting change. This function is called the Protection. When the function is enabled, buttons to operate are restricted into level transitions and the parameter indication among the Monitor level group. See Section 6-8.

7-12-2 Operation procedure

Setting the Protection

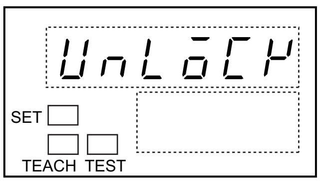
1. On any indication of the Monitor level group, press the button and the button together for 3 seconds or longer.
   The Protection setting is indicated for 0.5 second.



Then the Protection is enabled.

Releasing the Protection

1. In the Protection state, press the button and the button for 3 seconds or longer.
   The Protection releasing is indicated for 0.5 second.

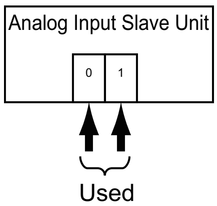
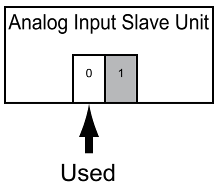


Then the indication returns to show any level of the Monitor level group.

7-13 Restricting the number of available channels

7-13-1 Function overview

An Analog Input Slave Unit processes conversion for all of its input channels. You can set and skip the conversion process for any unused channels. This way you can accelerate the conversion cycle.

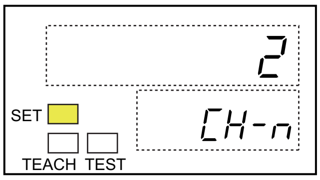
The number of conversion points	Description
2 points (Default)	Input data in Input channel 0 and 1 are converted. 
1 point	Input data only in Input channel 0 is converted. 

This is the rough time taken for an AD conversion.

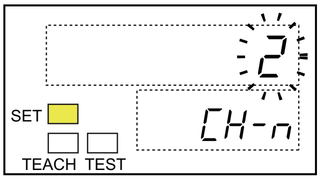
The number of conversion points	Conversion time [ms]
1	1
2	2

7-13-2 Operation procedure

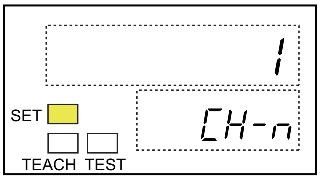
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.
Then the first parameter of the Initial Setting level, i.e., the Number of available channels (CH-n) is shown.



2. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



3. Press the button to set the number of available channels, i.e., to select either "1" or "2".
Press the button.
The selection is finalized.



7-14 Monitoring the network power voltage

7-14-1 Function overview

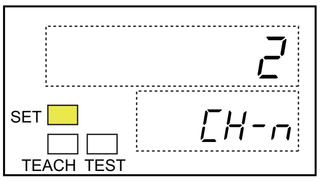
You can set the threshold for the network power voltage. If the actual voltage drops below the threshold, the Network Power Voltage Drop Flag in the Status area becomes on and tells the situation.

This is the settable range.

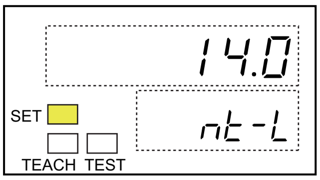
Indication No.2	Parameter	Settable range	Initial setting
nt-L	Network power voltage threshold	8.0 to 30.0	14.0

7-14-2 Operation procedure

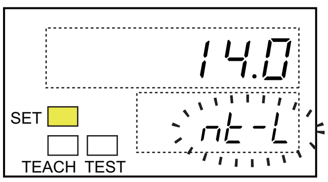
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



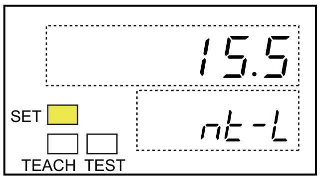
2. Press the button to show the parameter of Network Power Voltage Threshold (nt-L).



3. Press the button.
   Then the Indicator No.2 flashes to tell it waits for setting.



4. Press the button to increment the number and the button to decrement it, and set the threshold. Press the button. Then the threshold is finalized.
Then the threshold is finalized.



7-15 Changing the input or output range

7-15-1 Function overview

You can select and change the input and output range of the Slave Unit.

This table shows the set range and corresponding indication on the Numerical indicator. In default, it is set to show “0-5“ on the Indicator No.1.

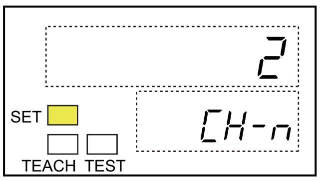
Indicator No.1	Set range
0-5	0 to 5 V
0- 10	0 to 10 V
4-20	4 to 20 mA
1-5	1 to 5 V
0-20	0 to 20 mA
- 10- 10	-10 to +10 V

Precautions for Correct Use

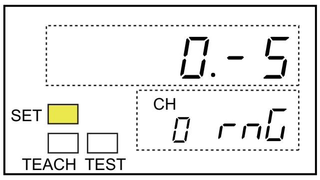
The setting is valid only when the Pin No.8 of the Input range setting or of the Output range setting is off. If it is on, the priority is placed on any setting by the Input range setting switch or by the Output range setting switch.

7-15-2 Operation procedure

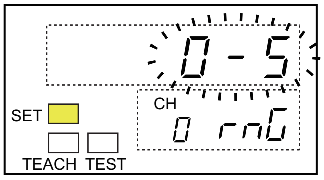
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



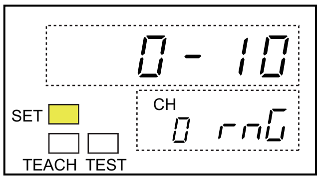
2. Press the button twice to show the parameter of Input range or Output range (rnG).



3. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



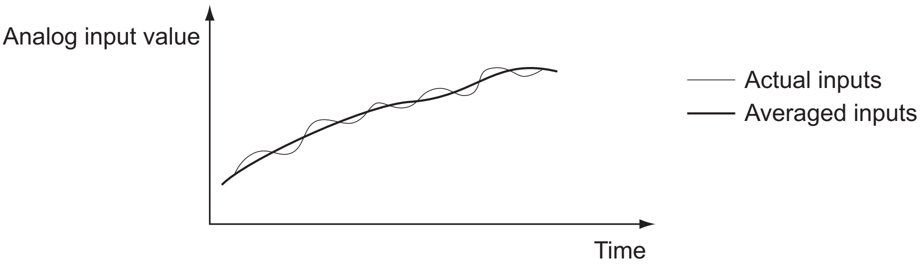
4. Press the button to set the input or output range. Press the button.



7-16 Taking the moving average of the inputs

7-16-1 Function overview

You can take the moving average of the last eight inputs. The results will be the conversion data. The moving average can minimize the influence of fine fluctuations on the inputs, if there is any, due to noise and others as shown below.

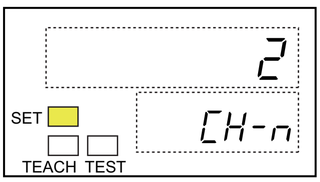


These are the setting selections and the corresponding indications on the Indicator No.1 of the Numerical indicator.The default is "ōFF".

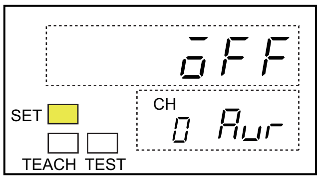
Indicator No.1	Selection
ōFF	Not to take the average of the inputs.
ōn	To take the average of the inputs.

7-16-2 Operation procedure

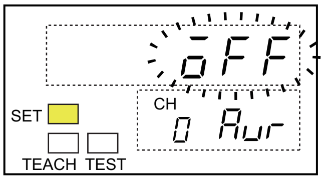
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



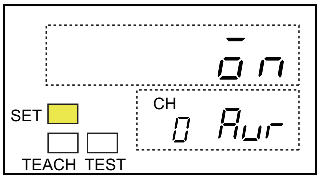
2. Press the button three times to show the parameter of Moving average (Aur).



3. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the button to set the indication on the Indicator No.1 to "on". Press the button.
Then the setting is finalized.

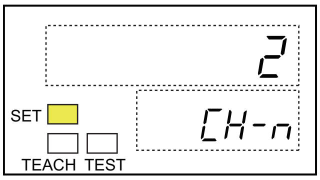


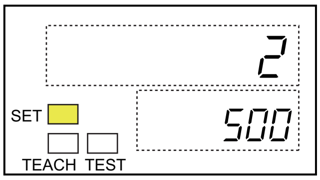
7-17 Changing the parameter indication style

7-17-1 Function overview

You can switch the indication pattern on the Indicator No.2 between the parameter name (abbreviation) and the parameter No.

E.g. Indicating the parameter of the Number of available channels:





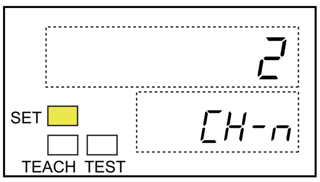
These are the setting selections and the corresponding indications on the Indicator No.1 of the Numerical indicator. The default is “CHAr“.

Indicator No.1	Selection
CHAr	Parameter name (abbreviation)
no	Parameter No.

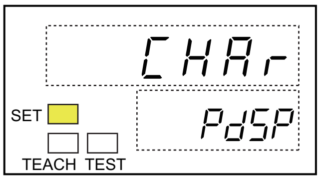
See Section A-1 for the parameters and corresponding indications of parameter names and numbers.

7-17-2 Operation procedure

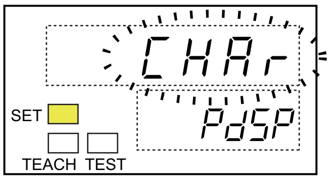
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



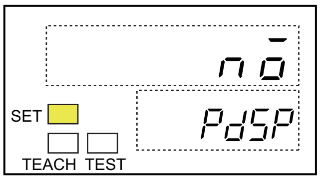
2. Press the button several times to show the parameter of Parameter indication style (PdSP).



3. Press the button. Then the Indicator No.1 flashes to tell it waits for setting.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the button to set the pattern. Press the button.
Then the setting is finalized.



7-18 Changing the indication colors

7-18-1 Function overview

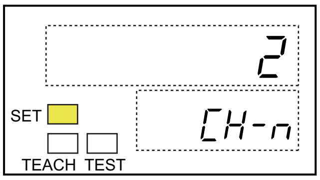
You can switch the color of Indication No.1 between green and red.

These are the color selections and the corresponding indications on the Indicator No.1 of the Numerical indicator. The default is “rEd”.

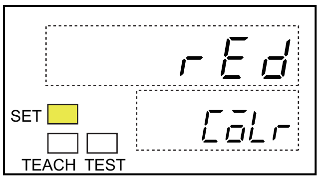
Indicator No.1	Selection
rEd	Red
Grn	Green

7-18-2 Operation procedure

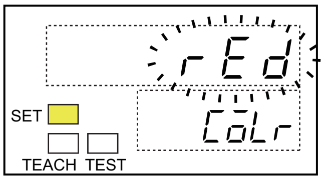
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



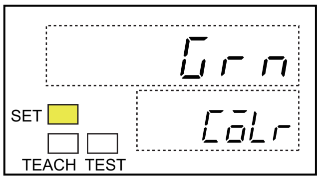
2. Press the button several times to show the parameter of Color in indication No.1 (CoLr).



3. Press the [》] button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the [︽] button to select a color. Press the [↩] button.
Then the setting is finalized.



7-19 Restricting the network settings

7-19-1 Function overview

You can restrict and disable any setting by the Explicit Messages and prioritize the setting by the Numerical Indicator.

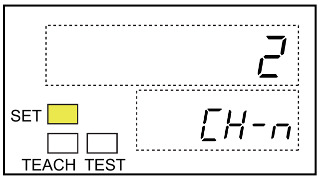
See Section 6-9-3 for the cases where the network setting and the local setting compete.

These are the setting selections and the corresponding indications on the Indicator No.1 of the Numerical indicator. The default is “oFF”.

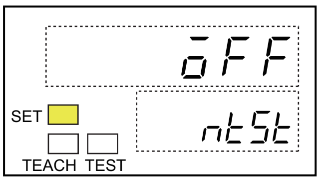
Indicator No.1	Selection
oFF	Enable the setting by the Explicit Messages or the network setting.
on	Disable the setting by the Explicit Messages or the network setting.

7-19-2 Operation procedure

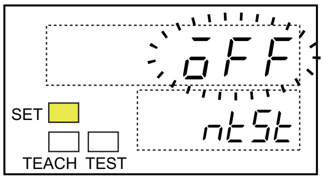
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



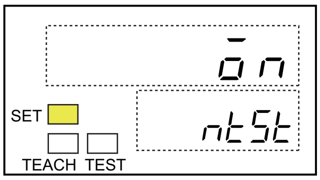
2. Press the button several times to show the parameter of Network setting (ntSt).



3. Press the [»] button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the [︽] button to make the indication on the Indicator No.1 to "on". Press the [↵] button.
Then the setting is finalized.



7-20 Setting the idle action

7-20-1 Function overview

You can select an output pattern on the Analog Output Slave Units, which makes an output due to an error on the Master Unit. This is called the idle action.

These are the settable output patterns and corresponding indications on the Indicator No.1. The default is "L".

Output pattern	Indicator No.1	Description
Low Limit	L	Outputs the value of corresponding output range in the below table.
High Limit	H	Outputs the value of corresponding output range in the below table.
Hold Last State	HoLd	Holds the value of immediately before the error, and outputs it.
User Count	SEt	Outputs the value set by the CX-Integrator. In default, it is set to "0". See Section 9-16.

- These are the output values for the corresponding output ranges, when the output pattern is set in Low Limit or High Limit.

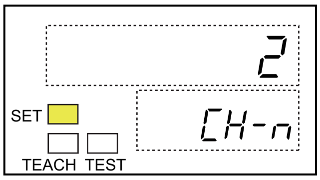
Output range	Output value	
	Low Limit	High Limit
0 to 5 V	-0.25 V	5.25 V
1 to 5 V	0.8 V	5.2 V
0 to 10 V	-0.5 V	10.5 V
-10 to +10 V	-11 V	11 V
0 to 20 mA	0 mA	21 mA
4 to 20 mA	3.2 mA	20.8 mA

Additional Information

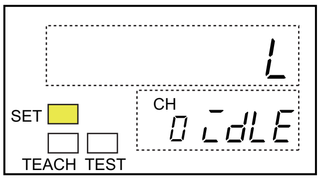
When the Master Unit is one of OMRON SYSMAC CS- or CJ-series, the idle output is commanded if the CPU Unit monitoring error or stopping error occurs.

7-20-2 Operation procedure

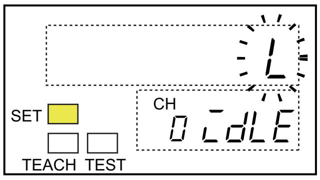
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



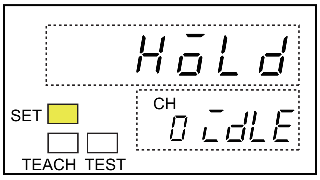
2. Press the button several times to show the parameter of Idle action (IdLE).



3. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the button to select an output pattern. Press the button.
Then the setting is finalized.



7-21 Setting the Fault action

7-21-1 Function overview

You can select an output pattern on the Analog Output Slave Units, which makes an output if a communications failure or timeout occurs. This is called fault action.

These are the settable output patterns and corresponding indications on the Indicator No.1. The default is “L“.

Output pattern	Indicator No.1	Description
Low Limit	L	Outputs the value of corresponding output range in the below table.
High Limit	H	Outputs the value of corresponding output range in the below table.
Hold Last State	HoLd	Holds the value of immediately before the error, and outputs it.
User Count	SEt	Outputs the value set by the CX-Integrator. In default, it is set to “0”. See Section 9-17.

- These are the output values for the corresponding output ranges, when the output pattern is set in Low Limit or High Limit.

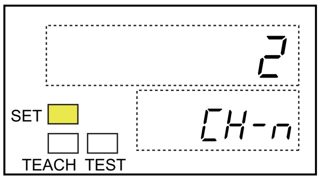
Output range	Output value	
	Low Limit	High Limit
0 to 5 V	-0.25 V	5.25 V
1 to 5 V	0.8 V	5.2 V
0 to 10 V	-0.5 V	10.5 V
-10 to +10 V	-11 V	11 V
0 to 20 mA	0 mA	21 mA
4 to 20 mA	3.2 mA	20.8 mA

General Information

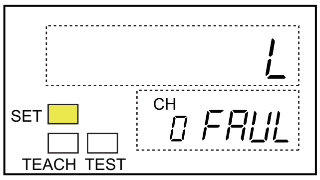
If the node address duplicates or the Slave Unit has an error, the setting on this parameter is disregarded. The voltage output is 0 V while the current output is 0 mA.

7-21-2 Operation procedure

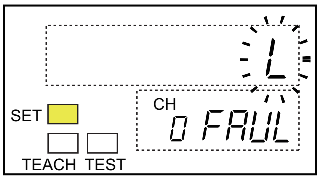
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



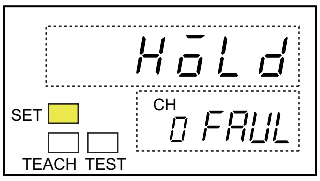
2. Press the button several times to show the parameter of Fault action (FAUL).



3. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



4. Press the button to select an output pattern. Press the button.
Then the setting is finalized.



7-22 Resetting the parameters

7-22-1 Function overview

You can reset or initialize all the settings to the factory settings or the defaults.

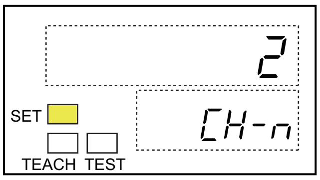
These are the selections and the corresponding indication on the Indictor No.1 of the Numerical indicator. The default is “no”.

Indicator No.1	Selection
no	Not initialize the parameter settings.
YES	Initializes the parameter settings.

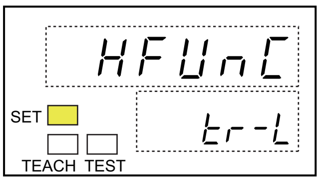
See Section A-1 for initialization and details of each function.

7-22-2 Operation procedure

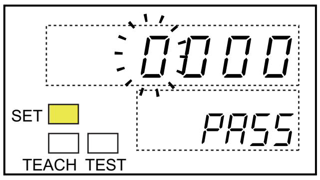
1. On any indication of the Monitor level group, press the [ ] button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



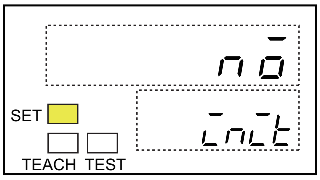
2. Press the [ ] button several times to show the parameter of Level transition (tr-L).



3. Press the button for 3 seconds or longer.
Then four digits of "0" are indicted on the Indicator No.1. The leftmost digit flashes to tell it waits for a password entry.



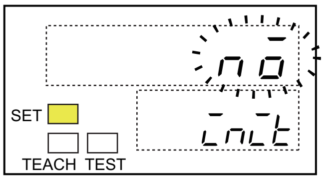
4. Press the button to change the value and the button to shift the digits, and enter the password "2843". Press the button.
Then the first parameter of the Special function setting level, i.e. Initializing (Init), is shown.



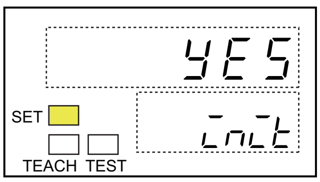
General Information

If any other values are entered at Step 4 beside "2843", it returns to Step 2. Then resume from Step 3.

5. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



6. Press the button to set "YES" on the Indicator No.1. Press the button.
Then the parameters are initialized, and automatically reset.



7-23 Changing the Time to Shift to Protection

7-23-1 Function overview

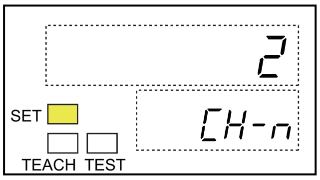
When you use the Protection function and restrict the button operations, you can also set the time from when the Protection function is selected until when it actually works to restrict the button operation. This setting is also applied to the time from the Protection function is released until when it actually returns to enable the normal button operation. See Section 6-8 for the Protection function for the details.

This is the settable range.

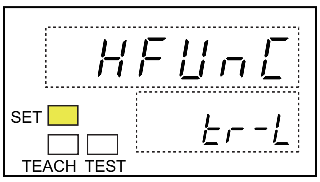
Indicator No.2	Parameter name	Settable range	Default
Pr-t	Time to shift to Protection	3 to 10 s	3

7-23-2 Operation procedure

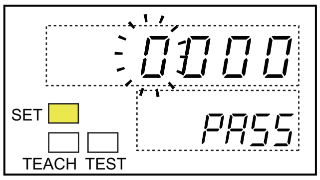
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



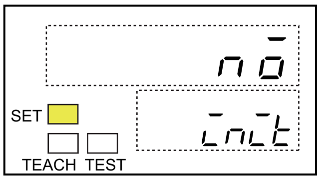
2. Press the button several times to show the parameter of Level transition (tr-L).



3. Press the button for 3 seconds or longer.
Then four digits of "0" are indicted on the Indicator No.1. The leftmost digit flashes to tell it waits for a password entry.



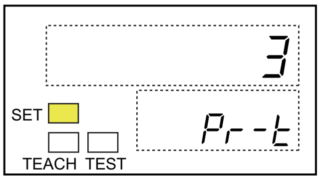
4. Press the button to change the value and the button to shift the digits, and enter the password "2843". Press the button.
Then the first parameter of the Special function setting level, i.e., Initializing (init), is shown.



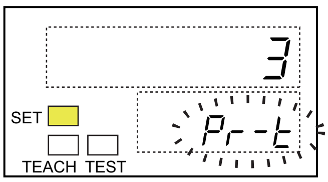
General Information

If any other values are entered at Step 4 beside "2843", it returns to Step 2. Then resume from Step 3.

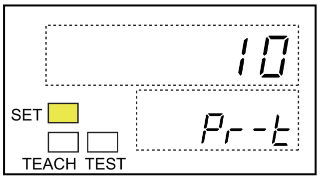
5. Press the button to show the parameter of Time to shift to Protection (Pr-t).



6. Press the button.
Then the Indicator No.2 flashes to tell it waits for setting.



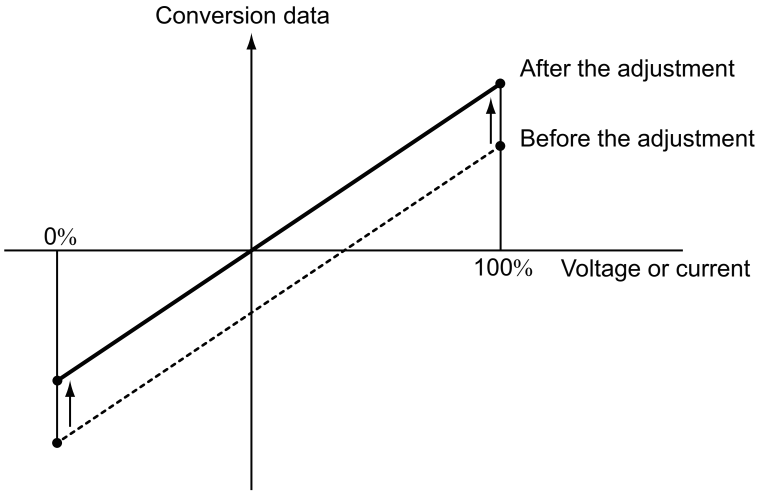
7. Press the button to increment the numerical value and the button to decrement it, and set the time. Press the button.
Then the setting is finalized.



7-24 Using the User Adjustment

7-24-1 Function overview

You can offset the dislocations on input or output current or voltage which results from characteristic of the input or output device or from improper connections of it. The conversion line can be adjusted in two points of 0% and 100% as shown in below.



The extent of offset is between -5% and +5% of the minimum and maximum input or output ranges respectively.

Input or Output range	Lower limit	Higher Limit
0 to 5 V	-0.25 to +0.25 V	4.75 to 5.25 V
1 to 5 V	0.8 to 1.2 V	4.8 to 5.2 V
0 to 10 V	-0.5 to +0.5 V	9.5 to 10.5 V
-10 to +10 V	-11 to -9 V	9 to 11 V
0 to 20 mA	-1 to +1 mA	19 to 21 mA
4 to 20 mA	3.2 to 4.8 mA	19.2 to 20.8 mA

Precautions for Correct Use

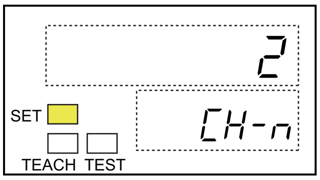
Initializing the Slave Unit will clear the user adjustment. Be sure to control the adjustment value, when you have a user adjustment.

7-24-2 Operation procedure

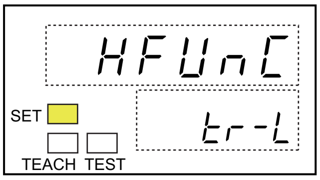
Adjusting the value on an Analog Input Slave Unit

- Making a shift to the User adjustment level

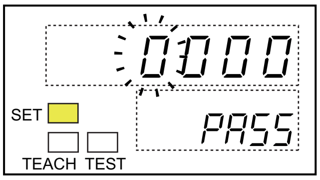
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



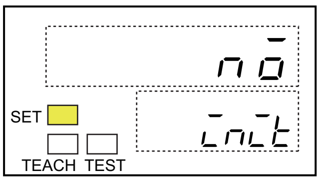
2. Press the button several times to show the parameter of Level transition (tr-L).



3. Press the button for 3 seconds or longer.
Then four digits of "0" are indicted on the Indicator No.1. The leftmost digit flashes to tell it waits for a password entry.



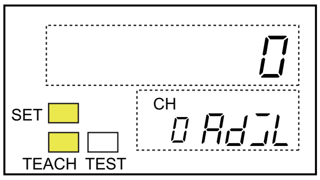
4. Press the button to change the value and the button to shift the digits, and enter the password "2843". Press the button.
Then the first parameter of the Special function setting level, i.e., Initializing (init), is shown.



General Information

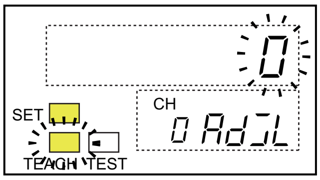
If any other values are entered at Step 4 beside “2843”, it returns to Step 2. Then resume from Step 3.

5. Press the [ ] button to move onto the User adjustment level.
Then TEACH indication lights on. The first parameter of User adjustment level, i.e., Lower adjustment value (AdjL) is shown.



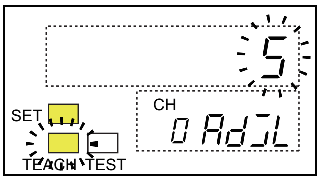
• Adjusting the lower limit

6. Press the [》] button for more than 1 second.
Then the Indicator No.1 and the TEACH indication flash to tell the Unit waits for an entry.

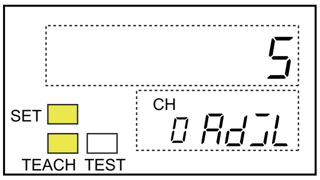


7. Enter the value for voltage or current corresponding to the lower limit of adjustment (0%).

8. Press the [︽] button.
Then the Indicator No.1 shows the difference from the original lower limit.

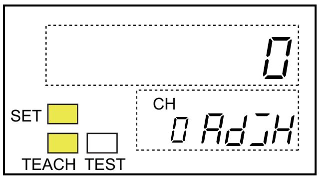


9. Press the button.
Then the flashing stops. The lower limit is finalized.

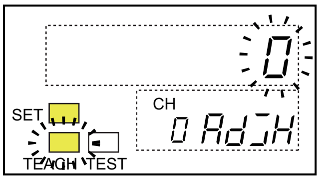


- Adjusting the upper limit

10. Press the button to show the parameter of Upper adjustment value (AdJH).

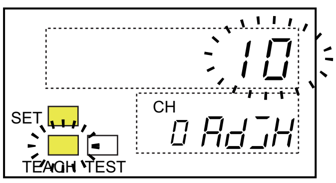


11. Press the button for more than 1 second.
Then the Indicator No.1 and the TEACH indication flash to tell the Unit waits for an entry of voltage or current.

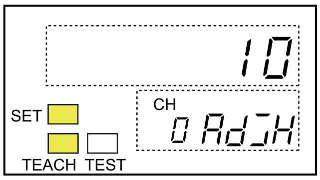


12. Enter the value for voltage or current corresponding to the upper adjustment limit (100%).

13. Press the button.
Then the Indicator No.1 shows the difference from the original upper limit.



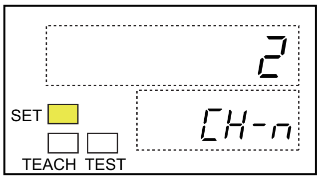
14. Press the button.
Then the flashing stops. The upper limit is finalized.



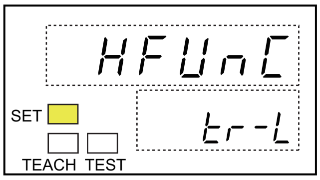
Adjusting the value on an Analog Output Slave Unit

- Making a shift to the User adjustment level

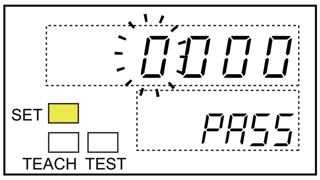
1. On any indication of the Monitor level group, press the button for 3 seconds or longer. Then the display moves on to the Initial Setting level of the Setting level group.



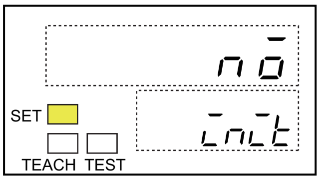
2. Press the button several times to show the parameter of Level transition (tr-L).



3. Press the button for 3 seconds or longer.
Then four digits of "0" are indicted on the Indicator No.1. The leftmost digit flashes to tell it waits for a password entry.



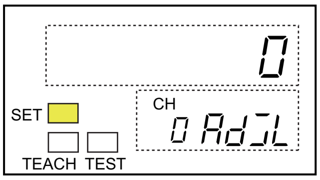
4. Press the [︽] button to change the value and the [》] button to shift the digits, and enter the password "2843". Press the [⬭] button.
Then the first parameter of the Special function setting level, i.e., Initializing (init), is shown.



General Information

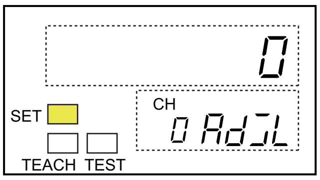
If any other values are entered at Step 4 beside "2843", it returns to Step 2. Then resume from Step 3.

5. Press the [⬭] button to move onto the User adjustment level.
The first parameter of User adjustment level, i.e., Lower adjustment value (AdjL) is shown.

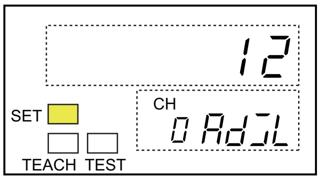


- **Adjusting the lower limit**

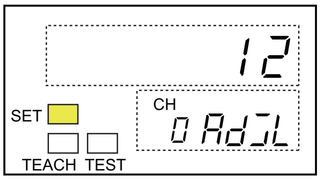
6. Press the [》] button.
Then the Indicator No.1 shows the present output value.



7. Press the button to increment the value and the button to decrement it, and set the output value.
Then the Indicator No.1 shows the difference from the original lower limit. And the output changes accordingly.
Monitor the value on the connected measuring device, and adjust the value to correspond to the output 0%.

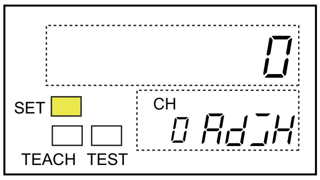


8. Press the button.
Then the flashing stops. The lower limit is finalized.

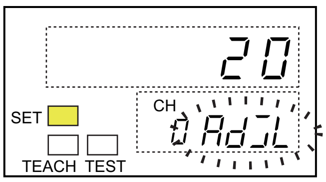


- Adjusting the upper limit

9. Press the button to show the parameter of Upper adjustment value (AdJH).

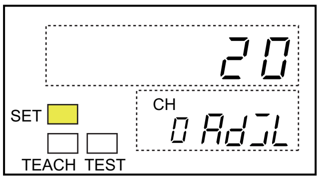


10. Press the button to increment the value and the button to decrement it, and set the output value.
Then the Indicator No.1 shows the difference from the original upper limit.
And the output changes accordingly. Monitor the value on the connected measuring device, and adjust the value to correspond to the output 100%.



11. Press the button.

Then the flashing stops. The upper limit is finalized.



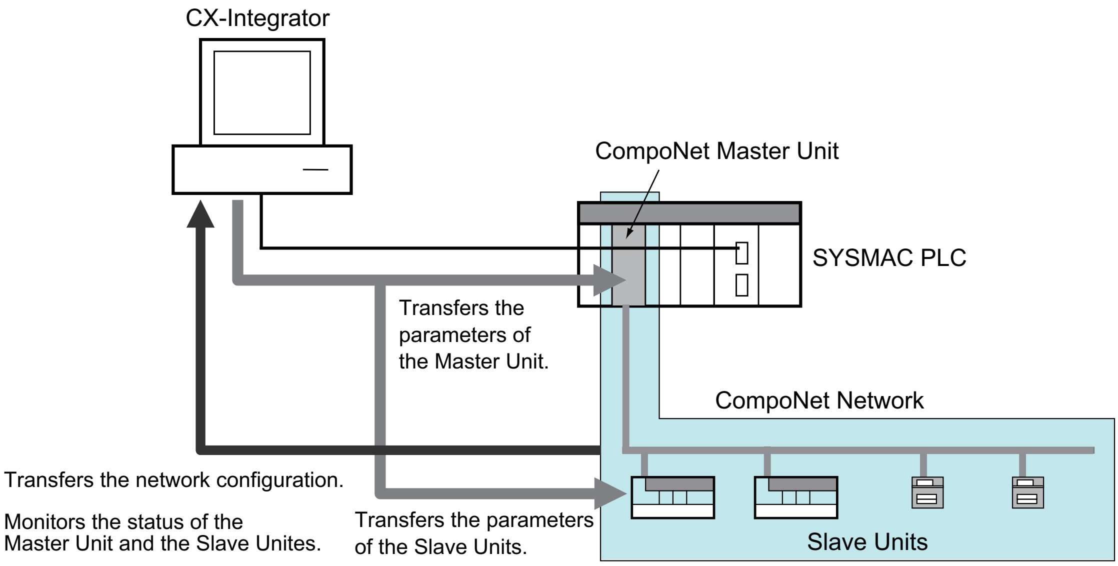
8

CX-Integrator

8-1 What a CX-Integrator can do?

The CX-Integrator is the support software for operating and setting the network and serial communication systems for Omron SYSMAC CS-, CJ-, CP-, and NSJ-series CPU Units. The CX-Integrator is included in the FA integration software package, CX-One.
The CX-Integrator allows monitoring the data and setting up various parameters for devices connected to the CompoNet Network.

The main functions are illustrated in below.



The following sections explain the procedures to start up the CX-Integrator, to set up the parameters and to monitor the data for the Slave Units. See the SYSMAC CS/CJ/CP/NSJ Series CX-Integrator Operation Manual Ver. 2.3, Doc. No. W646.

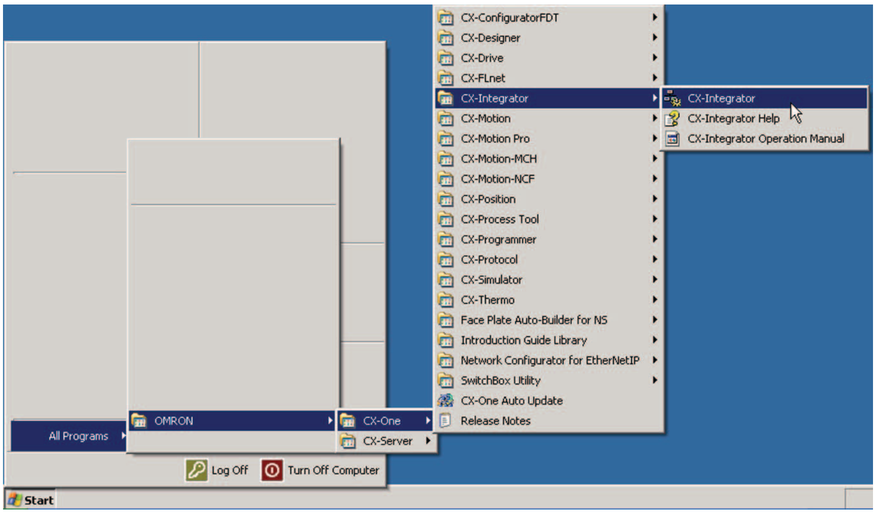
8-2 Start-up and Setting the CX-Integrator

8-2-1 Starting up the CX-Integrator

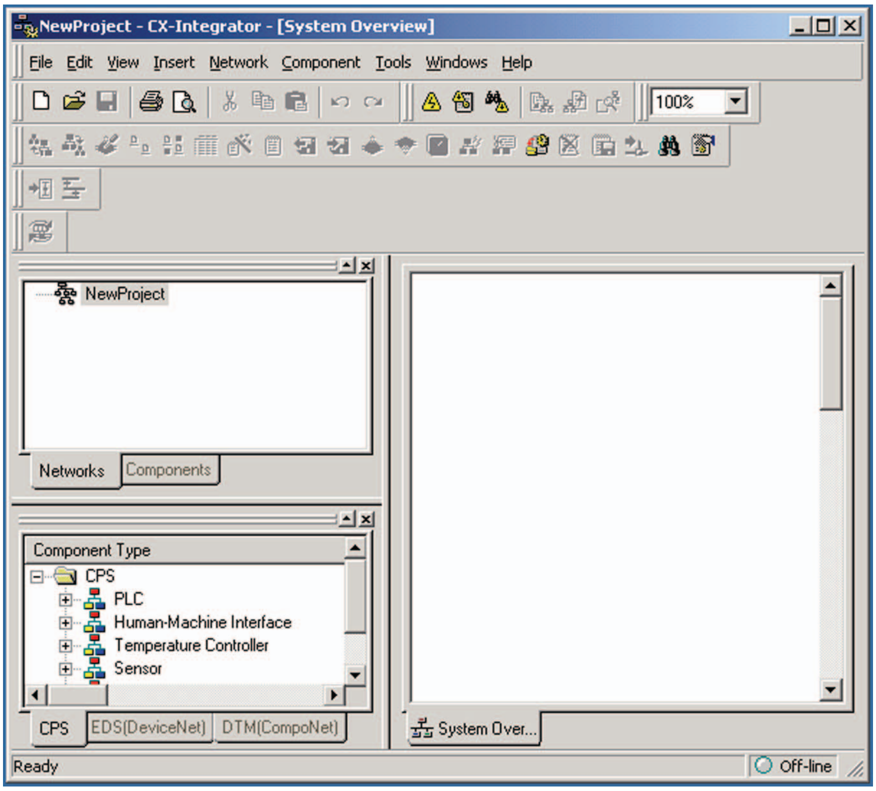
These are the procedures to start up the CX-Integrator.

1. Turn on the PC power to start up the Windows.

2. Click the **Start** button on the task bar. Select the ***All programs*** - ***OMRON*** - ***CX-One*** - ***CX-Integrator*** from the pop-up menu. Then click ***CX-Integrator***.

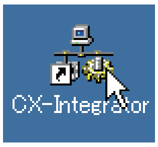


Then the CX-Integrator starts up. The Opening Window followed by the Main Window is shown.



Additional Information

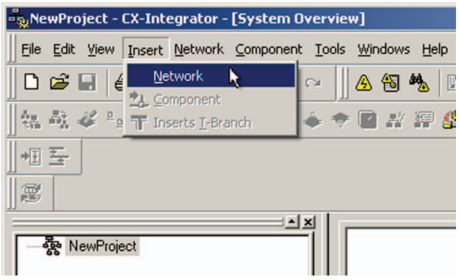
If you have a shortcut icon on the PC desktop, double-click it to start the Window.



8-2-2 Network setting

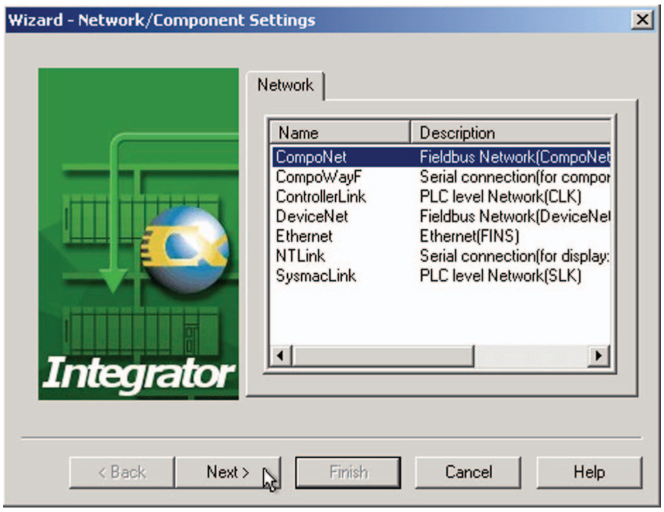
These are the procedures to configure a virtual network on the CX-Integrator.

1. Click the *Insert* on the menu bar. Select the ***Network*** from the pull-down menu.



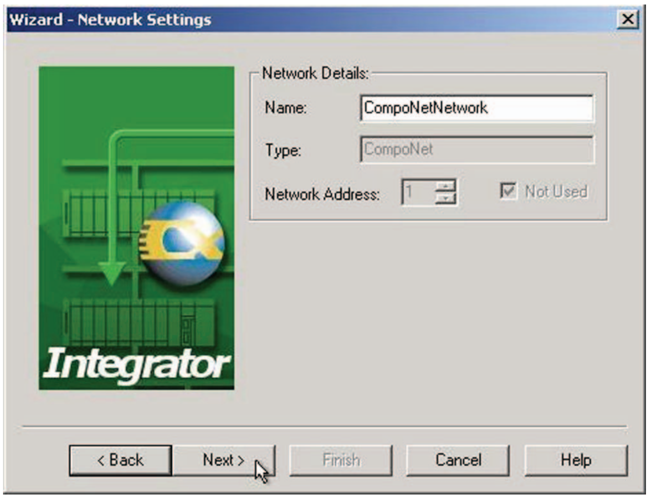
Then the Wizard - Network/Component Settings Window shows up.

2. Select the *CompoNet* among the list. Click the **Next** Button.



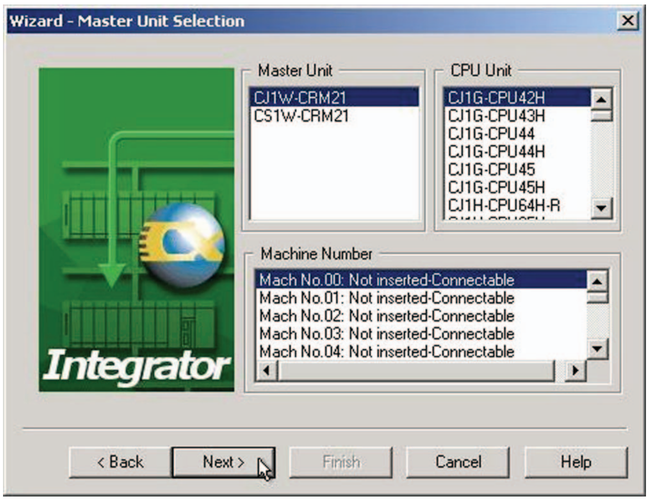
Then the Wizard shows another window of Setting the Network Window.

3. Enter a desired name for the network into the *Name* Field. Click the **Next** Button.



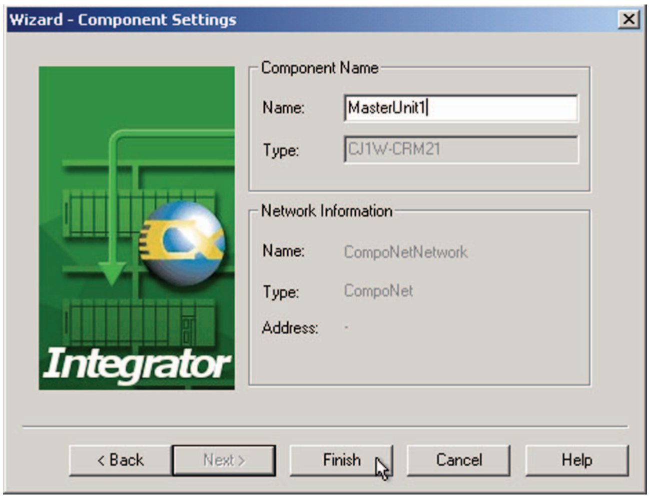
Then the Wizard shows the Selecting the Master Unit Window.

4. Select the Master Unit type, the CPU Unit type, and the Unit No. in the corresponding fields. Click the **Next** Button.



Then the Wizard shows the Setting the Combo Window.

5. Enter a desired name for the Master Unit into the *Name* field. Click the **Finish** button.

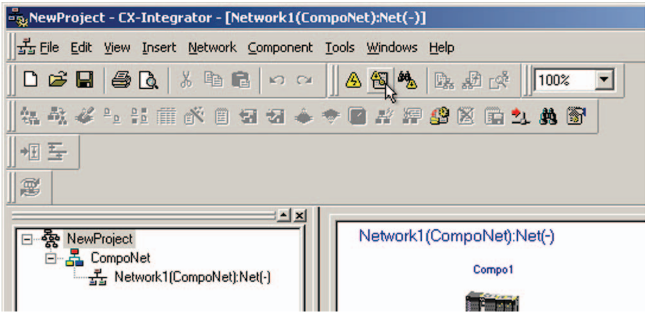


This will terminate all setting to configure a virtual network.

8-2-3 Transferring the network data

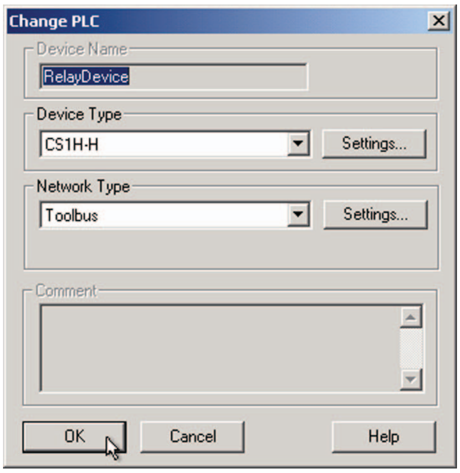
These are the procedures to transfer the actual CompoNet network data to the CX-Integrator.

1. Click the icon on the menu bar. Alternatively, select the ***Network*** - ***Communication Setting*** from the menu bar.



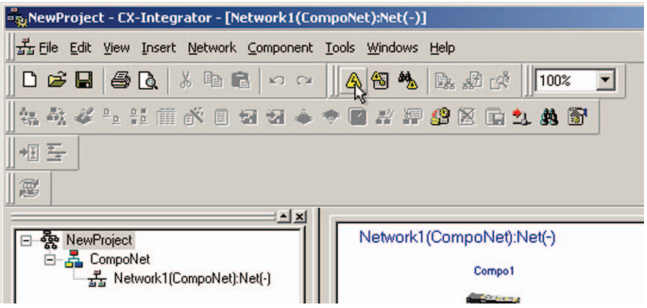
Then the pop-up menu of Mode Setting shows up.

2. Perform necessary selection in the fields. Then click the **OK** button.



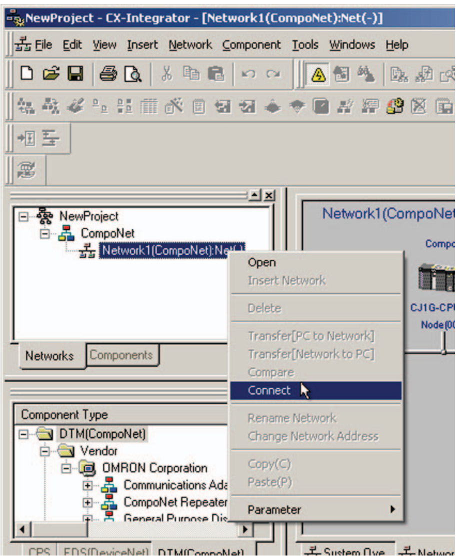
See the SYSMAC CX-Integrator Ver. *.* Operation Manual, Doc. No. W464, for the details of PLC Model Change window.

3. Click the  icon on the menu bar. Alternatively, select the ***Network*** - ***Work Online*** from the menu bar.



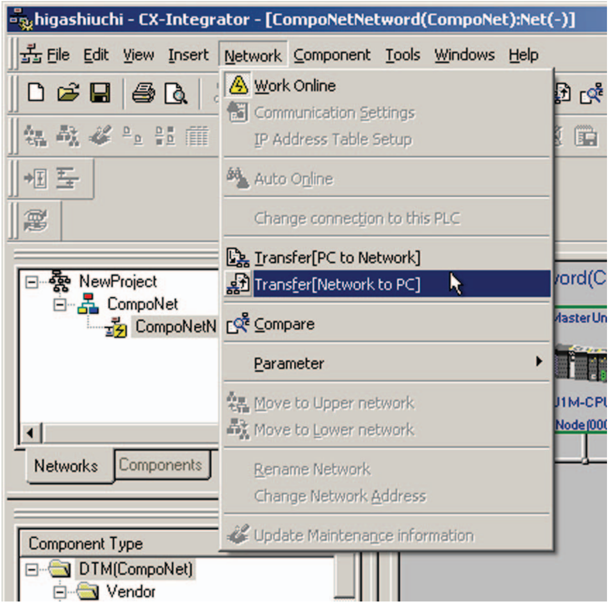
Then the background of the network configuration window turns to gray. It is online.

4. In the workspace window, right-click on the network to operate. Select the *Connect* from the pull-down list.



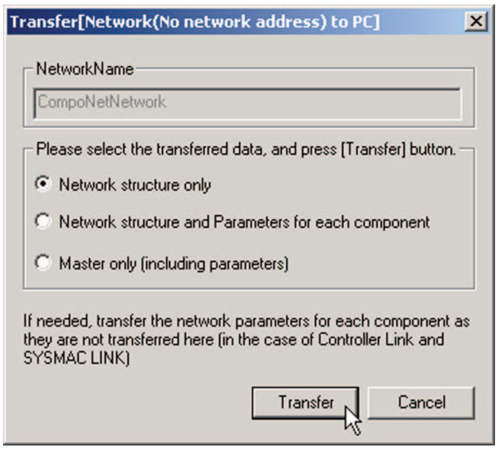
Then the CX-Integrator is connected with actual network.

5. Select the *Network* on the menu bar, and *Transfer [Network to PC]* from the pull-down menu.



Then the Transfer window is shown.

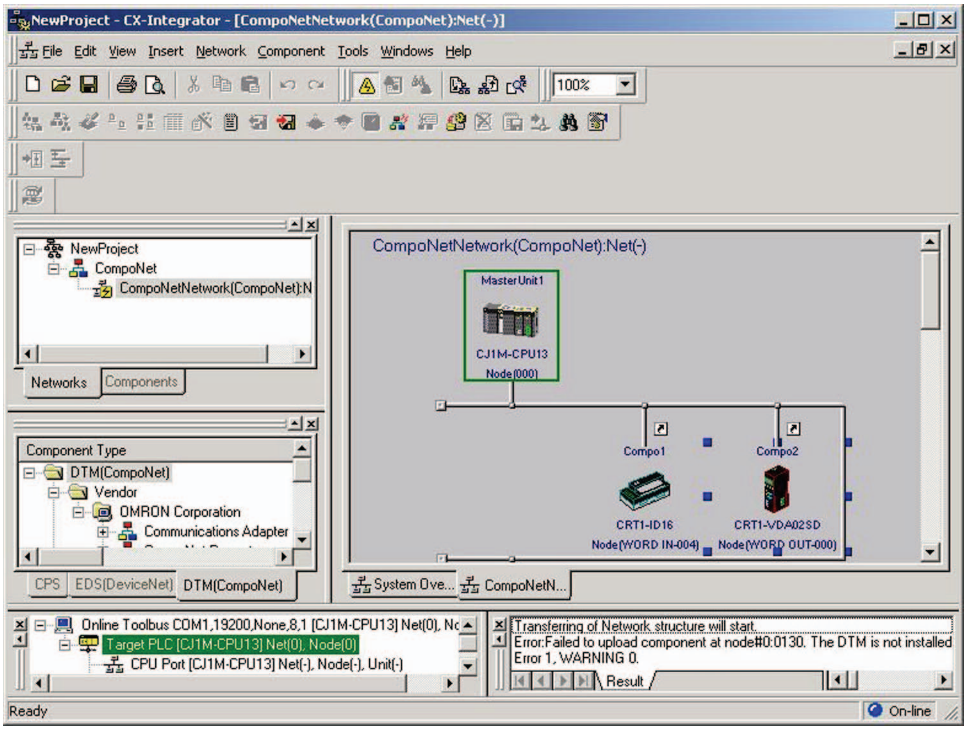
6. Select the data to transfer. Click the **Transfer** button.



8

8-2-3 Transferring the network data

Then the actual network data is transferred to the CX-Integrator. The Main Window shows the virtual network configuration.



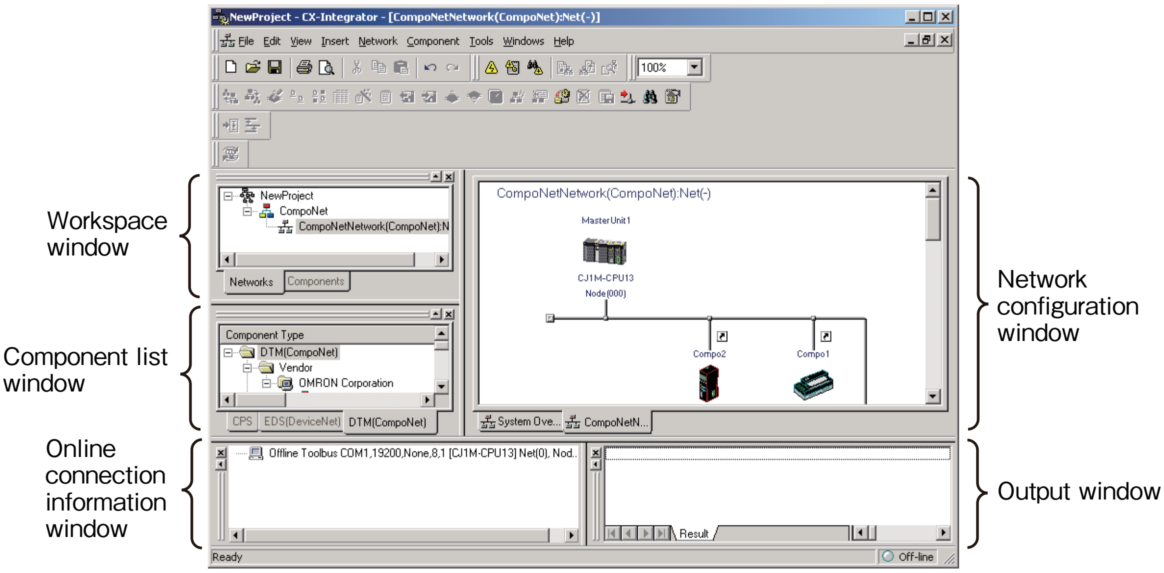
Clicking a Slave Unit's icon on the Main Window will show the data and parameters for the Slave Unit. You can monitor the data and set the parameters.

8-3 Display windows on CX-Integrator

The Main Window of the CX-Integrator has two display types: offline and online.

8-3-1 Offline Window

The Offline Window is the first display shown after the CX-Integrator is started. It has a white background. This is the window when the CX-Integrator is not actually connected with the CompoNet network.



To show any of these sub-windows on the Main Window, select the View on the menu bar and Window from the pop-up menu. Click the sub-window name to indicate.

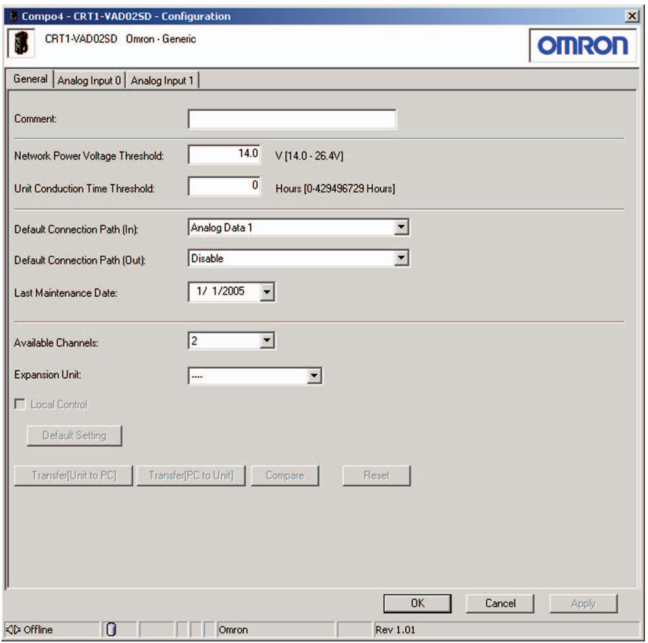
Additional Information

To show the Configuration Window, double-click a Slave Unit icon on the Network Configuration window, or right-click the icon and select Parameters - Edit from the pop-up menu.

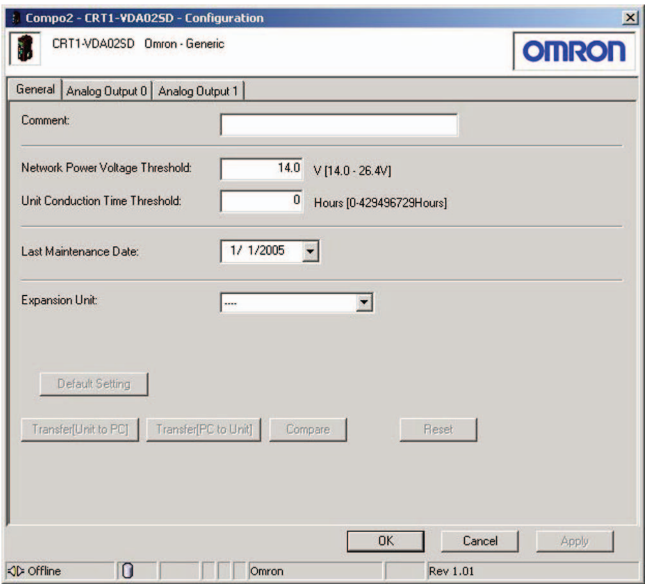
Configuration Window

You can set and edit parameters on the Configuration Window.

- Analog Input Slave Unit

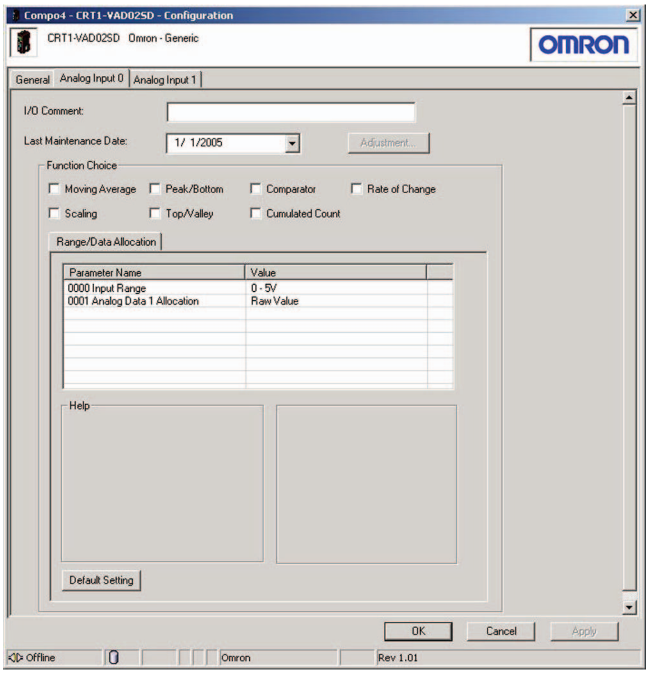


- Analog Output Slave Unit

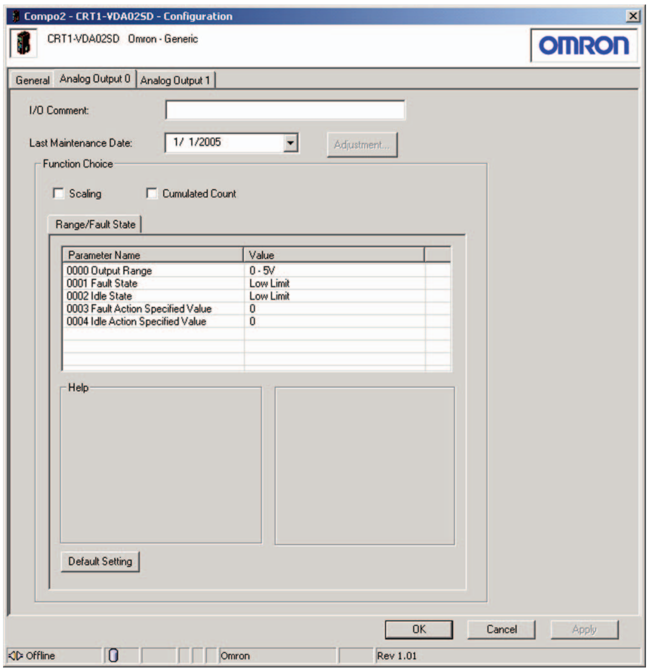


To have separate parameter settings for multiple channels, select the Analog Input x Tab or the Analog Output x Tab of the corresponding channel, and set the required parameters for each channel.

- Analog Input x Tab



- Analog Output x Tab



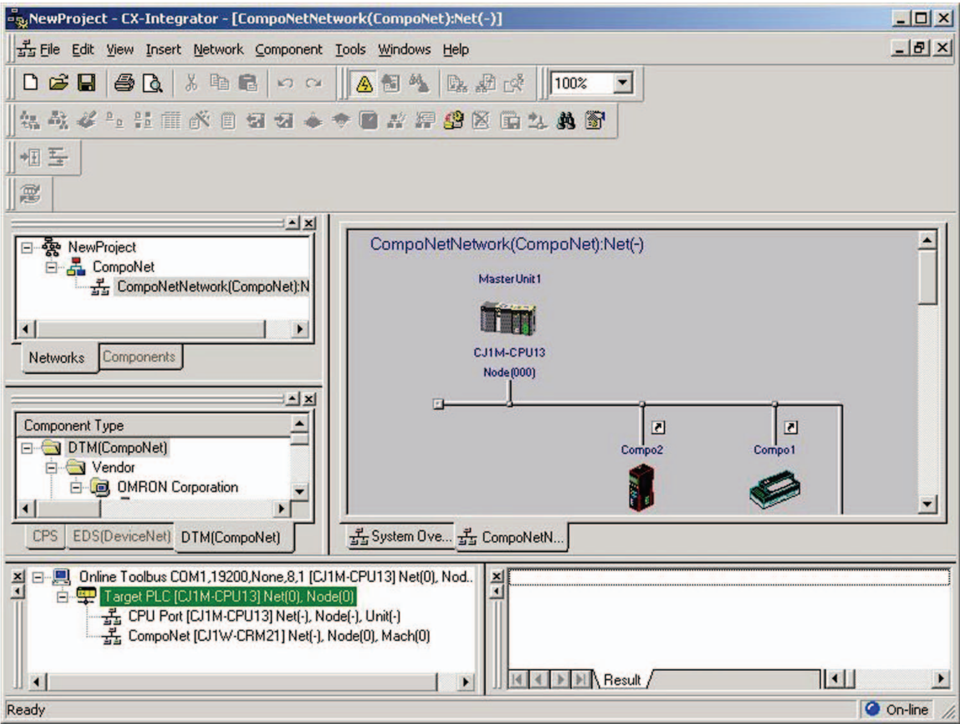
See Section 9 for setting the parameters.

8

8-3-1 Offline Window

8-3-2 Online Window

The Online Window is used to monitor information for CompoNet Slave Units. It has a gray background. This is the window when the CX-Integrator is actually connected to the CompoNet network. It is shown by switching the CX-Integrator to online.

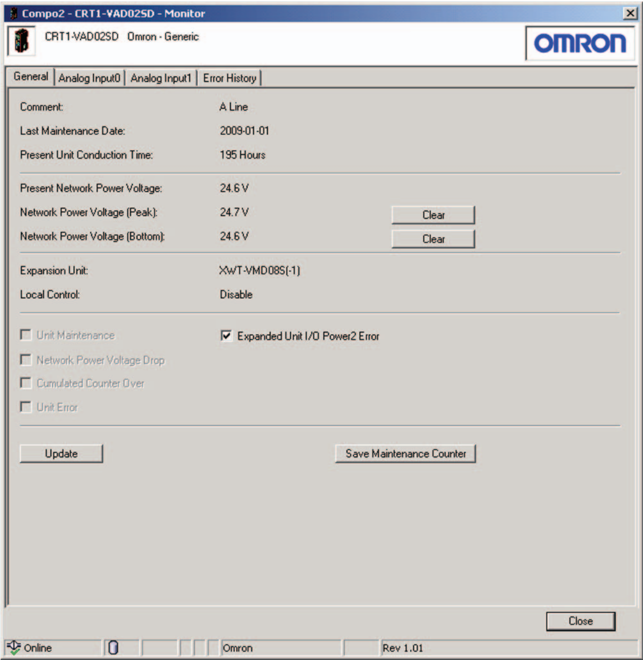


To show the Monitor Window, right-click the icon of any Slave Unit whose information you want to monitor on the Network Configuration window. Select the Monitor from the pop-up menu.

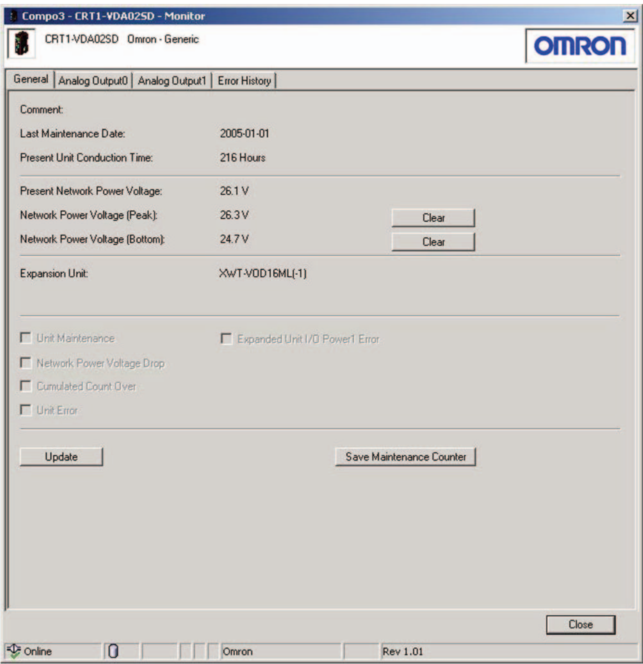
Monitor Window

On the Monitor Window, you can monitor the past and present data of the Slave Units.

- Analog Input Slave Unit

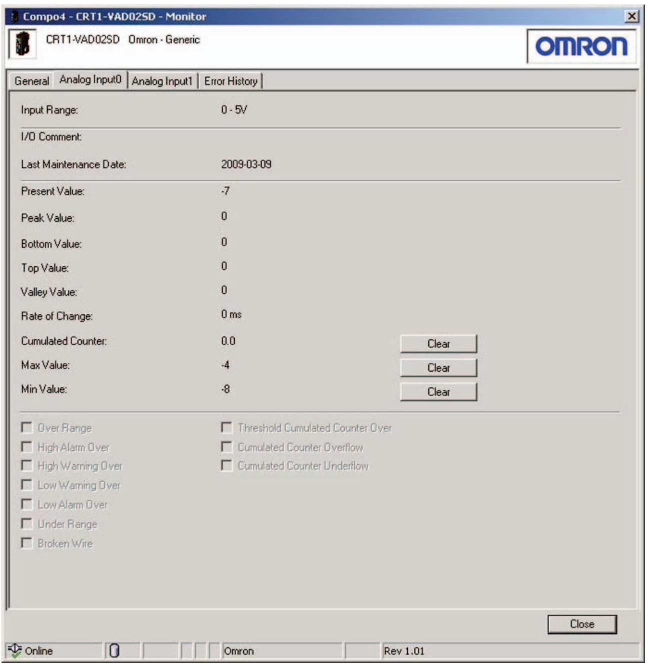


- Analog Output Slave Unit

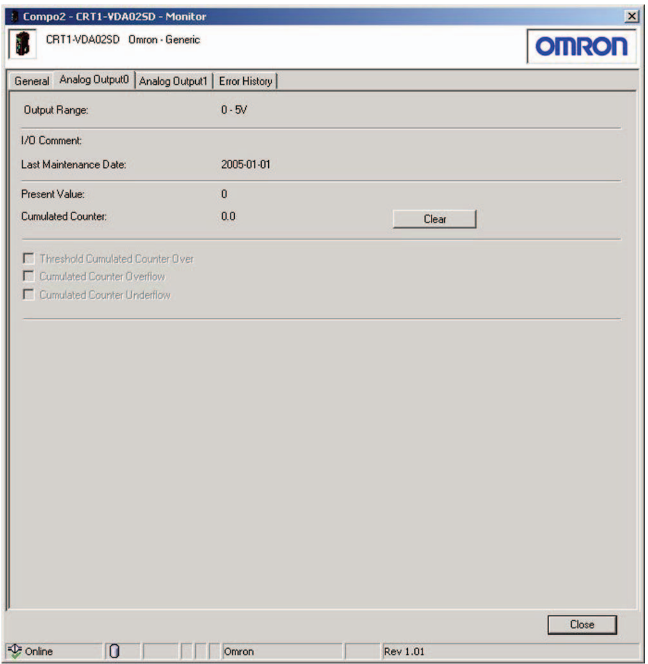


To monitor the error log or the data of any specific channel, select the Analog Input x Tab or the Analog Output x Tab of the corresponding channel.

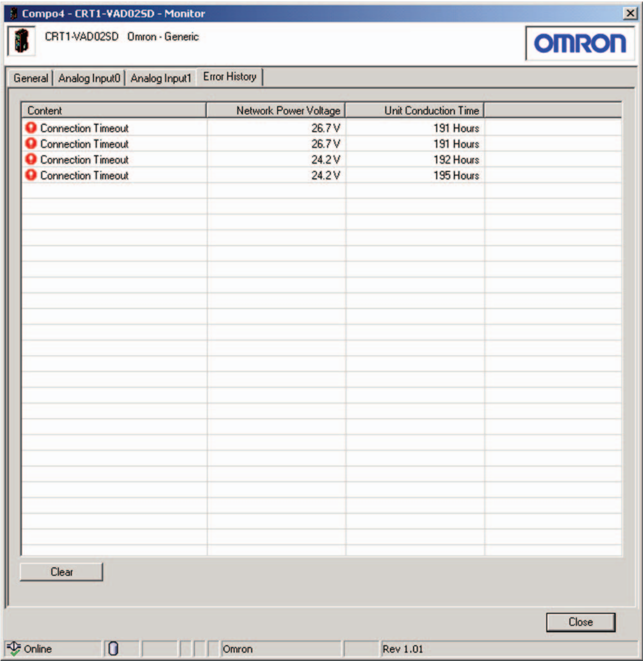
- Analog Input x Tab



- Analog Output x Tab



- Error History Tab



See Section 9 for monitoring items and contents.

9

Functions and Settings operable by CX-Integrator

9-1 Functions operable by CX-Integrator

Major data monitoring and parameter setting can be done on the part of Numerical Indicator of the Slave Unit. However, CX-Integrator provides much detailed monitoring and setting.
These are the functions available on the CX-Integrator.

Purpose	Input or Output Unit	Available Function	
		Content	Relevant
To name a Slave Unit	Input and Output	9-2 Naming the Units	9-3
To name a connected device	Input and Output	9-3 Naming the connected devices	9-5
To monitor the network power voltage	Input and Output	9-4 Monitoring the network power voltage	9-7
To monitor the conduction time of the Slave Unit	Input and Output	9-5 Monitoring the Unit conduction time	9-8
To keep record of the last date when the Slave Unit had a maintenance	Input and Output	9-6 Keep log of the last maintenance date	9-10
To skip the operation of unused channels	Input	9-7 Restricting the number of available channels	9-14
To change the input or output range	Input and Output	9-8 Changing the input or output range	9-16
To take the moving averages of the inputs	Input	9-9 Taking the moving average of the inputs	9-18
To set the scale	Input and Output	9-10 Setting the scale	9-20
To use the Comparator	Input	9-11 Using the Comparator	9-23
To calculate the change rate of the inputs	Input	9-12 Having the change rate	9-27
To hold the peak or bottom value	Input	9-13 Using the peak or bottom hold function	9-30
To hold the top or valley valueInput	Input	9-14 Using the top or valley hold function	9-33
To monitor the cumulated count value	Input and Output	9-15 Monitoring the cumulated count	9-38
To set the output during idle	Output	9-16 Setting the Idle action	9-42
To set the output at communications failures	Output	9-17 Setting the Fault action	9-44
To confirm the present network power voltage	Input and Output	9-18 Confirming the present network power voltage	9-46
To confirm the maximum or minimum network power voltage	Input and Output	9-19 Confirming the maximum or minimum network power voltage	9-47
To confirm the maximum or minimum input data value	Input	9-20 Confirming the maximum or minimum input or output value	9-48
To confirm the status	Input and Output	9-21 Confirming the status	9-49
To confirming the error history	Input and Output	9-22 Confirming the error log	9-51
To have I/O communications of any values beside analog data, such as peak or bottom value	Input	9-23 I/O communications of other data than analog value	9-52

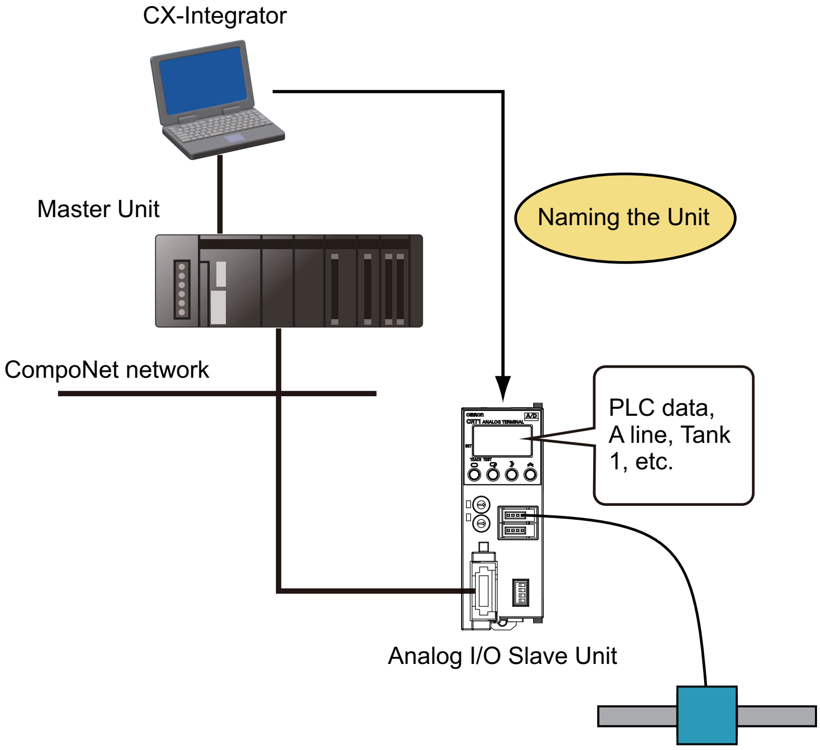
9

Purpose	Input or Output Unit	Available Function	
		Content	Relevant
To have I/O communications of status	Input	9-24 I/O communications of status	9-54
To reset the parameters	Input and Output	9-25 Resetting the parameters	9-56
To adjust the values	Input and Output	9-26 Using the User adjustment	9-58

9-2 Naming the Units

9-2-1 Function overview

You can add a name or comment on each Slave Unit with up to 32 characters. It is stored in the Slave Unit memory. The CX-Integrator reads or writes it, and shows it on the windows. Therefore giving a name on each Slave Unit will facilitate identification of multiple Units.

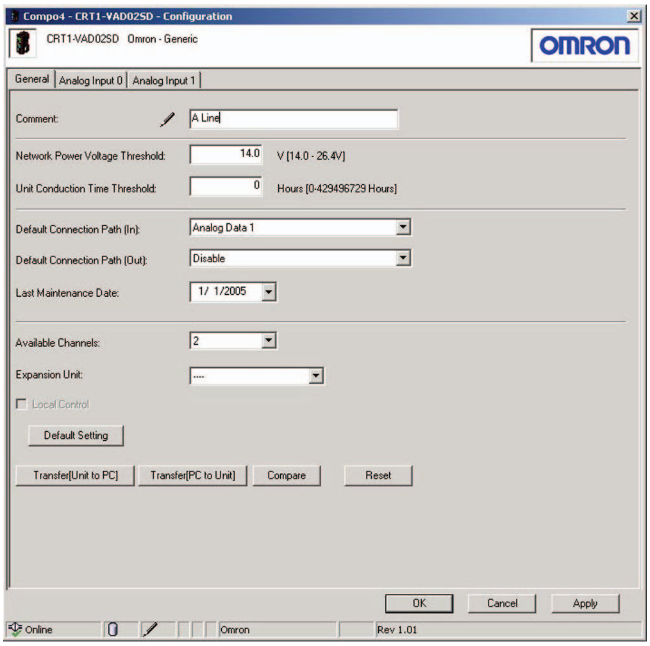


9-2-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **General** Tab. Enter the desired name or comment in the *Comment* field.



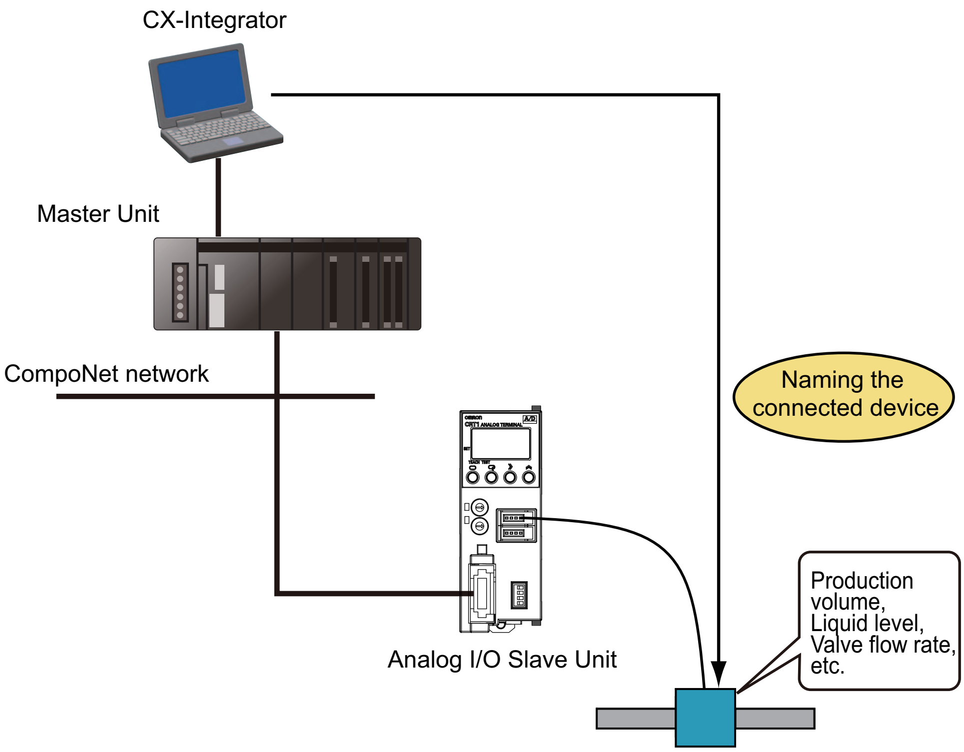
4. Click the **Transfer [PC to Unit]** Button to download the setting data.

5. Click the **OK** Button and exit the window.

9-3 Naming the connected devices

9-3-1 Function overview

You can add a name or comment on each device connected to any Slave Units. The name or comment can be up to 32 characters. It is stored in the Slave Unit memory. The CX-Integrator reads or writes it, and shows it on the windows. Therefore giving a name on each Slave Unit will facilitate identification of multiple connected devices.

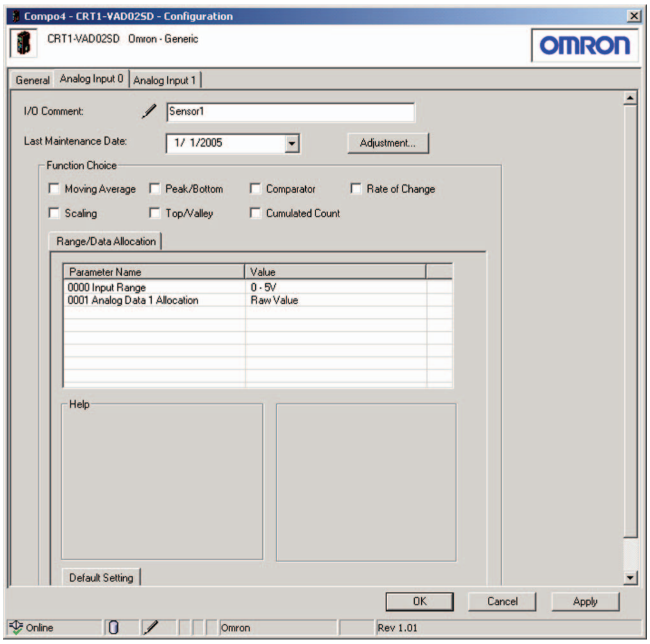


9-3-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **Analog Input x** or **Analog Output x** Tab for the channel to which a name or comment is to be added. Enter the desired name or comment in the *I/O Comment* Field.



4. Go back to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the setting data.

5. Click the **OK** Button and exit the window.

9-4 Monitoring the network power voltage

9-4-1 Function overview

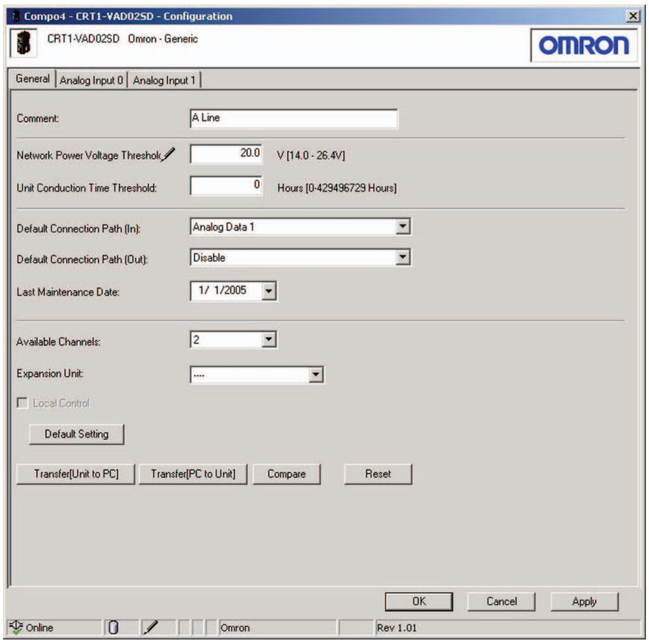
See Section 7-14 for the function.

9-4-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Click the **General** Tab. Enter the desired value between 14.0 and 26.4 in the *Network Power Voltage Threshold* Field.



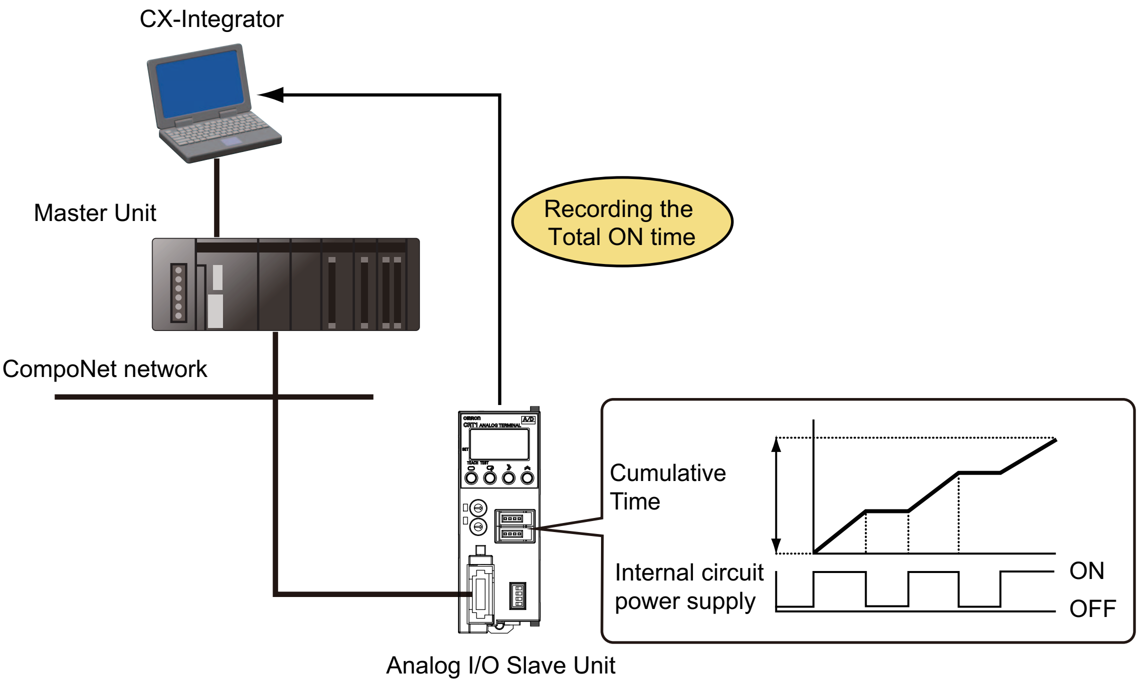
4. Click the **Transfer [PC to Unit]** Button to download the data.

5. Click the **OK** Button and exit the window.

9-5 Monitoring the Unit conduction time

9-5-1 Function overview

The function saves the cumulative time or the Total ON time while the internal circuit power supplies of the Slave Units have power conducted.



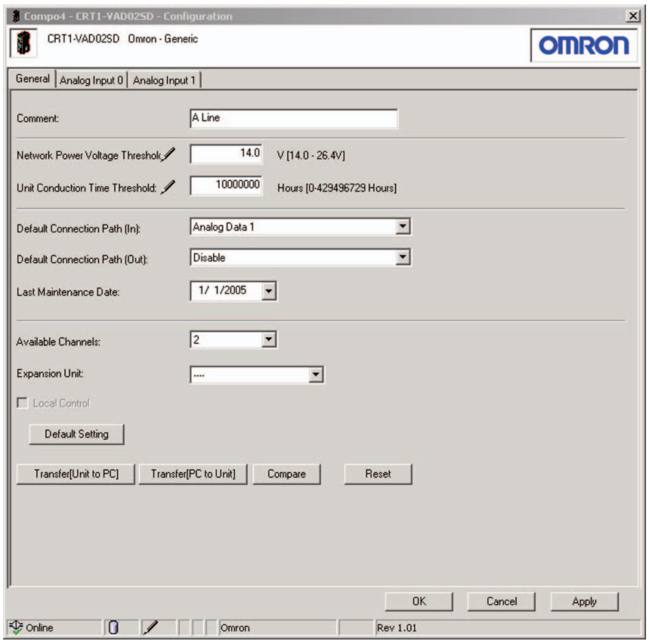
You can set the threshold. Once the Total ON time exceeds the threshold, the Unit Conduction Time Exceeded Flag in the Status area becomes on.

9-5-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu. Then the Configuration Window shows up.

3. Click the **General** Tab. Enter the desired value between 0 and 429496729 in the *Unit Conduction Time Threshold* Field.



4. Click the **Transfer [PC to Unit]** Button to download the setting data.

5. Click the **OK** Button and exit the window.

9-6 Keep log of the last maintenance date

9-6-1 Function overview

You can keep record, in the Slave Unit memory, of the last date when the maintenance was performed for the Slave Unit and the devices connected to it.

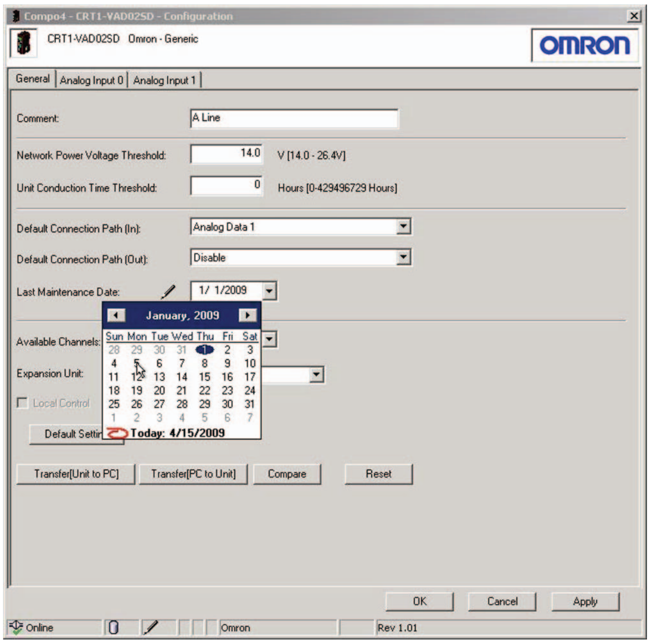
9-6-2 Operation procedure

Keeping log of the last maintenance date of any Slave Units

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select **Parameters** - **Edit** from the pop-up menu.
Then the Configuration Window shows up.

3. Click the **General** Tab. Click the pull-down list of the *Last Maintenance Date* Field. Select a date on the calendar.



General Information

- Clicking the arrow button (◀ or ▶)above the calendar will show the previous or the next month calendar respectively.
- Select *Today* from the bottom of the list to set today.

4. Click the **Transfer [PC to Unit]** Button to download the setting data.

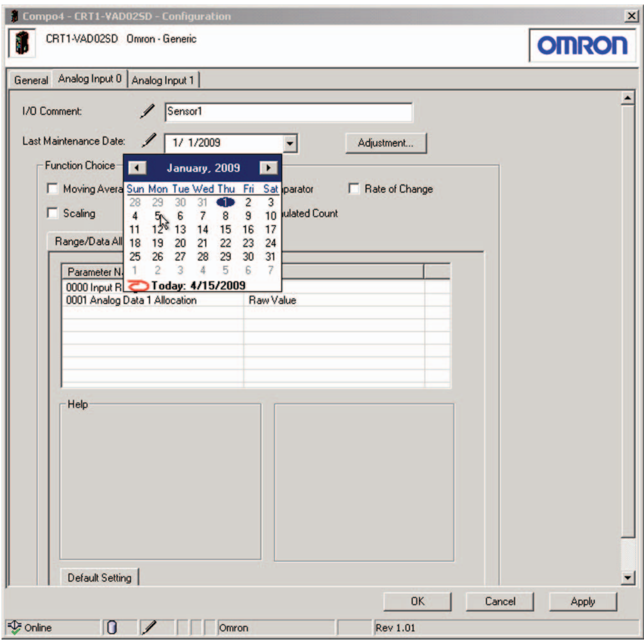
5. Click the **OK** Button and exit the window.

Keeping log of the last maintenance date of any connected devices

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu. Then the Configuration Window shows up.

3. Click the **Analog Input x** or **Analog Output x** Tab for the channel to which the last maintenance data is to be entered. Click the pull-down list of the *Last Maintenance Date* Field. Select a date on the calendar.



4. Go back to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the setting data.

5. Click the **OK** Button and exit the window.

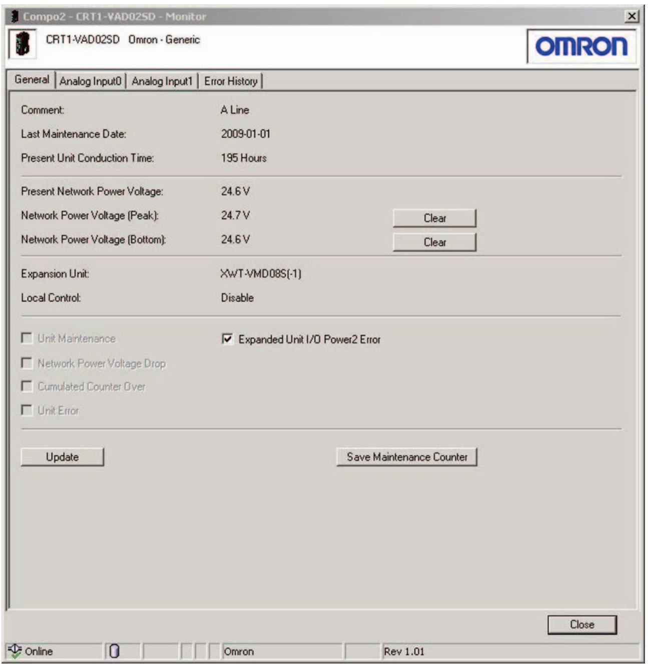
Confirming the last maintenance date

1. Boot the CX-Integrator.

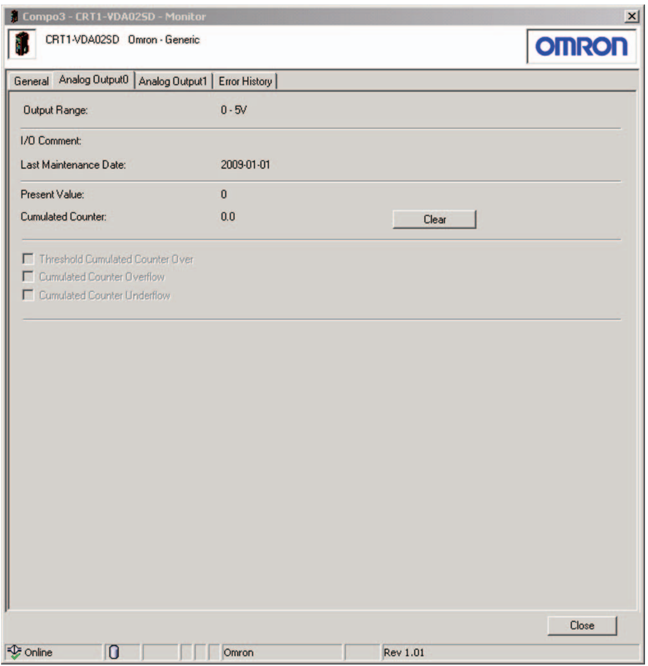
2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

3. Click the **General** Tab for a Slave Unit, or the **Analog Input x** or **Analog Output x** Tab for a connected device.
   Then the date that was set as the last maintenance date is shown.

   • General Tab



- Analog Output x Tab



4. Click the **Close** Button and exit the window.

9-7 Restricting the number of available channels

9-7-1 Function overview

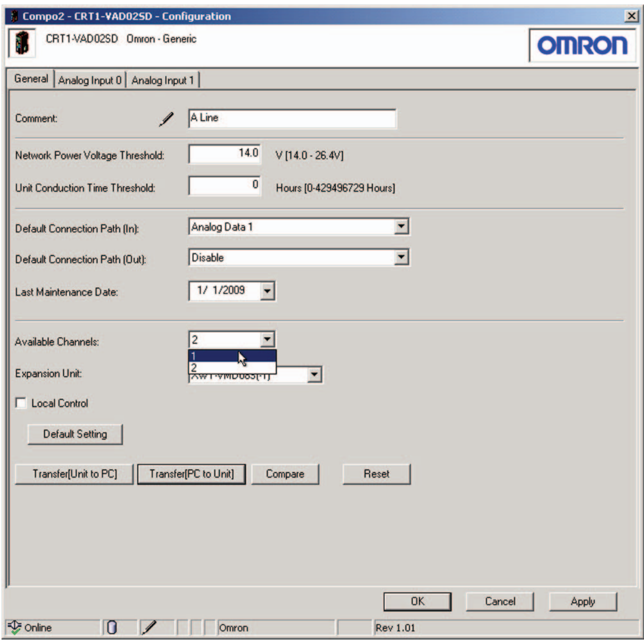
See Section 7-13 for the function.

9-7-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Click the **General** Tab. Click the pull-down list of the *Available Channels* Field. Select the number of channels to have conversion.



4. Click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

5. Click the **OK** Button and exit the window.

9-8 Changing the input or output range

9-8-1 Function overview

See Section 7-15 for the function.

Precautions for Correct Use

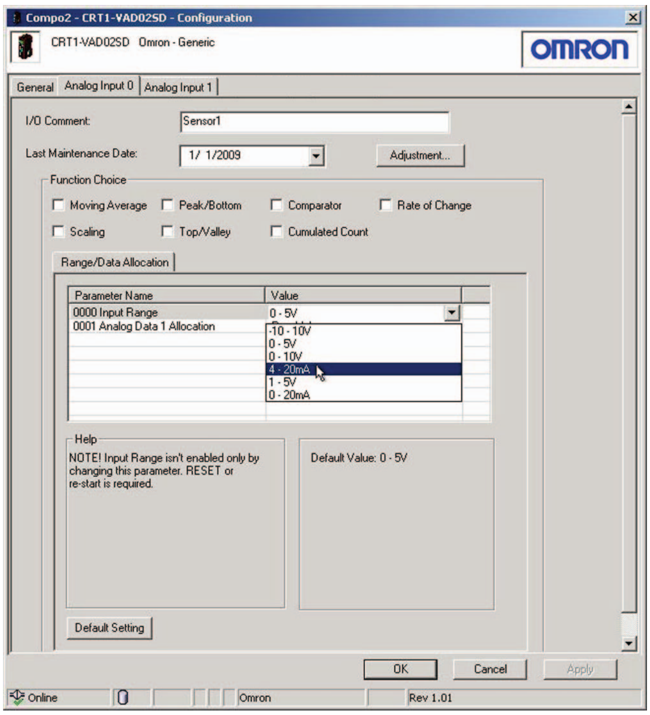
The setting is valid only when the Pin No.8 of the Input range setting or of the Output range setting is off. If it is on, the priority is placed on any setting by the Input range setting switch or by the Output range setting switch.

9-8-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **Analog Input x** or **Analog Output x** Tab for the channel to which the range is changed. Click the pull-down list of the *Input Range* or *Output Range* Field. Select a range.



4. Go back to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

5. Click the **OK** Button and exit the window.

9-9 Taking the moving average of the inputs

9-9-1 Function overview

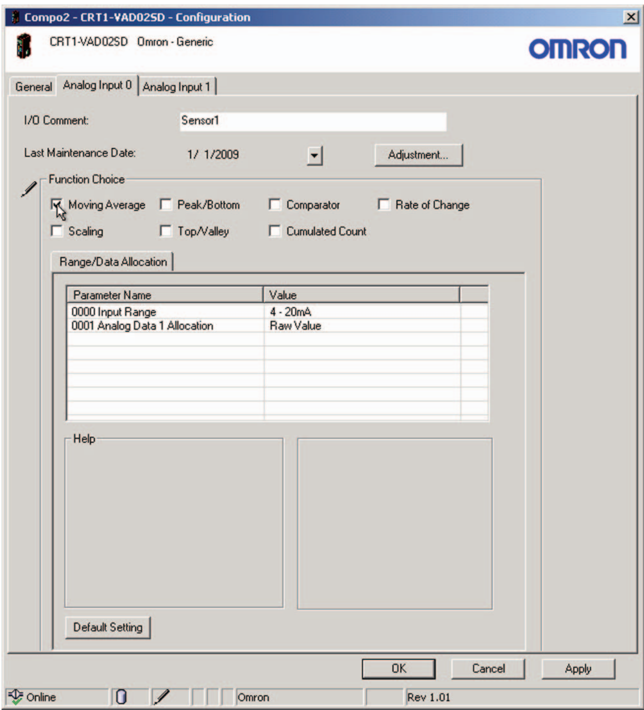
See Section 7-16 for the function.

9-9-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **Analog Input x** Tab for the channel to which the moving average is taken. Check the checkbox for the *Moving Average* in the *Function Choice* Field.



4. Click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

5. Click the **OK** Button and exit the window.

9-10 Setting the scale

9-10-1 Function overview

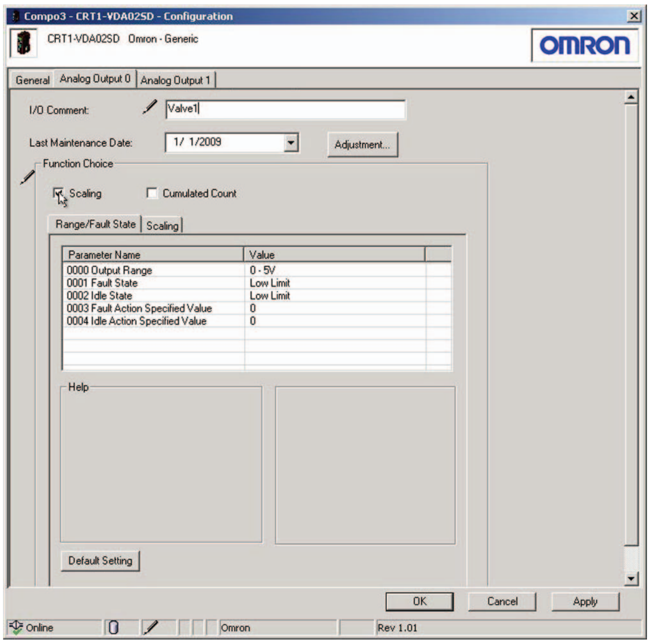
See Section 7-5 for the function.

9-10-2 Operation procedure

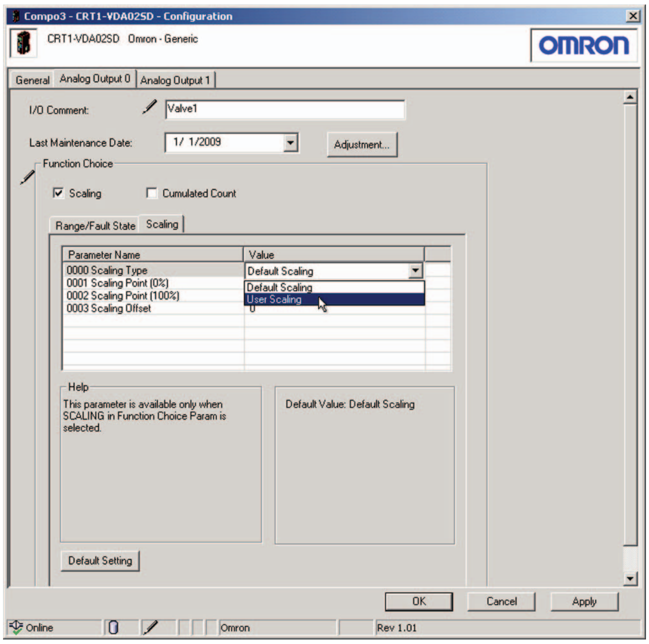
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

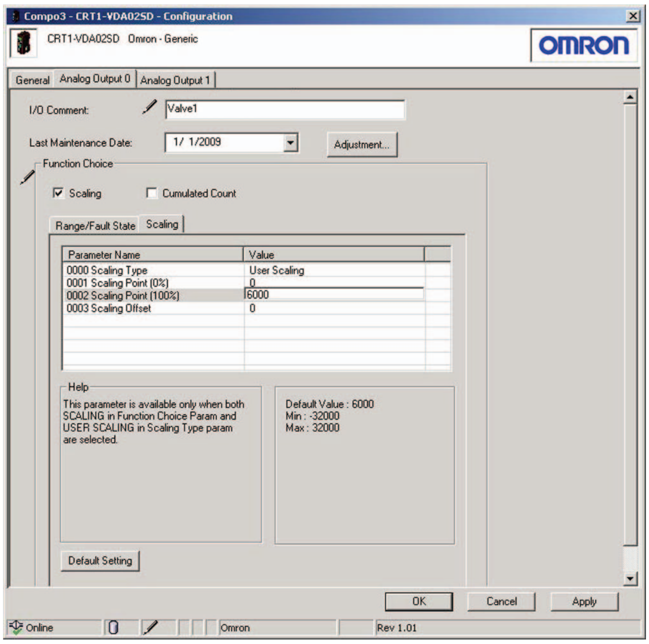
3. Select the **Analog Input x** Tab or **Analog Output x** Tab for the channel to be scaled. Check the checkbox for the *Scaling* in the *Function Choice* Field.



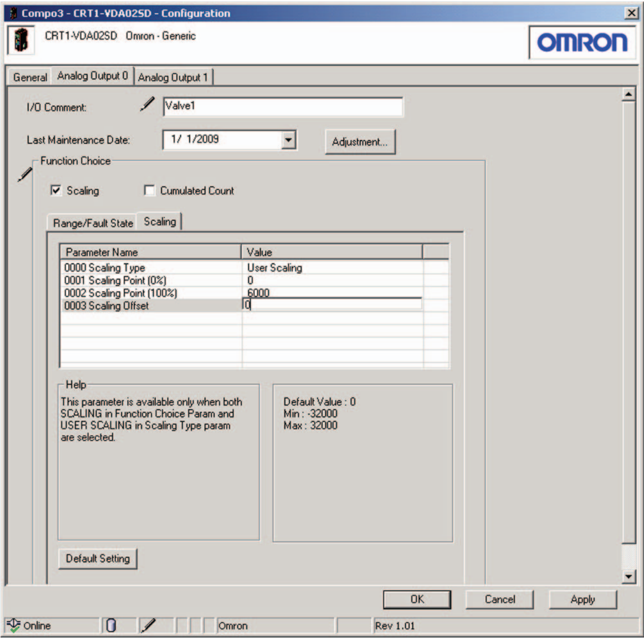
4. Click the **Scaling** Tab. Click the pull-down list of *Scaling Type* Field. Select either *Default Scaling* or *User Scaling*.



5. When User Scaling is selected, enter the lower limit (0%) in the *Scaling Point (0%)* Field and the *upper limit (100%)* in the *Scaling Point (100%)* Field.



6. To set the scaling offset, enter the offset value in the *Scaling Offset* Field.



7. Click the **General** Tab, and click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

8. Click the **OK** Button and exit the window.

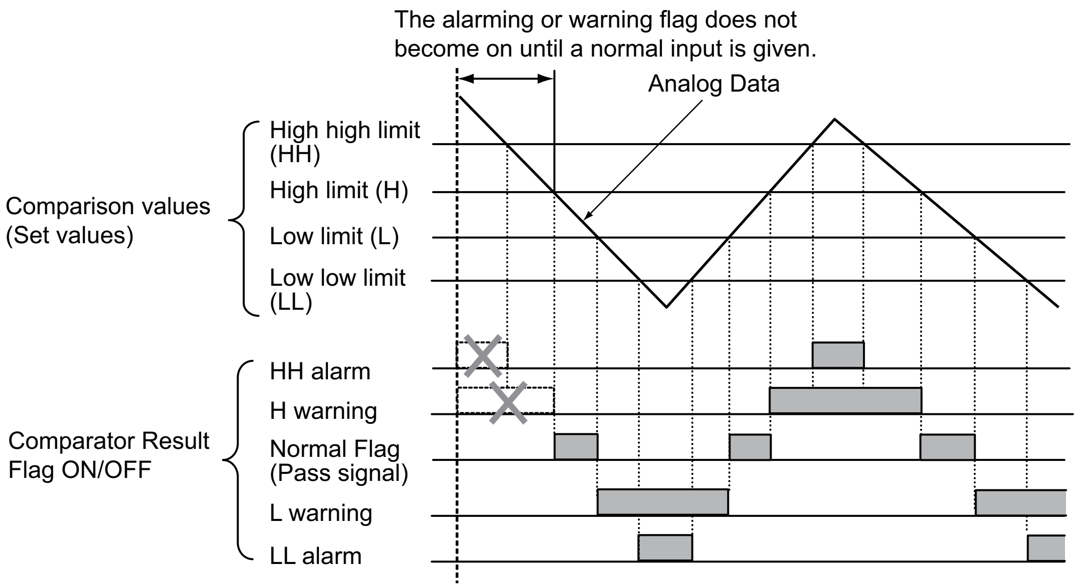
9-11 Using the Comparator

9-11-1 Function overview

This section explains the Comparator standby sequence function, which can be set only by the CX-Integrator. See Section 7-8 for the other functions.

Comparator standby sequence

The function keeps all of the comparator result flags among the analog status flags off, until a normal input is received or any input ranges between the high limit (H) and the low limit (L). This is to prevent unstable inputs right after the power-on cause unnecessary comparator operations. The function has “Enabled” and “Disabled” selections.

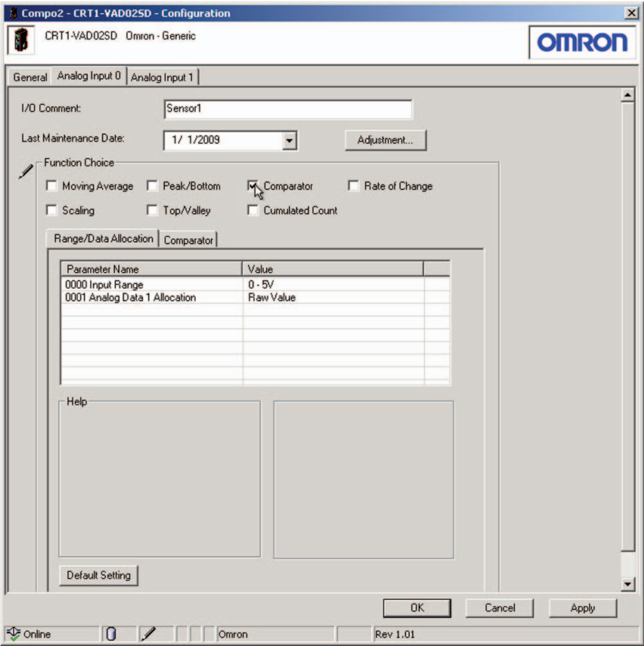


9-11-2 Operation procedure

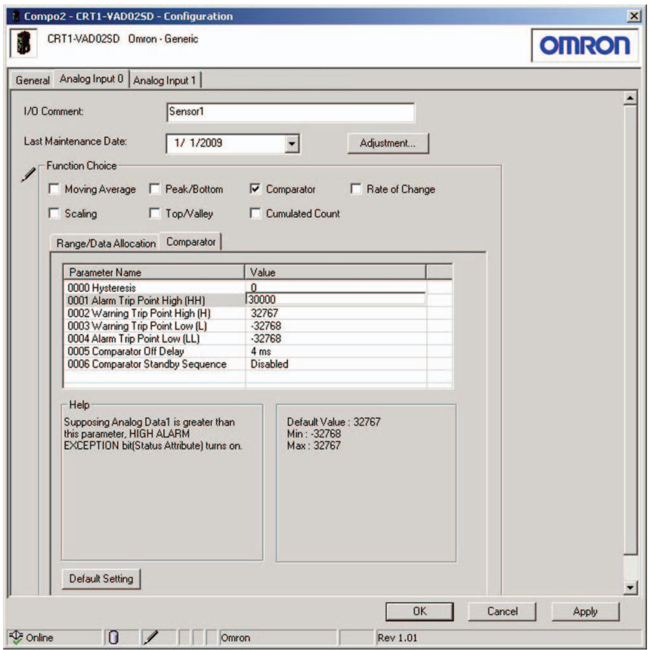
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

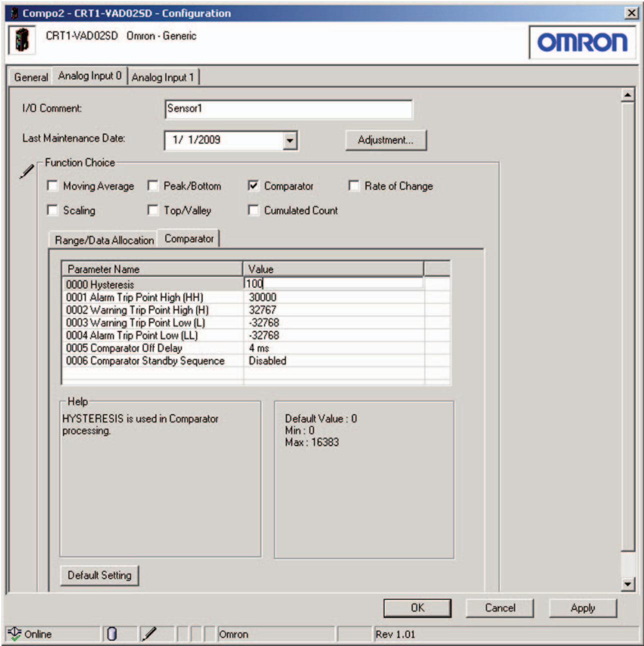
3. Select the **Analog Input x** Tab for the channel whose data is to be compared. Check the checkbox for the *Comparator* in the *Function Choice* Field.



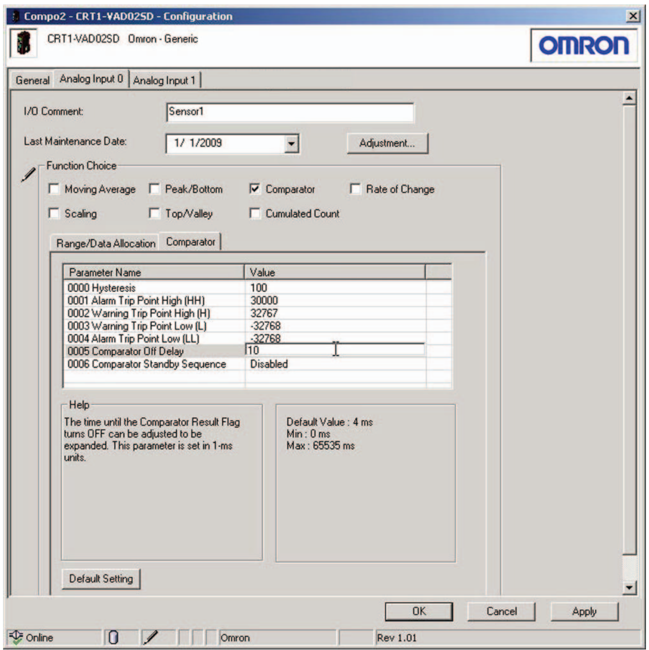
4. Click the **Comparator** Tab. Enter a threshold between -32768 and +32767 in each field of *Alarm Trip Point High (HH)*, *Warning Trip Point High (H)*, *Warning Trip Point Low (L)*, and *Alarm Trip Point Low (LL)* Fields.



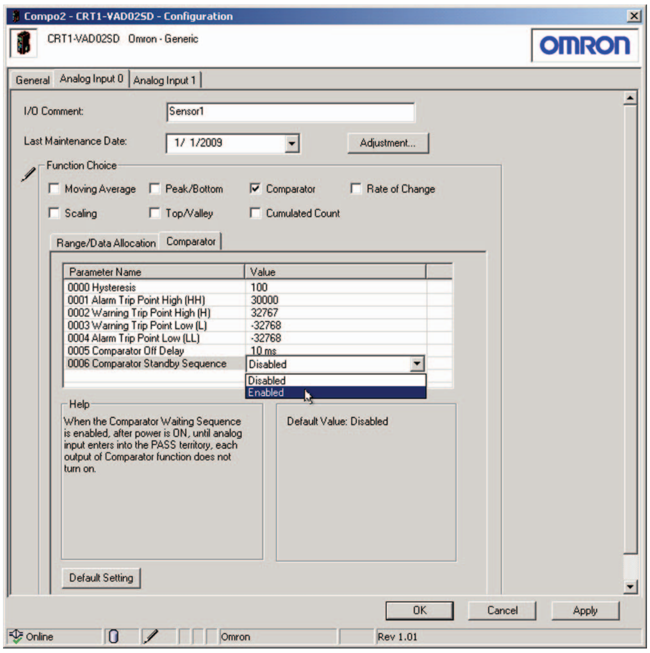
5. To set the hysteresis, enter the desired value between 0 and 16383 in the *Hysteresis* Field.



6. To set the OFF delay, enter the desired value between 0 and 65535 in the *Comparator Off Delay* Field.



7. To activate the Comparator standby sequence, click the list box on the *Comparator Standby Sequence* Field, and select *Enabled* on the list.



8. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.

General Information

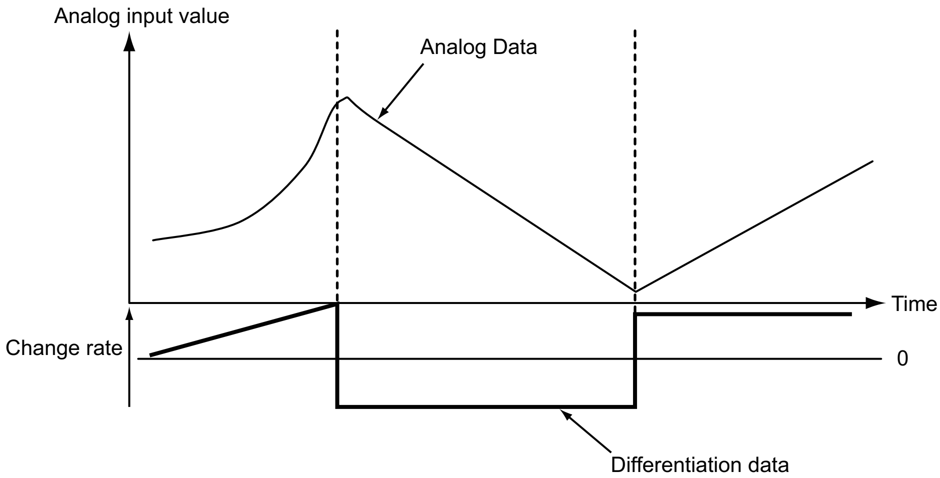
This setting is valid only after the next power-on.

9. Click the **OK** Button and exit the window.

9-12 Having the change rate

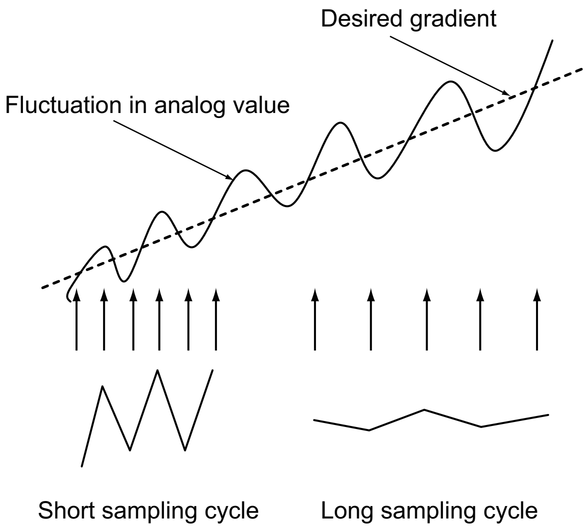
9-12-1 Function overview

The analog input values are sampled in the set sampling cycle or sampling rate. One sampled value is compared with the previously sampled value. Then the difference between them is calculated to have the change rate.



Additional Information

When the sampling cycle is set short, the change rate is susceptible to small variations. That is, if the sampling cycle is shorter than the minute fluctuations of the analog data, the fluctuation itself is regarded as the rate of change. In this case, the moving averages must be used to set a longer sampling cycle. See Section 9-9 for the moving average.

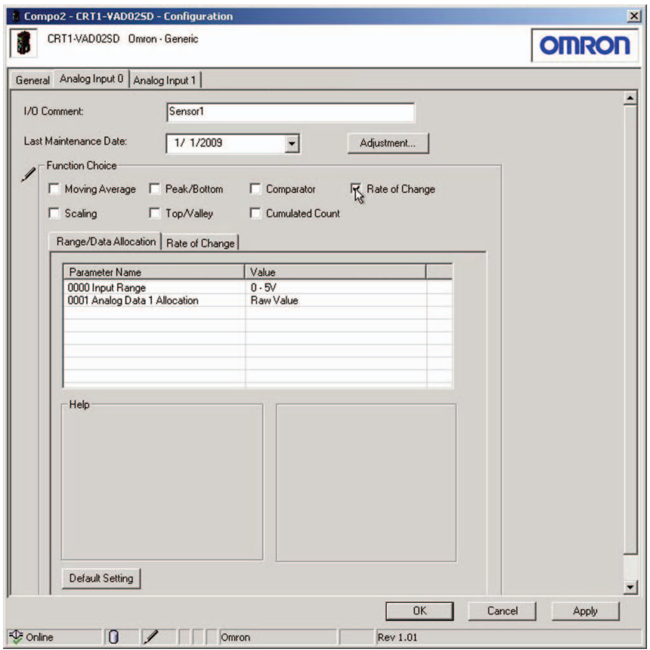


9-12-2 Operation procedure

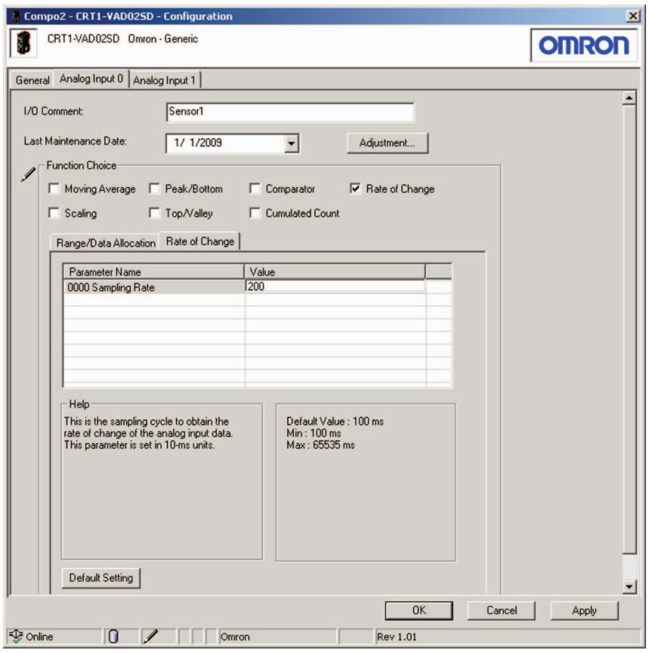
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Select the **Analog Input x** Tab for the channel to have the change rate. Check the checkbox for the *Rate of Change* under the *Function Choice* Field.



4. Click the **Rate of Change** Tab. Enter the desired value between 10 and 65535 for the *Sampling Rate* Field.



5. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data, and then click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

6. Click the **OK** Button and exit the window.

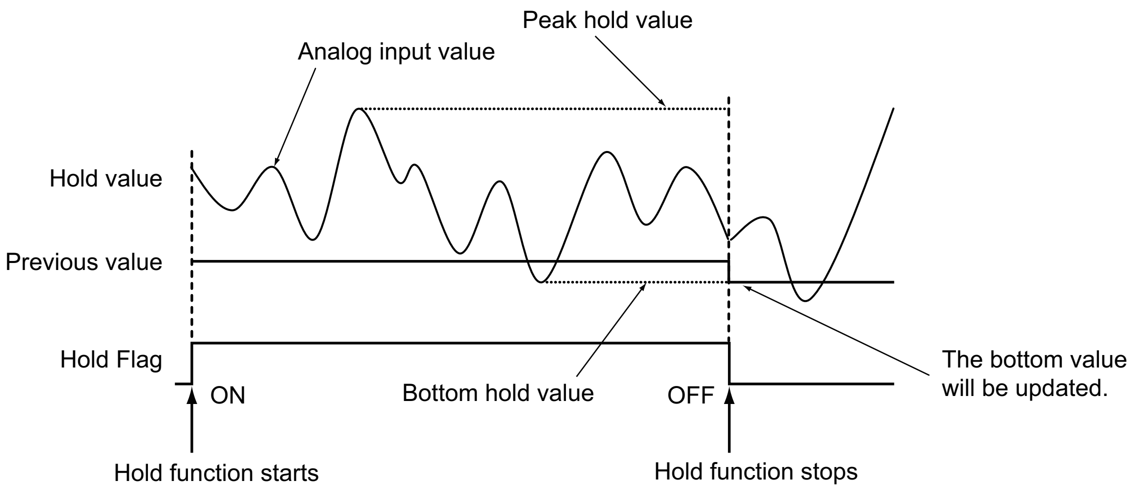
9

9-12-2 Operation procedure

9-13 Using the peak or bottom hold function

9-13-1 Function overview

This function holds the maximum (or peak) value or minimum (or bottom) value of the analog input value. The hold function starts when the Hold Flag (output) that is allocated in the OUT Area becomes ON. It searches for the peak or bottom value until the Hold Flag turns OFF. The peak or bottom value is refreshed when the Hold Flag turns OFF. See Section 4-2-4.



Additional Information

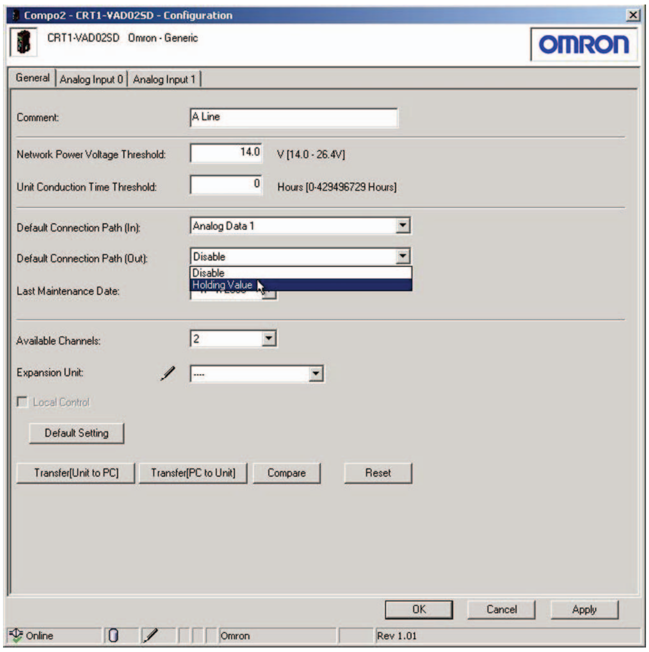
There is a delay in network transmission between the time when the Hold Flag becomes ON (or OFF) in the Master Unit ladder program and the time when the flag status is actually sent and notified to the Slave Unit. Therefore, even though the Hold Flag is ON in the ladder program, the first analog data transmitted to the Master Unit after the CPU power is turned ON may be the data from while the Hold Flag was OFF. The ladder program must consider this delay and include some time lag to recognize only the peak or bottom values after a certain time since the Hold Flag becomes ON.

9-13-2 Operation procedure

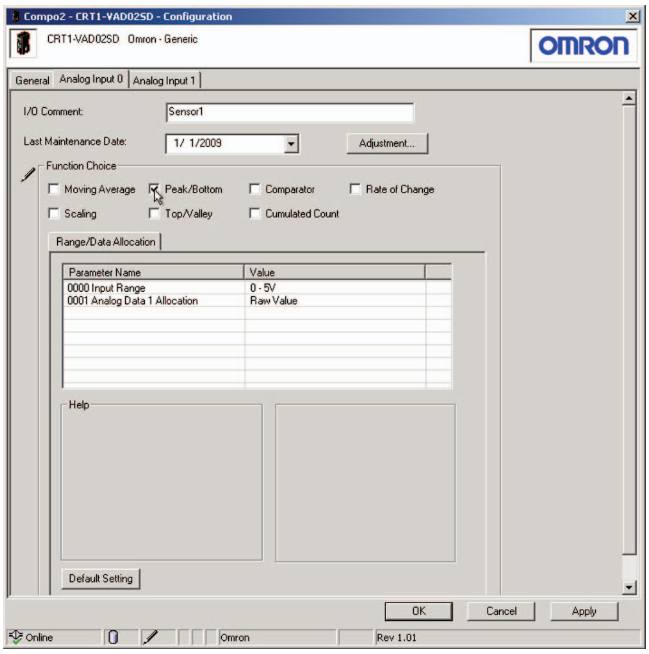
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select Parameters - Edit from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **General** Tab. Click the pull-down list of the *Default Connection Path (Out)* Field. Select the *Holding Value*.



4. Select the **Analog Input x** Tab for the channel to use the Hold function. Check the checkbox for the *Peak/Bottom* under the *Function Choice* Field.



5. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

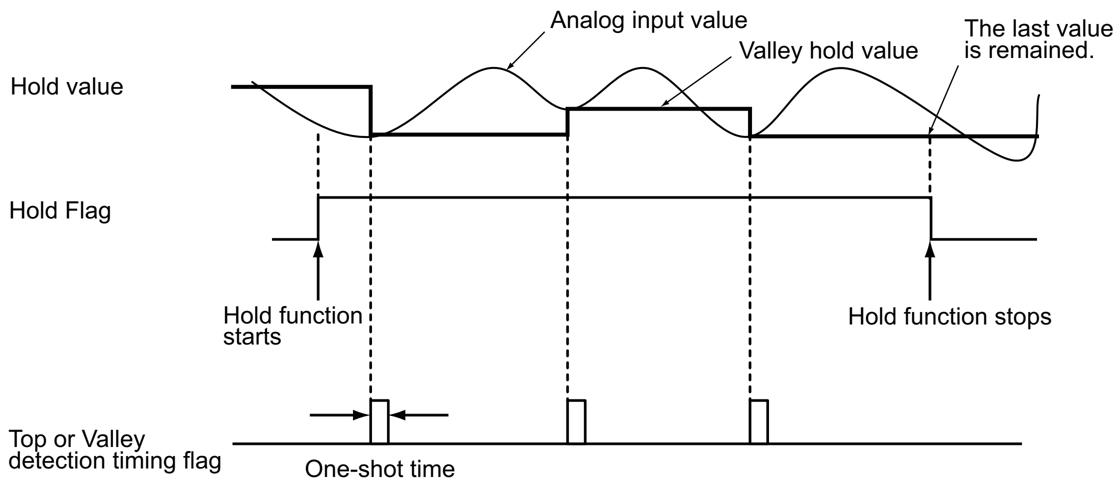
6. Click the **OK** Button and exit the window.

9-14 Using the top or valley hold function

9-14-1 Function overview

The function monitors up and down of the analog input values, and holds the top-of-the-hill value (or top value) or the valley-of-the-hill value (or valley value). The hold function starts when the Hold Flag (output) that is allocated in the OUT Area becomes ON. The values are updated constantly until the Hold Flag becomes OFF. See Section 4-2-4.

Once the Hold Flag is off, the last value is retained. The value is initialized, when the Flag turns ON again and a top or valley value is monitored. You can also allocate the detection timing to monitor the hold timing.



General Information

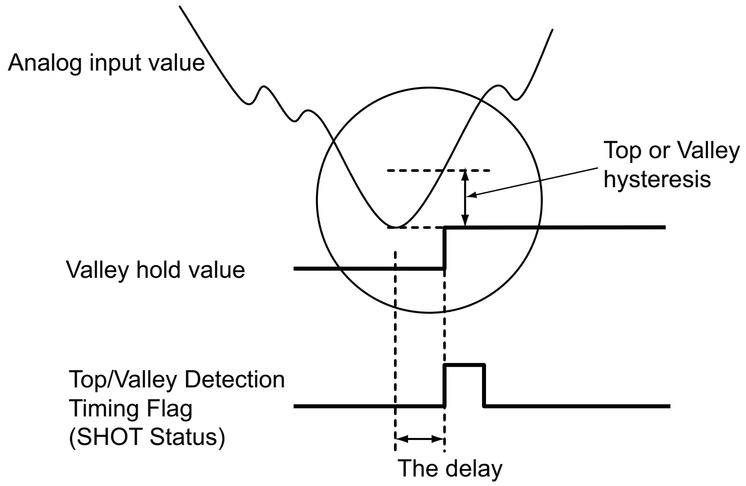
- The duration while the Top/Valley Detection Timing Flag (SHOT Status) is ON can be adjusted by setting the one-shot time.
- Even the Top/Valley Detection Timing Flag (SHOT Status) is set to be ON, it becomes off when the Hold Flag is turned off.

Additional Information

There is a network transmission delay between the time when the Hold Flag becomes ON (or OFF) in the Master Unit ladder program until the time when the flag status is actually sent and notified to the Slave Unit. Therefore, even though the Hold Flag is ON in the ladder program, the first analog data transmitted to the Master Unit after the CPU power is turned ON may be the data from while the Hold Flag was OFF. The ladder program must consider this delay and include some time lag to recognize only the top or valley values after a certain time since the Hold Flag becomes ON.

- Setting hysteresis

  The hysteresis can be set to prevent detections of top or valley values among minor fluctuations in the analog input values. When the hysteresis is used, the data hold timing is delayed from the actual top or valley values. The diagram below illustrates it.

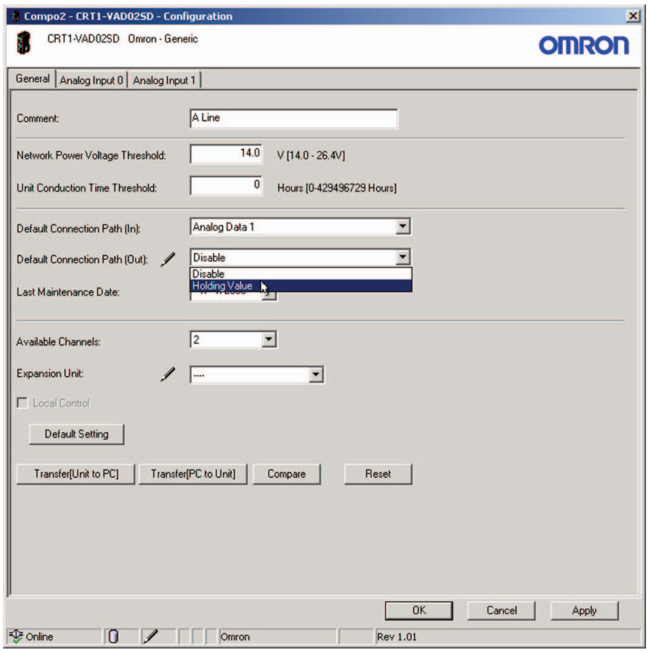


9-14-2 Operation procedure

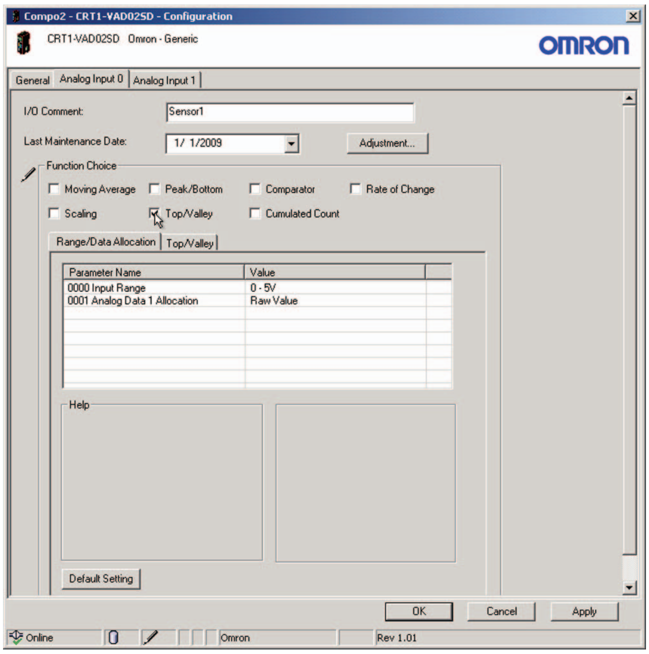
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **General** Tab. Click the pull-down list of the *Default Connection Path (Out)* Field. Select the *Holding Value*.



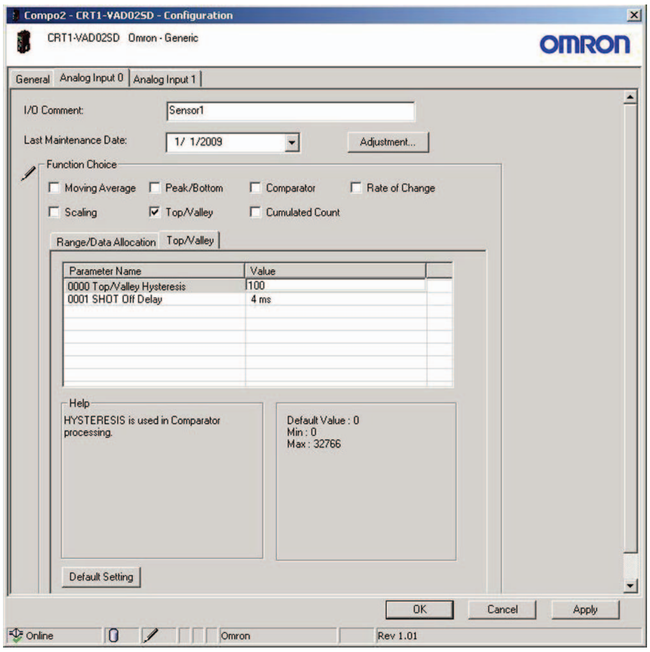
4. Select the **Analog Input x** Tab for the channel to use the Hold function. Check the checkbox for the *Top/Valley* under the *Function Choice*.



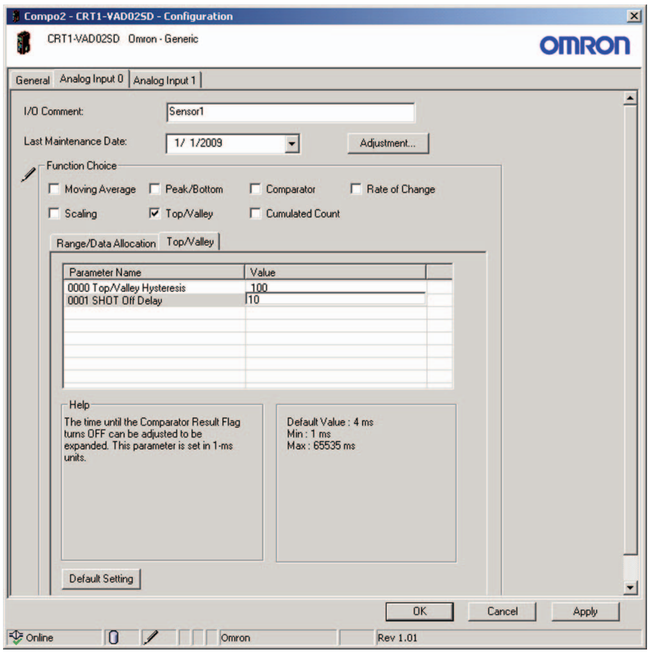
9

9-14-2 Operation procedure

5. To set the hysteresis, select the **Top/Valley** Tab, and enter the desired value between 0 and 32766 in the *Top/Valley Hysteresis* Field.



6. To set the one-shot time, enter the desired value between 1 and 65535 in the *SHOT-Off Delay* Field.



7. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

General Information

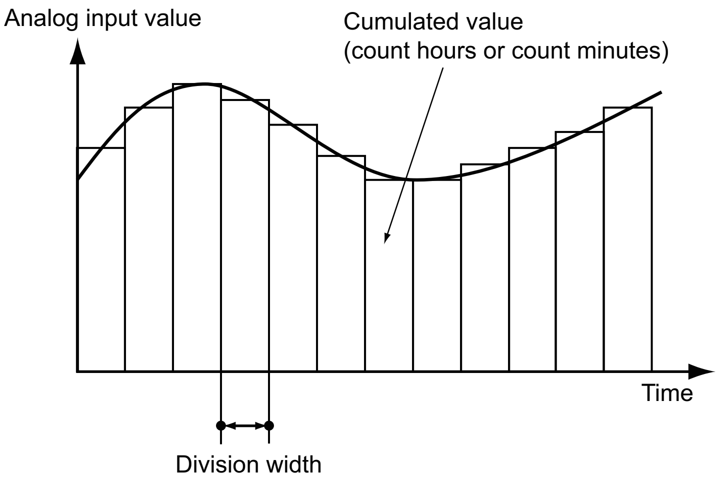
This setting is valid only after the next power-on.

8. Click the **OK** Button and exit the window.

9-15 Monitoring the cumulated count

9-15-1 Function overview

The cumulated counter calculates an approximation to the integral of analog input values over time. The value is calculated in hours, i.e., count hours, or in minutes, i.e., count minutes. For example, 100.0 count hours indicate that the analog input value equivalent to 100 counts continues for one hour.
The counter range for a four-byte area (or two words) is -214748364.8 to +214748364.7 in both count hours and count minutes. The value is displayed on the CX-Integrator in units of 0.1 hour or minute.
A threshold is set in the Slave Unit. If the cumulated count exceeds the threshold, the Cumulated Counter Over Flag in the Status Area becomes on.



* These are the division widths for the cumulated count

.

Unit	Division
Hour	3.6 s (1/1000 h)
Minute	60 ms (1/1000 min)

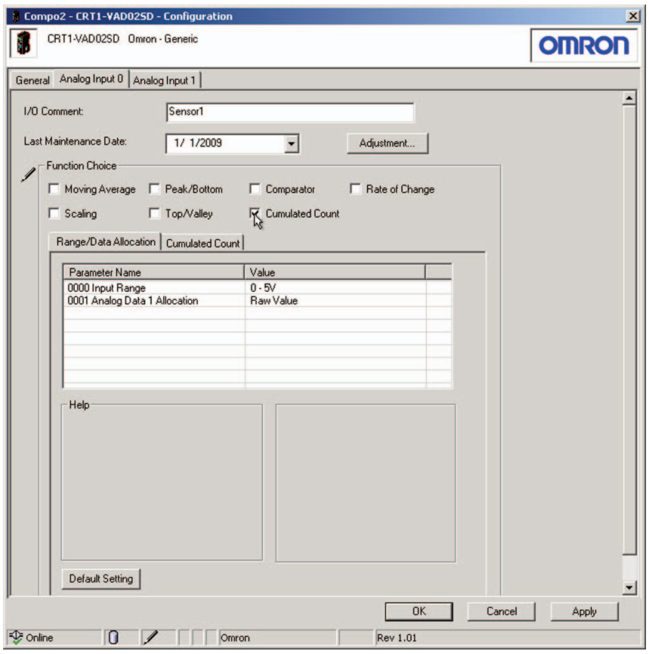
9-15-2 Operation procedure

1. Boot the CX-Integrator.

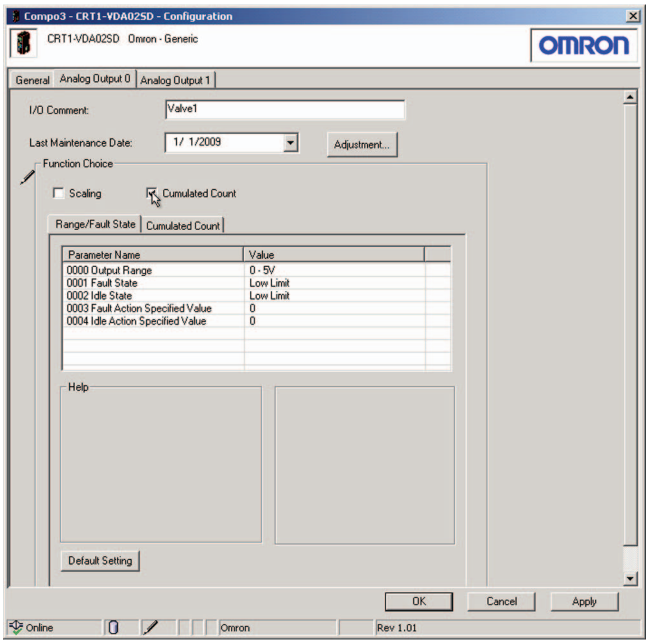
2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Select the **Analog Input x** Tab or **Analog Output x** Tab for the channel to use the Cumulated count. Check the checkbox for the *Cumulated Count* under the *Function Choice* Field.

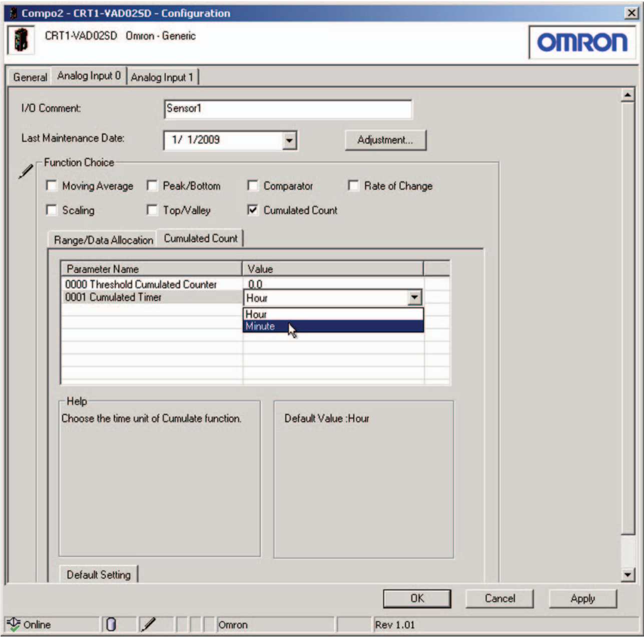
- Analog Input x Tab



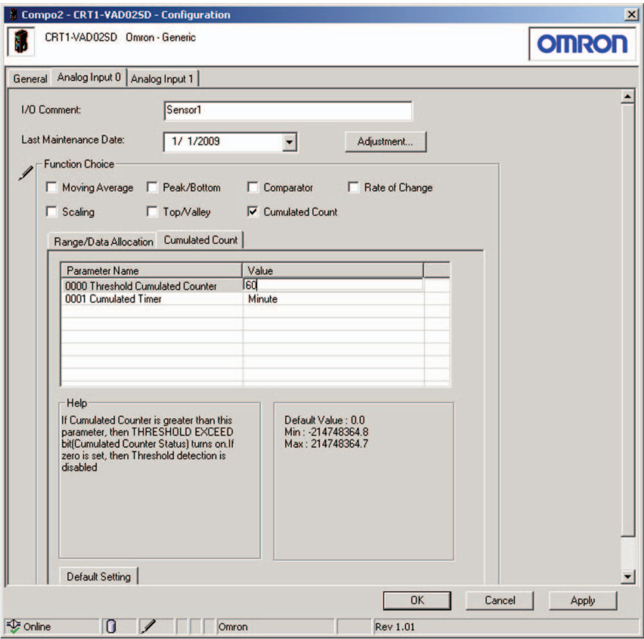
- Analog Output x Tab



4. Select the **Cumulated Count** Tab. Click the pull-down list of *Cumulated Timer* Field. Select either *Hour* or *Minute* from the list.



5. Enter the desired values between -214748364.8 and +214748364.7 in the *Threshold Cumulated Counter* Field.



6. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

7. Click the **OK** Button and exit the window.

9-16 Setting the Idle action

9-16-1 Function overview

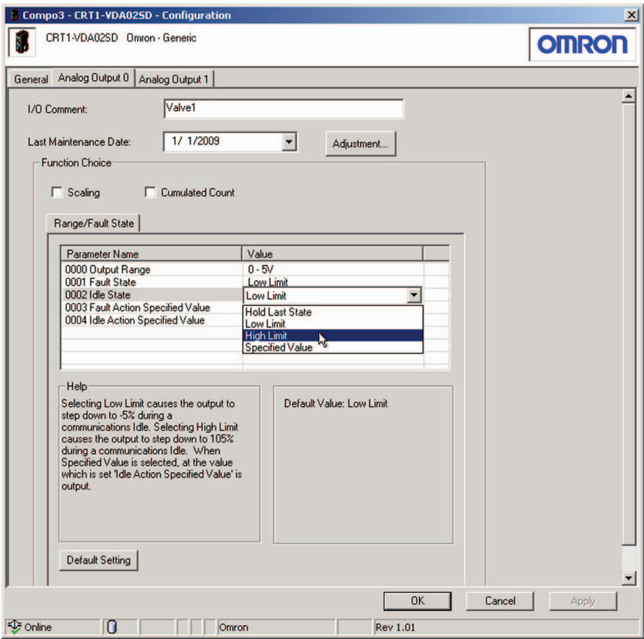
See Section 7-20 for the function.

9-16-2 Operation procedure

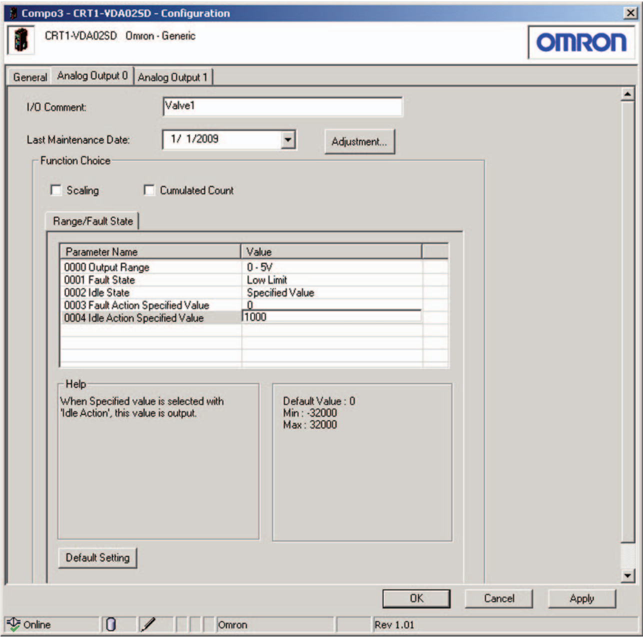
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Select the **Analog Output x** Tab for the channel to set the output. Click the pull-down list of *Idle State* Field. Select an output pattern among *Hold Last State*, *Low Limit, High Limit*, and the *Specified Value* in the list.



4. When you select the *Specified Value*, enter a desired value between -32000 and +32000 for the *Idle Action Specified Value*.



5. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

6. Click the **OK** Button and exit the window.

9-17 Setting the Fault action

9-17-1 Function overview

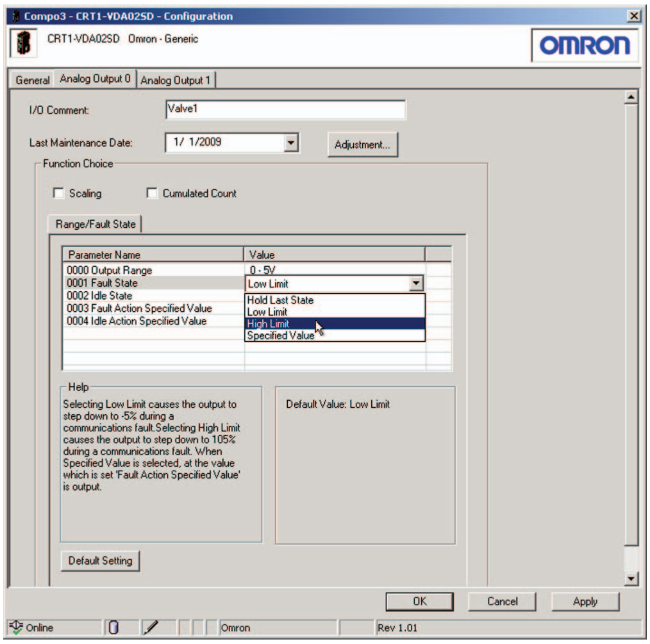
See Section 7-21 for the function.

9-17-2 Operation procedure

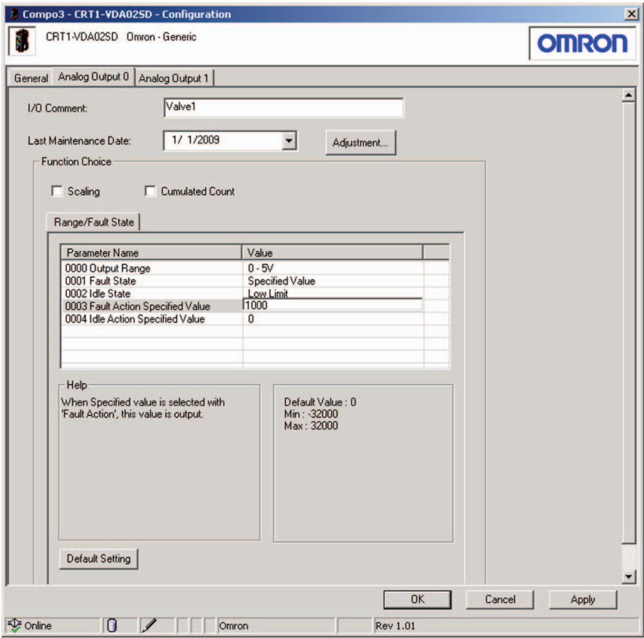
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Select the **Analog Output x** Tab for the channel to set the output. Click the pull-down list of in the *Fault State* Field. Select an output pattern among *Hold Last State*, *Low Limit*, *High Limit*, and *Specified Value* in the list.



4. When you select the *Specified Value*, enter a desired value between -32000 and +32000 for the *Fault Action Specified Value*.



5. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

This setting is valid only after the next power-on.

6. Click the **OK** Button and exit the window.

9-18 Confirming the present network power voltage

9-18-1 Function overview

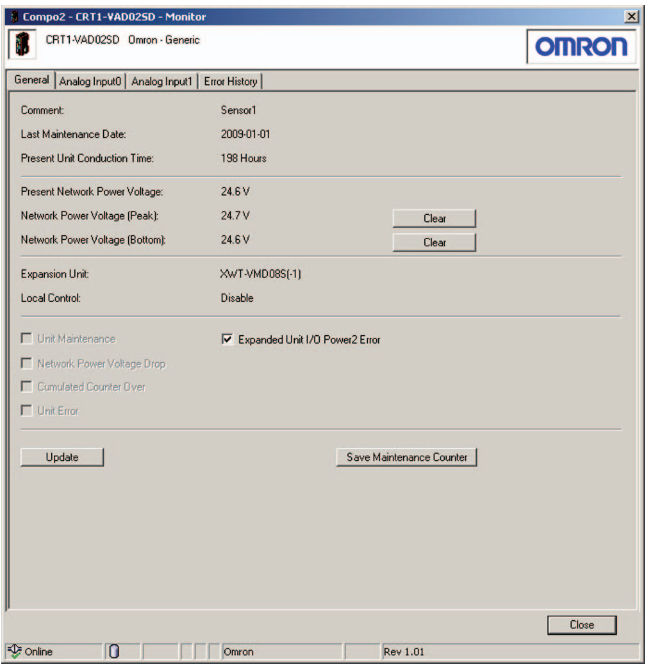
See Section 7-4 for the function.

9-18-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

   The present value of network power voltage is indicated beside the *Present Network Power Voltage* label.



3. Click the **Close** Button and exit the window.

9-19 Confirming the maximum or minimum network power voltage

9-19-1 Function overview

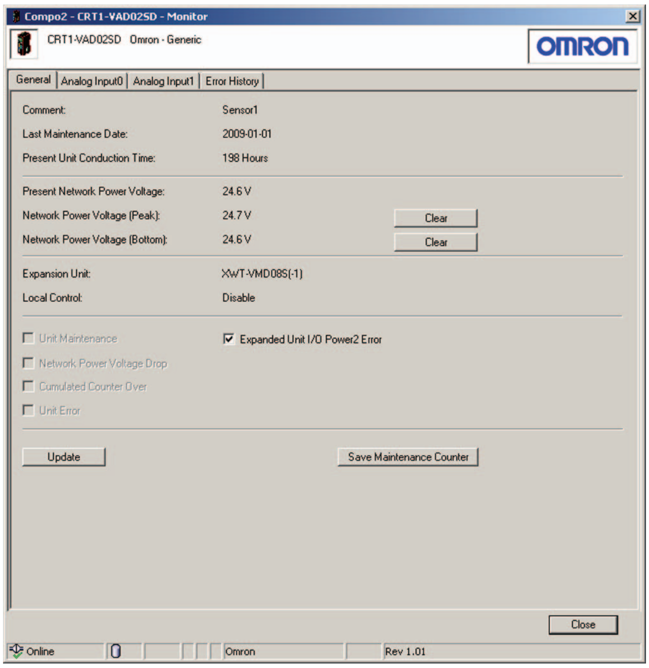
See Section 7-7 for the function.

9-19-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

The maximum value among the network power voltages entered so far is indicated beside the *Network Power Voltage (Peak)* label. The minimum value is also indicated beside the *Network Power Voltage (Bottom)* label.



3. Click the **Close** Button and exit the window.

9

9-19-1 Function overview

9-20 Confirming the maximum or minimum input or output value

9-20-1 Function overview

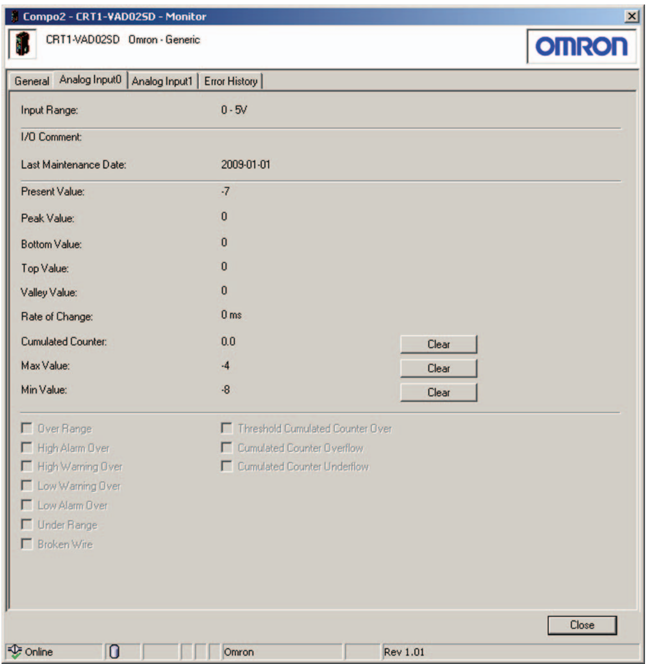
See Section 7-6 for the function. You can also confirm other data such as peak and bottom values by the CX-Integrator.

9-20-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

3. Select the **Analog Input x** Tab for the channel to confirm the data. The maximum value among the network power voltages entered till then is indicated beside the *Max Value* label. The minimum value is also indicated beside the *Min Value* label.



4. Click the **Close** Button and exit the window.

9-21 Confirming the status

9-21-1 Function overview

SeeSection 7-10 for the function.

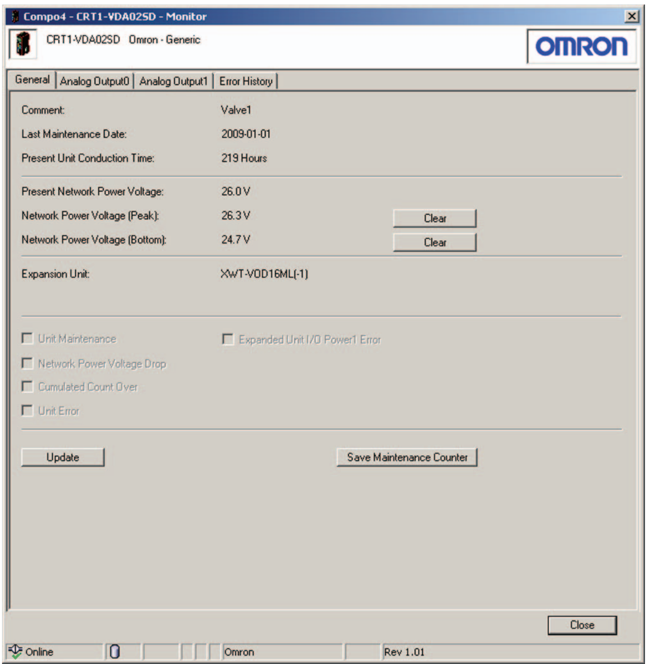
9-21-2 Operation procedure

1. Boot the CX-Integrator.

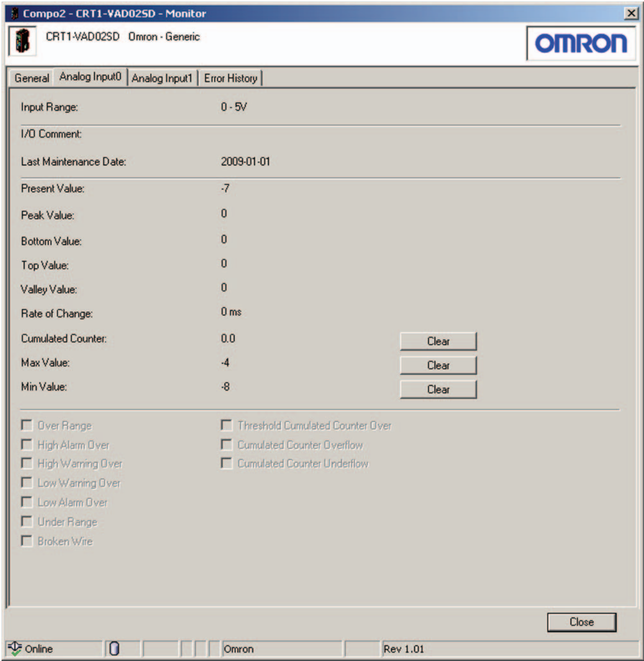
2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

3. Click the **General** Tab for a Slave Unit, or the **Analog Input x** or **Analog Output x** Tab for a connected device whose status is to be confirmed.
If there is an error, the checkbox of *corresponding error* is checked.

• General Tab



- Analog Input x Tab



4. Click the **Close** Button and exit the window.

9-22 Confirming the error log

9-22-1 Function overview

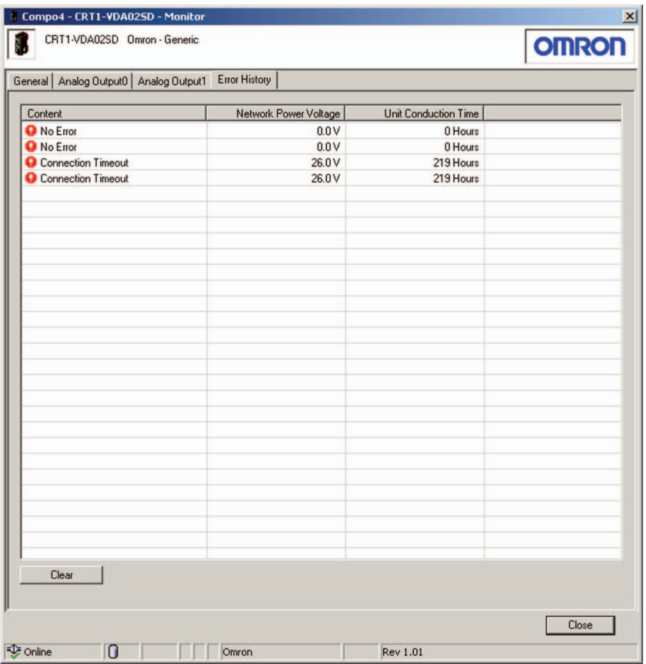
You can review the past communication errors on this network.

9-22-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, right-click the icon for the corresponding Slave Unit. Then the Monitor Window shows up.

3. Click the **Error History** Tab.
The past communications errors are listed with the network power voltage and the Unit conduction time then.



4. Click the **Close** Button and exit the window.

9-23 I/O communications of other data than analog value

9-23-1 Function overview

You can select other data type than analog value, and allocate it to the I/O memory to have the I/O communications. See Section 4-2-3.

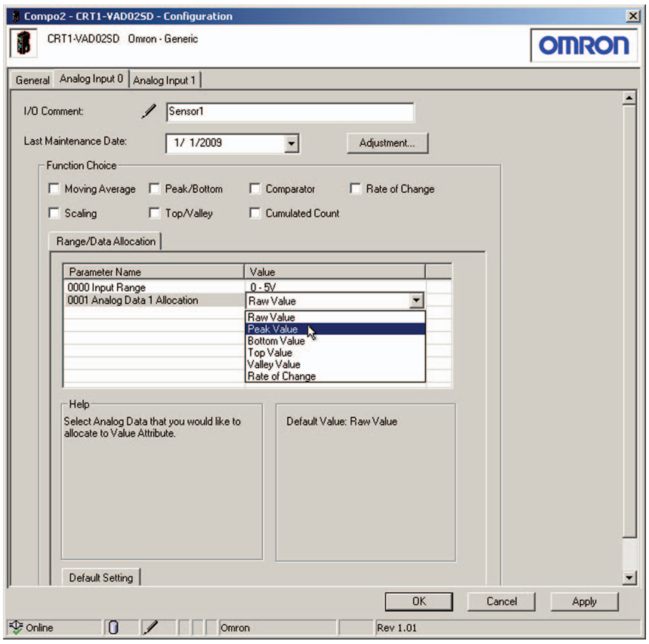
These are the settable data types.

- Analog Value (or raw value, This is set by default.)
- Peak Value
- Bottom Value
- Top Value
- Valley Value
- Rate of Change

9-23-2 Operation procedure

1. Boot the CX-Integrator.
2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Select the **Analog Input x** Tab for the channel to set the data type. Click the pull-down list of *Analog Data 1 Allocation* Field. Select the desired data type among the list.



4. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

5. Click the **OK** Button and exit the window.

9-24 I/O communications of status

9-24-1 Function overview

You can allocate the I/O data alone or in combination with other data such as status flag, and have the I/O communications. See Section 4-2-4 for the details of each flag and the I/O allocation.

These are the supported data.

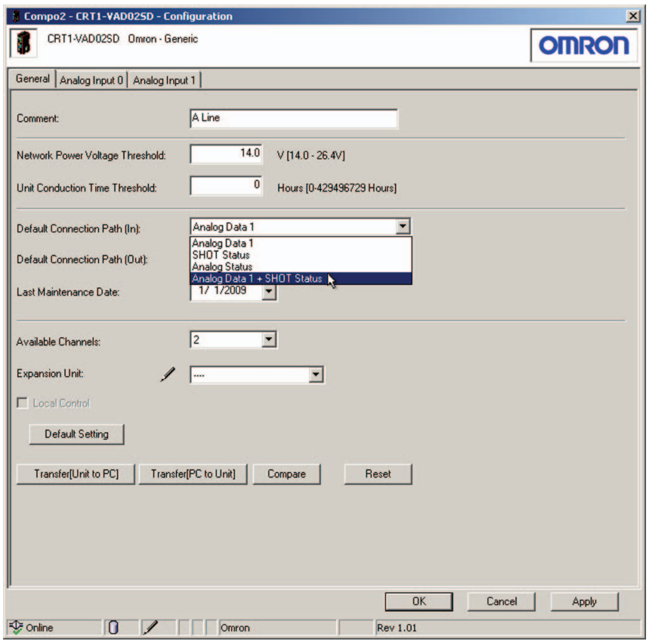
- Analog Data 1 (Default)
- Top/Valley Detection Timing Flag (SHOT Status)
- Analog Status
- Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status)

9-24-2 Operation procedure

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Select the **General** Tab. Click the pull-down list of *Default Connection Path (In)* Field. Select the data to allocate among the list.



4. Return to the **General** Tab. Click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

5. Click the **OK** Button and exit the window.

9

9-24-2 Operation procedure

9-25 Resetting the parameters

9-25-1 Function overview

See Section 7-22 for the function.

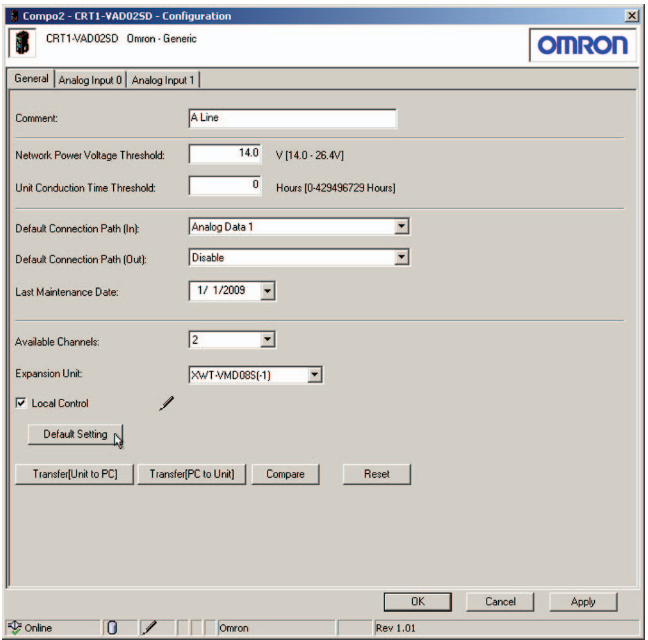
9-25-2 Operation procedure

1. Boot the CX-Integrator.

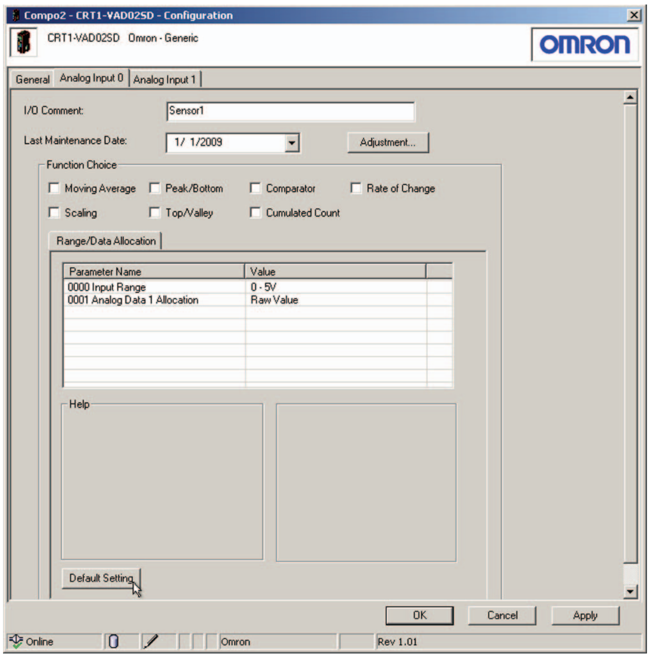
2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Click the **Default Setting** button on the **General** Tab page, or on the **Analog Input x** or the **Analog Output x** Tab page.

   • General Tab



- Analog Input x Tab or Analog Output x Tab



4. Return to the **General** Tab, if the **Analog Input x** or the **Analog Output x** Tab page is selected. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

General Information

When you click the Default button at the bottom of the Analog Input x Tab or the Analog Output x Tab, all settings on the window instantly are reset to defaults. The default setting is not reflected to any Slave Units. To activate the settings, click the Transfer [PC to Unit] Button and download the setting data.

5. Click the **OK** Button and exit the window.

9-26 Using the User adjustment

9-26-1 Function overview

See Section 7-24 for the function.

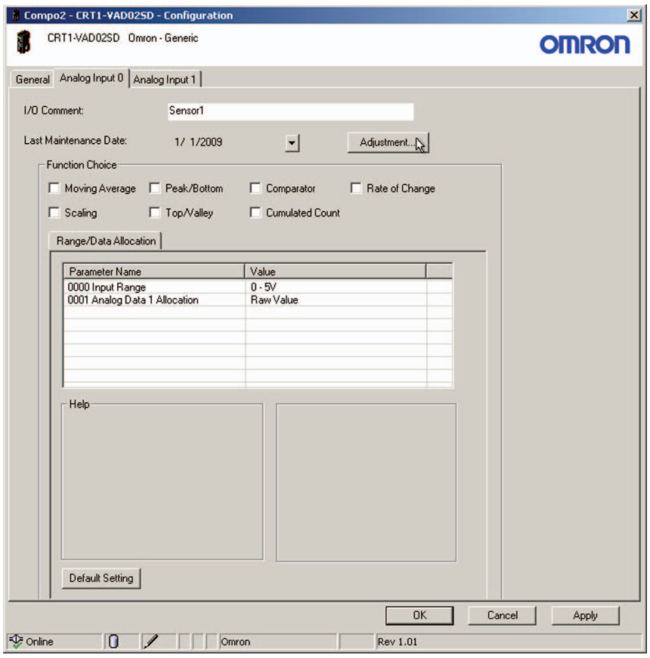
9-26-2 Operation procedure

Adjusting the Analog Input Slave Unit

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

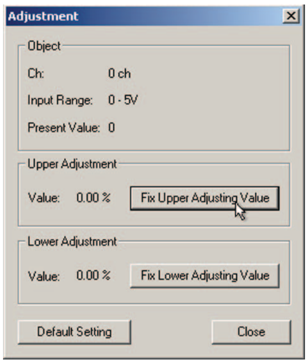
3. Click the **Analog Input x** Tab of the channel to have adjustment. Click the **Adjustment** button.



Then the Adjustment Window is shown.

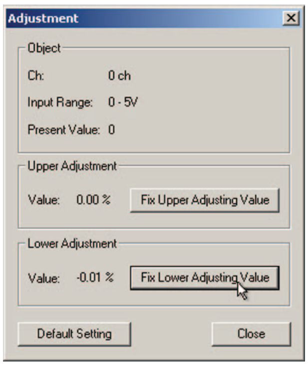
4. Enter a voltage or current equivalent to the upper adjustment value (100%) into the input terminal of the Slave Unit. The voltage or current is transmitted from the connected device.

5. Click the **Fix Upper Adjusting Value** button to update the upper adjustment value.



6. Enter a voltage or current equivalent to the lower adjustment (0%) into the Slave Unit.

7. Click the **Fix Lower Adjusting Value** button to update the lower adjustment value.



8. Click the **Close** button to close the Adjustment Window.

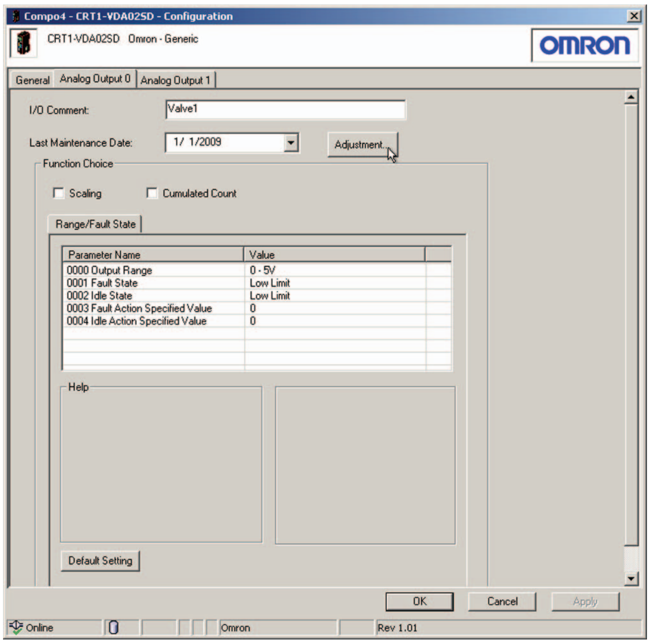
9. Click the **OK** Button and exit the window.

Adjusting the Analog Output Slave Unit

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Click the **Analog Output x** Tab of the channel to be adjusted. Click the **Adjustment** button.



The output range must be set before this step.

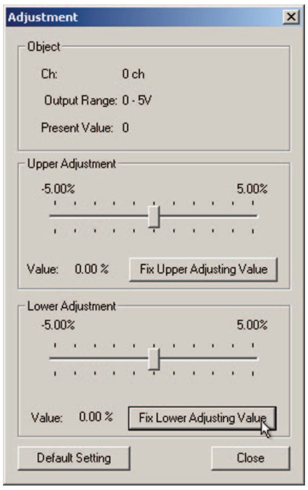
4. Enter a value equivalent to the lower adjustment (0%) into the Master Unit.

Precautions for Correct Use

On the Analog Output Slave Units, the lower limit must be adjusted before the upper limit.

5. Slide the button on the slide bar in the *Lower Adjustment* Field, and adjust the analog value outputted from the terminal.
Adjust it to correctly output the 0% value from the output devices.

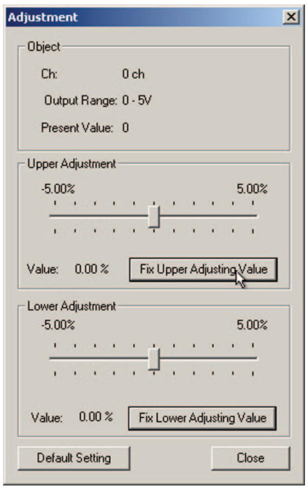
6. Click the **Fix Lower Adjusting Value** button.



7. Enter a value, into the Master Unit, that is equivalent to the maximum value of the Output Slave Unit.
It is recommendable to adjust by 100% value. Adjustment can be done, however, even if it is not 100% value.

8. Slide the button on the slide bar in the *Upper Adjustment* Field, and adjust the analog value output from the terminal.
Adjust it to correctly output the 100% value from the output devices.

9. Click the **Fix Upper Adjusting Value** button.



10. Click the **Close** button to close the Adjustment Window.

11. Click the **OK** Button and exit the window.

10

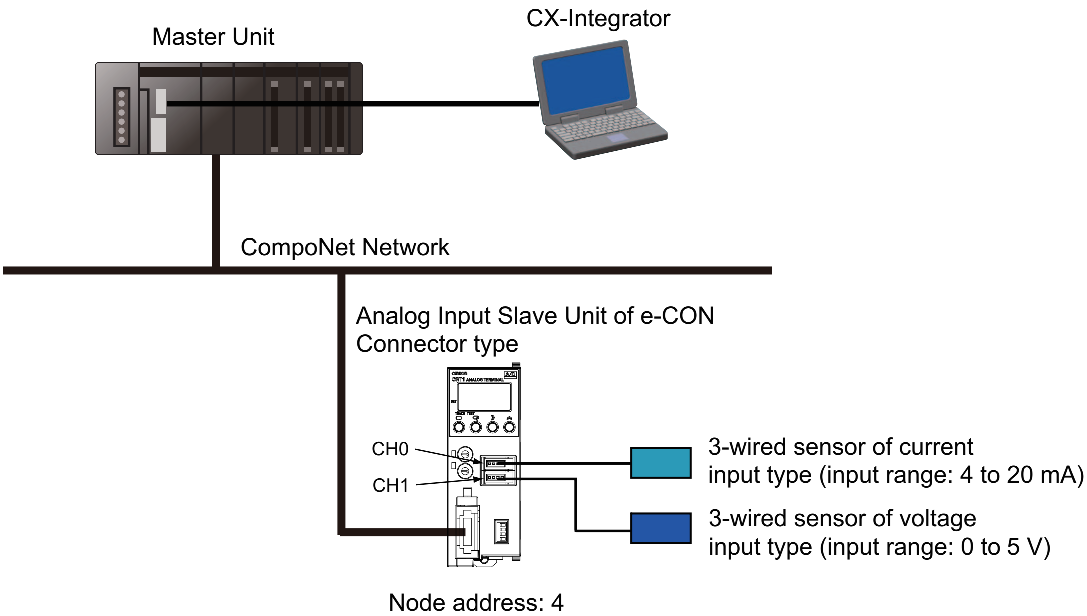
Simple Set-up Example

10-1 An Example and Basic Procedures

This section gives set-up examples and explains the procedures.

10-1-1 System Set-up Example

In this example, two sets of 3-wired sensors are connected to an Analog Input Slave Unit. The Slave Unit is an e-CON Connector type. One sensor is current input type whose input range is 4 to 20 mA. Another sensor is voltage input type whose input range is 0 to 5 V. The former sensor is connected to Channel 0 of the Slave Unit, while the latter is to Channel 1.



Additional Information

This is a typical configuration seen in Analog I/O Slave Units. See the CS/CJ-series CompoNet Master Units Operation Manual, Doc. # W456, for the set-up of Master Unit.

10-1-2 Basic Steps

The set-up operation for the example case has the following steps.

Connect the cables and sensors.

- Connect the communications cable.
- Connect the sensors.

Set up the Slave Unit.

- Set the node address.
- Set the input type.
- Set the sensor power supply mode.
- Set the input range.

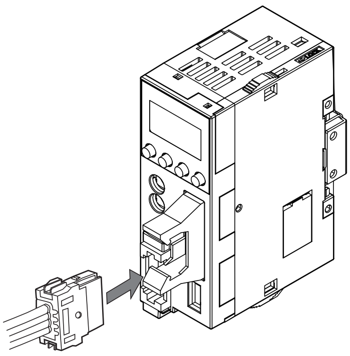
10-2 Connecting the Cables and the Sensors

This subsection explains the Step 1: connecting the communications cable and sensors.

10-2-1 Connecting to the Communications Cable

Connect the communications cable of CompoNet network to the communications connector on the Analog Input Slave Unit.

(Example) Connecting the DCA4-4F10 Flat Cable I

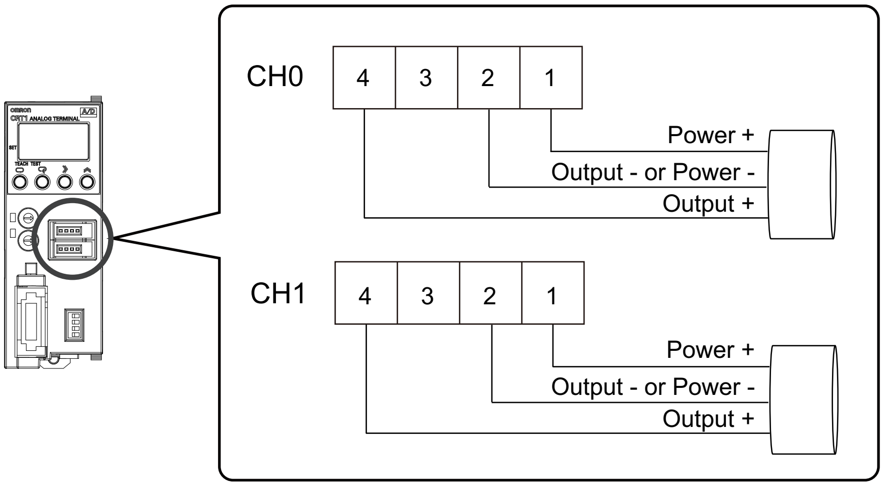


Additional Information

The connection method differs from the type of communications cable in use. See Section 2-3.

10-2-2 Connecting the sensors

Connect the power lines and the signal lines of the 3-wired sensor to the e-CON connector of the Analog Input Slave Unit.



Additional Information

See Section 2-5-3 for the attachment of an e-CON Connector.

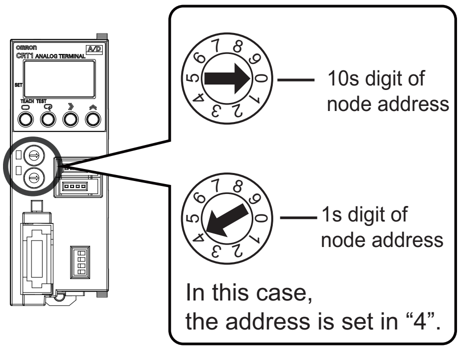
10

10-2 Connecting the Cables and the Sensors

10-3 Setting up the Slave Units

10-3-1 Setting the node addresses

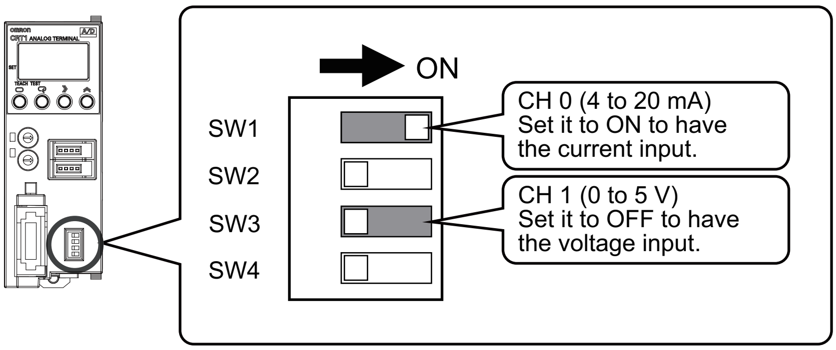
Use the Node Address Setting Switch and set the node address for the Slave Unit.



10-3-2 Setting the input type (voltage or current)

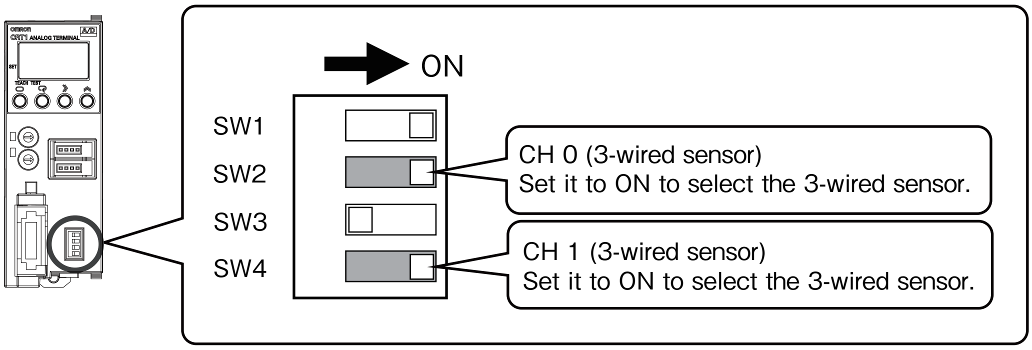
Use the Pin No.1 or 3 of the Mode Setting Switch to switch the input type for Channel 0 or 1 respectively. This switch must be set while the power for Slave Unit is turned off. The selection is activated from the following power-on.

In this example, Channel 0 is set in current input, while the Channel 1 is in voltage input.



10-3-3 Setting the sensor power supply mode

Use the Pin No.2 or 4 of the Mode Setting Switch to switch the sensor power supply mode for Channel 0 or 1 respectively. This switch must be set while the power for Slave Unit is turned off. The selection is activated from the following power-on.
In this example, both CH 0 and CH 1 are set in 3-wired sensor.



10-3-4 Setting the input range

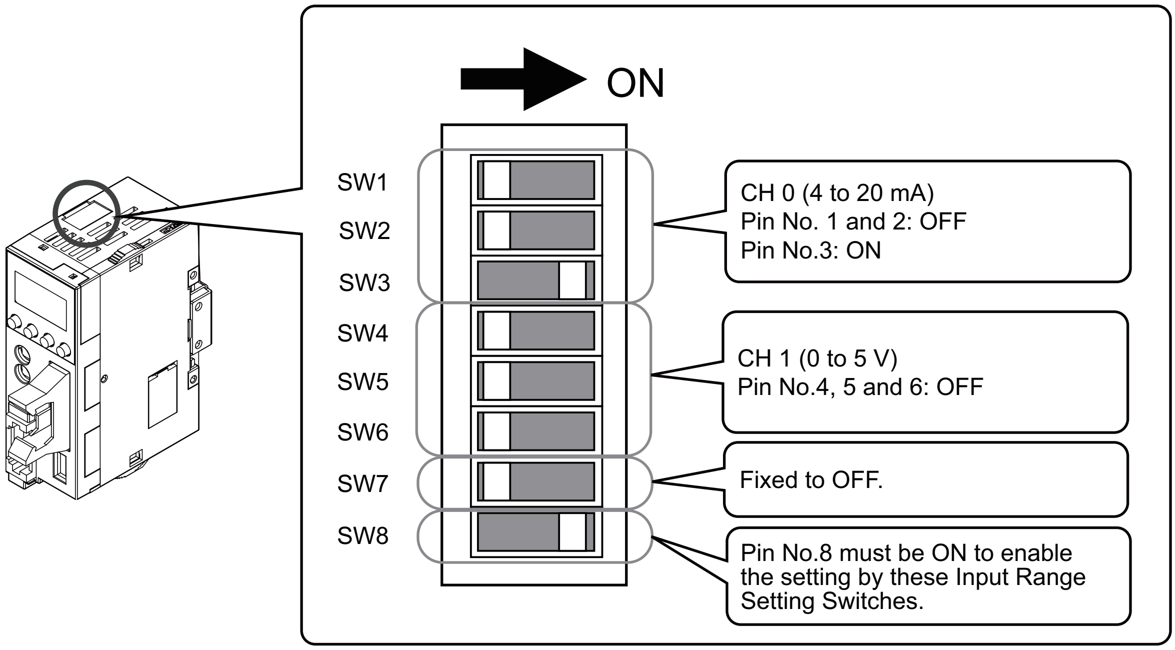
There are three ways to set the input range.

- Use the Input Range Setting Switch.
- Use the Numerical indicator.
- Use the CX-Integrator.

Each procedure is explained in below.

Setting the range by the Input Range Setting Switch

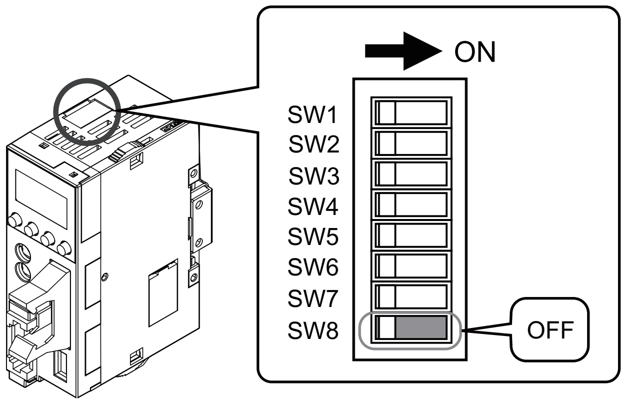
Set the pins for the Input Range Setting Switch for CH 0 and CH 1 as shown in below. This switch must be set while the power for Slave Unit is turned off. The setting is activated from the following power-on.



Setting the range on the Numerical indicator

In this example, the input range for CH 0 is also set to 4 to 20 mA, and the range for CH 1 is set to 0 to 5 V.

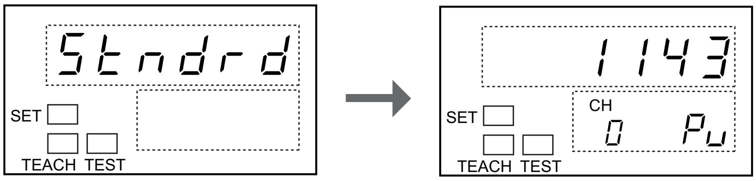
1. Set the Pin No. 8 of the Input Range Setting Switch to OFF.



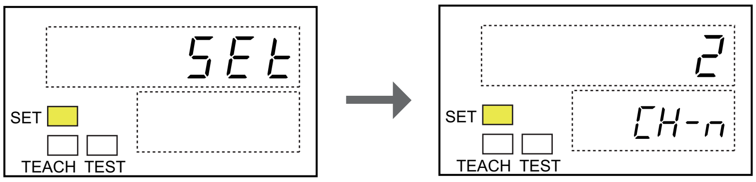
Precautions for Correct Use

When the Pin is ON, the setting on the Numerical indicator is disabled.

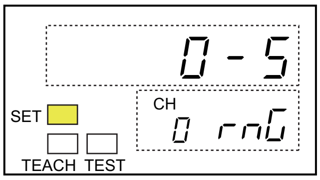
2. Turn on the power for the CompoNet network.
Then the display on the Numerical indicator turns to the Standard Level indication.



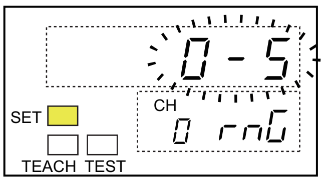
3. Press the button for 3 seconds or longer.
Then the indication turns to Initial Setting Level.



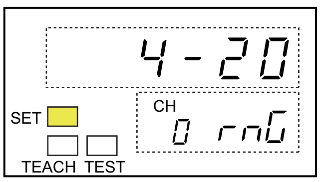
4. Press the button twice.
Then the Input range parameter is shown.



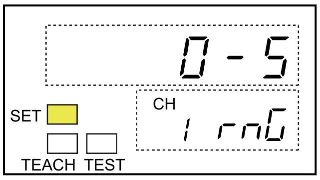
5. Press the button.
Then the Indicator No.1 flashes to tell it waits for setting.



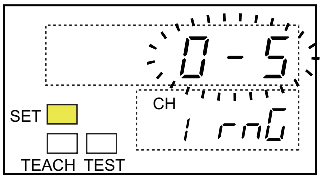
6. Press the button. Set the Indicator No.1 to "4-20", and press the button.
Then the input range for CH 0 is set to 4 to 20 mA.



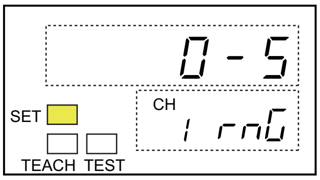
7. Press the [⌃] button to switch the channel to CH 1.



8. Press the [》] button.
Then the Indicator No.1 flashes to tell it waits for setting.



9. Confirm the Indicator No.1 shows "0-5", and press the [↩] button.
Then the input range for CH 1 is set into 0 to 5 V.

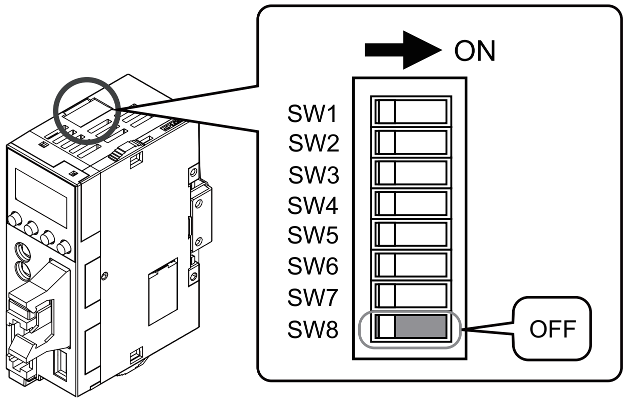


10. Press the [⬭] button for 1 second or longer.
This resets the previous setting in the memory of the Slave Unit. The indication returns to show the Standard Level.

Setting the range by the CX-Integrator

In this example, the input range for CH 0 is also set to 4 to 20 mA and the range for CH 1 is set to 0 to 5 V.

1. Set the Pin No. 8 of the Input Range Setting Switch to OFF.



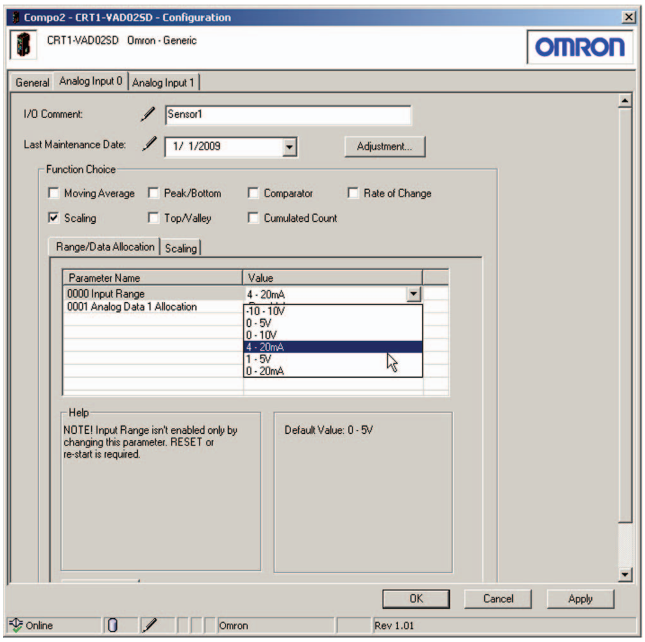
Precautions for Correct Use

When the Pin is ON, the setting by the CX-Integrator is disabled.

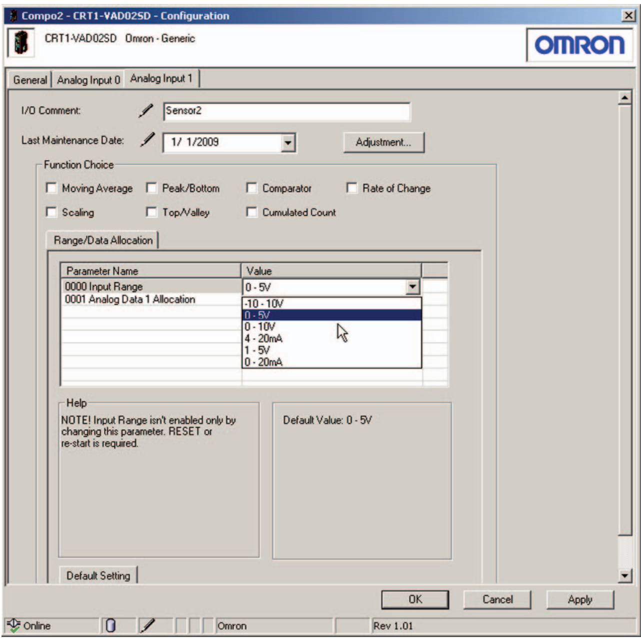
2. Start up the CX-Integrator.

3. Double-click the icon for the Slave Unit to have a setting on the Network Configuration window. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu. Then the Configuration window is shown.

4. Select the Analog Input 0 tab. Click the list button for the Input range. Select *4 to 20 mA*.



5. Select the **Analog Input 1** tab. Click the list button for the Input range. Select *0 to 5 V*.



6. Go back to the **General** tab, and click the **Transfer from PC to Unit** button to download the setting. Click the **Reset** button to reset the previous setting in the memory of the Slave Unit.

7. Click the **OK** button to end the setting.

This completes the connection and setting.

11

Expansion Units

11-1 Feature of Expansion Unit

This section explains the dedicated Expansion Units that can be mounted on the Analog Input or Output Slave Units.

11-1-1 Overview of Expansion Unit Functions

Adding a dedicated Digital Expansion Input or Output Unit to an Analog Input or Output Slave Unit will extend the range of supported functions. You can combine the digital data of the Expansion Unit with the analog data or status flag of the Analog I/O Slave Unit, and allocate them to the I/O memory of the Master Unit. One Expansion Unit can be mounted to an Analog I/O Slave Unit.

The addition also provides these functions. See Section 11-3 for the setting procedures.

- Local Control

You can combine the digital output of the Expansion Unit with the Comparator function of the Analog Input Slave Unit, and have the ON/OFF control.

- Setting the Input Time Constant

You can select a time period to check the on/off status of inputs to the Expansion Unit. The input values are read several times in the set time period. The inputs are regarded valid only when all read values are consistent, i.e., either they are all on or all off.

- Holding or Clearing the Outputs at Errors

You can select holding or clearing the output values when there is a communications error.

11-1-2 Overview of Expansion Units

Specifications

- An e-CON connector type 4-input and 4-output Expansion Unit

Item		Specification and Performance	
Common	Model	XWT-VMD08S	XWT-VMD08S-1
	Internal I/O common	NPN	PNP
	Number of I/O points	4 inputs, 4 outputs	
	ON delay time	1.5 ms max for inputs, 0.5 ms max for outputs	
	OFF delay time	1.5 ms max	
	Number of circuits per common	4 points	
	Insulation method	Inputs: Non-insulated Outputs: Photocoupler insulation	
	Input and output indication	Indicator (yellow)	
	Power supply type	Inputs: Network power supply Outputs: Multi-power supply	
	Communications power consumption	10 mA max. for 24-VDC power supply 15 mA max. for 14-VDC power supply	
	Weight	64 g	
Input part	ON voltage	10.5 VDC min (between each terminal and V terminal)	10.5 VDC min (between each terminal and G terminal)
	OFF voltage	5 VDC max (between each terminal and V terminal)	5 VDC max (between each terminal and G terminal)
	OFF current	1.0 mA max	
	Input current	6.0 mA max per point for 24-VDC power supply 3.0 mA min per point for 10.5-VDC power supply	
	Current supply for connected input devices	50 mA per point	
Output part	I/O power supply voltage	20.4 to 26.4 VDC (24 VDC -15% to +10%)	
	I/O consumption current	10 mA max for 24-VDC power supply	
	Rated output current	0.3 A per point, 1.0 A per common	
	Residual voltage	1.2 VDC max (DC at 0.3 A, between each output terminal and G terminal)	1.2 VDC max (DC at 0.3 A, between each output terminal and V terminal)
	Leakage voltage	0.1 mA max	
	Current supply for connected output devices	100 mA per point	

- An e-CON connector type 8-output Expansion Unit

Item	Specification and Performance	
Model	XWT-VOD08S	XWT-VOD08S-1
Internal I/O common	NPN	PNP
Number of I/O points	8 outputs	
I/O power supply voltage	20.4 to 26.4 VDC (24 VDC -15% to +10%)	
I/O consumption current	10 mA max for 24-VDC power supply	
Rated output current	0.3 A per point, 2.0 A per common	
Residual voltage	1.2 VDC max (DC at 0.3 A, between each output terminal and G terminal)	1.2 VDC max (DC at 0.3 A, between each output terminal and V terminal)
Leakage voltage	0.1 mA max	
Current supply for connected output devices	100 mA per point	
ON delay time	0.5 ms max	
OFF delay time	1.5 ms max	
Number of circuits per common	8 points	
Insulation method	Photocoupler insulation	
Output indication	Indicator (yellow)	
Power supply type	Multi-power supply	
Communications power consumption	10 mA max. for 24-VDC power supply 15 mA max. for 14-VDC power supply	
Weight	63 g	

- A MIL connector type 8-input and 8-output Expansion Unit

Item		Specification and Performance	
Common	Model	XWT-VMD16ML	XWT-VMD16ML-1
	Internal I/O common	NPN	PNP
	Number of I/O points	8 inputs, 8 outputs	
	ON delay time	1.5 ms max for inputs, 0.5 ms max for outputs	
	OFF delay time	1.5 ms max	
	Number of circuits per common	8 points	
	Insulation method	Photocoupler insulation	
	Input and output indication	Indicator (yellow)	
	Power supply type	Multi-power supply	
	Communications power consumption	10 mA max. for 24-VDC power supply 20 mA max. for 14-VDC power supply	
	Weight	64 g	
Input part	I/O power supply voltage	20.4 to 26.4 VDC (24 VDC -15% to +10%)	
	I/O consumption current	2 mA max for 24-VDC power supply	
	ON voltage	17 VDC min (between each terminal and V terminal)	17 VDC min (between each terminal and G terminal)
	OFF voltage	5 VDC max (between each terminal and V terminal)	5 VDC max (between each terminal and G terminal)
	OFF current	1.0 mA max	
	Input current	6.0 mA max per point for 24-VDC power supply 3.0 mA min per point for 17-VDC power supply	
Output part	I/O power supply voltage	20.4 to 26.4 VDC (24 VDC -15% to +10%)	
	I/O consumption current	10 mA max for 24-VDC power supply	
	Rated output current	0.3 A per point, 1.0 A per common	
	Residual voltage	1.2 VDC max (DC at 0.3 A, between each output terminal and G terminal)	1.2 VDC max (DC at 0.3 A, between each output terminal and V terminal)
	Leakage voltage	0.1 mA max	

- A MIL connector type 16-output Expansion Unit

Item	Specification and Performance	
Model	XWT-VOD16ML	XWT-VOD16ML-1
Internal I/O common	NPN	PNP
Number of I/O points	16 outputs	
I/O power supply voltage	20.4 to 26.4 VDC (24 VDC -15% to +10%)	
I/O consumption current	10 mA max for 24-VDC power supply	
Rated output current	0.3 A per point, 2.0 A per common	
Residual voltage	1.2 VDC max (DC at 0.3 A, between each output terminal and G terminal)	1.2 VDC max (DC at 0.3 A, between each output terminal and V terminal)
Leakage voltage	0.1 mA max	0.1 mA max
ON delay time	0.5 ms max	
OFF delay time	1.5 ms max	
Number of circuits per common	16 points	
Insulation method	Photocoupler insulation	
Output indication	Indicator (yellow)	
Power supply type	Multi-power supply type	
Communications power consumption	10 mA max. for 24-VDC power supply 20 mA max. for 14-VDC power supply	
Weight	64 g	

Extended Allocation of Digital Data to I/O Memory

The bits on the connected Expansion Unit can be allocated together with analog data of the Slave Unit to the I/O memory of the Master Unit. In the same manner, the combination of analog data and status flag can also be allocated. See Section 2-2-3 for the I/O data type and allocation.

The data formats when the bits of the Expansion Unit and the status flag are allocated to I/O memory are shown in below.

- Analog Input Slave Units

- Analog Data 1 + Bits of Expansion Unit

<Analog Data 1 + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 3 Bit 0
0	Analog Data for Input channel 0	
+1	Analog Data for Input channel 1	
+2	Reserved	Expansion bits 3 to 0

Offset (OUT area *)	Bit 15	Bit 3 Bit 0
0	Reserved	Expansion bits 3 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15 Bit 8	Bit 7 Bit 0
0	Analog Data for Input channel 0	
+1	Analog Data for Input channel 1	
+2	Reserved	Expansion bits 7 to 0

Offset (OUT area *)	Bit 15 Bit 8	Bit 7 Bit 0
0	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Expansion of an 8-output Expansion Unit>

Offset (IN area)	Bit 15 … Bit 0
0	Analog data of Input channel 0
+1	Analog data of Input channel 1

Offset (OUT area *)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Expansion of a 16-output Expansion Unit>

Offset (IN area)	Bit 15 … Bit 0
0	Analog data of Input channel 0
+1	Analog data of Input channel 1

Offset (OUT area *)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Expansion bits 15 to 8	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

- Top/Valley Detection Timing Flag (SHOT Status) + Bits of Expansion Unit

<Top/Valley Detection Timing Flag (SHOT Status) + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15 … Bit 8	Bit 7 … Bit 3	… Bit 0
0	Top Detection Timing Flag	Valley Detection Timing Flag	
+1	Reserved		Expansion bits 3 to 0

Offset (OUT area *)	Bit 15 …	Bit 3 … Bit 0
0	Reserved	Expansion bits 3 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Top/Valley Detection Timing Flag (SHOT Status) + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Top Detection Timing Flag	Valley Detection Timing Flag
+1	Reserved	Expansion bits 7 to 0

Offset (OUT area *)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Top/Valley Detection Timing Flag (SHOT Status) + Expansion of an 8-output Expansion Unit>

Offset (IN area)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Top Detection Timing Flag	Valley Detection Timing Flag

Offset (OUT area *)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Top/Valley Detection Timing Flag (SHOT Status) + Expansion of a 16-output Expansion Unit>

Offset (IN area)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Top Detection Timing Flag	Valley Detection Timing Flag

Offset (OUT area *)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Expansion bits 15 to 8	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

- Analog Status Flag + Bits of Expansion Unit

<Analog Status Flag + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15 ... Bit 8	Bit 7 ...	Bit 3 ... Bit 0
0	Analog Status Flag for Channel 1	Analog Status Flag for Channel 0	
+1	Reserved		Expansion bits 3 to 0

Offset (OUT area *)	Bit 15 ...	Bit 3 ... Bit 0
0	Reserved	Expansion bits 3 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Status Flag + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Status Flag for Channel 1		Analog Status Flag for Channel 0	
+1	Reserved		Expansion bits 7 to 0	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Reserved		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Status Flag + Expansion of an 8-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Status Flag for Channel 1		Analog Status Flag for Channel 0	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Reserved		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Status Flag + Expansion of a 16-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Status Flag for Channel 1		Analog Status Flag for Channel 0	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Expansion bits 15 to 8		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

- Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) + Bits of Expansion Unit

<Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 3	Bit 0
0	Analog Data for Input channel 0				
+1	Analog Data for Input channel 1				
+2	Top Detection Timing Flag		Valley Detection Timing Flag		
+3	Reserved			Expansion bits 3 to 0	

Offset (OUT area *)	Bit 15	Bit 3	Bit 0
0	Reserved	Expansion bits 3 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Data for Input channel 0			
+1	Analog Data for Input channel 1			
+2	Top Detection Timing Flag		Valley Detection Timing Flag	
+3	Reserved		Expansion bits 7 to 0	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Reserved		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) + Expansion of an 8-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Data for Input channel 0			
+1	Analog Data for Input channel 1			
+2	Top Detection Timing Flag		Valley Detection Timing Flag	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Reserved		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Analog Data 1 + Top/Valley Detection Timing Flag (SHOT Status) + Expansion of a 16-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 8	Bit 7	Bit 0
0	Analog Data for Input channel 0			
+1	Analog Data for Input channel 1			
+2	Top Detection Timing Flag		Valley Detection Timing Flag	

Offset (OUT area *)	Bit 15	Bit 8	Bit 7	Bit 0
0	Reserved		Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Hold Value + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15	Bit 3 Bit 0
0	Reserved	Expansion bits 3 to 0

Offset (OUT area *)	Bit 15	Bit 3 Bit 0
0	Reserved	Hold Values 3 to 0
+1	Reserved	Expansion bits 3 to 0

* When the output points of Expansion Unit are used by Local Control, the OUT area cannot not used for data allocation.

<Hold Value + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15 Bit 8	Bit 7 Bit 0
0	Reserved	Expansion bits 7 to 0

Offset (OUT area *)	Bit 15 Bit 8	Bit 7	Bit 3 Bit 0
0	Reserved		Hold Values 3 to 0
+1	Reserved	Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the Offset +1 area cannot not used for data allocation.

<Hold Value + Expansion of an 8-output Expansion Unit>

Offset (OUT area *)	Bit 15 Bit 8	Bit 7	Bit 3 Bit 0
0	Reserved		Hold Values 3 to 0
+1	Reserved	Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the Offset +1 area cannot not used for data allocation.

<Hold Value + Expansion of a 16-output Expansion Unit>

Offset (OUT area *)	Bit 15 … Bit 8	Bit 7 …	Bit 3 … Bit 0
0	Reserved		Hold Values 3 to 0
+1	Expansion bits 15 to 8	Expansion bits 7 to 0	

* When the output points of Expansion Unit are used by Local Control, the Offset +1 area cannot not used for data allocation.

- ## Analog Output Slave Unit

<Analog Data 1 + Expansion of a 4-input and 4-output Expansion Unit>

Offset (IN area)	Bit 15 …	Bit 3 … Bit 0
0	Reserved	Expansion bits 3 to 0

Offset (OUT area *)	Bit 15 …	Bit 3 … Bit 0
0	Analog Data for Output 0	
+1	Analog Data for Output 1	
+2	Reserved	Expansion bits 3 to 0

* When the output points of Expansion Unit are used by Local Control, the Offset +2 area cannot not used for data allocation.

<Analog Data 1 + Expansion of an 8-input and 8-output Expansion Unit>

Offset (IN area)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Reserved	Expansion bits 7 to 0

Offset (OUT area *)	Bit 15 … Bit 8	Bit 7 … Bit 0
0	Analog Data for Output 0	
+1	Analog Data for Output 1	
+2	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the Offset +2 area cannot not used for data allocation.

<Analog Data 1 + Expansion of an 8-output Expansion Unit>

Offset (OUT area *)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Analog Data for Output 0	
+1	Analog Data for Output 1	
+2	Reserved	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the Offset +2 area cannot not used for data allocation.

<Analog Data 1 + Expansion of a 16-output Expansion Unit>

Offset (OUT area *)	Bit 15 ... Bit 8	Bit 7 ... Bit 0
0	Analog Data for Output 0	
+1	Analog Data for Output 1	
+2	Expansion bits 15 to 8	Expansion bits 7 to 0

* When the output points of Expansion Unit are used by Local Control, the Offset +2 area cannot not used for data allocation.

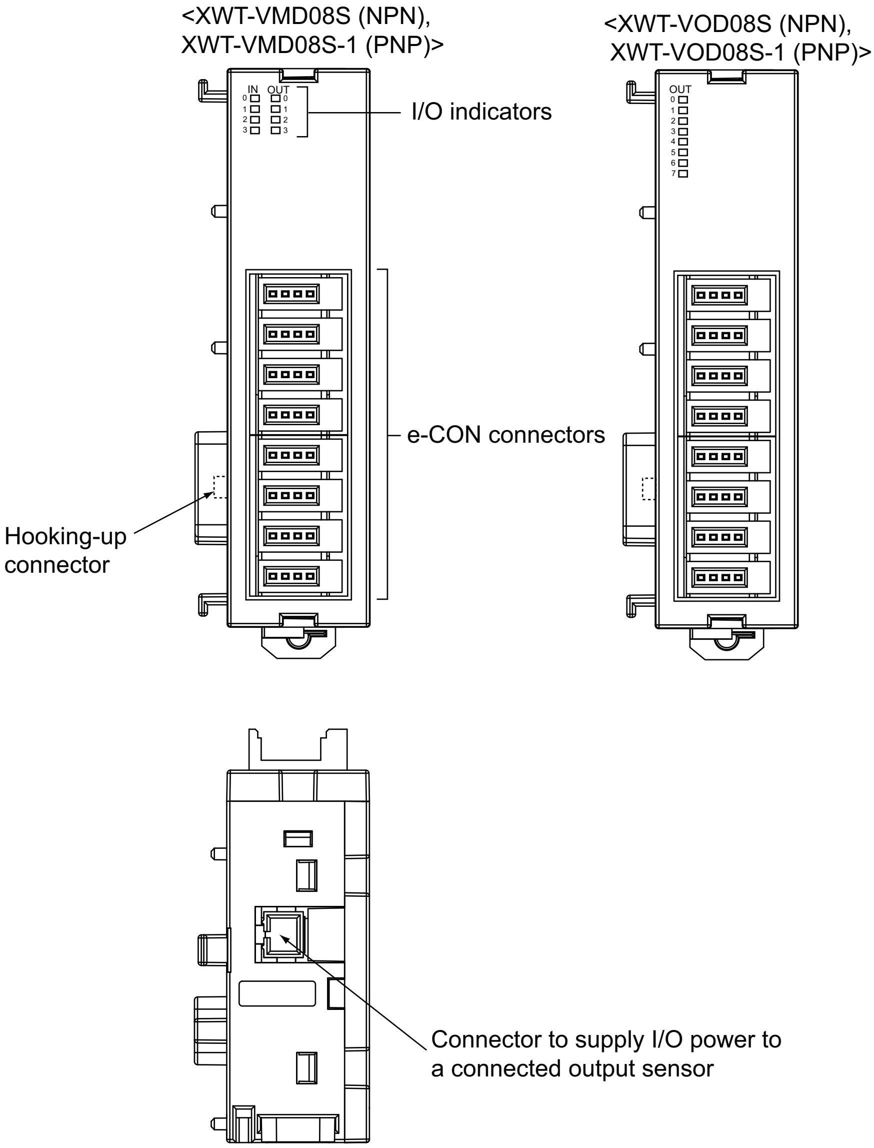
11-2 Component Names and Functions of Expansion Unit

This section explains the component names and the supported functions of Expansion Units.

11-2-1 Component Names

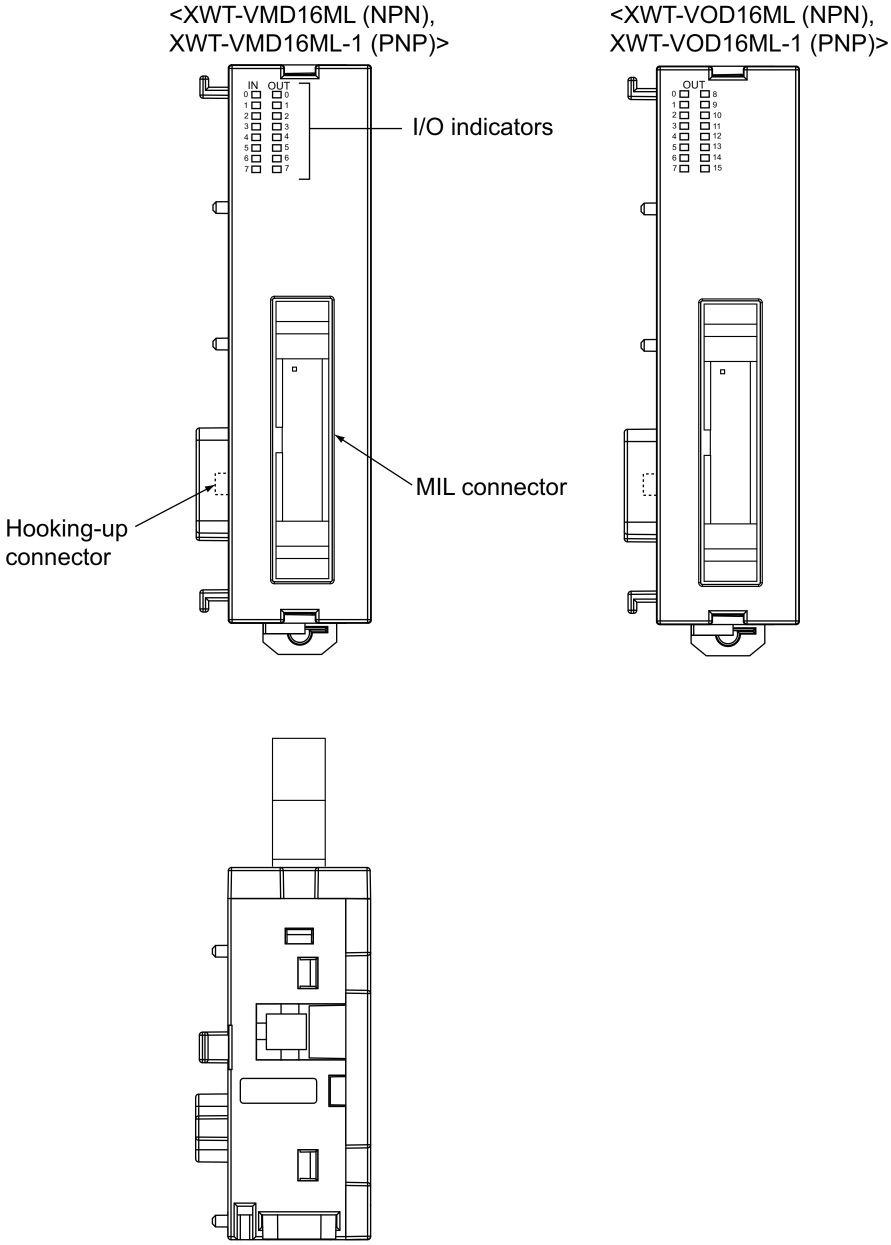
An e-CON connector type 4-input and 4-output Expansion Unit or 8-output Expansion Unit

XWT-VMD08S (NPN), XWT-VMD08S-1 (PNP), XWT-VOD08S (NPN), XWT-VOD08S-1 (PNP)



A MIL connector type 8-input and 8-output Expansion Unit or a 16-output Expansion Units

XWT-VMD16ML (NPN), XWT-VMD16ML-1 (PNP), XWT-VOD16ML (NPN), XWT-VOD16ML-1 (PNP)



11-2-2 Function of I/O Indicators

- XWT-VMD08S (-1)

Indicator name	Color	Indication status	I/O status and meaning
IN 0 to 3 OUT 0 to 3	Yellow	Light	Input or Output is on
		Unlit	Input or Output is off

- XWT-VOD08S (-1)

Indicator name	Color	Indication status	I/O status and meaning
OUT 0 to 7	Yellow	Light	Output is on
		Unlit	Output is off

- XWT-VMD16ML (-1)

Indicator name	Color	Indication status	I/O status and meaning
IN 0 to 7 OUT 0 to 7	Yellow	Light	Input or Output is on
		Unlit	Input or Output is off

- XWT-VOD16ML (-1)

Indicator name	Color	Indication status	I/O status and meaning
OUT 0 to 15	Yellow	Light	Output is on
		Unlit	Output is off

11-3 Function Setting

This section explains the functions supported by mounting an Expansion Unit to an Analog I/O Slave Unit, and their setting procedures.

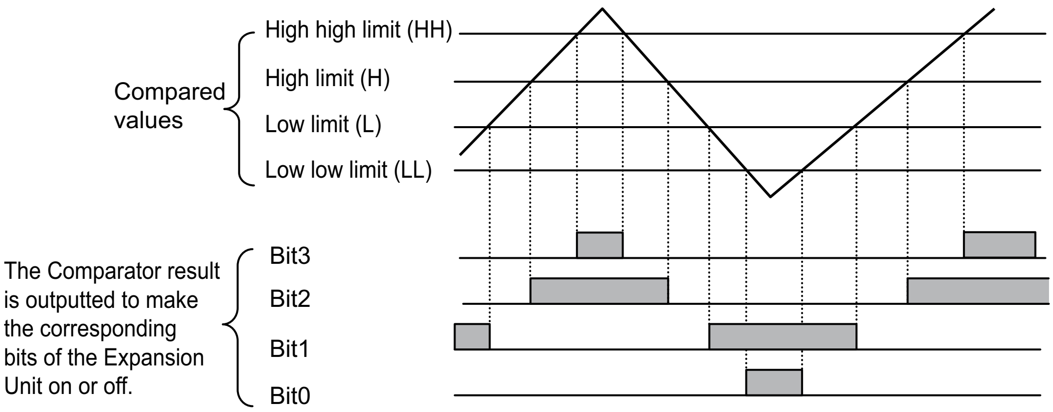
11-3-1 Local Control

Function Overview

Adding an Expansion Unit to an Analog Input Slave Unit will extend the supported functions. You can combine the digital output of the Expansion Unit with the Comparator function of the Analog Input Slave Unit, and have the ON/OFF control.

If the Comparator result finds an alarming status, it is outputted to the corresponding bit on the Expansion Unit.

Example: An Expansion Unit with 8 digital outputs



Each bit on an Expansion Unit has an alarm flag allocated. When the Comparator result flag is ON, telling the alarming status, the corresponding bit on the Expansion Unit becomes ON. The table below summarizes the function of each flag.

- Expansion Unit with 4 digital outputs (A 4-input and 4-output Expansion Unit)

Bit on Expansion Unit	Description
0	Becomes on or off in accordance with the low limit warning flag for Channel 0.
1	Becomes on or off in accordance with the high limit warning flag for Channel 0.
2	Becomes on or off in accordance with the low limit warning flag for Channel 1.
3	Becomes on or off in accordance with the high limit warning flag for Channel 1.

- Expansion Unit with 8 digital outputs (An 8-output Expansion Unit, and an 8-input and 8-output Expansion Unit)

Bit on Expansion Unit	Description
0	Becomes on or off in accordance with the low low limit alarming flag for Channel 0.
1	Becomes on or off in accordance with the low limit warning flag for Channel 0.
2	Becomes on or off in accordance with the high limit warning flag for Channel 0.
3	Becomes on or off in accordance with the high high limit alarming flag for Channel 0.
4	Becomes on or off in accordance with the low low limit alarming flag for Channel 1.
5	Becomes on or off in accordance with the low limit warning flag for Channel 1.
6	Becomes on or off in accordance with the high limit warning flag for Channel 1.
7	Becomes on or off in accordance with the high high limit alarming flag for Channel 1.

- Expansion Unit with 16 digital outputs (A 16-output Expansion Unit)

Bit on Expansion Unit	Description
0	Becomes on or off in accordance with the low low limit alarming flag for Channel 0.
1	Becomes on or off in accordance with the low limit warning flag for Channel 0.
2	Becomes on or off in accordance with the PASS flag for Channel 0.
3	Becomes on or off in accordance with the high limit warning flag for Channel 0.
4	Becomes on or off in accordance with the high high limit alarming flag for Channel 0.
5	Reserved
6	Reserved
7	Reserved
8	Becomes on or off in accordance with the low low limit alarming flag for Channel 1.
9	Becomes on or off in accordance with the low limit warning flag for Channel 1.
10	Becomes on or off in accordance with the PASS flag for Channel 1.
11	Becomes on or off in accordance with the high limit warning flag for Channel 1.
12	Becomes on or off in accordance with the high high limit alarming flag for Channel 1.
13	Reserved
14	Reserved
15	Reserved

Precautions for Correct Use

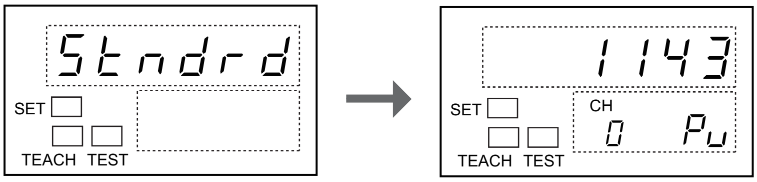
When the Local Control function is enabled, the Master Unit cannot give ON/OFF commands to the Expansion Unit.

Operation procedure

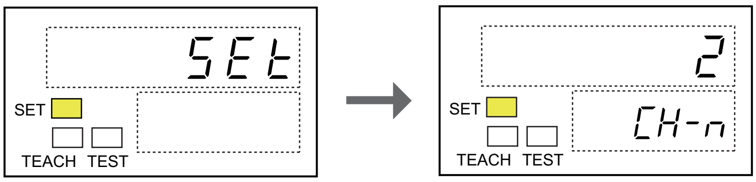
Setting can be made by the Numerical Indicator on the Unit or by the CX-Integrator.

- Setting by the Numerical Indicator

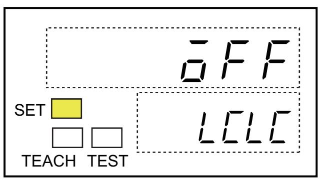
1. Turn on the power for CompoNet network.
Then the Numerical Indicator shows the Standard Level.



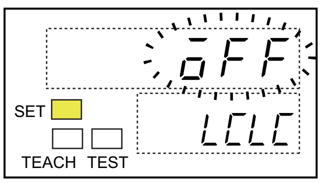
2. Press the button for 3 seconds or longer.
Then the indication changes to the Initial Setting Level.



3. Press the button several times to show the Local control parameter (LCLC).



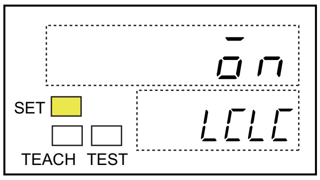
4. Press the button.
Then the Indicator No.1 flashes to tell it accepts setting.



11

11-3-1 Local Control

5. Press the [up-arrow button] button to show "on" on the Indication No.1. Press the [mode button] button.



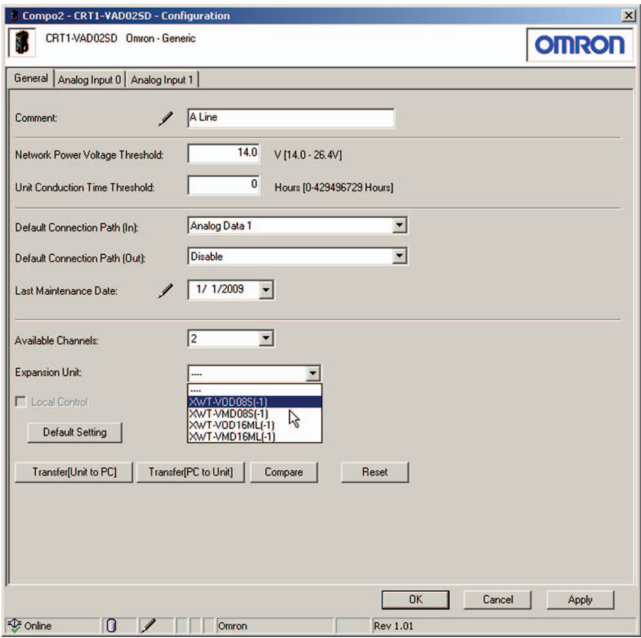
6. Press the [button] button for 1 second or longer.
Then the Unit is reset. The indication returns to the Standard Level.

- Setting by the CX-Integrator

1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
Then the Configuration Window shows up.

3. Select the **General** Tab. Click the list button of Expansion Unit. Select the model that is mounted on to the Slave Unit.

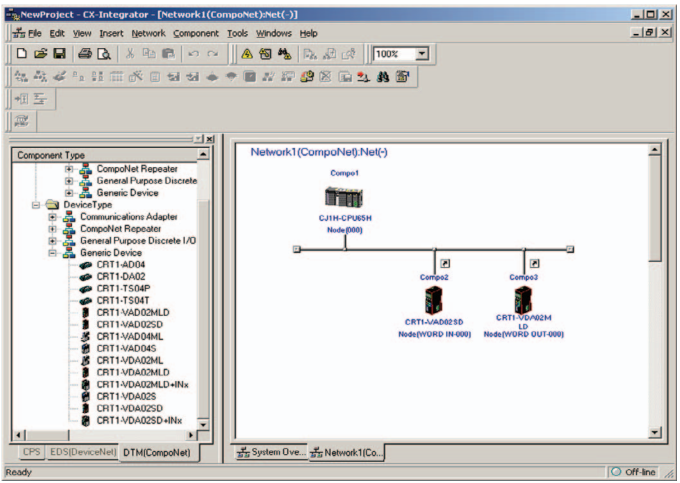


General Information

When Expansion Units are mounted on Analog Output Slave Units, the names of the Units are shown on the combo list window and the network configuration window of the CX-Integrator. The names are indicated as below:

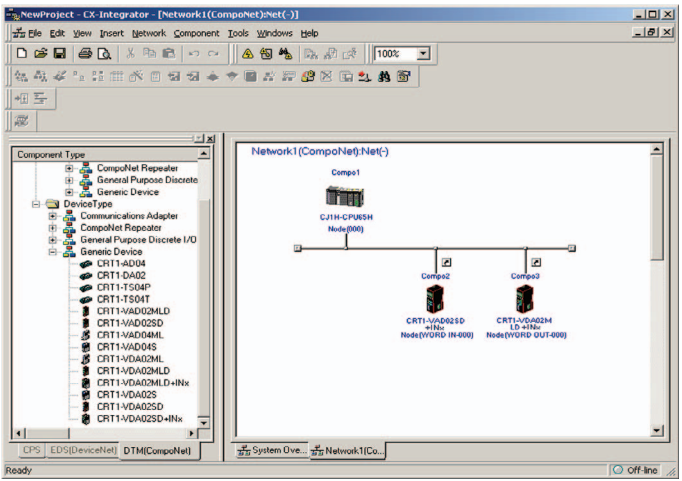
- In case of Analog Output Slave Unit + Expansion Output Unit (XWT-VOD08S (-1) or XWT-VOD16ML (-1)) :

  "CRT1-VDA02SD" or "CRT1-VDA02MLD"



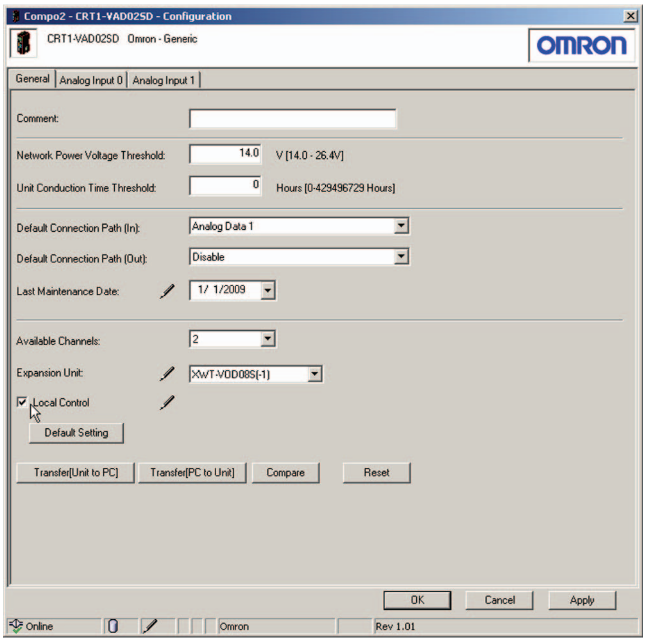
- In case of Analog Output Slave Unit + Expansion I/O Unit (XWT-VMD08S (-1) or XWT-VMD16ML (-1)) :

  "CRT1-VDA02SD + INx" or "CRT1-VDA02MLD + INx"



These must be aware when the network is configured while the CX-Integrator is offline.

4. Check the checkbox of Local Control.



5. Click the **Transfer [PC to Unit]** Button to download the data. Click the **Reset** Button to reset the Unit.

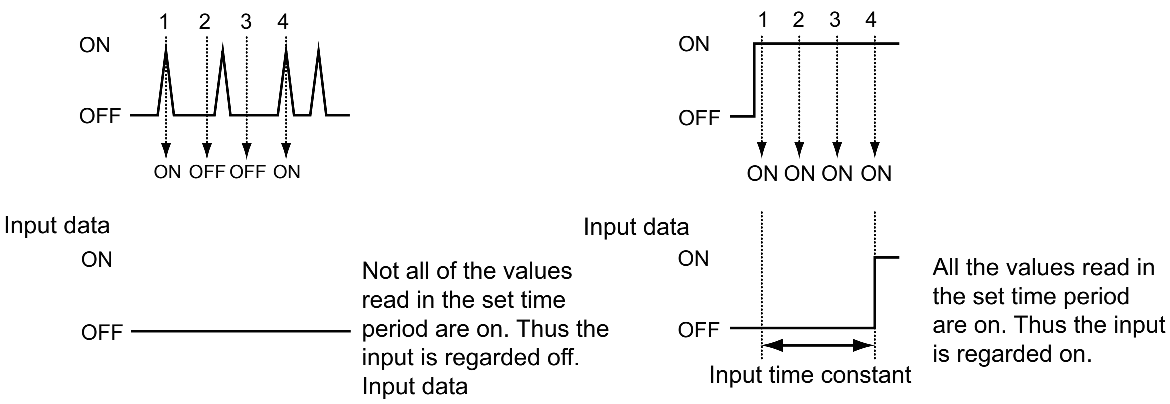
6. Click the **OK** Button and exit the window.

11-3-2 Setting the Input Time Constant

Function Overview

You can select a time period to check the on/off status of inputs. The input values are read several times in the set time period. The inputs are regarded valid only when all read values are consistent, i.e., either they are all on or all off.

When the input data changes from off to on, or from on to off, the input data is read in one-forth intervals of the set time period. Thus it is read four times in the set time period. The input is regarded as on when all the read values are on. Likewise, the input is regarded as off when the read values are all off. This function eliminates data fluctuation due to noise and chattering, and secures data reading. The On/Off timing delays for the amount of time constant.



The input time constant can be selective from the following eight options.

Set time period [ms]
0
0.25
0.5
1
2
4
8
16
32

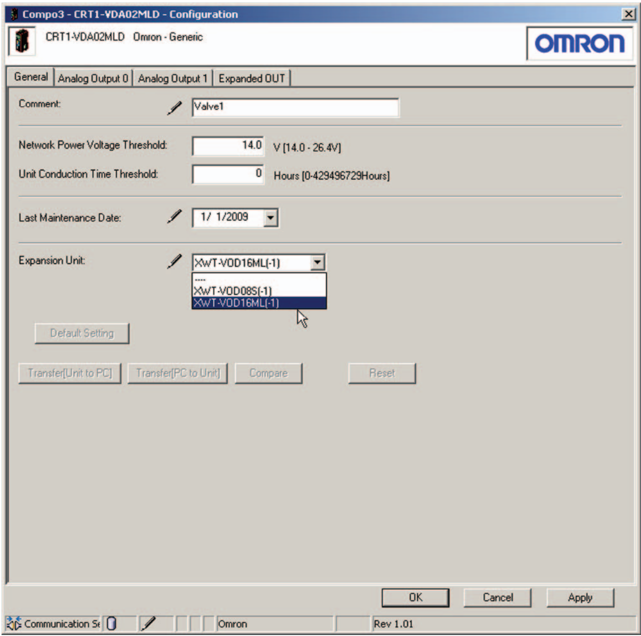
Operation Method

This function can be set only by the CX-Integrator.

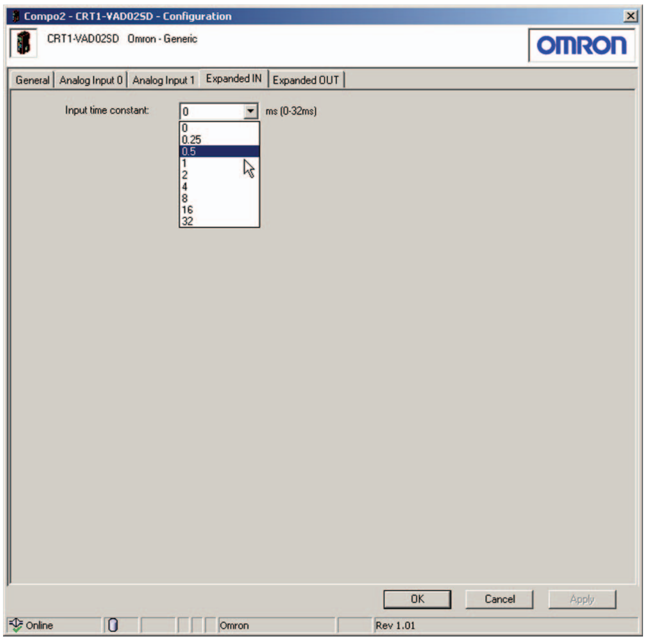
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Select the **General** Tab. Click the list button of Expansion Unit. Select the model that is mounted on to the Slave Unit.



4. Select the **Extended IN** Tab. Click the list button of Input Time Constant, and select a value from the list.



5. Click the **General** Tab, and click the **Transfer [PC to Unit]** Button to download the setting data. Click the **Reset** Button to reset the Unit.

6. Click the **OK** Button and exit the window.

11-3-3 Holding or Clearing the Outputs at Errors

Function Overview

You can set to hold or clear the output values when there is an error.

There are two cases to have this setting. You can set the output for each case in units of bit.

- Output at communications failures (Fault action)

This is the state in which the Slave Unit cannot communicate with the Master Unit.

Clear: At a communications failure, clear all data outputted from the Master Unit to zero.
Hold: At a communications failure, hold the data that was outputted from the Master Unit immediately before the communications failure.

- Output at idle states (Idle action)

This is the state where the Slave Unit can communicate with the Master Unit, but it is commanded to perform the idle action by the Master Unit, due to an error on the Master Unit.

Clear: At an idle action, clear all data outputted from the Master Unit to zero.
Hold: At an idle action, hold the data outputted from the Master Unit immediately before the idle action.

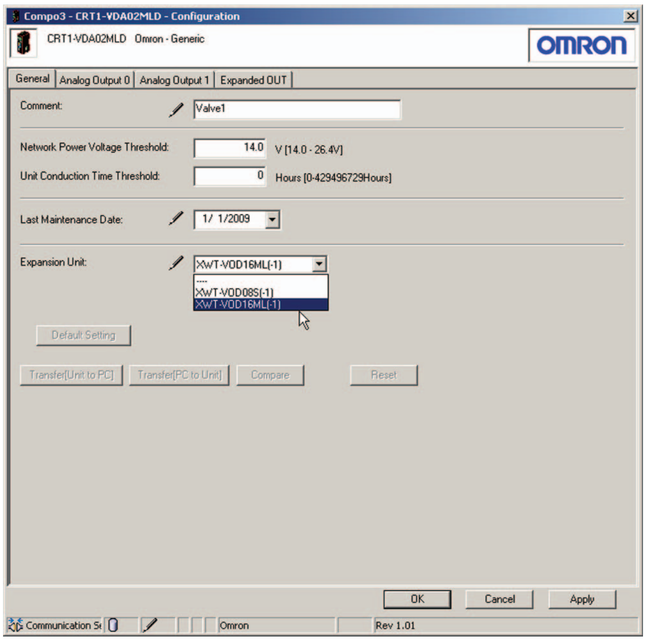
Operation Method

This function can be set only by the CX-Integrator.

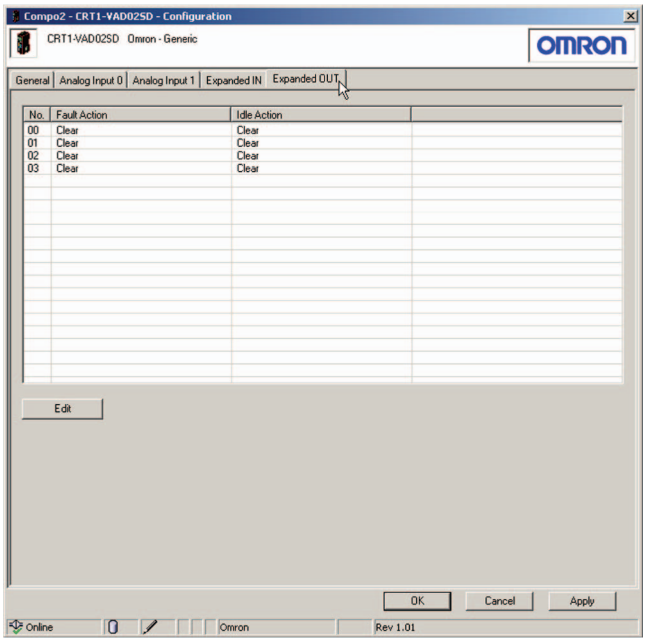
1. Boot the CX-Integrator.

2. On the Network Configuration Window, double-click the icon for the corresponding Slave Unit. Alternatively, right-click the icon and select ***Parameters*** - ***Edit*** from the pop-up menu.
   Then the Configuration Window shows up.

3. Select the **General** Tab. Click the list button of Expansion Unit. Select the model that is mounted on to the Slave Unit.



4. Select the **Extended OUT** Tab.



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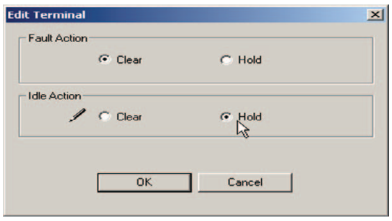
11-3-3 Holding or Clearing the Outputs at Errors

5. Double-click the No. of the Expansion Unit to have this setting. Then the Edit Terminal pop-up window shows up.
Check either *Clear* or *Hold* for Fault Action and Idle Action. Click the **OK** button to close the pop-up window.



6. Click the **General** Tab, and click the **Transfer [PC to Unit]** Button to download the setting data.
Click the **Reset** Button to reset the Unit.

7. Click the **OK** Button and exit the window.

12

Troubleshooting and Maintenance

12-1 Confirming the Indicators

12-1-1 Errors identifiable by indictors

You can confirm the state of communications and Slave Units by MS and NS indictors on the Units.

MS and NS indicators	Error content		Meaning Action to be taken
MS Light green NS Light green	Remote I/O communications or message communications is in progress.	In remote I/O communications	Either remote I/O communications or message communications is, or both are taking place.
MS Light green NS Unlit	Synchronizing the speed.	Waiting for a connection with the Master Unit	If only a part of Slave Unit has this state while the others do not, check the abnormal Slave Units for correct data rate. Then restart them.
MS Light green NS Flash green	Waiting for a connection.	Waiting for a connection with the Master Unit to be established	-
MS Light red NS Unlit	Hardware error	A Slave Unit has a watchdog timer error.	Replace the Slave Unit. Or check the Expansion Unit for proper connection.
MS Flash red NS Unlit	Illegal switch setting	Any switches such as DIP switches are set incorrectly.	Check the switch setting.
	EEPROM sum value error	EEPROM data error	Initialize the settings at the Slave Unit Indication part or by the CX-Integrator.
MS Light green NS Light red	Configuration error	- Duplicated node address, - Repeater Unit configuration error	Check no node address overlaps. Check also the Repeater Unit configuration. Then restart the Slave Units.
MS Light green NS Flash red	Communications timeout	-	Check these. Then restart the Slave Units: - the Master Unit and Slave Units have the same data rate, - the trunk line and the branch lines are in proper cable length, - cable disconnection or looseness, - any Terminating Resistors are located at other places than each end of the trunk line, - too much noise
MS Flash red NS Light red	Configurations error	A node address is set out of settable range.	Check that the node address is set within the allowable range. Then restart the Slave Unit.

12-1-2 Error causes and actions to be taken

MS or NS indicator lights or flashes red

Indicator state	Error cause and action to be taken
MS indicator lights red	- The Slave Unit is broken. Replace it. - The Expansion Unit is not properly connected. Check the connection.
MS indictor flashes red	- The DIP switch or other setting is illegal. Check the switch settings. Then restart the Slave Unit. - There is an error in the Slave Unit's EEPROM memory data. Initialize the setting at the Slave Unit indication part or by the CX-Integrator. If the MS LED keeps flashing red even after the data is returned to the default settings, replace the Slave Unit. - It is set to use an Expansion Unit while no Expansion Unit is mounted. Mount one.
NS indicator lights red without flashing green	Check the following items. Then restart the abnormal Slave Unit. - The node address was set out of range or duplicated. Or a Repeater Unit configuration error occurred. Check all node addresses and the Repeater Unit configuration. Change the settings if required. - Make sure that the I/O area does not have data of another Slave Unit allocated. If the same area is used by plural Slave Units, change the node address. - Replace the Slave Unit if its NS indicator keeps lighting red. - See also the column "NS indicator lights green momentarily, but it soon turns to solid red or flashing red".
NS indicator lights green momentarily, but it soon turns to solid red or flashing red.	Check the following items. Then restart the abnormal Slave Unit. - Check that a Terminating Resistor (121 Ω) is connected to each end of the network trunk line. Check if they are correct Terminating Resistors. If not, connect a Terminating Resistor of 121 Ω - Check that all Slave Units are set correctly. - Check that the communications cable is wired correctly. - Check that the power supply cable and power supply are wired correctly and that the settings are correct. - Check connector connection for all nodes to make sure that the communications cable and power supply cables are connected properly to the connectors. - Check that the communications power is supplied correctly. - If there are devices in the vicinity of any noise generators, take necessary measures against the noise to protect the Master Unit and Slave Units and the communications cable. - If the OMORN Master Unit has an error, see the operation manual for the Master Unit. If a Master Unit from another manufacturer has an error, see the operation manual for that product. - Replace the Slave Unit if its NS indicator keeps lighting red.

Not possible to participate into the network

Indicator state	Error cause and action to be taken
NS indicator remains unlit, and not makes any change.	- Check that all Slave Unit connectors are connected correctly. - Check that the Master Unit is operating correctly. If the Master Unit is an OMRON product, check the Master Unit mode and the Slave Unit node addresses. If the Master Unit is a product of another manufacturer, see the appropriate operation manual. - Check that the communications cable is wired correctly. - Check that the power supply cable and power supply are wired correctly and that the settings are correct. - Check connector connection to make sure that the communications cable and power supply cables are connected properly.
NS indicator remains flashing green, and not makes any change.	Check the following items. and take corrective measures based on the Master Unit indicator. - Check that the Master Unit is operating correctly. See to the Master Unit operation manual for the detail. - Check that the Slave Unit is registered in the Master Unit registration table. - Re-register the Slave Units to the registration table. - Check that the Slave Unit I/O area does not exceed the range defined by the Master Unit. Change the node address if the I/O area is over the range.

12-2 Confirming the error codes

You can confirm the error content by the error code indicated on the Numerical indicator of the Slave Unit.

12-2-1 Analog Input Slave Units

Error code	Problem		Cause and action to be taken
E01	EEPROM sum value error	EEPROM has some data errors.	Initialize the setting on the Unit or by CX-Integrator.
E08	Disconnection detected	A device to be connected is disconnected.	Check if the wire of the input device to be connected is properly connected.
E09	Analog hardware error	Hardware error of an Analog Input Slave Unit	The Slave Unit is broken. Replace it with a new one.
E10	Connection timeout	Communications from the Master Unit is not established.	Communications with the Master Unit is disabled. Check if the cable of the Master Unit is properly connected.
E11	Duplicated address or Repeater configuration error	- A node address duplicates. - Repeater configuration error	Check no node address duplicates. Then restart the Slave Unit.
E12	Initialization error	Initialization error at starting up the Slave Unit	The Slave Unit is broken. Replace it with a new one.
E13	WDT error	Error of watchdog timer built in the Slave Unit	The Slave Unit is broken. Replace it with a new one.
E14	Parameter error	Parameter setting errorA part of parameter has an error.	Initialize the setting by the level switch on the Unit or by CX-Integrator.
E15	SW setting error	Error of DIP or other switch setting	The switch setting has an error. Check the setting of DIP switches and node addresses. After resolving the error, restart the Slave Unit.
E21	EEPROM hardware error	Hardware error of EEPROM	The Slave Unit is broken. Replace it with a new one.
E29	Expansion Unit hardware error	Hardware error on Expansion Unit	The Expansion Unit is separated. Check if the cable of the Expansion Unit is properly connected. If the error persists, the Expansion Unit is broken. Replace it with a new one.

12-2-2 Analog Output Slave Units

Error code	Problem		Cause and action to be taken
E01	EEPROM sum value error	EEPROM has some data errors.	Initialize the setting on the Unit or by CX-Integrator.
E09	Analog hardware error	Hardware error of an Analog Output Slave Unit	The Slave Unit is broken. Replace it with a new one.
E10	Connection timeout	Communications from the Master Unit is not established.	Communications with the Master Unit is disabled. Check if the cable of the Master Unit is properly connected.
E11	Duplicated address or Repeater configuration error	- A node address duplicates. - Repeater configuration error	Check no node address duplicates. Then restart the Slave Unit.
E12	Initialization error	Initialization error at starting up the Slave Unit	The Slave Unit is broken. Replace it with a new one.
E13	WDT error	Error of watchdog timer built in the Slave Unit	The Slave Unit is broken. Replace it with a new one.
E14	Parameter error	Parameter setting error A part of parameter has an error.	Initialize the setting by the level switch on the Unit or by CX-Integrator.
E15	SW setting error	Error of DIP or other switch setting	The switch setting has an error. Check the setting of DIP switches and node addresses. After resolving the error, restart the Slave Unit.
E21	EEPROM hardware error	Hardware error of EEPROM	The Slave Unit is broken. Replace it with a new one.
E29	Expansion Unit hardware error	Hardware error on Expansion Unit	The Expansion Unit is separated. Check if the cable of the Expansion Unit is properly connected. If the error persists, the Expansion Unit is broken. Replace it with a new one.

12-3 Other error causes and actions

Problem	Cause	Action
The MS and NS indicators do not light green	See Section 5-2.	-
The Network Power Voltage Drop Flag does not become on, even if the voltage actually drops.	The threshold is set too low. In default, it is set to 14 V.	Set the threshold again.
The Network Power Voltage Drop Flag is on, although the voltage is appropriate.	The threshold is set too high.	Set the threshold again.
Cannot set the Network Power Voltage threshold.	The value you entered is out of the settable range of 14.0 to 26.4 V.	Set a value within the range.
Cannot set the name or comment for a Slave Unit or for any connected I/O devices.	The value you entered is over the acceptable limit of 32 characters.	Set a value within the limit.
I/O communications stops, after an Expansion Unit is mounted or removed and the power is turned on.	Mounting or removing an Expansion Unit increases or decreases the number of I/O points. Thus it does not conform to the I/O table list in the Master Unit.	Set the I/O table again on the Master Unit.
The MS indicator lights red, after an Expansion Unit is mounted or removed online.	You must not mount and remove any Expansion Units online.	Be sure to mount or remove it while the power is off.
The status flag does not becomes on even if the threshold is exceeded.	Comparator function is disabled. When the threshold is set to 0, the status flag is off unconditionally.	Enable the Comparator function. Set the threshold to any value other than 0. Confirm the position of decimal point, and set the threshold again.
- Changing the input type, the display mode, or the unit does not result in an expected analog input value, or it does not output an expected analog value. - Changing the data allocation to the I/O or enabling a function bit does not operate the Slave Unit as expected.	Setting change becomes effective only after the power is cycled or after the Slave Unit is reset at the Indication part or by CX-Integrator.	Cycle the main power, or reset the Slave Unit at the Indication part or by CX-Integrator.
- The analog data differs greatly from the expected value, or it has a too-large error. - A disconnection is detected even though there is no actual disconnection.	- The I/O data function is not properly allocated. - The value is scaled. - The connected device has different input type from the setting. - The user adjustment error is too large.	- Check that the analog data type is correctly allocated to the I/O data. - When the values are scaled, be sure to have the correct setting. - Disable the wrong scaling function. - Check the input type again. - Perform the user adjustment again.
The Input or Output Range Setting Switch cannot set the input or output range.	The Pin No.8 of the Input or Output Range Setting Switch is off. (It is in default setting state.)	Switch the Pin No.8 on.

Problem	Cause	Action
The user adjustment is not accepted.	The attempted adjustment has inputs outside the setting range.	- Adjust again with a correct voltage or current input. - Change the adjustment system if necessary.
The disconnection indication persists.	The sensor is disconnected.	- Restore the sensor disconnection. - Check the connected sensor and the input type.
The disconnection indication does not show up.	It does not show up, if the voltage is not between 1 and 5 V or the current is not between 4 and 20 mA.	-
The conversion cycle is too long.	- The number of AD conversion points reaches 2 in maximum. - Decrease the number of points, if there are any unused inputs. Then convert again.	- Adding a function extends the process time. - Remove any unused functions. Then convert again.
The expected value is not held when a communications error occurs.	The communications error output or the fault action is set incorrectly.	Check the output setting or the fault action again.

12-4 Daily Maintenance

This section describes routine maintenance. In particular, it includes daily cleaning and inspection, and Slave Unit replacement procedures.

12-4-1 Cleaning

Perform the following cleaning items regularly, and keep the network system in the best condition.

- Wipe the network devices over with a soft, dry cloth in daily basis.
- If dirt remains even after above action, wipe them over with a wrung-dry cloth that has been wet with a sufficiently diluted detergent (2%).
- The Slave Units will be stained if substances such as rubber or vinyl products or adhesive tape are left in contact with the Unit surface for a long period. Remove such items during regular cleaning.

Precautions for Correct Use

Never use benzine, thinners, or other volatile solvents, or chemical cloths. The Unit coating may deteriorate if these products are used.

12-4-2 Inspection

Perform periodic inspections, and keep the network in the best condition. Normally a periodic inspection should occur in annual or semiannual basis. However, if the Slave Units are used in environments subject to extremely high temperature, humidity, or dust, they must be inspected in a shorter interval.

Materials Required for Inspections

The following materials are required to perform periodic inspections.

● Materials Used Regularly

- Phillips screwdrivers and flat-blade screwdrivers
- Screwdrivers for communications connectors
- Testers or digital voltmeters
- Industrial alcohol and pure cotton cloth

● Materials Required in some cases

- Synchroscope
- Pen oscilloscope
- Thermometer and hygrometer

Inspection Items

Check the following items. If any items deviate from the criteria, adjust the environment or the Slave Unit until the criteria are satisfied.

Checking area	Checking items	Criteria	Inspection tool
Environment	Is the ambient and in-panel temperature appropriate?	See the Slave Unit specifications.	Thermometer
	Is the ambient and in-panel humidity appropriate?	See the Slave Unit specifications.	Hygrometer
	Is the Slave Unit free from dust?	No dust allowed	Visual inspection
Installation	Are the Slave Units installed securely?	No looseness allowed	Phillips screwdriver
	Are the communications cables connector fully inserted?	No looseness allowed	Phillips screwdriver
	Are the external wiring screws sufficiently tightened?	No looseness allowed	Phillips screwdriver
	Are the connection cables free from damages?	No visible damages allowed	Visual inspection

12-4-3 Replacing the Units

A network consists of a Master Unit and some Slave Units. If any of them has a trouble, the entire network may be affected. Therefore the abnormal Unit must be replaced immediately. To restore from malfunctions promptly, it is recommendable that you keep some spare Units on hand, so that you can replace them with malfunctioning Units whenever it is necessary.

Precautions When Replacing Units

- After replacement, confirm the new Unit works properly.
- When you request OMRON to repair a defective product, elaborate the defect on a paper and attach it to the product. Send them to an OMRON representative listed at the end of this manual or to your OMRON representative.
- If any connection has poor contact, wipe it with a clean pure cotton cloth that has been soaked in industrial alcohol.

Settings after Unit Replacement

Make the switches and other settings in the same states as before the Unit replacement.

Appendices

A-1 Numerical indicator parameters

A-1-1 Monitor Level Group

Standard Level

Indicator No.2	No. indication	Parameter name	Indication range					Remarks
			CH	Decimal point	Zero suppress	Values	Characters	
Pu	5d00	Present value	Yes	*	Yes	No scaling: 0 to 6000 (when the input range is beside -10 V to +10 V), -3000 to +3000 (when the input range is -10 V to +10 V) Default scaling: 0 to 5, 1 to 5, 0 to 10, -10 to 10, 4 to 20, or 0 to 20 User scaling: -32768 to +32766	5.Err (when a disconnection is detected)	Indicates from -5% to 105%, "ɔɔɔɔ" means over the upper limit. "cccc" means under the lower limit.
nodE	5d01	Present node address	-	-	No	00 to 63	-	
nt-u	5d02	Present network power voltage	-	1st	Yes	0.0 to 30.0	-	
tr-L	5d03	Level transition	-	-	Yes	-	tESt	Makes a transit to I/O Test level
Ein	5d04	Present value on the Expansion Input Unit	-	-	No	0x0000 to 0xFFFF	-	Indicated only when an Expansion Unit is mounted.
EoUt	5d05	Present value on the Expansion Output Unit	-	-	No	0x0000 to 0xFFFF	-	Indicated only when an Expansion Unit is mounted.

* The position conforms to the scaling setting.

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Option Level

● Analog Input Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					Remarks
			CH	Decimal point	Zero suppress	Values	Characters	
dGt	oP01	Digital value	Yes	*	Yes	0 to 6000	S.Err (when a disconnection is detected)	Indicates from -5% to 105%.
i-Hu	oP02	Maximum input	Yes	*	Yes	-32768 to 32766	-	
i-Lu	oP03	Minimum input	Yes	*	Yes	-32768 to 32766	-	
nt-H	oP04	Maximum network power voltage	-	1st	Yes	0.0 to 30.0		
nt-L	oP05	Minimum network power voltage	-	1st	Yes	0.0 to 30.0		
CmPr	oP06	Comparator result	Yes	-	-	-	HHH H L LLL PASS	Only when Comparator function is used. HH, H, L, LL, PASS
StS	oP07	Status flag	-	-	-	-	oFF nt-u rUn-t C-Cnt ouEr E-iou	Displays the flags that are ON, by switching, among Threshold over (for Network power voltage, Unit conduction time, and Cumulated count), Scaling overflow, Scaling underflow, and Expansion Unit I/O power supply.

* The position conforms to the scaling setting.

● Analog Output Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					Remarks
			CH	Decimal point	Zero suppress	Values	Characters	
dGt	oP01	Digital value	Yes	*	Yes	0 to 6000	S.Err (when a disconnection is detected)	Indicates from -5 % to 105 %.
nt-H	oP04	Maximum network power voltage	-	1st	Yes	0.0 to 30.0		
nt-L	oP05	Minimum network power voltage	-	1st	Yes	0.0 to 30.0		
StS	oP07	Status flag	-	-	-	-	oFF nt-u rUn-t C-Cnt ErOUt E-iou	Displays the flags that are ON, by switching, among Threshold over (for Network power voltage, Unit conduction time, and Cumulated count), Error output, and Expansion Unit I/O power supply.

* The position conforms to the scaling setting.

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Comparator Setting Level (Analog Input Slave Units only)

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
HH	C00	High high limit (HH)	Yes	*	Yes	-32768 to 32766	-	digit moving + increment	32767	
H	C01	High limit (H)	Yes	*	Yes	-32768 to 32766	-	digit moving + increment	32767	
L	C02	Low limit (L)	Yes	*	Yes	-32768 to 32766	-	digit moving + increment	-32768	
LL	C03	Low low limit (LL)	Yes	*	Yes	-32768 to 32766	-	digit moving + increment	-32768	
oFFd	C04	OFF delay value	Yes	-	Yes	0 to 65535	-	digit moving + increment	4	

* The position conforms to the scaling setting.

Error code level

● Analog Input Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					Remarks
			CH	Decimal point	Zero suppress	Values	Characters	
E01	E01	EEPROM sum value error	-	-	-	-	EEP.S	
E21	E21	EEPROM hardware error	-	-	-	-	EEP.H	
E08	E08	Disconnection detected	Yes	-	-	-	S.Err	
E09	E09	Analog Unit hardware error	-	-	-	-	HArdA	
E29	E29	Expansion Unit hardware error	-	-	-	-	HArd.E	
E10	E10	Connection timeout	-	-	-	-	t.oUt	
E11	E11	Address duplication or Repeater configuration error	-	-	-	-	Addr	
E12	E12	Initialization error	-	-	-	-	InIErr	
E13	E13	WDT error	-	-	-	-	WdtErr	
E14	E14	Parameter error	-	-	-	-	PrmErr	
E15	E15	SW setting error	-	-	-	-	SWErr	
nodE	E99	Node address	-	-	No	00 to 63	-	

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● Analog Output Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					Remarks
			CH	Deci mal point	Zero suppr ess	Values	Characters	
E01	E01	EEPROM sum value error	-	-	-	-	EEP.S	
E21	E21	EEPROM hardware error	-	-	-	-	EEP.H	
E09	E09	Analog Unit hardware error	-	-	-	-	HArdA	
E29	E29	Expansion Unit hardware error	-	-	-	-	HArd.E	
E10	E10	Connection timeout	-	-	-	-	t.oUt	
E11	E11	Address duplication or Repeater configuration error	-	-	-	-	Addr	
E12	E12	Initialization error	-	-	-	-	InIErr	
E13	E13	WDT error	-	-	-	-	WdtErr	
E14	E14	Parameter error	-	-	-	-	PrmErr	
E15	E15	SW setting error	-	-	-	-	SWErr	
nodE	E99	Node address	-	-	No	00 to 63	-	

A-1-2 Setting Level Group

Initial setting level

● Analog Input Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
CH-n	500	Number of available channels	-	-	-	1 to 2	-	Select	2	
nt-L	501	Value on network power voltage monitor	-	1st	Yes	8.0 to 30.0	-	Increment or decrement	14.0	
rnG	502	Input range	Yes	-	-	-	0-5 1-5 4-20 0-10 0-20 -10-10	Select	0-5	Only when the Input range setting switch Pin No.8 is OFF.
Avr	503	Moving average	Yes	-	-	-	oFF/on	Select	oFF	Not-use or Use
SCL	504	Scaling	Yes	-	-	-	oFF/dEF/USEr	Select	oFF	OFF, Default scaling, or User scaling
CmPr	505	Comparate	Yes	-	-	-	oFF/on	Select	oFF	Not-use or Use
PdSP	508	Parameter indication style	-	-	-	-	CHAr/no	Select	CHAr	Parameter name or Parameter No.
CoLr	509	Color of Indicator No.1	-	-	-	-	rEd/Grn	Select	rEd	Red or Green
ntSt	510	Network setting	-	-	-	-	oFF/on	Select	oFF	Network or Local
tr-L	511	Level transition	-	-	-	-	HFUnC	-	-	Makes a transit to Special Function Setting Level
LCLC	512	Local control	-	-	-	-	oFF/on	Select	oFF	Only when an Expansion Unit is mounted. Digital I/O expansion, or Local control

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● Analog Output Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
CH-n	500	Number of available channels	-	-	-	1 to 2	-	Select	2	
nt-L	501	Value on network power voltage monitor	-	1st	Yes	8.0 to 30.0	-	Increment or decrement	14.0	
rnG	502	Output range	Yes	-	-	-	0-5 1-5 4-20 0-10 0-20 -10-10	Select	0-5	Only when the Output range setting switch Pin No.8 is OFF.
SCL	504	Scaling	Yes	-	-	-	oFF/dEF/USEr	Select	oFF	OFF, Default scaling, or User scaling
FAUL	506	Failed action	Yes	-	-	-	L/H/HoLd/SEt	Select	L	L, H, Hold, Specified value
IdLE	507	Idle action	Yes	-	-	-	L/H/HoLd/SEt	Select	L	L, H, Hold, Specified value
PdSP	508	Parameter indication style	-	-	-	-	CHAr/no	Select	CHAr	Parameter name or Parameter No.
CoLr	509	Color of Indicator No.1	-	-	-	-	rEd/Grn	Select	rEd	Red or Green
ntSt	510	Network setting	-	-	-	-	oFF/on	Select	oFF	Network or Local
tr-L	511	Level transition	-	-	-	-	HFUnC	-	-	Makes a transit to Special Function Setting Level

Scaling level

● Analog Input Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
dGt 1	SC00	Digital value 1	Yes	-	Yes	0 to 5999	S.Err (at disconnection or short)	Digit moving + increment	0	Teaching supported
dGt2	SC01	Digital value 2	Yes	-	Yes	1 to 6000	S.Err (at disconnection or short)	Digit moving + increment	6000	Teaching supported
SCL 1	SC02	Scaling value 1	Yes	-	Yes	-32000 to 32000		Digit moving + increment	0	
SCL2	SC03	Scaling value 2	Yes	-	Yes	-32000 to 32000		Digit moving + increment	6000	
dP	SC04	Position of decimal point	Yes	0 to 5th	-	0.00000 to 000000		Digit moving	000000	Move the decimal point
oFSt	SC05	Scaling offset	Yes	-	Yes	-32000 to 32000		Digit moving + increment	0	
HYS	SC06	Hysteresis	Yes	-	Yes	0 to 16383		Digit moving + increment	0	

● Analog Output Slave Units

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
dGt 1	SC00	Digital value 1	Yes	-	Yes	0 to 5999	S.Err (at disconnection or short)	Digit moving + increment	0	
dGt2	SC01	Digital value 2	Yes	-	Yes	1 to 6000	S.Err (at disconnection or short)	Digit moving + increment	6000	
SCL 1	SC02	Scaling value 1	Yes	-	Yes	-32000 to 32000		Digit moving + increment	0	
SCL2	SC03	Scaling value 2	Yes	-	Yes	-32000 to 32000		Digit moving + increment	6000	
dP	SC04	Position of decimal point	Yes	0 to 4th	-	0.00000 to 000000		Digit moving	000000	Move the decimal point
oFSt	SC05	Scaling offset	Yes	-	Yes	-32000 to 32000		Digit moving + increment	0	

A-1-3 Special Function Setting Level Group

Special function setting level

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
init	HF00	Initializing	-	-	-	-	no/YES	Select	no	Not initialize or Initialize
Pr-t	HF01	Time to shift to protection	-	-	Yes	3 to 10	-	Increment and decrement	3	Reflected when Protection is ON or OFF

User adjustment level

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Default	Remarks
			CH	Decimal point	Zero suppress	Values	Characters			
AdjL	A00	Lower adjustment value	Yes	-	Yes	-300 to 300	-	Increment and decrement	0	Teaching supported only when to input, not when to output
AdjH	A01	Upper adjustment value	Yes	-	Yes	-300 to 300	-	Increment and decrement	0	Teaching supported only when to input, not when to output

A-1-4 I/O Test Level Group

I/O Test Level

Indicator No.2	No. indication	Parameter name	Indication range					How to change	Remarks
			CH	Decimal point	Zero suppress	Values	Characters		
tESt	t00	Analog I/O test	Yes	*	Yes	-32768 to 32766	-	Increment and decrement	
Ein	t01	Expansion input test	-	-	No	0x0000 to 0xFFFF	-	Increment and decrement	Indicated only when an Expansion Unit is mounted.
EoUt	t02	Expansion output test	-	-	No	0x0000 to 0xFFFF	-	Increment and decrement	Indicated only when an Expansion Unit is mounted.

* The position conforms to the scaling setting.

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A-2 CompoNet Explicit Messaging

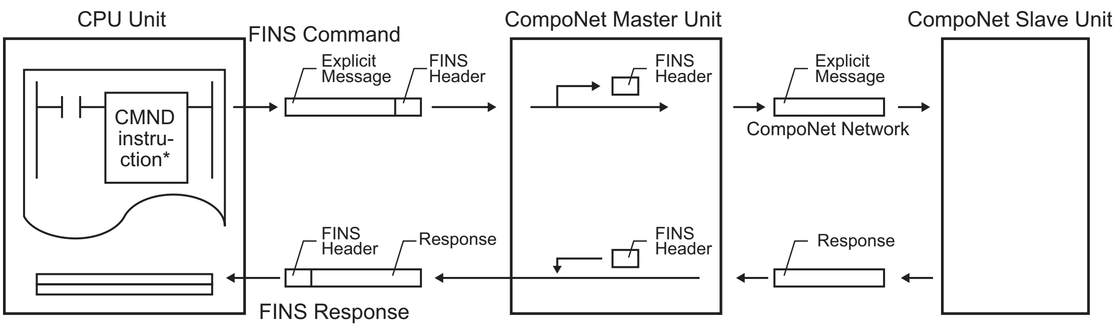
CompoNet explicit messages are used to read or write any parameter of the specified Slave Unit. The messages are sent from the CompoNet Master Unit to a CompoNet Slave Unit. The Slave Units process the commands sent from the Master Unit and then return responses to the Master Unit.

A-2-1 Sending Explicit Messages by FINS Commands

FINS commands are used to send CompoNet explicit messages from a CS- or CJ-series CompoNet Master Unit. For details on FINS commands, see the SYSMAC CS-, CJ- and CP-series, and SYSMAC One NSJ-series Communications Commands Reference Manual (Cat. No. W342).

Message Flow

FINS commands are sent by using the CX-Programmer's CMND instruction. When a FINS command is sent from the CPU Unit to the CompoNet Master Unit, the CompoNet Master Unit converts the FINS command to a CompoNet explicit message and sends it to a CompoNet Slave Unit. The response explicit message from the Slave Unit is converted by the Master Unit to a FINS response and sent back to the CPU Unit.

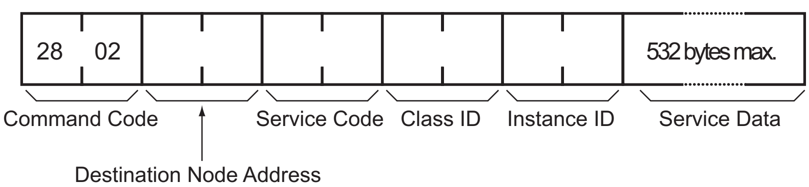


* The FINS command code is specified as "2802"

FINS Format

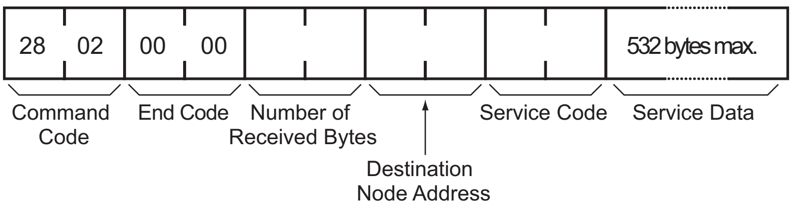
The FINS command code of 2802 hex is used to send CompoNet explicit messages.

- Command Format

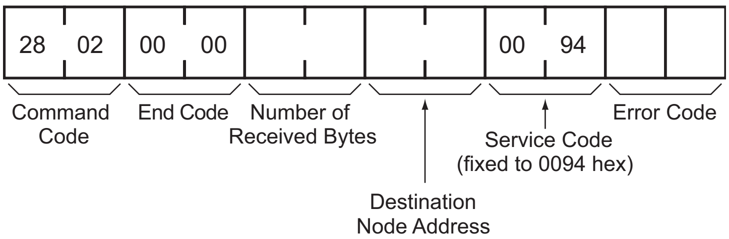


Response Format

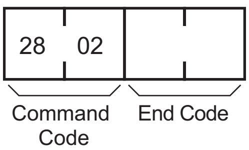
- When a normal response is returned for a CompoNet Explicit Message sent;



- When an error response is returned for a CompoNet Explicit Message (CompoNet Explicit Message Communications Error);



- When a transmission of CompoNet Explicit Message fails or times out (i.e., a FINS communications error);



Responce Format

- [Destination node address] (command)

  It specifies the node address of the destination Slave Unit to which an Explicit Message is sent.

Word IN or MIX Slave	Word OUT Slave	Bit IN or MIX Slave	Bit OUT Slave	Repeater Unit
10xx hex	20xx hex	40xx hex	50xx hex	70xx hex

  The node address, in hexadecimal, of corresponding Slave Unit is entered to the mark xx.

- [Service Code] (command and response)

  It specifies the service code that is defined in the CompoNet Network. See the list in below. The normal response returns the specified service code with its highest-order bit in 1 or on. The error response returns 0094 hex, which notifies an error.

  Service code list

Service	Read	Write	Reset	Save
Command	0E hex	10 hex	05 hex	16 hex
Normal response	8E hex	90 hex	85 hex	96 hex

- [Class ID] (Command)
  It specifies the class ID for the Explicit Message.

- [Instance ID] (Command)
  It specifies the instance ID for the Explicit Message.

- [Service Data] (Command and Response)
  In a command, it specifies the data defined for the service code. In a response, it returns the reception data defined for the service code.

- [Number of Bytes Received] (Response)
  It returns the number of bytes, in the received data, following to the destination node address.

- [Destination Node Address] (Response)
  It returns the node address of the Slave Unit, which generates the Explicit response message.

- [Error Code] (Response)
  It returns the error code as defined in the CompoNet Network. See the error code list in below.

  Error code list

Response code	Error title	Cause
08FF	Service not supported	The Service Code is incorrect.
09FF	Invalid attribute value	The specified Attribute is not supported. The written data is beside the valid range.
16FF	Object does not exist	The specified Instance ID is not supported.
15FF	Too much data	The data is larger than the specified size.
13FF	Not enough data	The data is smaller than the specified size.
0CFF	Object state conflict	The specified command cannot be executed due to an internal hardware failure.
20FF	Invalid Parameter	The specified operation command is not supported.
0EFF	Attribute not settable	The service code issued commands writing for the Attribute ID which only supports reading.
10FF	Device state conflict	The specified command cannot be executed due to an internal hardware failure.
14FF	Attribute not supported	The specified Attribute is not supported.
19FF	Store operation failure	The data was not stored in memory.
D0FF	Network setting protect	The network setting is prohibited.

- [End code]
  It returns the end code to finish the FINS communications.

A-2-2 Explicit Message List

Setting and monitoring the Unit Conduction Time

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Setting the threshold for Unit conduction time	Get	Reads the threshold for Slave Unit Conduction Time (unit: 0.1 hr).	0E hex	95 hex	01 hex	73 hex	-	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
	Set	Writes the threshold for Slave Unit Conduction Time (unit: 0.1 hr).	10 hex	95 hex	01 hex	73 hex	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)	-
Reading the present value of Unit conduction time	Get	Read the present value for the Slave Unit Conduction Time (unit: 0.1 hr).	0E hex	95 hex	01 hex	71 hex	-	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
Reading the monitoring status of Unit conduction time	Get	Reads the monitoring status to see if Slave Unit Conduction Time exceeds the threshold.	0E hex	95 hex	01 hex	72 hex	-	1 byte 00 hex: within the range, 01 hex: out of the range (over the threshold)

Reading the Waning or Alarming Status

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading Warning Status	Get	Reads the warning status area of the Slave Unit.	0E hex	95 hex	01 hex	C5 hex	-	2 bytes
Reading Alarm Status	Get	Reads the alarm status area of the Slave Unit.	0E hex	95 hex	01 hex	C6 hex	-	2 bytes

Reading the DIP switch

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading DIP Switch Status	Get	Reads the status of the DIP switches.	0E hex	94 hex	01 hex	68 hex	-	1 byte

Setting and reading the Analog Input Slave Units

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading Analog Data 1 Value	Get	Reads the value for Analog Data 1.	0E hex	0A hex	01 to 02 hex	03 hex	-	2 bytes
Reading Analog Data 2 Value	Get	Reads the value for Analog Data 2.	0E hex	0A hex	01 to 02 hex	65 hex	-	2 bytes
Setting and reading the number of AD conversion points	Set or Get	Sets the number of AD conversion points.	Write: 10 hex, Read: 0E hex	0A hex	00 hex	64 hex	2 bytes	2 bytes
Setting and Reading input range	Set or Get	Set the input range. 0: -10 to +10 V, 1: 0 to 5 V, 2: 0 to 10 V, 3: 4 to 20 mA, 7: 1 to 5 V, 8: 0 to 20 mA	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	07 hex	1 byte	1 byte
Reading Analog Status Flag	Get	Reads the status of Analog Status Flag. D0: LL, D1: L, D2: Pass, D3: H, D4: HH, D5: Valley shot, D6: Top shot, D7: Disconnection detected	0E hex	0A hex	01 to 02 hex	66 hex	-	1 byte
Selecting data to allocate to Analog Data 1	Set or Get	Selects the data to be allocated to the Analog Data 1. 0: Analog value, 1: Peak value, 2: Bottom value, 3: Top value, 4: Valley value, 5: Rate of change	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	68 hex	1 byte	1 byte

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Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Selecting data to allocate to Analog Data 2	Set or Get	Selects the data to be allocated to the Analog Data 2. 0: Analog value, 1: Peak value, 2: Bottom value, 3: Top value, 4: Valley value, 5: Rate of change	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	69 hex	1 byte	1 byte
Setting Function	Set or Get	Set the functions. (ON: Enabled, OFF: Disabled) D0: Moving average, D1: Scaling, D2: Peak/Bottom Hold, D3: Top/Valley Hold, D4: Comparator, D5: Cumulated Count, D6: Rate of change	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	6E hex	1 byte	1 byte
Setting Scaling Type	Set or Get	0: Default scaling, 1: User scaling	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	6F hex	1 byte	1 byte
Setting Scaling Point 1	Set or Get	Sets the analog value for 0% user scaling.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	70 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Setting Scaling Point 2	Set or Get	Sets the analog value for 100% user scaling.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	71 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Offset after Scaling	Set or Get	Compensates the scaling error.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	72 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Reading Maximum Value	Get or Reset	Reads the maximum value since the power-on.	Read: 0E hex, Reset: 35 hex	0A hex	01 to 02 hex	73 hex	-	2 bytes
Reading Minimum Value	Get or Reset	Reads the minimum value since the power-on.	Read: 0E hex, Reset: 35 hex	0A hex	01 to 02 hex	74 hex	-	2 bytes
Reading Peak Value	Get	Reads the peak value retained by Hold function.	0E hex	0A hex	01 to 02 hex	75 hex	-	2 bytes
Reading Bottom Value	Get	Reads the bottom value retained by Hold function.	0E hex	0A hex	01 to 02 hex	76 hex	-	2 bytes
Reading Top Value	Get	Reads the top value retained by Hold function.	0E hex	0A hex	01 to 02 hex	77 hex	-	2 bytes
Reading Top Detection Timing	Get	Reads the timing to have detected the top value.	0E hex	0A hex	01 to 02 hex	78 hex	-	1 byte
Reading Valley Value	Get	Reads the Valley value retained by Hold function.	0E hex	0A hex	01 to 02 hex	79 hex	-	2 bytes

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Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading Valley Detection Timing Flag	Get	Reads the timing to have detected the valley value.	0E hex	0A hex	01 to 02 hex	7A hex	-	1 byte
Setting HH Value	Set or Get	Sets the HH value.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	7D hex	2 bytes (-32768 to +32767)	2 bytes (-32768 to +32767)
Setting LL Value	Set or Get	Sets the LL value.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	7E hex	2 bytes (-32768 to +32767)	2 bytes (-32768 to +32767)
Setting H Value	Set or Get	Sets the H value.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	7F hex	2 bytes (-32768 to +32767)	2 bytes (-32768 to +32767)
Setting L Value	Set or Get	Sets the L value.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	80 hex	2 bytes (-32768 to +32767)	2 bytes (-32768 to +32767)
Reading Scaled Analog Input Value	Get	Reads the scaled input analog value.	0E hex	0A hex	01 to 02 hex	8D hex	-	2 bytes
Reading Rate of Change	Get	Reads the Rate of Change for every set sampling cycle.	0E hex	0A hex	01 to 02 hex	8E hex	-	2 bytes
Setting Sampling Cycle	Set or Get	Sets the sampling cycle to have the Rate of Change from previous sampled value.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	90 hex	2 bytes (10 to 65535)	2 bytes (0 to 65535)
Reading Cumulated Value	Get or Reset	Reads the cumulated analog input value.	Read: 0E hex, Reset: 35 hex	0A hex	01 to 02 hex	91 hex	-	4 bytes (-214748364.8 to +214748364.7)
Reading Cumulated Count Flag	Get	Reads the cumulated count status in the Cumulated Count Flag. D0: Counter overflow, D1: Counter underflow, D7: Set value overflow	Read: 0E hex	0A hex	01 to 02 hex	92 hex	-	1 byte
Setting Cumulated Count Threshold	Set or Gett	Writes or reads the Cumulated Count threshold.	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	93 hex	4 bytes	4 bytes
Setting Unit of Cumulated Timer	Set or Gett	Sets the unit for cumulated count. 0: Hour (count × hour), 1: Minute (count × minutes)	Write: 10 hex, Read: 0E hex	0A hex	01 to 02 hex	94 hex	1 byte	1 byte

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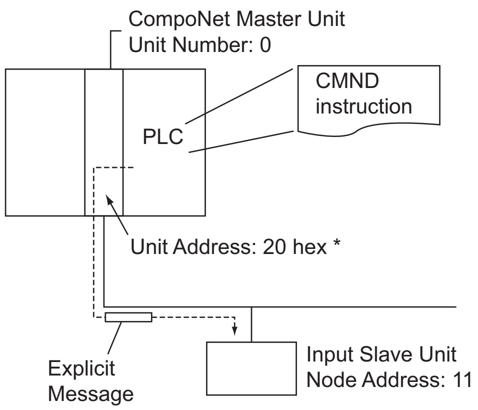
Setting and reading the Analog Output Slave Units

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading Analog Output Value	Get	Reads the analog output value.	0E hex	0B hex	01 to 02 hex	03 hex	-	2 bytes
Setting Output Range	Set or Gett	Sets the output range. 0: 4 to 20 mA, 1: 0 to 10 V, 2: 0 to 20 mA, 3: -10 to 10 V, 4: 0 to 5 V, 6: 1 to 5 V	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	07 hex	1 byte	1 byte
Setting Fault Action	Set or Gett	Selects the output at communications failure for each channel. 0: Hold Last State, 1: Low Limit, 2: High Limit, 3: User Count	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6A hex	1 byte	1 byte
Setting Idle Action	Set or Gett	Selects the output at idle for each channel. 0: Hold Last State, 1: Low Limit, 2: High Limit, 3: User Count	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6B hex	1 byte	1 byte
Setting the specified value for Idle Action	Set or Gett	Sets the specified value for Idle action for each channel.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6C hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Setting the specified value for Fault Action	Set or Gett	Sets the specified value for Fault action for each channel.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6D hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Setting Function	Set or Gett	Set the functions. D0: Scaling, D1: Cumulated Count	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6E hex	1 byte	1 byte
Setting Scaling Type	Set or Gett	0: Default scaling, 1: User scaling	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	6F hex	1 byte	1 byte
Setting Scaling Point 1	Set or Gett	Sets the converted value for 0% user scaling.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	70 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Setting Scaling Point 2	Set or Gett	Sets the converted value for 100% user scaling.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	71 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Offset after Scaling	Set or Gett	Compensates the scaling error by offset value.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	72 hex	2 bytes (-32000 to +32000)	2 bytes (-32000 to +32000)
Reading Cumulated Count	Get or Reset	Reads the cumulated analog input value.	Read: 0E hex, Reset: 35 hex	0B hex	01 to 02 hex	91 hex	-	4 bytes (-214748364.8 to +214748364.7)

Explicit Message	Service	Function	Command					Response
			Service Code	Class ID	Instance ID	Service Data		Service Data
						Attribute ID	Data	
Reading Cumulated Count Flag Threshold	Get	Reads the cumulative count status in the Cumulated Count Flag. D0: Counter overflow, D1: Counter underflow, D7: Set value overflow	Read: 0E hex	0B hex	01 to 02 hex	92 hex	-	1 byte
Setting Cumulated Counter	Set or Get	Writes or reads the Cumulated Counter threshold.	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	93 hex	4 bytes	4 bytes
Setting Cumulated Timer Setting	Set or Get	Sets the unit for cumulated counting. 0: Hour (count hour), 1: Minute (count minutes)	Write: 10 hex, Read: 0E hex	0B hex	01 to 02 hex	94 hex	1 byte	1 byte

A-2-3 Explicit messaging example

Sending an Explicit Message with CMND Instruction



* The unit address of the CompoNet Master Unit (or Special I/O Unit) is the unit number + 20 hex.

- Operation

- The CompoNet Master Unit reads the present value of the Unit conduction time (class ID: 95 hex, Instance ID: 01 hex, Attribute ID: 71 hex) from the Slave Unit.
- The data is read by using the command code “Sending an Explicit Message” (28 02 hex).
- The command data is written in words starting from D01000 in the CPU Unit and the response data is stored in words starting from D02000.

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Commands

[CMND S D C]

S	D01000	+0	:	2802 hex	Command code
		+1	:	100B hex	Destination node address (IN Slave: node address 11)
		+2	:	000E hex	Service code: 0E hex
		+3	:	0095 hex	Class ID: 0095 hex
		+4	:	0001 hex	Instance ID: 0001 hex
		+5	:	7100 hex	Attribute ID: 71 hex (The rightmost 00 hex is not read because the number of bytes in a command data is set in 11 bytes.)
D	D02000		:	The number for the first word that stores the response.	
C	D00000	+0	:	000B hex	Number of bytes in a command code: 11 bytes
		+1	:	000E hex	Number of bytes in a response data: 14 bytes
		+2	:	0000 hex	Destination Master Unit network address: 0
		+3	:	0020 hex	Destination Master Unit node address: 0
					Destination Master Unit No. address: 20 hex
		+4	:	0000 hex	Response required, Communications port number: 0, Number of retries: 0 hex
		+5	:	0064 hex	Response monitoring time

Responses

D02000	+0	:	2802 hex	
	+1	:	0000 hex	
	+2	:	0008 hex	
	+3	:	100B hex	Destination node address: 11 (0B hex)
	+4	:	008E hex	Normal end: 8E hex
	+5	:	2F07 hex	The Unit Maintenance Present value (0000072F hex) is stored from the leftmost digit and to the rightmost digit. (See next page.)
	+6	:	0000 hex	

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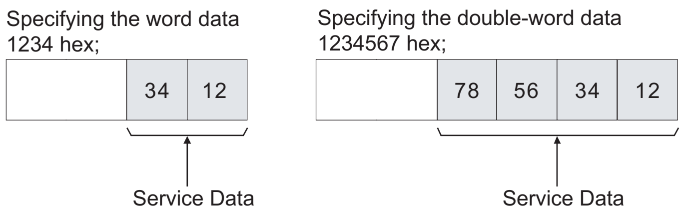
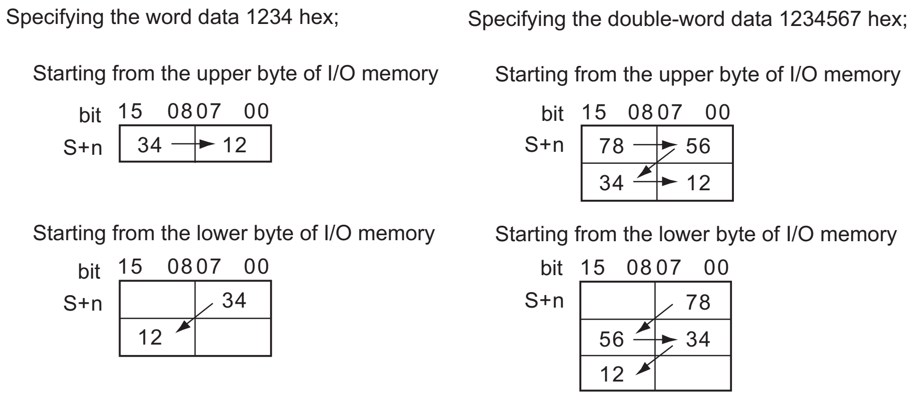
Additional Information

- Among the Service Data, word data (in unit of 2 bytes) and double-word data (in unit of 4 bytes) such as channel data and error releasing codes are specified from the lower-order bits first, and stored in a command format. For example, when the word data 1234 hex is specified, 34 hex is specified first, which is followed by 12 hex. When the double-word data 12345678 hex is specified, the lowest order bit 78 hex is specified first. Then it is followed by 56 hex, 34 hex and 12 hex in this order. These command formats are as illustrated in below.



Data is thus set in I/O memory starting from the address specified for operand S of the CMND instruction as follows:



- In the same manner, when the Service Data for a response message is with words (in unit of 2 bytes) or double-words (in unit of 4 bytes), the lower-order bit is stored first in the response format, then followed by upper bits.

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A-3 Object Mounting

A-3-1 Identity Objects (0x01)

Object class	Attribute	Not supported
	Service	Not supported

Object instance	Attribute	ID	Contents	Get	Set	Value
		1	Vendor	Yes	-	47
		2	Devicetype	Yes	-	*
		3	Productcode	Yes	-	*
		4	Revision	Yes	-	1.1
		5	Status (bitssupported)	Yes	-	Bit 0 only
		6	Serialnumber	Yes	-	Unique for each Unit
		7	Productname	Yes	-	*
		8	State	-	-	-
	Service	Code	Contents	Parameter option		
		05	Reset	No		
		0E	Get_Attribute_Single	No		

* These items differ by the type of Slave Unit. See following tables.

Model		DeviceType	Product code	Product name
Slave Unit	Expansion Unit			
CRT1-VAD02SD	None	00 hex	06B6 hex	CRT1-VAD02SD
	XWT-VMD08S	00 hex	06B6 hex	
	XWT-VMD08S-1	00 hex	06B6 hex	
	XWT-VOD08S	00 hex	06B6 hex	
	XWT-VOD08S-1	00 hex	06B6 hex	
	XWT-VMD16ML	00 hex	06B6 hex	
	XWT-VMD16ML-1	00 hex	06B6 hex	
	XWT-VOD16ML	00 hex	06B6 hex	
	XWT-VOD16ML-1	00 hex	06B6 hex	
CRT1-VAD02MLD	None	00 hex	06B7 hex	CRT1-VAD02MLD
	XWT-VMD08S	00 hex	06B7 hex	
	XWT-VMD08S-1	00 hex	06B7 hex	
	XWT-VOD08S	00 hex	06B7 hex	
	XWT-VOD08S-1	00 hex	06B7 hex	
	XWT-VMD16ML	00 hex	06B7 hex	
	XWT-VMD16ML-1	00 hex	06B7 hex	
	XWT-VOD16ML	00 hex	06B7 hex	
	XWT-VOD16ML-1	00 hex	06B7 hex	

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Model		DeviceType	Product code	Product name
Slave Unit	Expansion Unit			
CRT1-VDA02SD	None	00 hex	06B8 hex	CRT1-VDA02SD
	XWT-VMD08S	00 hex	06BB hex	CRT1-VDA02SD + INx
	XWT-VMD08S-1	00 hex	06BB hex	
	XWT-VOD08S	00 hex	06B8 hex	CRT1-VDA02SD
	XWT-VOD08S-1	00 hex	06B8 hex	
	XWT-VMD16ML	00 hex	06BB hex	CRT1-VDA02SD + INx
	XWT-VMD16ML-1	00 hex	06BB hex	
	XWT-VOD16ML	00 hex	06B8 hex	CRT1-VDA02SD
	XWT-VOD16ML-1	00 hex	06B8 hex	
CRT1-VDA02MLD	None	00 hex	06B9 hex	CRT1-VDA02MLD
	XWT-VMD08S	00 hex	06BC hex	CRT1-VDA02MLD + INx
	XWT-VMD08S-1	00 hex	06BC hex	
	XWT-VOD08S	00 hex	06B9 hex	CRT1-VDA02MLD
	XWT-VOD08S-1	00 hex	06B9 hex	
	XWT-VMD16ML	00 hex	06BC hex	CRT1-VDA02MLD + INx
	XWT-VMD16ML-1	00 hex	06BC hex	
	XWT-VOD16ML	00 hex	06B9 hex	CRT1-VDA02MLD
	XWT-VOD16ML-1	00 hex	06B9 hex	

A-3-2 Message Router Objects (0x02)

Object class	Attribute	Not supported
	Service	Not supported
Object instance Attribute	Attribute	Not supported
	Service	Not supported
Addition of vender specification		None

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A-3-3 Assembly Objects (0x04)

Object class	Attribute	Not supported
	Service	Not supported

Object instance	Attribute	ID	Contents	Get	Set	Value
		1	Number of members in list	-	-	-
		2	Member list	-	-	-
		3	Data	Yes	-	-
	Service	Code	Contents	Parameter option		
		0E	Get_Attribute_Single	No		

These tables show the assembly instances for CompoNet Slave Units.

● Analog Input Slave Units

Instance No.	Byte	Bit allocation								Supported model
Instance 102 Analog Data 1 (input)	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD
	+1									
	+2	Ch1 Analog Data								
	+3									
Instance 122 Top/Valley Detection Timing Flag	+0	0	0	0	0	0	0	V_ST1	V_ST0	CRT1-VAD02SD CRT1-VAD02MLD
	+1	0	0	0	0	0	0	T_ST1	T_ST0	
Instance 132 Analog Status Flag	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-VAD02SD CRT1-VAD02MLD
	+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	
Instance 120 Expansion Output	+0	0	0	0	0	o3	o2	o1	o0	XWT-VMD08S (1) /ML (-1)
	+0	o7	o6	o5	o4	o3	o2	o1	o0	XWT-VOD08S (-1) /ML (-1) XWT-VMD16S (-1) /ML (-1)
	+0	o7	o6	o5	o4	o3	o2	o1	o0	XWT-VOD16S (-1) /ML (-1)
	+1	o15	o14	o13	o12	o11	o10	o9	o8	
Instance 172 Analog Data 1 + Top/valley Detection Timing Flag	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	0	0	0	0	0	0	V_ST1	V_ST0	
	+5	0	0	0	0	0	0	T_ST1	T_ST0	

Instance No.	Byte	Bit allocation								Supported model
Instance 112 Analog Data 1 + Expansion Input	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD08S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	0	0	0	0	i3	i2	i1	i0	
	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD16S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	i7	i6	i5	i4	i3	i2	i1	i0	
Instance 124 Top/Valley Detection Timing Flag + Expansion Input	+0	0	0	0	0	0	0	V_ST1	V_ST0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD08S (-1) /ML (-1)
	+1	0	0	0	0	0	0	T_ST1	T_ST0	
	+2	0	0	0	0	i3	i2	i1	i0	
	+0	0	0	0	0	0	0	V_ST1	V_ST0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD16S (-1) /ML (-1)
	+1	0	0	0	0	0	0	T_ST1	T_ST0	
	+2	i7	i6	i5	i4	i3	i2	i1	i0	
Instance 142 Analog Status Flag + Expansion Input	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD08S (-1) /ML (-1)
	+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	
	+2	0	0	0	0	i3	i2	i1	i0	
	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD16S (-1) /ML (-1)
	+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	
	+2	i7	i6	i5	i4	i3	i2	i1	i0	
Instance 182 Analog Data 1 + Top/Valley Detection Timing Flag + Expansion Input	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD08S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	0	0	0	0	0	0	V_ST1	V_ST0	
	+5	0	0	0	0	0	0	T_ST1	T_ST0	
	+6	0	0	0	0	i3	i2	i1	i0	
	+0	Ch0 Analog Data								CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD16S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	0	0	0	0	0	0	V_ST1	V_ST0	
	+5	0	0	0	0	0	0	T_ST1	T_ST0	
	+6	i7	i6	i5	i4	i3	i2	i1	i0	
Instance 190 HOLD Flag	+0	-	-	-	-	-	-	HD1	HD0	CRT1-VAD02SD CRT1-VAD02MLD

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Instance No.	Byte	Bit allocation								Supported model
Instance 194 HOLD Flag + Expansion Output	+0	-	-	-	-	-	-	HD1	HD0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VMD08S (-1) /ML (-1)
	+1	0	0	0	0	0	0	0	0	
	+2	0	0	0	0	o3	o2	o1	o0	
	+0	-	-	-	-	-	-	HD1	HD0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VOD08S (-1) /ML (-1) XWT-VMD16S (-1) /ML (-1)
	+1	0	0	0	0	0	0	0	0	
	+2	o7	o6	o5	o4	o3	o2	o1	o0	
	+0	-	-	-	-	-	-	HD1	HD0	CRT1-VAD02SD CRT1-VAD02MLD + XWT-VOD16S (-1) /ML (-1)
	+1	0	0	0	0	0	0	0	0	
	+2	o7	o6	o5	o4	o3	o2	o1	o0	
	+3	o15	o14	o13	o12	o11	o10	o9	o8	

● Analog Output Slave Unit

Instance No.	Byte	Bit allocation								Supported model
Instance 192 Analog Output Data	+0	Ch0 Analog Data								CRT1-VDA02SD CRT1-VDA02MLD
	+1									
	+2	Ch1 Analog Data								
	+3									
Instance 100 Expansion Input	+0	0	0	0	0	i3	i2	i1	i0	XWT-VMD08S (-1) /ML (-1)
	+0	i7	i6	i5	i4	i3	i2	i1	i0	XWT-VMD16S (-1) /ML (-1)
Instance 152 Analog Output Data + Expansion Output	+0	Ch0 Analog Data								CRT1-VDA02SD CRT1-VDA02MLD + XWT-VMD08S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	0	0	0	0	o3	o2	o1	o0	
	+0	Ch0 Analog Data								CRT1-VDA02SD CRT1-VDA02MLD + XWT-VMD08S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	o7	o6	o5	o4	o3	o2	o1	o0	
	+0	Ch0 Analog Data								CRT1-VDA02SD CRT1-VDA02MLD + XWT-VMD08S (-1) /ML (-1)
	+1									
	+2	Ch1 Analog Data								
	+3									
	+4	o7	o6	o5	o4	o3	o2	o1	o0	
	+5	o15	o14	o13	o12	o11	o10	o9	o8	

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A-3-4 Connection Object (0x05)

Object class	Attribute	Not supported
	Service	Not supported
	Number of maximum active connections	1

Object instance 1	Section	Information		Number of maximum instances		
	Instance type	Polled I/O		1		
	Production trigger	Cyclic		-		
	Transport type	Server				
	Transport class	2				
	Attribute	ID	Contents	Get	Set	Value
		1	State	Yes	-	-
		2	Instance type	Yes	-	01 h
		3	Transport class trigger	Yes Yes	-	82 h: (In and Mix slaves) 80 h: (Out slaves and Repeaters)
		4	Produced connection ID	Yes	-	-
		5	Consumed connection ID	Yes	-	-
		6	Initial comm.characteristics	Yes	-	01 h
		7	Produced connection size	Yes	-	*
		8	Consumed connection size	Yes	-	*
		9	Expected packet rate	Yes	Yes	-
		12	Watchdog time-out action	Yes	-	00
		13	Produced connection path length	Yes	-	*
		14	Produced connection path	Yes	-	*
		15	Consumed connection path length	Yes	-	*
		16	Consumed connection path	Yes	-	*
		17	Production inhibit time	Yes	-	0000 h
	Service	Code	Description	Parameter option		
		05	Reset	None		
		0E	Get_Attribute_Single	None		
		10	Set_Attribute_Single	None		

* These items differ by the type of Slave Unit. See following tables.

Model		Name	Produced connection size	Produced connection path length	Produced connection path	Consumed connection size	Consumed connection path length	Consumed connection path
Slave Unit	Expansion Unit							
CRT1-VAD02SD		Analog Data1	0004	0006	20_04_24_66_ 30_03	0000	0000	-
		Generic Status	0001	0006	20_04_24_79_ 30_03	0000	0000	-
		Top and Valley shot	0002	0006	20_04_24_7A_ 30_03	0000	0000	-
		Analog Status	0002	0006	20_04_24_84_ 30_03	0000	0000	-
		Top and Valley shot + Generic Status	0003	0006	20_04_24_97_ 30_03	0000	0000	-
		Analog Status + Generic Status	0003	0006	20_04_24_A4_ 30_03	0000	0000	-
		Analog data1 + Top and valley shot	0006	0006	20_04_24_AC_ 30_03	0000	0000	-
		Analog data + Top and valley shot + Generic Status	0007	0006	20_04_24_B8_ 30_03	0000	0000	-
		Hold control	0000	0000	-	0001	0006	20_04_24_BE_ 30_03

Model		Name	Produced connection size	Produced connection path length	Produced connection path	Consumed connection size	Consumed connection path length	Consumed connection path
Slave Unit	Expansion Unit							
CRT1-VAD02MLD		Analog Data1	0004	0006	20_04_24_66_ 30_03	0000	0000	-
		Generic Status	0001	0006	20_04_24_79_ 30_03	0000	0000	-
		Top and Valley shot	0002	0006	20_04_24_7A_ 30_03	0000	0000	-
		Analog Status	0002	0006	20_04_24_84_ 30_03	0000	0000	-
		Top and Valley shot + Generic Status	0003	0006	20_04_24_97_ 30_03	0000	0000	-
		Analog Status + Generic Status	0003	0006	20_04_24_A4_ 30_03	0000	0000	-
		Analog data1 + Top and valley shot	0006	0006	20_04_24_AC_ 30_03	0000	0000	-
		Analog data + Top and valley shot + Generic Status	0007	0006	20_04_24_B8_ 30_03	0000	0000	-
		Hold control	0000	0000	-	0001	0006	20_04_24_BE_ 30_03
CRT1-VDA02SD		Generic Status	0001	0006	20_04_24_79_ 30_03	-	-	-
		Analog Data	-	-	-	0004	0006	20_04_24_C0_ 30_03
CRT1-VDA02MLD		Generic Status	0001	0006	20_04_24_79_ 30_03	-	-	-
		Analog Data	-	-	-	0004	0006	20_04_24_C0_ 30_03

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A-4 Connectable Devices

A-4-1 Analog I/O Slave Units

Model	Name and Specification	Manufacturer
CRT1-VAD02SD	CompoNet Analog Slave Unit with 2 inputs (e-CON connector terminal)	OMRON
CRT1-VDA02SD	CompoNet Analog Slave Unit with 2 outputs (e-CON connector terminal)	
CRT1-VAD02MLD	CompoNet Analog Slave Unit with 2 inputs (MIL connector terminal)	
CRT1-VDA02MLD	CompoNet Analog Slave Unit with 2 outputs (MIL connector terminal)	

A-4-2 Expansion Units

Model	Name and Specification	Manufacturer
XWT-VMD08S	Expansion Unit with 4 inputs and 4 outputs (e-CON connector terminal, NPN)	OMRON
XWT-VMD08S-1	Expansion Unit with 4 inputs and 4 outputs (e-CON connector terminal, PNP)	
XWT-VOD08S	Expansion Unit with 8 outputs (e-CON connector terminal, NPN)	
XWT-VOD08S-1	Expansion Unit with 8 outputs (e-CON connector terminal, PNP)	
XWT-VMD16ML	Expansion Unit with 8 inputs and 8 outputs (MIL connector terminal, NPN)	
XWT-VMD16ML-1	Expansion Unit with 8 inputs and 8 outputs (MIL connector terminal, PNP)	
XWT-VOD16ML	Expansion Unit with 16 outputs (MIL connector terminal, NPN)	
XWT-VOD16ML-1	Expansion Unit with 16 outputs (MIL connector terminal, PNP)	

A-4-3 Communications Cables

Model	Name and Specification	Manufacturer
-	Round cable I, conforming to CompoNet specifications.	-
-	Round cable II, conforming to CompoNet specifications.	-
DCA4-4F10	Flat Cable I (a standard Flat Cable, 4 conductors, UL certified) Length: 100 m, Conductor size: 0.75 mm2 x 2 wires, 0.5 mm2 x 2 wires	OMRON
DCA5-4F10	Flat Cable II (a sheathed Flat Cable, 4 conductors, UL certified) Length: 100 m, Conductor size: 0.75 mm2 x 2 wires, or 0.5 mm2 x 2 wires, IP54	OMRON

A-4-4 Connectors

Model	Name and Specification	Manufacturer
DCN4-TR4	Flat Connector I Socket, a connector socket for Flat Cable I	OMRON
DCN5-TR4	Flat Connector II Socket, a connector socket for Flat Cable II	
DCN4-BR4	Flat Connector I Plug, a connector plug for Flat Cable I	
DCN5-BR4	Flat Connector II Plug, a connector plug for Flat Cable II	
DCN4-MD4	Multidrop Connector, for multidrop connections	
DCN4-TB4	Open Type Connector, for connecting Master, Slave and Repeater Units. It is used to convert the communications connector of the Unit to a terminal block. The block sizes M3.	

A-4-5 Terminating Resistors

Model	Name and Specification	Manufacturer
DRS1-T	Terminal block-type Terminating Resistor for round cable I, 121 Ω	OMRON
DCN4-TM4	Connector-type Terminating Resistor for round cable II and Flat Cable I, 121 Ω	
DCN5-TM4	Connector-type Terminating Resistor for Flat Cable II, 121 Ω	

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A-5 Current Consumption Summary

A-5-1 Analog I/O Slave Units

Model	Communications current consumption (mA max)
CRT1-VAD02SD	70 for 24 VDC, 105 for 14 VDC
CRT1-VDA02SD	125 for 24 VDC, 195 for 14 VDC
CRT1-VAD02MLD	70 for 24 VDC, 105 for 14 VDC
CRT1-VDA02MLD	125 for 24 VDC, 195 for 14 VDC

A-5-2 Expansion Units

Model	Communications current consumption (mA max)
XWT-VMD08S	10 for 24 VDC, 15 for 14 VDC
XWT-VMD08S-1	10 for 24 VDC, 15 for 14 VDC
XWT-VOD08S	10 for 24 VDC, 15 for 14 VDC
XWT-VOD08S-1	10 for 24 VDC, 15 for 14 VDC
XWT-VMD16ML	10 for 24 VDC, 20 for 14 VDC
XWT-VMD16ML-1	10 for 24 VDC, 20 for 14 VDC
XWT-VOD16ML	10 for 24 VDC, 20 for 14 VDC
XWT-VOD16ML-1	10 for 24 VDC, 20 for 14 VDC

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Revision History

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

Cat. No. W484-E1-01

Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	May 2009	Original production

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