Cat. No. W457-E1-01

CRT1-ID16(-1)/OD16(-1),
CRT1B-ID/OD/MD□□□□(-1),
CRT1-AD04/DA02,
CRS1-RPT01

CompoNet Slave Units and Repeater Unit

OPERATION MANUAL

OMRON

CompoNet

CRT1-ID16(-1)/OD16(-1), CRT1B-ID/OD/MD□□□□(-1), CRT1-AD04/DA02 Slave Units and CRS1-RPT01 Repeater Unit

Operation Manual

Produced September 2006

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

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

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

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes the installation and operation of the CompoNet CRT1-ID16(-1)/OD16(-1), CRT1B-ID/OD/MD□□□(-1), and CRT1-AD04/DA02 Slave Units, and the CRS1-RPT01 Repeater Unit and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate a CompoNet Slave Unit or Repeater Unit. Be sure to read the precautions provided in the following section. Also be sure to read the *CompoNet Master Unit Operation Manual* (see following table) together with this manual.

Precautions provides general precautions for using the CompoNet Slave Units, Repeater Units, Programmable Controller, and related devices.

Section 1 introduces the CompoNet Slave Units and the various models that are available.

Section 2 describes the configurations of CompoNet Networks.

Section 3 describes how to install and wire a CompoNet Network.

Section 4 provides the basic specifications of the Slave Units.

Section 5 describes the Digital I/O Slave Units.

Section 6 describes the Bit Slave Units.

Section 7 describes the Analog I/O Slave Units.

Section 8 describes the Repeater Unit.

Section 9 individually describes the functions provided by CompoNet Slave Unit. The functions are divided into those supported by all CompoNet Slave Units and those supported only by specific CompoNet Slave Units.

Section 10 provides troubleshooting information that can be used in the event a problem occurs in CompoNet Slave Unit operation. It also provides information on maintenance that should be performed to ensure optimum application of the CompoNet Slave Units.

The ***Appendices*** provide specialized information, including information on CompoNet explicit messages, object mounting, connectable devices, current consumption, and precautions for connecting two-wire DC sensors.

Related Manuals:

Cat. No.	Models	Name	Description
W456	CS1W-CRM21 and CJ1W-CRM21	CS/CJ-series CompoNet Master Units Operation Manual	Provides an overview of CompoNet Networks, communications specifications, wring methods, and CompoNet Master Unit functions.
W457 (this manual)	CRT1-ID16(-1)/0D16(-1) CRT1B-ID/OD/MD□□□□(-1) CRT1-AD04/DA02 CRS1-RPT01	CompoNet Slave Units and Repeater Unit Operation Manual	Provides the specifications of CompoNet Slave Units and Repeater Unit.

⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

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.

PRECAUTIONS

This section provides general precautions for using the CompoNet CRT1-ID16(-1)/OD16(-1), CRT1B-ID/OD/MD□□□(-1), and CRT1-AD04/DA02 Slave Units, and the CRS1-RPT01 Repeater Unit.

The information contained in this section is important for the safe and reliable application of the CompoNet Slave Units and Repeater Unit. You must read this section and understand the information contained before attempting to set up or operate a CompoNet Network using CompoNet Slave Units or Repeater Units.

1 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.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the Unit. Be sure to read this manual before attempting to use the Unit and keep this manual close at hand for reference during operation.

⚠WARNING It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications.

3 Safety Precautions

⚠WARNING Do not attempt to take any Unit apart and do not touch the interior of any Unit while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Provide safety measures in external circuits (i.e., not in the Programmable Controller), 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-V DC output (service power supply) is overloaded or short-circuited, 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.

⚠ **WARNING** 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.

4 Operating Environment Precautions

⚠**Caution** 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 (including acids).
- Locations subject to shock or vibration.

⚠**Caution** 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.

⚠**Caution** The operating environment of the PLC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PLC System. Make sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Application Precautions

Observe the following precautions when using a CompoNet Network.

- Always separate Flat Cables (Standard and Sheathed) for different CompoNet lines by at least 5 mm to prevent unstable operation due to interference. Do not bundle Flat Cables.
- 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.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.
- Always use the power supply voltages specified in this manual. 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.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

- When installing the Units, ground to 100 Ω min.
- Mount the Units securely using either DIN Track or screws.
- Always turn OFF the power supply before assembling any Units.
- Check all wiring and switch settings to be sure they are correct.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.
- 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 turn OFF the power supply to the PLC and Slave Units before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
    - Mounting or dismounting I/O Units, Power Supply Units, CPU Units, Memory Cassettes, Master Units, or any other Units.
    - Removing or attaching terminal blocks to Slave Units.
    - Assembling Units.
    - Setting DIP switches and rotary switches.
    - Connecting cables or wiring the system.
- 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.
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.
- When replacing parts, be sure to confirm that the ratings of the new part are correct. Not doing so may result in malfunction or burning.
- After replacing Units, resume operation only after transferring to the new CPU Unit and/or Special I/O Units the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- After setting the rotary switches and completing wiring for water-resistant Units, tighten the cover screws to the specified torque. The degree of protection will not be achieved if the screws are not tightened properly.
- Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.
- Make sure that all terminal block screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Make sure that all Slave Unit mounting screws and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Use the correct wiring materials to wire the Units.
- Double-check all wiring before turning ON the power supply. Incorrect wiring may result in burning.
- Do not allow foreign matter to enter the Unit.
- Confirm the polarity of all terminals before wiring them.
- Confirm voltage specifications when wiring communications, the power supply, and I/O crossovers. Incorrect wiring may result in malfunction.
- Wire all connections correctly according to instructions in the manual.

- 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.
- Do not drop any Unit or subject any Unit to excessive shock or vibration. Otherwise, Unit failure or malfunction may occur.
- When transporting the Unit, use special packing boxes and protect it from being exposed to excessive vibration or impact during transportation.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in unexpected operation.
- Touch a grounded piece of metal to discharge static electricity from your body before touching any Unit.
- Do not bend cables past their natural bending radius or pull on cables.
- Always use the specified communications cables and connectors.
- 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.
- Do not extend connection distances or the number of connected nodes beyond the ranges given in the specifications.

6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives

6-2 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 (see note). 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.

Note 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)

6-3 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:

1,2,3...

1. The products must be installed within a control panel.
2. The DC power supplies connected to DC Power Supply Units and I/O Units must use reinforced insulation or double insulation.
3. 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.

SECTION 1
Features and Slave Units

This section introduces the CompoNet Slave Units and the various models that are available.

1-1 Features of CompoNet Slave Units

1-1-1 Overview

CompoNet Slave Units do not simply input and output ON/OFF signals, they can also collect a variety of information that can improve equipment operating rates.

They can also be used to build maintenance systems separate from control systems. Coexisting control and maintenance systems can contribute to reducing equipment startup time, recovery time after problems, and preventative maintenance of equipment.

■ **Control System:**

For remote I/O communications with the PLC, I/O is allocated for each node address by default. In addition, Slave Unit status information other than I/O is allocated in an input area in the Master Unit. The allocation can be set using the CompoNet Support Software or explicit messages.

■ **Maintenance System:**

Slave Units can store several kinds of equipment data. This data can be read from or written to the Slave Unit's memory using the CompoNet Support Software or by sending explicit messages from the Master Unit (PLC) to the Slave Unit.

1-1-2 Features of CompoNet Slave Units

CompoNet Slave Units have the following features.

Features Common to All Slave Units

Rotary Switch Setting of Node Addresses
Node addresses can now be set much more easily using rotary switches.

Automatic Baud Rate Detection
The baud rate is automatically set to the same baud rate as the Master Unit; therefore, there is no need to set the baud rate of the Slave Units.

Network Power Voltage Monitoring
The network power supply voltage (present, maximum, and minimum values) can be stored in the Slave Unit memory. These values can be read using the CompoNet Support Software. A monitor voltage can also be set in the Slave Unit to enable obtaining notification of the status if the voltage drops to the preset value.

Unit ON Time Monitor
The total ON time of the Slave Unit's internal circuit power supply can be stored. This value can be read using the CompoNet Support Software or explicit messages. A value can also be set in the Slave Unit to enable obtaining notification of the status if the total time reaches a set monitor value.

Naming Units
The user can set any name for each Unit as a comment. The names are stored in Slave Unit memory.

Naming Connected Devices
Any name can be set for each I/O contact (e.g., sensor or valve) connected to a Slave Unit. The names are stored in Slave Unit memory.

Communications Error History Monitor
The previous four error records (communications error codes and the power voltage when the error occurred) can be held in the Slave Unit memory and can be read using the CompoNet Support Software.

Last Maintenance Date (Maintenance Function)
The date that maintenance was performed can be written in the Slave Unit using the CompoNet Support Software.

Features of Word Slave Units and Bit Slave Units

Input Filters

The Slave Units can eliminate data omissions by noise or switch chattering by reading input values multiple times during the set time.

An ON delay or OFF delay can also be implemented using this function.

Preventing Malfunctions Caused by Inrush Current at Startup

This function holds inputs from when the power is turned ON until the Unit stabilizes, i.e., inputs are not received while the I/O power is OFF and for 100 ms after the I/O power is turned ON. This contributes to eliminating input errors caused by inrush current when the I/O power is turned ON.

Contact Operation Monitor

The number of times each input contact or output contact is turned ON can be counted (resolution: 50 Hz max.) and stored. These values can be read using the CompoNet Support Software or explicit messages. A value can also be set in the Slave Unit to enable obtaining notification of the status if the number of contact operations reaches the set value.

Note The contact operation monitor and the total ON time monitor cannot both be used for the same contact at the same time.

Total ON Time Monitor

The total ON time of sensors, relays, and other devices are stored in the Slave Unit memory. These values can be read using the CompoNet Support Software or explicit messages. A value can also be set in the Slave Unit to enable obtaining notification of the status if the total time reaches the set value.

Note The total ON time monitor and the contact operation monitor cannot be used at the same time for the same contact.

Operation Time Monitor

The Slave Unit can quickly measure the time from when an output turns ON until an input turns ON without relying on the ladder program. A time can be set in the Slave Unit memory to enable obtaining notification of the status when the measured time exceeds the set time. (This data can be read using the CompoNet Support Software or by explicit messages.)

Communications Error Output Setting (Output Units Only)

The output value when a communications error occurs can be set for each bit of an Output Unit.

Features Unique to Bit Slave Units

Bit-level Distribution

Units are available with 2 inputs, 2 outputs, 4 inputs, 2 inputs/2 outputs. This enables bit-level distribution with Slave Units. At the same time, unused Slave Unit I/O can be suppressed.

Industry Standard e-CON Connectors

No special tools are required for connections because e-CON Connectors (industry standard) are used. Electrical cables do not need to be stripped and are simply inserted with pliers. Using e-CON Connectors, there is no need to prepare special tools for wiring.

Units with Clamp Terminal Blocks (CRT1B-MD04SLP (-1))

There is no need to tighten the screws because these units use screw-less clamp terminal blocks. Connections are made simply by inserting the pin terminals. Wiring can be completed in one step.

IP54 Dust-tight, Splash-proof Units

The CRT1B-□D□□SP(-1) Units conform to the IEC IP54 dust-tight, splash-proof degree of protection (see note). These Units can be used outside of control panels in environments subject to dust and water splashes.

Note The degree of protection is the protection against ingress by the human body, solid material, or water. IP54 means that dust will not penetrate inside the device to interfere the operation for protection against the human body and solid material. As for water, water splashing from any direction will not harmfully affect the devices.

Flat Cable Connected as a Standard Features

Bit Slave Units are sold with Standard or Sheathed Flat Cable already connected. Bit Slaves cannot be used, however, for a baud rate of 4 Mbit/s (no branch lines).

No I/O Power Supply Wiring Required

The current consumption for external I/O (sensors or actuators) connected to Bit Slaves using e-CON or clamp terminals is supplied through the Flat Cable. No separate wiring is required for I/O power supply.

Sensor Power Short-circuit Detection

The I/O power current is monitored. If an excessive current is detected, it will be assumed that a sensor power short-circuit has occurred and the sensor power output will be turned OFF forcibly.

External Load Short-circuit Detection

The output load current is monitored. If an excessive current is detected, it will be assumed that an external load short-circuit has occurred and the output will be turned OFF forcibly to prevent damage to the Unit's output circuit.

Features Unique to Digital I/O Slave Units

I/O Power Status Monitor

The I/O power status monitor function checks if the I/O power is ON or not, and provides notification in a status area. (This data can be read using the CompoNet Support Software or by explicit messages.)

Removable Terminal Block

The terminal block can be removed.

Expansion Using Expansion Units

One Expansion Unit can be added to each Basic Unit. This enables expanding to a variety of I/O combinations, e.g., 16 inputs and 8 outputs or 24 inputs (16 inputs + 8 inputs). This extends the range of possible system configurations.

Features of Analog I/O Slave Units

Setting the Number of AD Conversion Points (Input Units Only)

The conversion cycle is 4 ms max. when using all 4 analog inputs. The AD conversion cycle can be made faster if fewer AD conversion points are used.

Moving Average (Input Units Only)

Analog Input Slave Units can calculate the average of the last 8 inputs (moving average) and use it as the converted digital data. Smooth input values can be obtained by averaging the inputs if there are small fluctuations in the input.

Scaling

Converted data can be scaled to any value by the user. Ladder program calculations for the Master Unit are not required if the scaling function is used with the Slave Unit. The offset compensation function can also be used to offset scaled values.

Peak/Bottom Hold (Input Units Only)

The peak/bottom hold function holds the maximum (peak) or the minimum (bottom) value input to the Analog Input Slave Unit. The maximum (peak) and minimum (bottom) value can be compared with an alarm set value and used as status data to turn ON alarm flags (comparator function).

Top/Valley Hold (Input Units Only)

The top/valley hold function holds the top or valley value input to the Analog Input Slave Unit. The Top/Valley Detection Timing Flag can be used to check when top and valley values were detected. The top and valley values can be compared with an alarm set value and used as status data to turn ON alarm flags (comparator function).

Rate of Change Calculations (Input Units Only)

The rate of change calculation function can find the rate of change for the set data sampling cycle for the values input to the Analog Input Slave Unit.

Comparator (Input Units Only)

The inputs to Analog Input Slave Units or calculated data can be compared with alarm settings (upper upper limit, upper limit, lower limit, and lower lower limit) and the result stored in the Analog Status Flags. The Normal Flag (pass signal) turns ON for values outside the set range.

Disconnected Line Detection (Input Units Only)

With Analog Input Slave Units, the Disconnected Line Detection Flag for each channel can be used in the Master Unit to check whether the analog input lines (for voltage inputs or current inputs) are disconnected for channels enabled for analog inputs under the setting of the number of AD conversion points. This function is supported only when the input range is 1 to 5 V or 4 to 20 mA.

For Temperature Input Slave Units, this function checks for disconnection of connected sensor inputs at each contact. Any disconnected inputs can be checked from the Master Unit using the Disconnected Line Detection Flags.

User Adjustment

The user adjustment function can be used to compensate offsets in input (or output) values that occur due to the features of or connection method used for input or output devices to adjust the input (or output). The conversion line is adjusted at two points: 0% and 100%.

Cumulative Counter

The cumulative counter function calculates the integral time for input (or output) analog values and reads the cumulative value.

Monitor values can be set in Units. If the cumulative counter value exceeds the set monitor value, the Cumulative Counter Monitor Flag in general status turns ON.

Communications Error Output Setting (Output Units Only)

The output value when a communications error occurs can be set for each word for Output Units.

1-2 Slave Unit Models

CompoNet Slave Units can be classified into the following groups.

Word Slave Units

Word Slave Units are Slave Units that are allocated units of 16 bits (i.e., 1 word) in I/O memory of the CPU Unit.

Digital I/O Slave Units: Slave Units with digital I/O functions that use Flat Cable (either Standard or Sheathed) or VCTF 2-conductor cable.

Analog I/O Slave Units: Slave Units with analog I/O functions that use Flat Cable (either Standard or Sheathed) or VCTF 2-conductor cable.

IP20 and IP54 Bit Slave Units

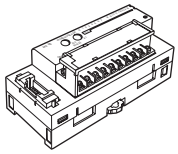
Bit Slave Units are Slave Units that are allocated units of 2 bits in I/O memory of the CPU Unit.

Bit Slave Units provide 2 or 4 digital contact I/O points and have Standard or Sheathed Flat Cable already connected.

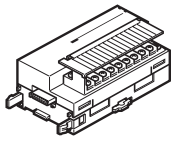
1-2-1 Word Slave Units

Digital I/O Slave Units

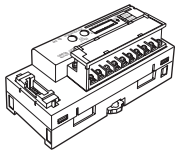
Basic Units

Appearance	I/O capacity	Model	Features
	16 inputs (NPN)	CRT1-ID16	Terminal blocks can be attached/ removed from the Unit.
	16 inputs (PNP)	CRT1-ID16-1	
	16 outputs (NPN)	CRT1-OD16	
	16 outputs (PNP)	CRT1-OD16-1	

Expansion Units

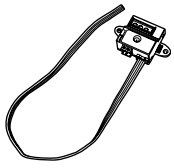
Appearance	I/O capacity	Model	Features
	8 inputs (NPN)	XWT-ID08	Expansion Units expand the number of points for a Basic Unit. One Expansion Unit can be added to each Basic Unit.
	8 inputs (PNP)	XWT-ID08-1	
	8 outputs (NPN)	XWT-OD08	
	8 outputs (PNP)	XWT-OD08-1	
	16 inputs (NPN)	XWT-ID16	
	16 inputs (PNP)	XWT-ID16-1	
	16 outputs (NPN)	XWT-OD16	
	16 outputs (PNP)	XWT-OD16-1	

Analog I/O Slave Units

Appearance	I/O capacity	Model	Features
	4 analog inputs	CRT1-AD04	0 to 5 V, 1 to 5 V, 0 to 10 V, -10 to 10 V, 0 to 20 mA, 4 to 20 mA
	2 analog outputs	CRT1-DA02	

1-2-2 Bit Slave Units

IP20 Bit Slave Units

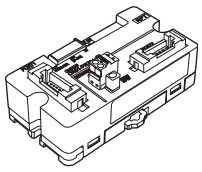
Appearance	I/O capacity	Connectors	Degree of protection	Model	Features
	2 inputs (NPN)	Industrial standard connectors (e-CON)	IP20 indoor enclosure	CRT1B-ID02S	• Flat Cable connected as standard feature • Industrial standard connectors (e-CON)
	2 inputs (PNP)			CRT1B-ID02S-1	
	2 outputs (NPN)			CRT1B-OD02S	
	2 outputs (PNP)			CRT1B-OD02S-1	

IP54 Bit Slave Units

Appearance	I/O capacity	Connectors	Degree of protection	Model	Features
	2 inputs (NPN)	Industrial standard connectors (e-CON)	IP54 dust-tight/splash-proof	CRT1B-ID02SP	• Flat Cable connected as standard feature • Industrial standard connectors (e-CON)
	2 inputs (PNP)			CRT1B-ID02SP-1	
	2 outputs (NPN)			CRT1B-OD02SP	
	2 outputs (PNP)			CRT1B-OD02SP-1	
	4 inputs (NPN)			CRT1B-ID04SP	
	4 inputs (PNP)			CRT1B-ID04SP-1	
	2 inputs/2 outputs (NPN)	Clamp terminal block		CRT1B-MD04SLP	• Flat Cable connected as standard feature • Clamp Terminal Block
	2 inputs/2 outputs (PNP)			CRT1B-MD04SLP-1	

Note Bit Slaves have Standard or Sheathed Flat Cable connected as standard feature. They cannot be at a baud rate of 4 Mbit/s, for which branch lines are not supported.

1-2-3 Repeater Units

Appearance	Specifications	Model	Features
	Two communications connectors (Upstream port and downstream port) One downstream port power supply connector Up to 64 Units can be connected for each Master Unit.	CRS1-RPT01	• For trunk line-branch line formations, sub-trunk lines can be connected under a Repeater Unit just like they can be under the Master Unit. • For unrestricted branching formations, there are no restrictions on the connections. • Repeater Units enable branching the trunk line, adding more nodes, increasing the connection distance, and changing the type of cable upstream and downstream of the Repeater Unit.

1-2-4 CompoNet Slave Unit Functions

Yes: Supported, ---: Not supported

Unit / Function	CompoNet Slave Units						
	Digital I/O Slave Units		Bit Slave Units			Analog I/O Slave Units	
	Input Units	Output Units	Input Units	Output Units	I/O Units	Input Units	Output Units
Operation Time Monitor	Yes					---	
Contact Operation Monitor	Yes					---	
Total ON Time Monitor	Yes					---	
Automatic Baud Rate Detection	Yes						
Unit ON Time Monitor	Yes						
Naming Units	Yes						
Naming Connected Devices	Yes						
Network Power Voltage Monitor	Yes						
I/O Power Status Monitor	Yes					---	
Communications Error History Monitor	Yes						
Input Filter	Yes	---	Yes	---	Yes	---	
Communications Error Output	---	Yes	---	Yes		---	Yes
Preventing Malfunctions Caused by Inrush Current at Startup	Yes	---	Yes	---	Yes	---	---
Sensor Power Short-circuit Detection	---		Yes	---	Yes	---	
External Load Short-circuit Detection	---			Yes		---	
Expansion Using Expansion Units	Yes		---				
Scaling	---					Yes	
Last Maintenance Date	Yes						
Cumulative Counter	---					Yes	
Moving Average	---					Yes	---
Setting the Number of AD Conversion Points	---					Yes	---
Rate of Change	---					Yes	---
Comparator	---					Yes	---
Peak/Bottom Hold	---					Yes	---
Top/Valley Hold	---					Yes	---
Disconnected Line Detection	---					Yes	---
User Adjustment	---					Yes	Yes

Note The Contact Operation Monitor and the Total ON Time Monitor cannot be used at the same time for the same contact.

1-2-5 Slave Unit Installation and Wiring Methods

Installing Slave Units

Refer to the following table for the installation and wiring methods for the Slave Units.

Slave Unit Installation and Wiring Methods

Name		Model	Slave Unit installation	I/O wiring method	Internal power	External power
Digital I/O Slave Units		CRT1-ID16(-1)	DIN Track	M3 terminal block	Supplied along with communications power	An external power supply is required for I/O.
		CRT1-OD16(-1)				
Digital I/O Slave Units Expansion Units		XWT-ID16(-1)				Refer to following table.
		XWT-OD16(-1)				
		XWT-ID08(-1)				
		XWT-OD08(-1)				
Bit Slave Units	IP20 Bit Slave Units	CRT1B-ID02(-1)	Screw installation	Industrial standard connector (e-CON)		Supplied along with communications power (See note 1.)
		CRT1B-OD02(-1)				
	IP54 Bit Slave Units	CRT1B-ID02SP(-1)				
		CRT1B-OD02SP(-1)				
		CRT1B-ID04SP(-1)				
		CRT1B-MD04SLP(-1)		Clamp Terminal Block		
Analog I/O Slave Units		CRT1-AD04	DIN Track	M3 terminal block		---
		CRT1-DA02				
Repeater Units		CRS1-RPT01	DIN Track or screw installation	---		Communications power for the downstream line must be supplied from the communications power supply connector.

Note

(1) For Bit Slave Units, the external I/O (sensor and actuator) current consumption is also provided through the Flat Cable from the communications power supply connected to the Master Unit or the Repeater Unit. When calculating the output current of the communications power supply, always include the external I/O current consumption for Bit Slave Units.

(2) Supply I/O power to Expansion Slave Units according to the following table.

Combination	I/O power supply to Expansion Slave Unit
Basic Input Unit with Expansion Input Unit Example: CRT1-ID16 + XWT-ID16 (or XWT-ID08)	Not required (Expansion Slave Unit uses the same I/O power supply as the Basic Slave Unit.)
Basic Input Unit with Expansion Output Unit Example: CRT1-ID16 + XWT-OD16 (or XWT-OD08)	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Input Unit Example: CRT1-OD16 + XWT-ID16 (or XWT-ID08)	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Output Unit Example: CRT1-OD16 + XWT-OD16 (or XWT-OD08)	Required (I/O power must be supplied to both Units.)

SECTION 2
Wiring Configurations

This section describes the configurations of CompoNet Networks.

2-1 Wiring Formations

2-1-1 Wiring Formations

There are two possible formation for a CompoNet Network.

- Trunk line-branch line formation
- Unrestricted wiring formation

The type of cable and baud rate determines the formation as shown below.

Cable type	Baud rate			
	4 Mbits/s	3 Mbits/s	1.5 Mbits/s	93.75 kbits/s
VCTF 2-conductor cable				
Flat Cable				

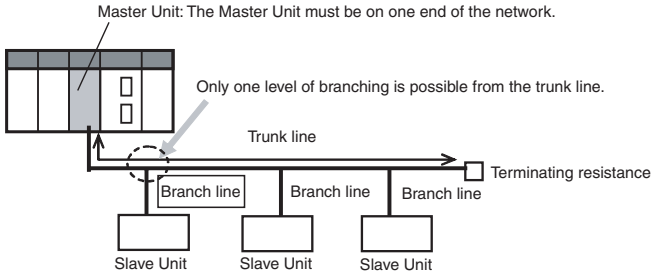
: Trunk line-branch line formation : Unrestricted wiring formation

Trunk Line-Branch Line Formation

With this wiring formation, the trunk line is differentiated from branch lines.

The Master Unit must be on one end of the network and there are branching restrictions.

The trunk line-branch line formation is used in all cases except when Standard or Sheathed Flat Cable is used at a baud rate of 93.75 kbits/s.

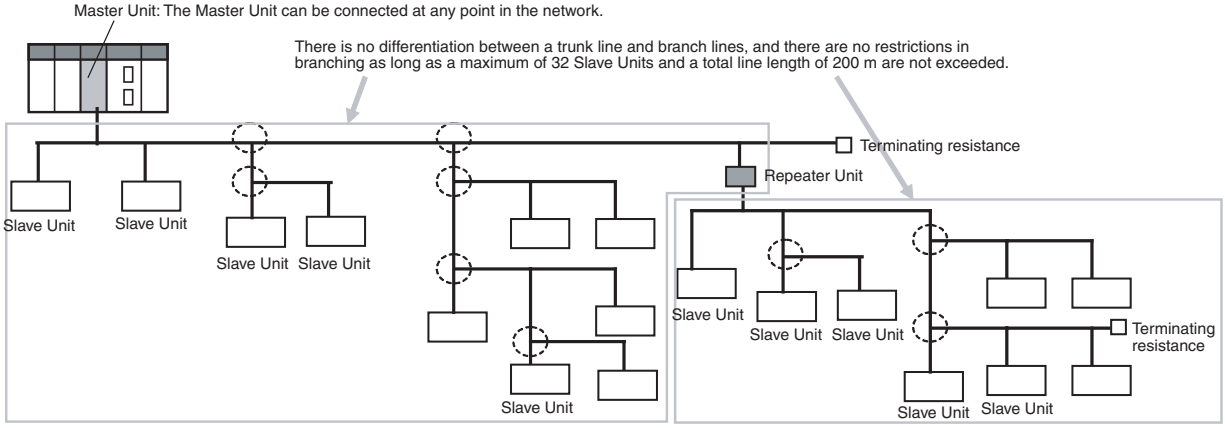


Unrestricted Wiring Formation

With this wiring formation, there is no differentiation between a trunk line and branch lines.

The Master Unit can be located anywhere in the network (not necessarily at the end) and there are no restrictions on branching. Repeater Units can be used.

An unrestricted wiring formation can be used only when Standard or Sheathed Flat Cable is used at a baud rate of 93.75 kbits/s.



Wiring Formations

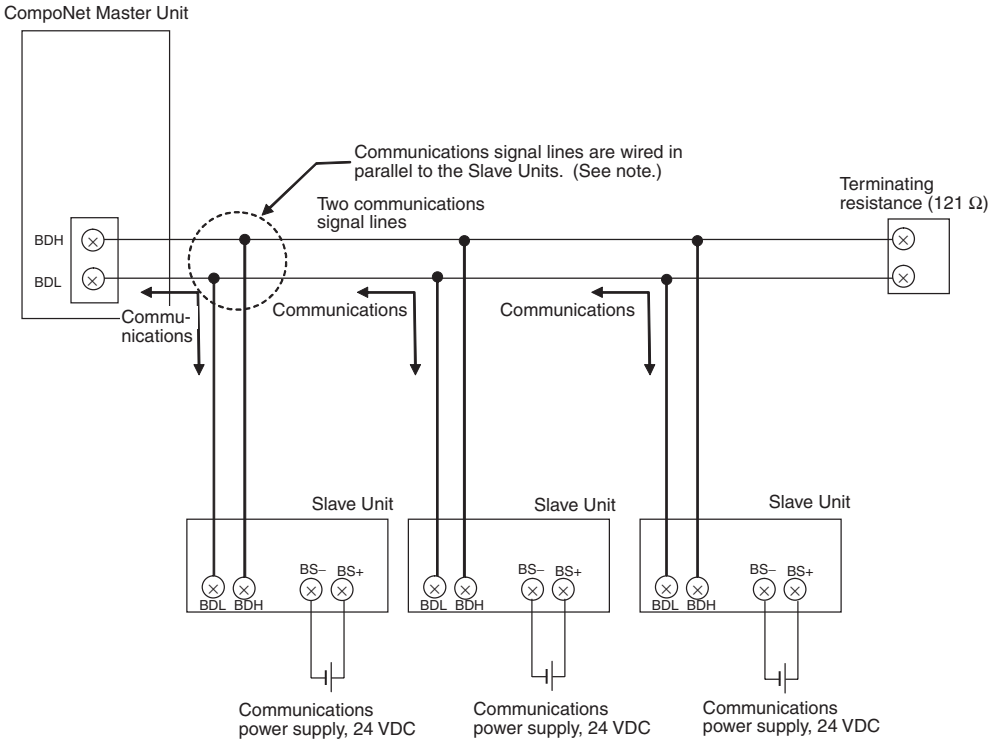
Item	Wiring formation	
	Trunk line-branch line formation	**Unrestricted wiring formation**
Overview	With this wiring formation, the trunk line is differentiated from branch lines. (There are also restrictions in branching from the trunk line.) Repeater Units can be used to create sub-trunk lines, which are equivalent to the trunk line.	With this wiring formation, there is no differentiation between the trunk line and branch lines. Wiring is unrestricted as long as the total cable length is 200 m or less.
Cable type and baud rate restrictions	VCTF cable at any baud rate, or Standard or Sheathed Flat Cable at any baud rate other than 93.75 kbits/s.	Standard or Sheathed Flat Cable at a baud rate of 93.75 kbits/s.
Master Unit location	End of network	Anywhere in network (not necessarily at the end)
Number of branch levels (between Master Unit or Repeater Unit and terminating resistance)	One branching level off of the trunk line or any one sub-trunk line	Any number of levels (no restriction)
Maximum number of Slave Units connected to any one branch line	1 or 3 depending on the cable type and baud rate	No restrictions
Terminating resistance location	On the most-remote (opposite) ends of the trunk line and all sub-trunk lines from the Master Unit and each Repeater Unit	On the most-remote ends of the network from the Master Unit and each Repeater Unit

2-2 CompoNet Network Wiring

2-2-1 CompoNet Network Wiring System

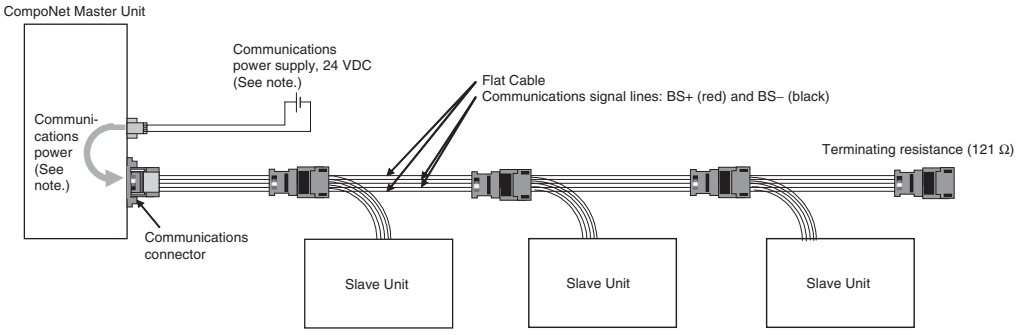
- There are two communications lines: BDH (communications data high) and BDL (communications data low).
- Communications between the Master Unit and Slave Units are possible merely by connecting the two communications lines in parallel to the Master Unit and Slave Units and supplying communications power to the Slave Units.
- Wiring is performed with VCTF 2-conductor cable or Flat Cable (4-conductor).
  - VCTF 2-conductor cable provides the two communications lines.
  - Flat Cable (4-conductor) provides four lines: two communications line and two communications power lines.
- BS+ and BS− are used to provide communications power to the Slave Units (for communications and internal Slave Unit power). A 24-VDC power supply is used.
  - If VCTF 2-conductor cable is used, the power supply must be provided using separate lines.
  - If Flat Cable (4-conductor) is used, the BS+ and BS- lines in the Flat Cable are used to supply communications power.

■ Wiring Example Using VCTF 2-conductor Cable



Note The parallel connections of the signal lines can be made with commercially available relay terminal blocks or multidrop connections.

■ Wiring Example Using Flat Cable (4-conductor)



Note The communications power supply for the Slave Units is connected to the Master Unit or Repeater Unit and supply through the Flat Cable.

2-2-2 Cable Types

Cable Types

The three types of cable listed in the following table can be used as the communications cable for a CompoNet Network.

Do not use any other cables.

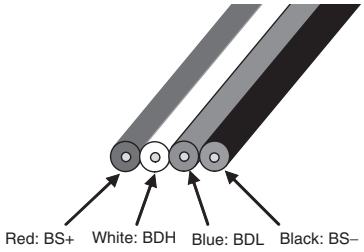
Cable type	Main application		Communications power	Conductors			
				BDH (signal high)	BDL (signal low)	BS+ (communications power supply positive side)	BS− (communications power supply negative side)
VCTF 2-conductor cable	• Wiring Slave Units between the Master Unit and Repeater Units • Wiring Slave Units downstream from a Repeater Unit	• When using commercially available cable is desirable. • To provide communications power separately. • When Bit Slave Units are not being used.	Provided separately.	Black	White	None	None
Standard Flat Cable		• To supply communications power to all Slave Units with the communications cable. • To use Bit Slave Units.	Included	White	Blue	Red	Black
Sheathed Flat Cable		• To supply communications power to all Slave Units with the communications cable. • To use Bit Slave Units. • Applications in environments that required IP54 compliance (drip-proof, splash-proof).	Included	White	Blue	Red	Black

VCTF 2-conductor Cable (Commercially Available)

Commercially available VCTF cable: 600-V vinyl-insulated cab-tyre cord)

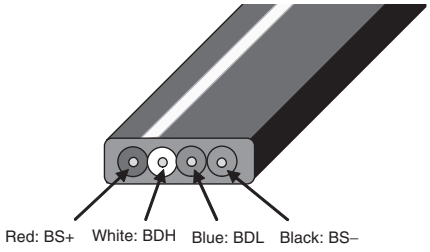
VCTF vinyl cord JIS C 3306, 2-conductor with nominal cross-section of 0.75 mm^2 (two signal lines), conductor resistance at 20°C: 25.1 Ω/km max.

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



Model	Conductor No.	Insulation color	Application	Nominal cross-section	Conductor resistance (Ω/km)	Dielectric strength (V)	Insulation resistance (MΩ)	Allowable current (A)
DCA4-4F10	1	Red	BS+ (communications power supply positive side)	AWG19	25.0 max.	2000	20 min.	5 max.
	2	White	BDH (signal high)	AWG21	37.5 max.			---
	3	Blue	BDL (signal low)	AWG21	37.5 max.			---
	4	Black	BS– (communications power supply negative side)	AWG19	25.0 max.			5 max.

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



Model	Conductor No.	Insulation color	Application	Nominal cross-section	Conductor resistance (Ω/km)	Dielectric strength (V)	Insulation resistance (MΩ)	Allowable current (A)
DCA5-4F10	1	Red	BS+ (communications power supply positive side)	AWG19	25.0 max.	2000	20 min.	5 max.
	2	White	BDH (signal high)	AWG21	37.5 max.			---
	3	Blue	BDL (signal low)	AWG21	37.5 max.			---
	4	Black	BS– (communications power supply negative side)	AWG19	25.0 max.			5 max.

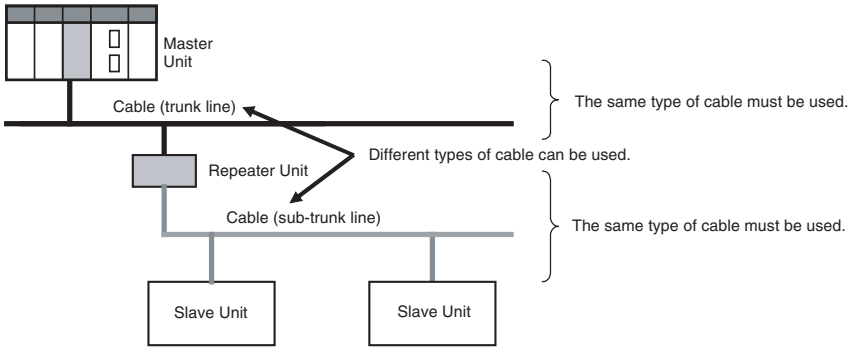
Note The characteristics of each conductor in the Flat Cable has been adjusted to the application of the conductor. Check the line insulator colors and use each line only for the application given in the above table.

Using Different Cable Types

There are three types of cable: VCTF 2-conductor cable, Standard Flat Cable, and Sheathed Flat Cable.

The same type of cable must be used for all lines downstream from the Master Unit or from a Repeater Unit (i.e., the trunk line and branch lines, sub-trunk lines and their branch lines, and branch lines and sub-branch lines must use the same type of cable).

Different types of cable can be used upstream and downstream from a Repeater Unit, i.e., for a trunk line and sub-trunk line or for two different sub-trunk lines.



Note Standard Flat Cable and Sheathed Flat Cable are considered as different types of cable.

Selecting Cable Types

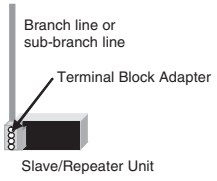
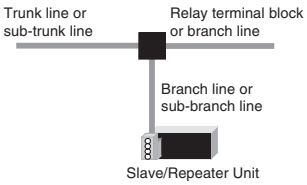
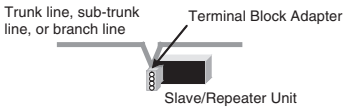
Select the cable type using the following items as conditions.

Item			Cable type		
			VCTF 2-conductor cable	**Standard Flat Cable**	**Sheathed Flat Cable**
Application			Wring Slave Units between the Master Unit and Repeater Units Wring Slave Units downstream from a Repeater Unit		
			• When using commercially available cable is desirable. • To provide communications power separately. • When not using Bit Slave Units.	• To supply communications power to all Slave Units with the communications cable. • To use IP20-type Bit Slave Units.	• To supply communications power to all Slave Units with the communications cable. • To use IP54-type Bit Slave Units. • Applications in environments that required IP54 compliance (drip-proof, splash-proof).
Applicable Slave Units	Word Slave Units		Supported	Supported	
	Bit Slave Units	IP20 Bit Slave Units	NA **Note** Bit Slave Units cannot be used with VCTF 2-conductor cable. Bit Slave Units are sold with Standard or Sheathed Flat Cable already connected.	Supported	NA
		IP54 Bit Slave Units		NA	Supported
Wiring method for communications power supply			Wired separately from the communications cable.	Same cable as communications cable. (Power is supplied from the Master Unit and Repeater Units.)	
Conditions for using different types of cable together			Different type of cable can be used upstream and downstream from a Repeater Unit (VCTF 2-conductor cable, Standard Flat Cable, Sheathed Flat Cable). In all other cases, the same type of cable must be used for the trunk line (or sub-trunk line) and all branch and sub-branch lines).		
Master Unit location			End of trunk line	Baud rates other than 93.75 kbits/s: End of trunk line 93.75 kbits/s: Anywhere in network	
Branch lines			4 Mbits/s: NA Baud rates other than 4 Mbits/s: Supported	4 Mbits/s: NA Baud rates other than 4 Mbits/s: Supported 93.75 kbits/s: Unrestricted branching	

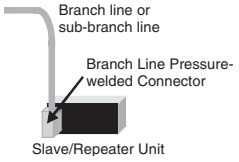
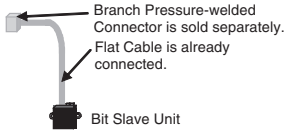
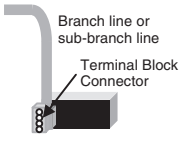
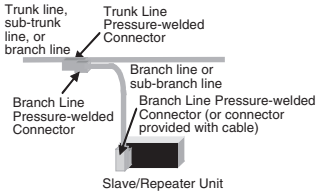
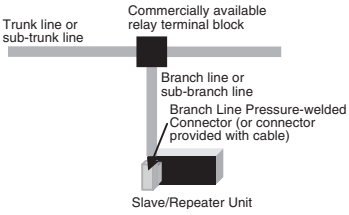
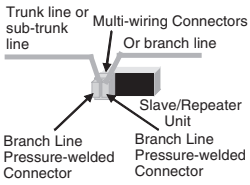
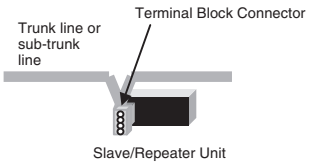
Item		Cable type		
		VCTF 2-conductor cable	**Standard Flat Cable**	**Sheathed Flat Cable**
Multi-connections on branch lines	Multidrop connections on branch lines	1.5 Mbits/s: Supported (3 multidrop connections per branch)	1.5 Mbits/s: Supported (3 multidrop connections per branch) 93.75 kbits/s: Unrestricted branching	
	Sub-branch lines	NA	1.5 Mbits/s: Supported (3 per branch) 93.75 kbits/s: Unrestricted branching	
Communications distance	4 Mbits/s	Trunk line/sub-trunk line: 30 m max.	Trunk line/sub-trunk line: 30 m max.	
	3 Mbits/s	Trunk line/sub-trunk line: 30 m max.	Trunk line/sub-trunk line: 30 m max.	
	1.5 Mbits/s	Trunk line/sub-trunk line: 100 m max. without branches, 30 m max. with branches	Trunk line/sub-trunk line: 30 m max.	
	93.75 kbits/s	Trunk line/sub-trunk line: 500 m max.	Total wiring length: 200 m max.	

2-2-3 Connection Methods

VCTF 2-conductor Cable

Slave Unit/Repeater Unit connections	Cable branches	
	T-branch connections	Multidrop connections
Terminal Block Adapter 	Commercially available relay terminal block 	Terminal Block Adapter 

Flat Cable

Slave Unit/Repeater Unit connections	Cable branches	
	T-branch connections	Multidrop connections
Branch Line Pressure-welded Connector  **Note** Bit Slave Units are sold with Flat Cables already connected to them.  **Note** A Terminal Block Adapter can also be used. 	Trunk/Branch Line Pressure-welded Connector  **Note** A commercially available relay terminal block can also be used. 	Multi-wiring Connector  **Note** Multidrop connections using Multi-wiring Connectors is not possible for Sheathed Flat Cable. **Note** A Terminal Block Adapter can also be used. 

2-2-4 Node Connection Methods

Nodes are connected to the CompoNet Network using the methods described in this section.

Slave Unit and Repeater Unit Connections

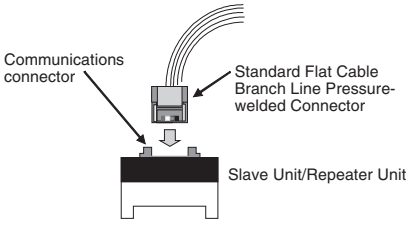
The Slave Units and Repeater Units have a communications connector to which a communications cable is connected.

Connecting Flat Cable with a Branch Line Pressure-welded Connector

The following Branch Line Pressure-welded Connectors are used to connect Flat Cable to a Slave Unit or Repeater Unit.

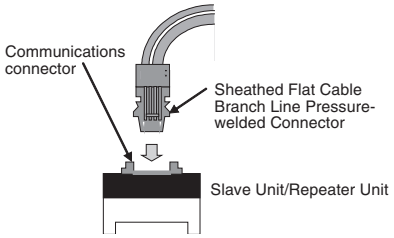
Standard Flat Cable

A DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector is used.



Sheathed Flat Cable

A DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector is used.



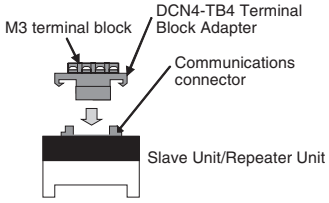
Connecting VCTF 2-conductor Cable with a Terminal Block Adapter

The following Terminal Block Adapter is used to connect VCTF 2-conductor cable to a Slave Unit or Repeater Unit.

The Terminal Block Adapter is used to convert the communications connector on the Master Unit to a terminal block. The Terminal Block Adapter takes M3 crimp terminals.

VCTF 2-conductor Cable

A DCN4-TB4 Terminal Block Adapter is used.



2-2-5 Cable Branches

There are two methods that can be used to branch the trunk line, sub-trunk lines, and branch lines: T-branches and multidrop connections.

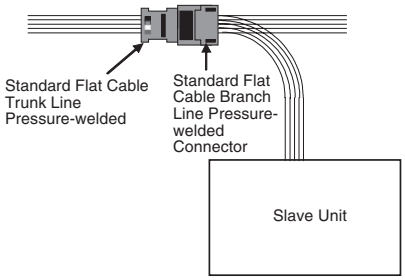
T-branches

Connecting Flat Cable with Trunk Line and Branch Line Pressure-welded Connectors

A T-branch is made using special pressure-welded connectors (Trunk Line Pressure-welded Connector and Branch Line Pressure-welded Connector).

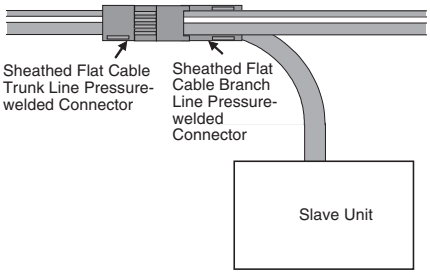
■ Standard Flat Cable

A DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector and DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector are used.



■ Sheathed Flat Cable

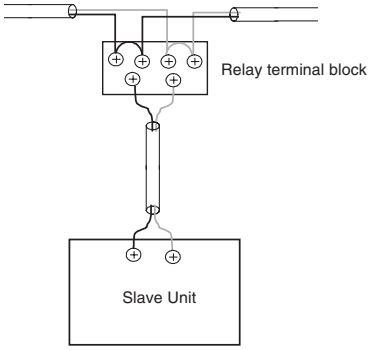
A DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector and DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector are used.



Note The same type of cable must be used for the trunk line and branch line.

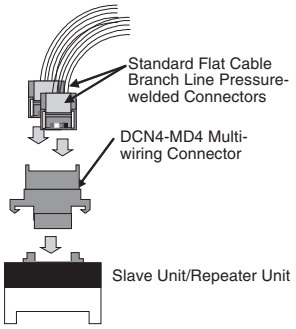
Connecting VCTF 2-conductor Cable with a Commercially Available Relay Terminal Block

A T-branch is made using a commercially available relay terminal block.

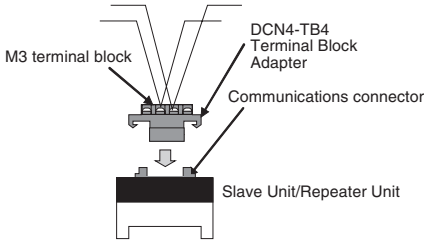


Multidrop Connections

Connecting Flat Cable with a Multi-wiring Connector

Standard Flat Cable	Sheathed Flat Cable
	Multidrop connections using Multi-writing Connectors is not possible with Sheathed Flat Cable.

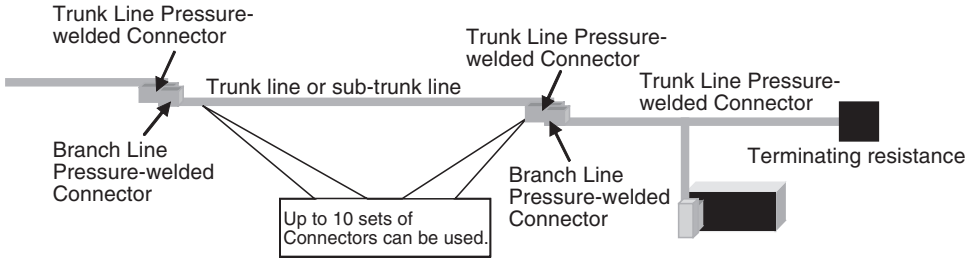
Connecting VCTF 2-conductor Cable with a Terminal Block Adapter



2-2-6 Extending the Cable Length

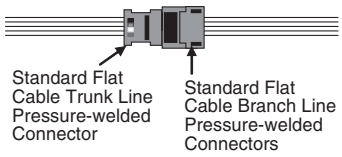
The cable length for the trunk line, sub-trunk lines, branch lines, and sub-branch lines can be extended by combining a Trunk Line Pressure-welded Connector with a Branch Line Pressure-welded Connector.

When this method is used, up to 10 sets of Trunk Line and Branch Line Pressure-welded Connectors can be used. The maximum extendable length, however, is the standard maximum trunk line length.



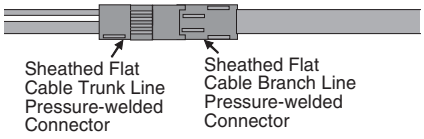
■ Standard Flat Cable

A DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector with a cable stopper and a DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector are used.



■ **Sheathed Flat Cable**

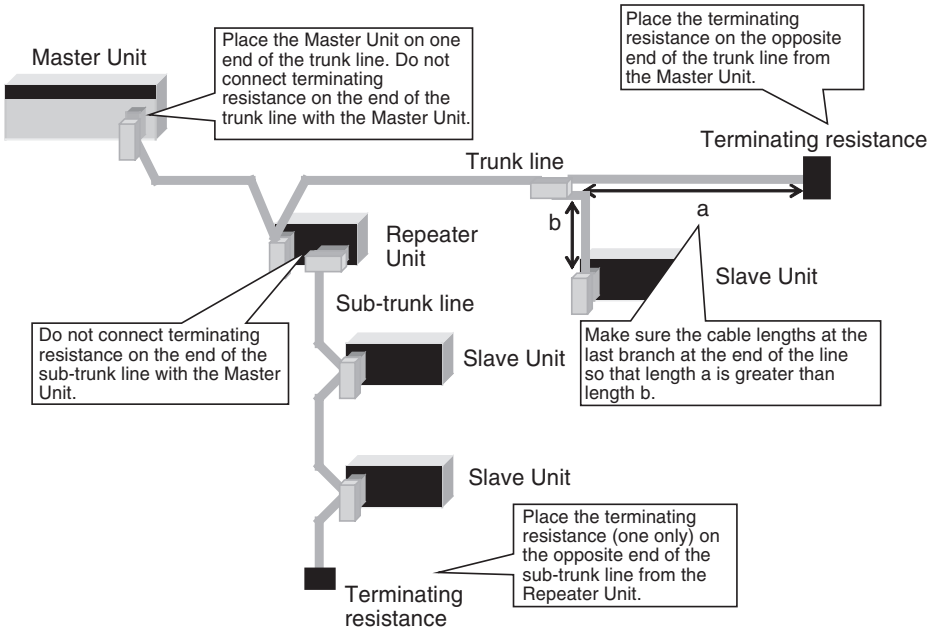
A DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector with an internal stopper and a DCN54-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector are used.



2-2-7 Connection Locations for Terminating Resistance

Terminating resistance must always be connected to the trunk line and each sub-trunk line on the opposite end from the Master Unit or Repeater Unit.

Note Do not connect terminating resistance on the end of the Network with the Master Unit. When the trunk line or sub-trunk line is branched, the terminating resistance is connected to the end of the branch line farthest from the Master Unit or Repeater Unit.

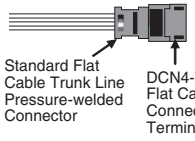
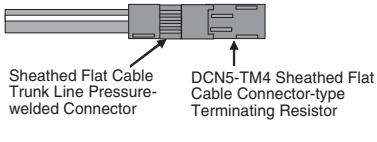


Connecting Terminating Resistance

There are three methods that can be used to connect terminating resistance.

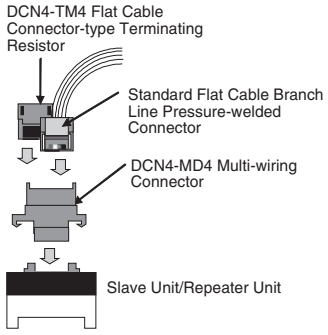
Method 1:

Connect a Trunk Line Pressure-welded Connector to the trunk line or sub-trunk line and then connect a Terminating Resistor to the Connector.

Standard Flat Cable	Sheathed Flat Cable
	

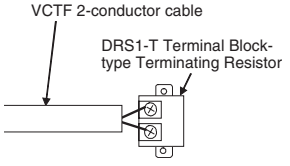
Method 2:

Connect a Multi-wiring Connector to the communications connector for the upstream port on the Slave Unit or Repeater Unit and then connect the trunk line cable and a Connector-type Terminating Resistor to the Multi-wiring Connector.

Standard Flat Cable	Sheathed Flat Cable
	Inserting a Connector-type Terminating Resistor to the Multi-wiring Connector is not possible with Sheathed Flat Cable.

Method 3:

Connect a Terminal Block-type Terminating Resistor to the trunk line or sub-trunk line cable.

VCTF 2-conductor Cable


Models and Characteristics of Terminating Resistors

There are two types of Terminating Resistor: the Connector-type and the Terminal Block-type.

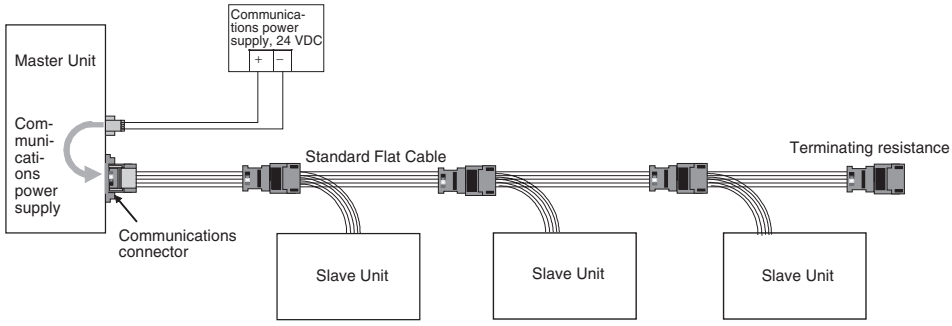
Type of Terminating Resistor	Connector-type		Terminal Block-type
Name	Standard Flat Cable Connector-type Terminating Resistor	Sheathed Flat Cable Connector-type Terminating Resistor	Terminal Block-type Terminating Resistor
Model	DCN4-TM4	DCN5-TM4	DRS1-T
Resistance	121 Ω	121 Ω	121 Ω
Rated power	1/4 W	1/4 W	1/4 W

Type of Terminating Resistor	Connector-type		Terminal Block-type
Accuracy	1% max.	1% max.	---
Power handling capacity	0.01 μF	0.01 μF	---
Applicable cable	Standard Flat Cable	Sheathed Flat Cable	VCTF 2-conductor cable

2-2-8 Connection Locations for Communications Power Supply

Connect the communications power supply as shown in the following diagrams. The communications power supply (BS+ and BS−) is connected to the communications power supply connector on the Master Unit. This allows communications power to be supplied to the Slave Units on the trunk line through the Flat Cable. Refer to *3-4 Power Supply Wiring* for details on wiring the communications power supply.

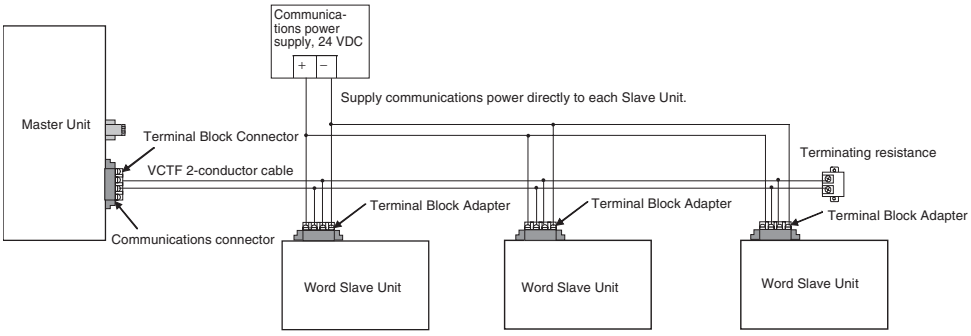
Flat Cable



Note
(1) Connect the communications power supply at only one location for the trunk line and each sub-trunk line.
(2) Connect the communications power supply to the downstream port communications power supply connector on the Repeater Unit to supply power to a sub-trunk line.

VCTF 2-conductor Cable

The communications power supply (BS+ and BS-) is connected separately to each Slave Unit and Repeater Unit (see note). Power does not need to be supplied to the Master Unit.



Note The communications power to the Repeater Unit must be supplied to the BS+ and BS- terminals on the upstream port (port 1).

SECTION 3
Installation and Wiring

This section describes how to install and wire a CompoNet Network.

3-1 Installation

Note

(1) A sheet is attached to the Master Unit to prevent pieces of wire from entering it. Install and wire the Master Unit with this sheet in place. Stray strands of wire could cause malfunctions.

(2) Be sure to remove the sheet after installation and wiring to facilitate cooling. The Master Unit could overheat and malfunction if the sheet is not removed.

3-1-1 Tools Required for Installation and Wiring

The following tools are required to install, wire, and set the Units.

- Phillips screwdrivers: M3 and M4: To install and wire I/O for the Master Unit, Slave Units, and Repeater Units.
- Precision screwdriver: To set rotary switches and DIP switches.

3-1-2 Installation Locations According to Degree of Protection

The degree of protection of the CompoNet Network Units depends on the model of the Unit. The degree of protection for each Unit is given in the following table. Select suitable installation locations accordingly.

Master Units, Slave Units, and Repeater Units

Name	Model	Degree of protection	Applicable peripheral devices
Master Units	CS1W-CRM21	---	Standard Flat Cable peripheral devices, Sheathed Flat Cable peripheral devices, and VCTF 2-conductor cable
	CJ1W-CRM21		
Digital I/O Slave Units	CRT1-ID16	---	
	CRT1-ID16-1		
	CRT1-OD16		
	CRT1-OD16-1		
IP20 Bit Slave Units	CRT1B-ID02S	IP20	Standard Flat Cable peripheral devices only
	CRT1B-ID02S-1		
	CRT1B-OD02S		
	CRT1B-OD02S-1		
IP54 Bit Slave Units	CRT1B-ID02SP	IP54	Sheathed Flat Cable peripheral devices only
	CRT1B-ID02SP-1		
	CRT1B-OD02SP		
	CRT1B-OD02SP-1		
	CRT1B-ID04SP		
	CRT1B-ID04SP-1		
	CRT1B-MD04SLP		
	CRT1B-MD04SLP-1		
Analog I/O Slave Units	CRT1-AD04	---	Standard Flat Cable peripheral devices, Sheathed Flat Cable peripheral devices, and VCTF 2-conductor cable
	CRT1-DA02		
Repeater Unit	CRS1-RPT01	---	

Standard Flat Cable Peripheral Devices

Name	Model	Degree of protection	Remarks
Standard Flat Cable	DCA4-4F10	---	Standard Flat Cable (100 m)
Standard Flat Cable Trunk Line Pressure-welded Connector	DCN4-TR4	IP40	Only for Standard Flat Cable
Standard Flat Cable Branch Line Pressure-welded Connector	DCN4-BR4	IP40	Only for Standard Flat Cable
Standard Flat Cable Connector-type Terminating Resistor	DCN4-TM4	IP40	Only for Standard Flat Cable

Sheathed Flat Cable Peripheral Devices

Name	Model	Degree of protection	Remarks
Sheathed Flat Cable	DCA5-4F10	---	Sheathed Flat Cable (100 m)
Sheathed Flat Cable Trunk Line Pressure-welded Connector	DCN5-TR4	IP54	Only for Sheathed Flat Cable
Sheathed Flat Cable Branch Line Pressure-welded Connector	DCN5-BR4	IP54	Only for Sheathed Flat Cable
Sheathed Flat Cable Connector-type Terminating Resistor	DCN5-TM4	IP54	Only for Sheathed Flat Cable

3-1-3 Installing Slave Units

Installing Slave Units

Refer to the following table for the installation and wiring methods for the Slave Units.

CompoNet Slave Unit Installation and Wiring Methods

Name	Model	Installation method	I/O wiring method	Internal power	External power
Basic Digital I/O Slave Units (transistor-type)	CRT1-ID16(-1)	DIN Track	M3 terminal block	Supplied along with communications power.	An external power supply is required for I/O.
	CRT1-OD16(-1)				
Expansion Digital I/O Slave Units (transistor-type)	XWT-ID16(-1)				Refer to following table.
	XWT-OD16(-1)				
	XWT-ID08(-1)				
	XWT-OD08(-1)				
Bit Slave Units (transistor-type)	CRT1B-ID02(-1)	Screw installation (M4)	Industrial standard sensor connector (e-CON)		Supplied along with communications power.
	CRT1B-OD02(-1)				
	CRT1B-ID02SP(-1)				
	CRT1B-OD02SP(-1)				
	CRT1B-ID04SP(-1)				
	CRT1B-MD04SLP(-1)		Screw-less terminal block		
Analog I/O Slave Units	CRT1-AD04	DIN Track	M3 terminal block		An external power supply is required for I/O.
	CRT1-DA02				
Repeater Unit	CRS1-RPT01	DIN Track or Screw installation (M4)	---		Communications power for the sub-trunk line must be supplied from the power supply connector.

Note Supply I/O power to Expansion Slave Units according to the following table.

Combination	I/O power supply to Expansion Slave Unit
Basic Input Unit with Expansion Input Unit Example: CRT1-ID16 + XWT-ID16	Not required (Expansion Slave Unit uses the same I/O power supply as the Basic Slave Unit.)
Basic Input Unit with Expansion Output Unit Example: CRT1-ID16 + XWT-OD16	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Input Unit Example: CRT1-OD16 + XWT-ID16	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Output Unit Example: CRT1-OD16 + XWT-OD16	Required (I/O power must be supplied to both Units.)

Installation

Word Slave Units

Word Slave Units CRT1-ID16(-1), CRT1-OD16(-1), CRT1-AD04, and CRT1-DA02) can be installed in the control panel using the following method.

- DIN Track

Note Installation with screws is not possible.

Repeater Units

The Repeater Unit (CRS1-RPT01) can be installed in the control panel using the following methods.

- Screw installation
- DIN Track

Bit Slave Units

Bit Slave Units (CRT1B-□D0□S□□(-1)) can be installed in the control panel using the following method.

- Screw installation

Note Installation on DIN Track is not possible.

Installation on DIN Track (Word Slave Units and Repeater Units)

Connect the back of Word Slave Units and Repeater Units to 35-mm DIN Track. Pull down the DIN Track mounting pin on the back of the Slave Unit or Repeater Unit and be sure that the DIN Track is securely and completed inserted into the back of the Slave Unit or Repeater Unit. The Slave Unit or Repeater Unit can be mounted to the DIN Track without pulling down the mounting pin, but be sure that the Slave Unit or Repeater Unit is mounted securely either way.

Connect an End Plate on both sides on the Slave Unit or Repeater Unit.

Note Always secure the Slave Unit or Repeater Unit by mounting an End Plate on both sides.

Materials Required for Installation

The following are required when installing a Slave Unit or Repeater Unit to DIN Track.

Screws are not required to secure the Slave Unit or Repeater Unit to the control panel in this case.

Name	Model	Length	Remarks
35-mm DIN Track	PFP-50N	50 cm	
	PFP-100N	100 cm	
	PFP-100N2	100 cm	
End Plate	PFP-M	---	Two End Plates are required for each Slave Unit and each Repeater Unit.

Installing Bit Slave Units and Repeater Units to the Control Panel with Screws

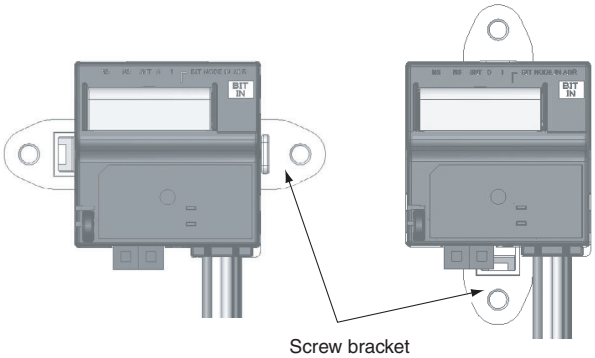
Refer to the dimensions for the Bit Slave Unit or Repeater Unit, prepare mounting holes in the control panel, and use the specified size of screws and tightening torque to mount a Bit Slave Unit or Repeater Unit to the control panel.

- M4 screws, 0.9 N·m

Installing Bit Slave Units (CRT1B-ID02S(-1) and CRT1B-OD02S(-1))

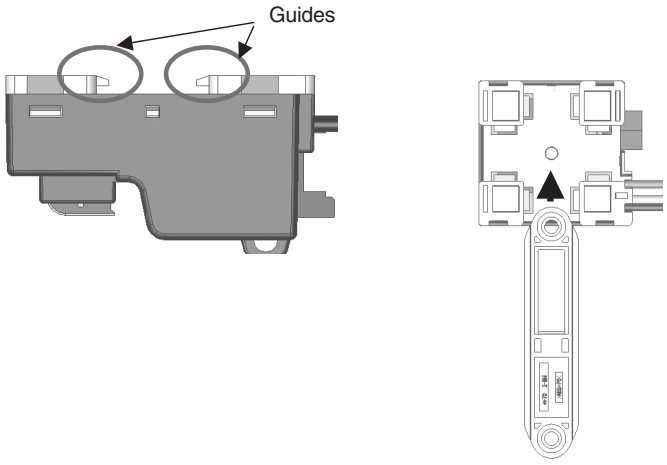
This section describes specific installation methods.

The CRT1B-ID02S(-1) and CRT1B-OD02S(-1) are installed using the enclosed screw bracket along with screw holes in one of two orientations.

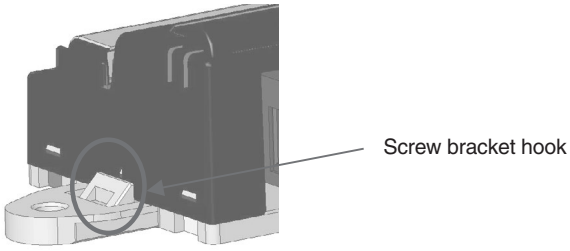


Attaching the Screw Bracket

1,2,3... 1. Insert the screw bracket into the back of the Unit along the guides.

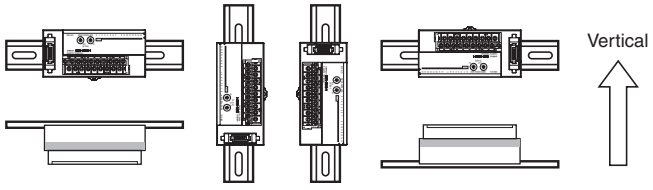


2. Press the screw bracket in until the hooks on the bracket are completely locked into place.



Installation Orientation

There are no restrictions in the orientation unless otherwise specified in Slave Unit instructions. Installation is possible in any of the following orientations.



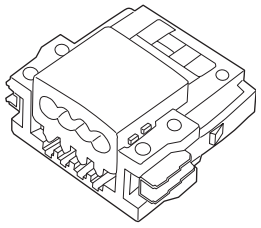
3-2 Connecting Cables

Connecting Trunk Lines, Sub-trunk Lines, Branch Lines, and Sub-branch Lines to Slave Units or Repeater Units

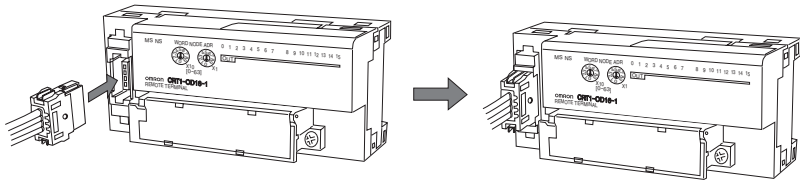
Standard Flat Cable

A DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector is connected to the communications connector on the Slave Unit or Repeater Unit.

Refer to *3-3 Preparing Pressure-welded Connectors* for information on attaching a cable to the Connector.



Be sure the face of the Connector on which line colors are indicated (red, white, blue, and black) is facing to the left and press in the Connector until it clicks into place.

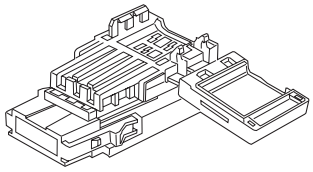


Note To remove a Connector once it has been attached, press in on the catches on both sides and pull out the Connector.

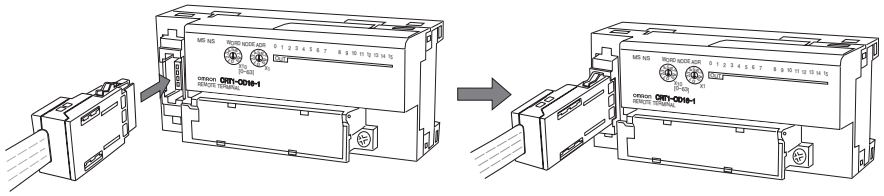
Sheathed Flat Cable

A DCN4-BR5 Sheathed Flat Cable Branch Line Pressure-welded Connector is connected to the communications connector on the Slave Unit or Repeater Unit.

Refer to *3-3 Preparing Pressure-welded Connectors* for information on attaching a cable to the Connector.

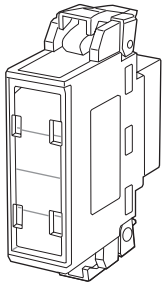


Orient the Connector so that the white line on the cable is facing to the left and press in the Connector until it clicks into place.

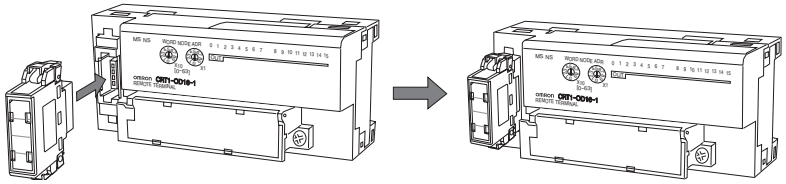


Note To remove a Connector once it has been attached, press in firmly on the catches on both sides of the front of the Connector and pull out the Connector.

VCTF 2-conductor Cable A DCN4-TB4 Terminal Block Adapter is used.



Orient the Adapter so that surface with the open terminals is facing to the left and press in the Adapter until it clicks into place.



Note To remove the Adapter once it has been attached, press in on the catches on both sides and pull out the Adapter.

3-2-1 Branching Lines

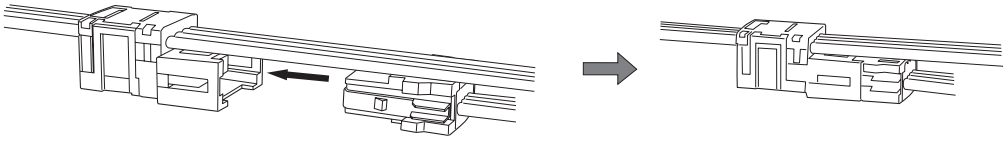
T-branches

Creating Branch Lines off Trunk or Sub-trunk Lines and Sub-branch Lines off Branch Lines

■ Standard Flat Cable

A DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector is connected to a DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector.

Be sure the face of the Standard Flat Cable Branch Line Pressure-welded Connector on which line colors are indicated (red, white, blue, and black) is facing downward and press in the Connector until it clicks into place.

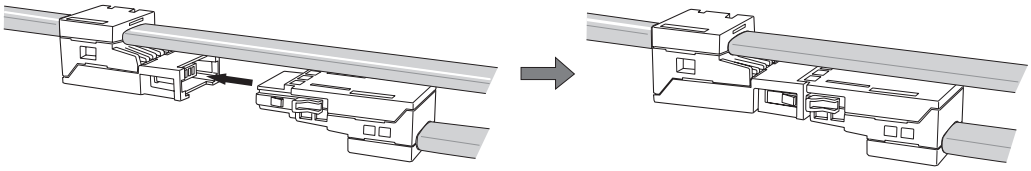


Note To remove the Standard Flat Cable Branch Line Pressure-welded Connector once it has been attached, press in on the catches on both sides and pull out the Connector.

■ Sheathed Flat Cable

A DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector is connected to a DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector.

Orient the Sheathed Flat Cable Branch Line Pressure-welded Connector so that the white line on the cable is facing downward and press in the Connector until it clicks into place.



Note To remove the Sheathed Flat Cable Branch Line Pressure-welded Connector once it has been attached, press in firmly on the catches on both sides of the front of the connector and pull out the connector.

■ **VCTF 2-conductor Cable**

A commercially available relay terminal block is used.

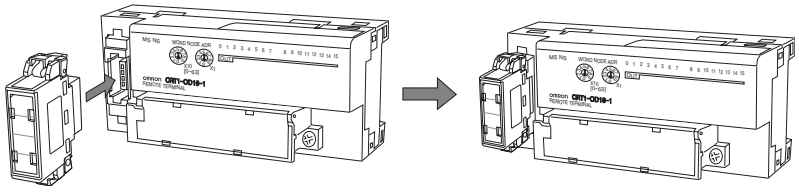
Multidrop Branches

Creating Multi-drop Branches off Trunk Lines, Sub-trunk Lines, Branch Lines, and Sub-branch Lines

■ **VCTF 2-conductor Cable**

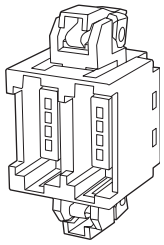
A DCN4-TB4 Terminal Block Adapter is used.

Orient the connector so that surface with the open terminals is facing to the left and press in the connector until it clicks into place.

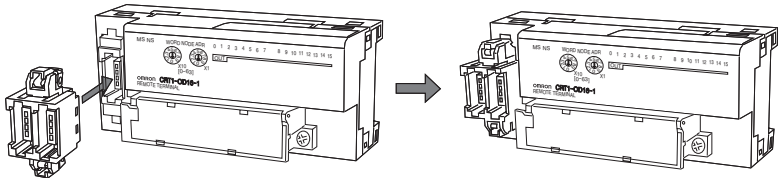


■ **Flat Cable**

A DCN4-MD4 Multi-wiring Connector is used.

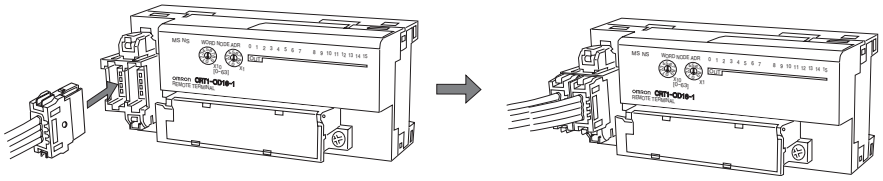


Orient the Connector so that surface with the printed numbers is facing to the left and press in the Connector until it clicks into place.



A DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector is connected to the DCN4-MD4 Multi-wiring Connector.

Be sure the face of the Connector on which line colors are indicated (red, white, blue, and black) is facing to the left and press in the Connector until it clicks into place.



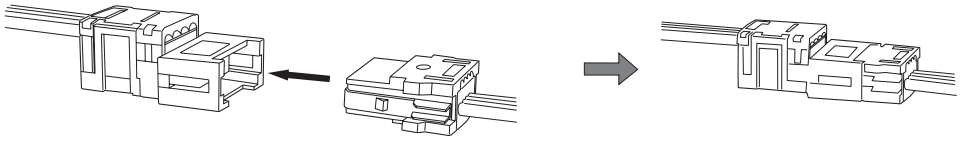
3-2-2 Extending Lines

Extending Trunk Lines, Sub-trunk Lines, and Branch Lines

■ **Standard Flat Cable**

A DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector is connected to a DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector.

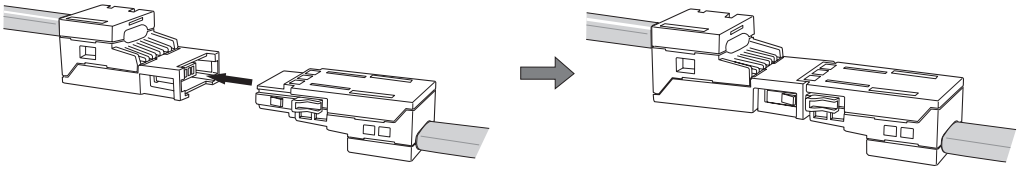
Be sure the face of the Standard Flat Cable Branch Line Pressure-welded Connector on which line colors are indicated (red, white, blue, and black) is facing downward and press in the Connector until it clicks into place.



■ **Sheathed Flat Cable**

A DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector is connected to a DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector are used.

Orient the Sheathed Flat Cable Branch Line Pressure-welded Connector so that the white line on the cable is facing downward and press in the Connector until it clicks into place.

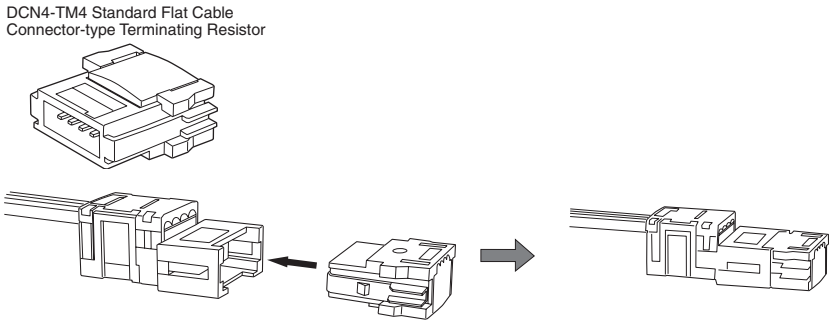


3-2-3 Connecting Terminating Resistance

Trunk Lines and Sub-trunk Lines

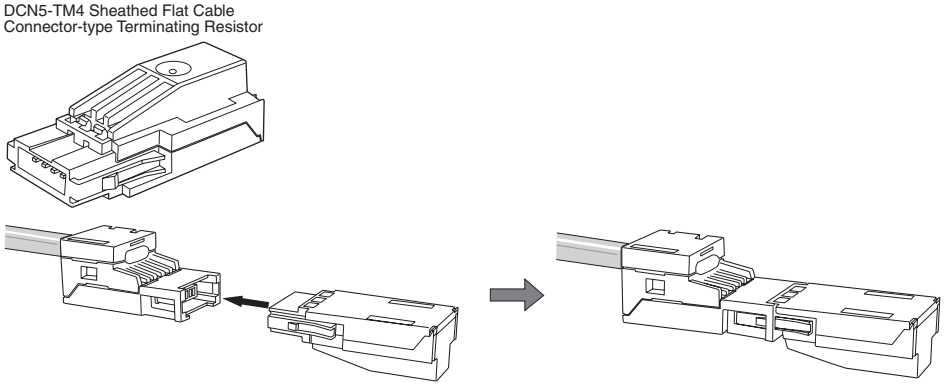
■ **Standard Flat Cable**

A DCN4-TM4 Standard Flat Cable Connector-type Terminating Resistor is connected to a DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector.

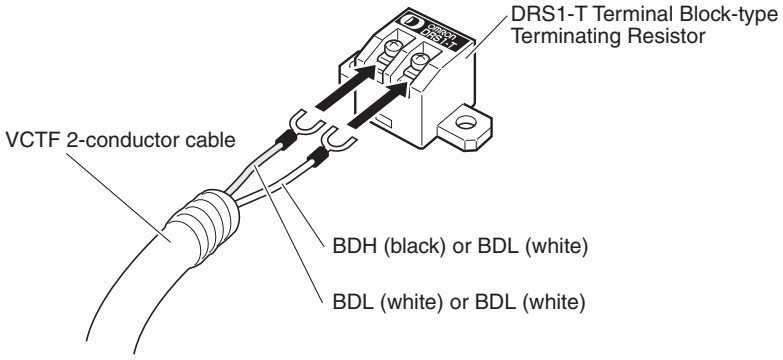


■ Sheathed Flat Cable

A DCN5-TM4 Sheathed Flat Cable Connector-type Terminating Resistor is connected to a DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector.



■ DRS1-T Terminal Block-type Terminating Resistor



Use the following M3 crimp terminals for the connections. Tighten the terminal screws to 0.3 to 0.5 N·m.

3-3 Preparing Pressure-welded Connectors

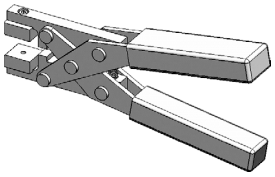
This section describes how to prepare CompoNet Network communications cables and pressure-welded connectors.

3-3-1 Tools Required for Installation and Wiring

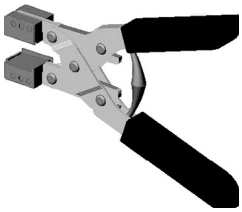
The following tools are required to prepare pressure-welded connectors.

- Wire cutters: To cut the cable
- Pliers: To crimp connectors
  Use one of the following pliers.

For Standard Flat Cable: DWT-A01



For Sheathed Flat Cable: DWT-A02



3-3-2 Standard Flat Cables

Use the following procedure to connect a pressure-welded connector to the communications cable.

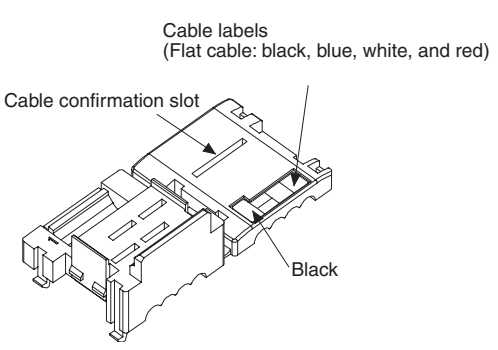
Note Pressure-welded connectors cannot be reused once they have been connected. Perform the procedure with care. Always hold on to the connector when connecting or disconnecting a connector.When connecting a connector, press it all the way in and then pull out on the connector to be sure it is locked into place. Before connecting a connector, check the cable labels and the cable colors to be sure they match.

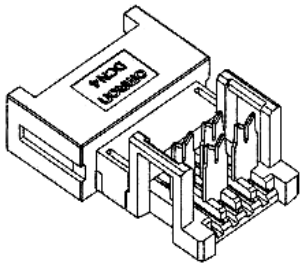
DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connectors

DCN4-TR4 Standard Flat Cable Trunk Line Pressure-welded Connector

Cover

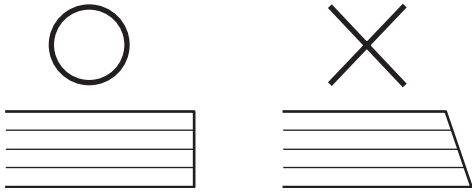
Housing





■ **Cutting the Cable**

Cut the cable perpendicular to the length.

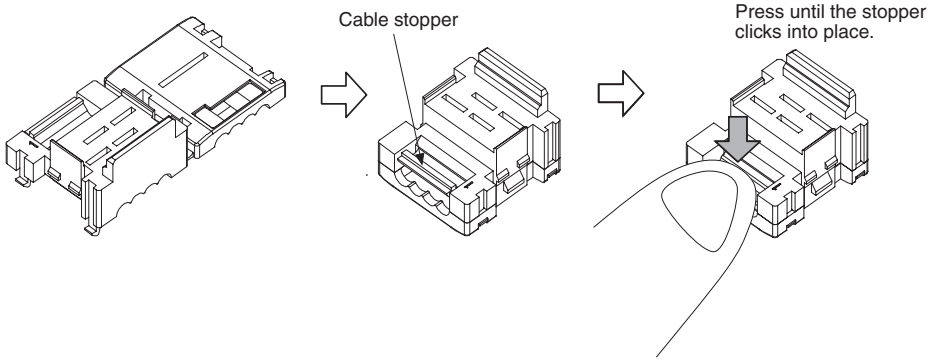


To prevent short-circuits, cut the cable with a sharp blade and be sure that there are no whiskers from the conductors.

■ **Assembling the Cable Stopper (for an Extension or End of Line)**

A stopper must be prepared in advance when extending a line or at the end of the line.

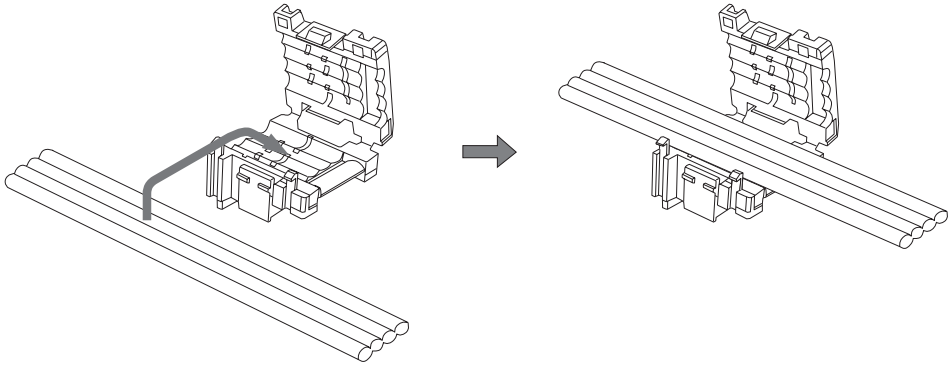
Close the cover, secure the hooks, and then press down on the cable stopper until it clicks into place.



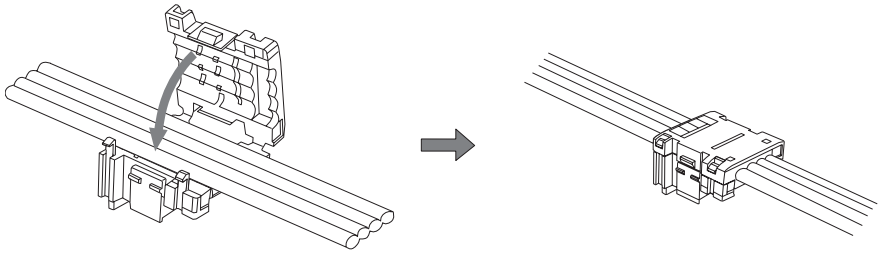
■ **Attaching the Cable**

■ **T-branch Connections**

1,2,3... 1. Align the cable labels and cable colors and place the cable into the connector.

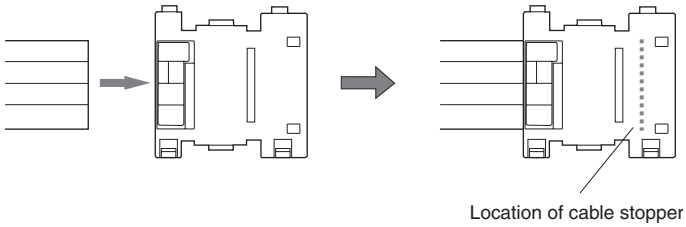


2. Close the cover and secure it with the hooks.



■ **Line Extensions and Line Ends**

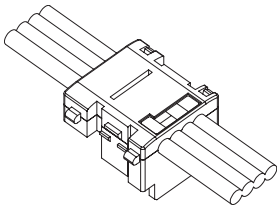
Insert the cable all the way into a cover with the cable stopper already prepared.



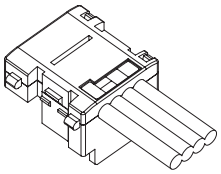
Connector with Cable Attached

Flat Cable

T-branch connections:

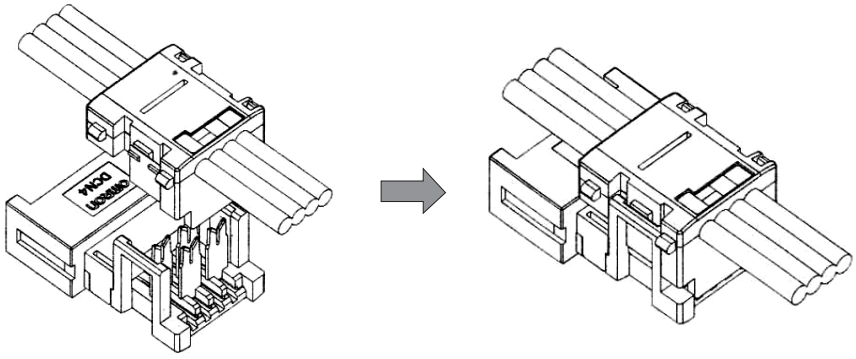


Line extensions and line ends:



■ **Attaching the Connector Housing**

Confirm that the cable labels and cable colors match and then temporarily secure the housing to the cover.

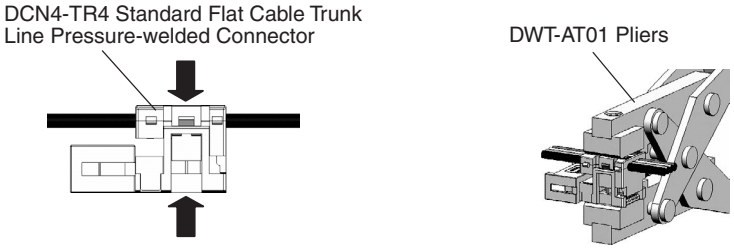


Note The housing cannot be removed from the cover once it has been attached. The connector may be damaged if the housing is forcefully removed.

■ Pressure-welding the Connector

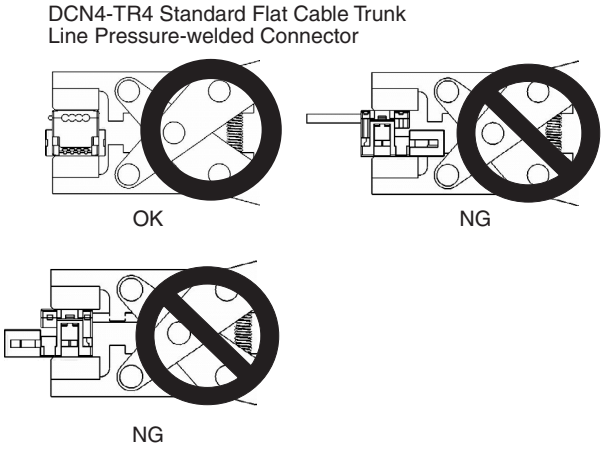
The connector is pressure-welded using the DWT-AT01 Pliers.

1,2,3... 1. Align the center (see arrow) or the connector cover with the center of the pressure-welding block on the DWT-AT01 Pliers and set the cover in the Pliers.

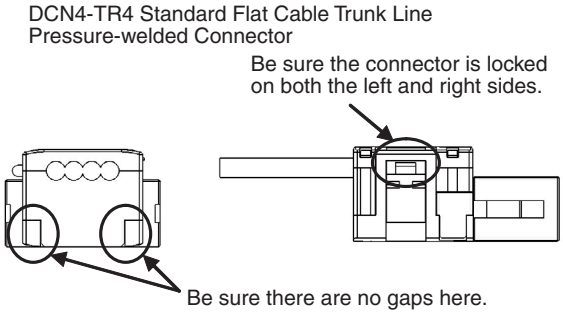


2. Squeeze firmly on the DWT-A01 Pliers until the lock on the connector clicks into place.

Note (a) Do not pressure-weld the connector cover at the edges.
(b) Do not pressure-weld the connector cover at the back of the pressure-welding block.
(c) Set the connector in the correct orientation.

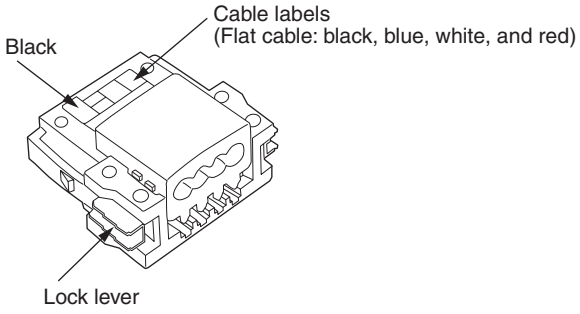


3. After attaching the cable, confirm that it is properly pressure-welded.



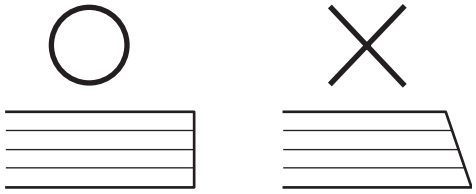
DCN4-TR4 Standard Flat Cable Branch Line Pressure-welded Connector

DCN4-BR4 Standard Flat Cable Branch Line Pressure-welded Connector



■ Cutting the Cable

Cut the cable perpendicular to the length.

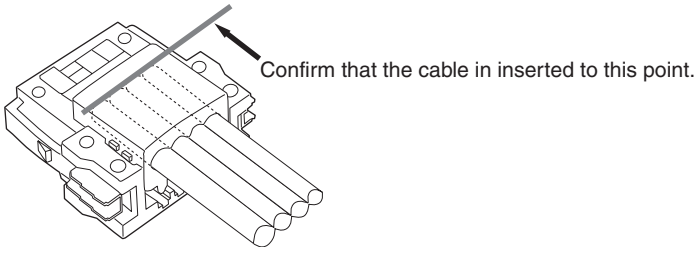


To prevent short-circuits, cut the cable with a sharp blade and be sure that there are no whiskers from the conductors.

■ Attaching the Cable

1,2,3...

1. Align the cable labels and cable colors and insert the cable into the connector.
2. Confirm that the cable is inserted all the way to the back. (The cover is semi-transparent.)

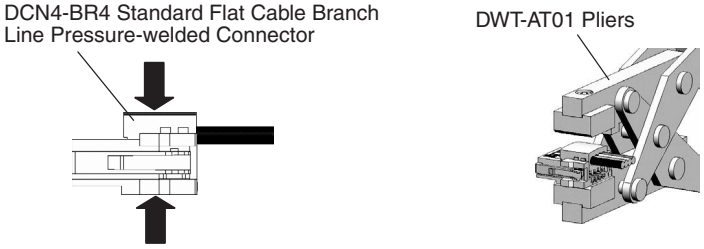


■ Pressure-welding the Connector

Before pressure-welding the connector, be sure that the cable is inserted all the way to the back and do not let it be pulled out.

The connector is pressure-welded using the DWT-AT01 Pliers.

1,2,3... 1. Align the center (see arrow) or the connector cover with the center of the pressure-welding block on the DWT-AT01 Pliers and set the cover in the Pliers.

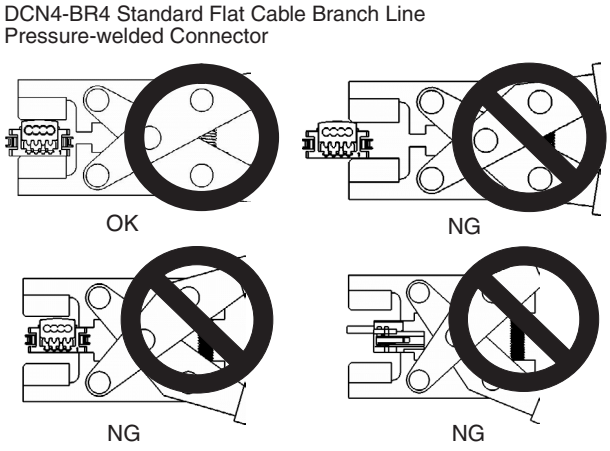


2. Squeeze firmly on the DWT-A01 Pliers until the lock on the connector clicks into place.

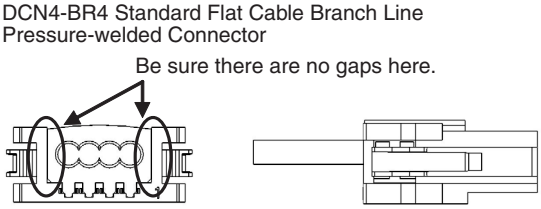
Note (a) Do not pressure-weld the connector cover at the edges.

(b) Do not pressure-weld the connector cover at the back of the pressure-welding block.

(c) Set the connector in the correct orientation.



3. After attaching the cable, confirm that it is properly pressure-welded.

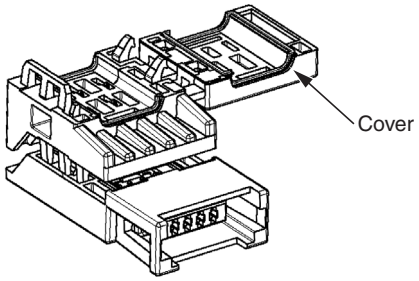


3-3-3 Sheathed Flat Cable

Use the following procedure to connect a pressure-welded connector to a Sheathed Flat Cable.

DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector

DCN5-TR4 Sheathed Flat Cable Trunk Line Pressure-welded Connector



■ **Cutting the Cable**

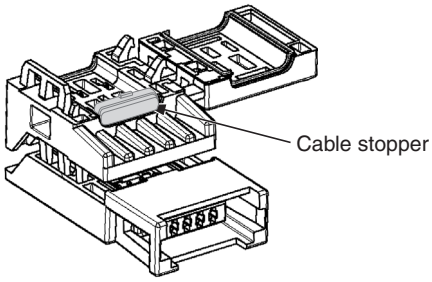
Cut the cable for an extension or line end perpendicular to the length.

To prevent short-circuits, cut the cable with a sharp blade and be sure that there are no whiskers from the conductors.

■ **Setting the Cable Stopper (for Extension or End of Line)**

A stopper must be set in advance when extending a line or at the end of the line.

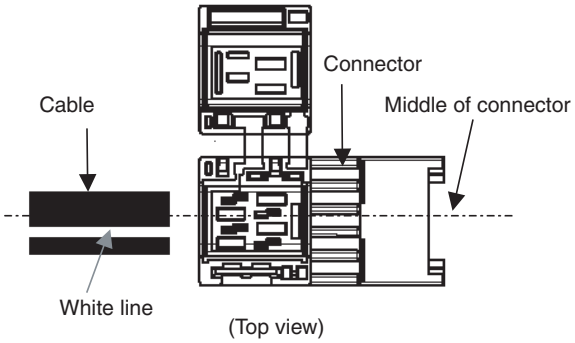
Insert the cable into the cover and position it so that the cable end strikes the cable stopper.



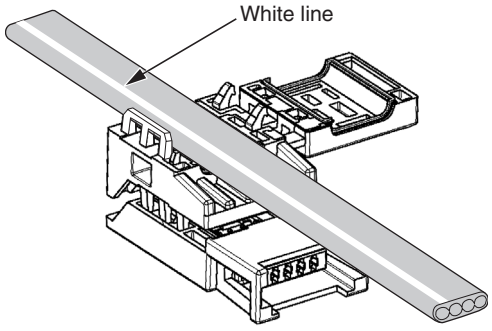
■ **Attaching the Cable**

Place the cable on the connector with the white line on the cable facing upward.

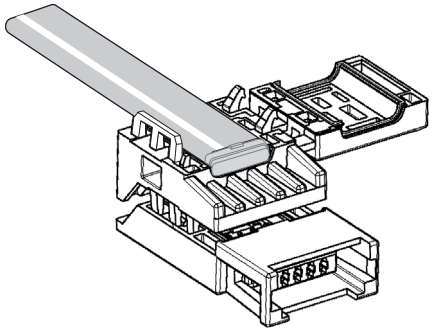
Place the white line on the cable upward and on the opposite of the connector from the cover, as shown in the figure.



■ **T-branch Connections**



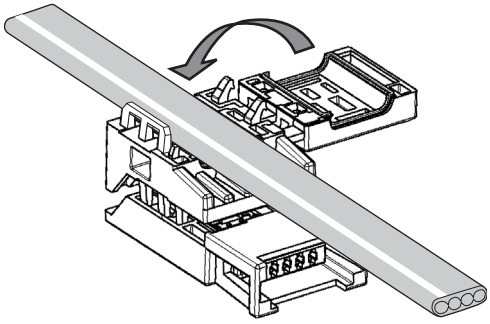
■ **Line Extensions and Line Ends**



■ Pressure-welding the Connector

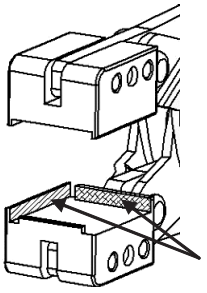
1,2,3... 1. Hold the cable so that it does not move and close the cover.

Note For extensions and line ends, be sure that the cable is inserted all the way to the cable stopper and do not let it be pulled out.



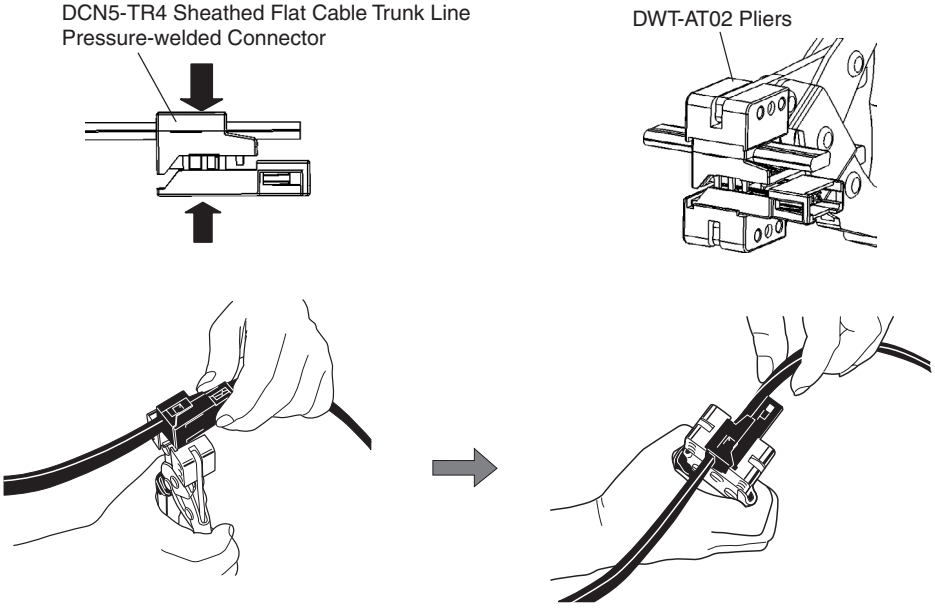
2. The connector is pressure-welded using the DWT-AT02 Pliers.

Note When placing the connector on the pressure-welding block, align it using the reference surfaces shown in the following figure.

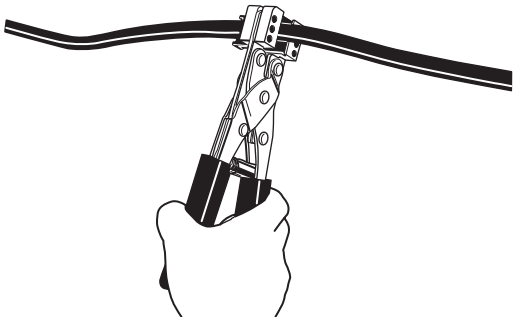


Connector position reference surfaces

3. Set the connector on the pressure-welding block of the DWT-A02 Pliers as shown in the following figure and pressure-weld it in the direction indicated by the arrow.

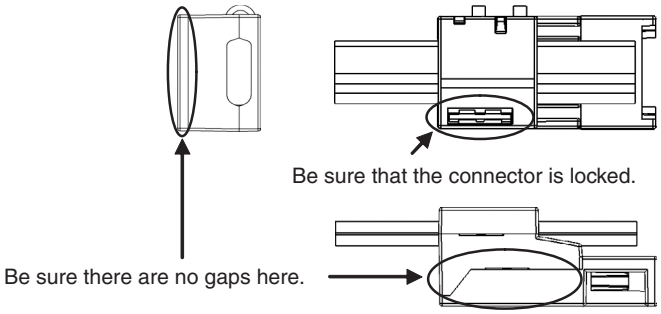


4. Squeeze firmly on the DWT-A02 Pliers until the lock on the connector clicks into place.



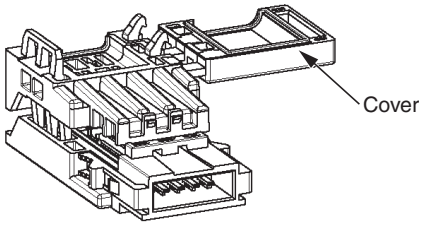
5. After attaching the cable, confirm that it is properly pressure-welded.

DCN5-TR4 Sheathed Flat Cable Trunk Line
Pressure-welded Connector



DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector

DCN5-BR4 Sheathed Flat Cable Branch Line Pressure-welded Connector



■ Cutting the Cable

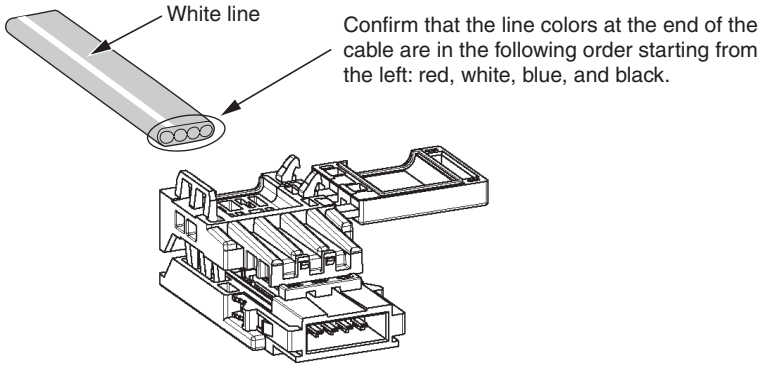
Cut the cable perpendicular to the length.

To prevent short-circuits, cut the cable with a sharp blade and be sure that there are no whiskers from the conductors.

■ Attaching the Cable

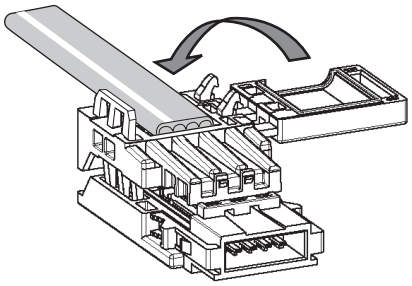
Set the end of the cable as shown in the following figure.

Be sure that the red line at the cable end is opposite of the cover.



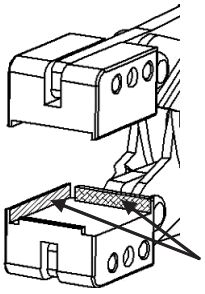
■ Pressure-welding the Connector

1,2,3... 1. Hold the cable so that it does not move and close the cover.



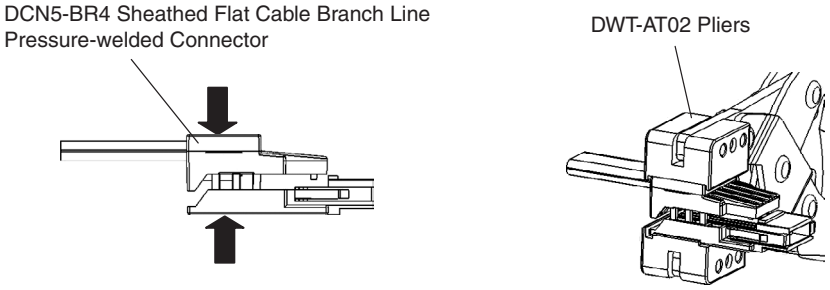
2. The connector is pressure-welded using the DWT-AT02 Pliers.

Note When placing the connector on the pressure-welding block, align it using the reference surfaces shown in the following figure.

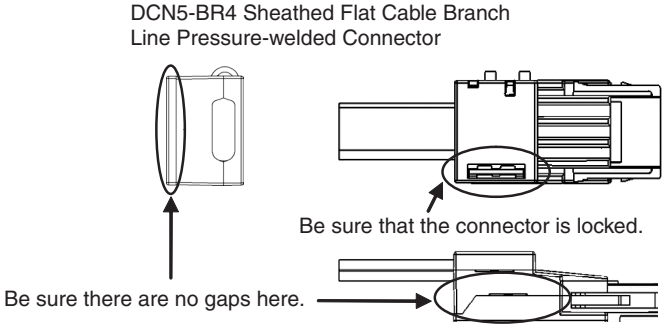


Connector position reference surfaces

3. Set the connector on the pressure-welding block of the DWT-A02 Pliers as shown in the following figure and pressure-weld it in the direction indicated by the arrow.



4. Squeeze firmly on the DWT-A02 Pliers until the lock on the connector clicks into place.
5. After attaching the cable, confirm that it is properly pressure-welded.



3-4 Power Supply Wiring

The following power supplies are required to operate the CompoNet Network.

- Communications power supply: Used for node communications and internal circuit operation.
- I/O power supply: Used for external I/O operation for Slave Units with contact I/O.

Note The Master Unit operation using the power supply from the PLC's Power Supply Unit. No external power supply is required for the Master Unit.

3-4-1 Supplying Power to Slave Units

Slave Units are supplied power as listed in the following table.

Slave Unit classification according to power supply method	Power supply		Cable type		Applicable Slave Units
	Communications power supply	I/O power supply	Flat Cable	VCTF 2-conductor cable	
Multi-power supply	Power can be supplied either through the Flat Cable or to each Slave Unit externally.	Power cannot be supplied through the Flat Cable and must be supplied to each Slave Unit externally.	Communications power is supplied to all Slave Units through the communications cable.	Communications power is supplied to each Slave Unit externally.	Word Slave Units
Network power supply	The communications power and I/O power are supplied together through the Flat Cable.			NA (See note.)	Bit Slave Units

Note Bit Slave Units are sold with a Flat Cable already attached to them. VCTF 2-conductor cable cannot be used.

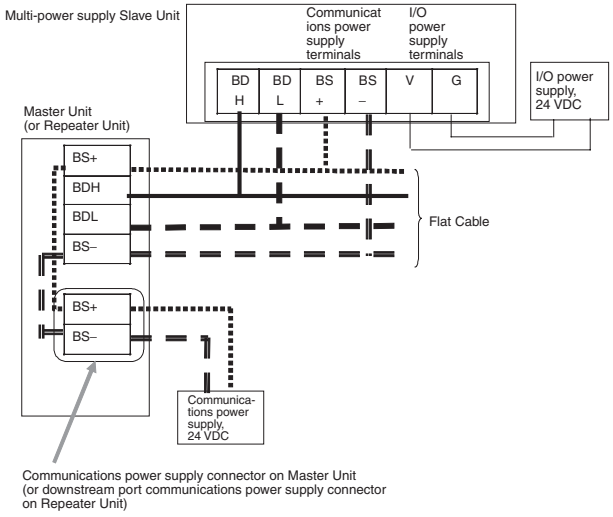
Multi-power Supply Slave Units

The communications power can be supplied either through the network (Flat Cable) or from an external source.

- If the Flat Cable is used, the communications power supply is connected to the communications power supply connector on the Master Unit or to the downstream port communications power supply connector on the Repeater Unit.
- If VCTF 2-conductor cable is used, the communications power supply must be supplied to the communications power supply terminals on each Slave Unit. To prevent noise, use separate power supplies for I/O and communications.

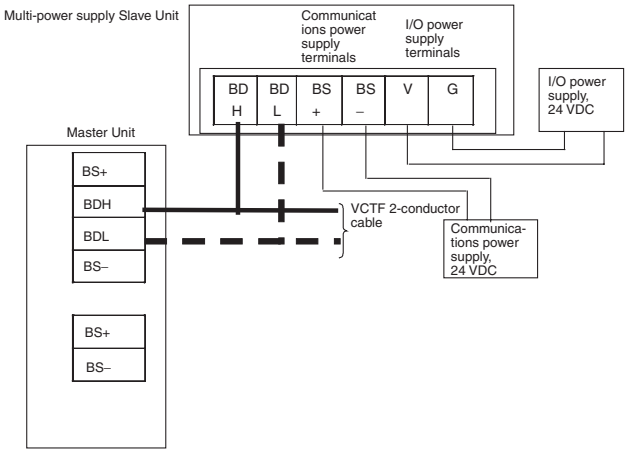
Flat Cable

Communications power is supplied to all Slave Units through the Flat Cable.



VCTF 2-conductor cable

Communications power is supply to each Slave Unit externally.



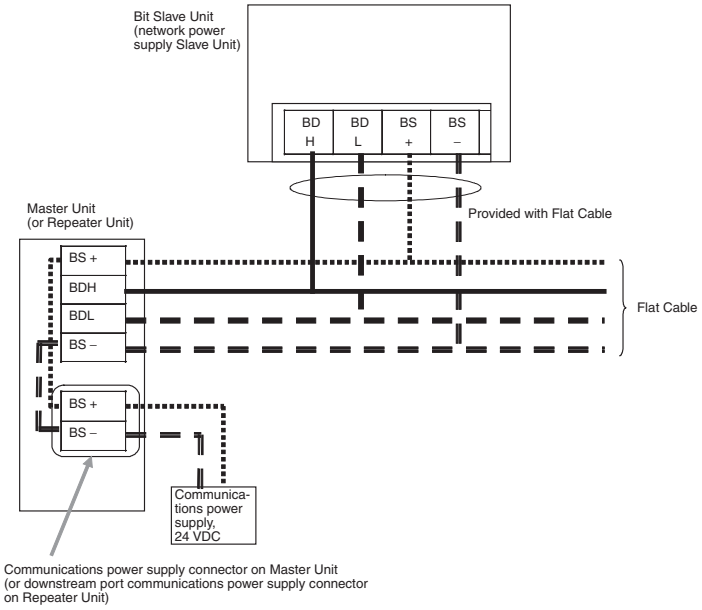
Network Power Supply Slave Units

These Slave Units have only one set of power supply terminals for both communications and I/O power. They use relatively little current and are all supplied power from the network.

For example, Bit Slave Units are sold with a Flat Cable already attached and power can be supplied only through the Flat Cable (communications cable).

Power is supplied from the Master Unit or Repeater Unit.

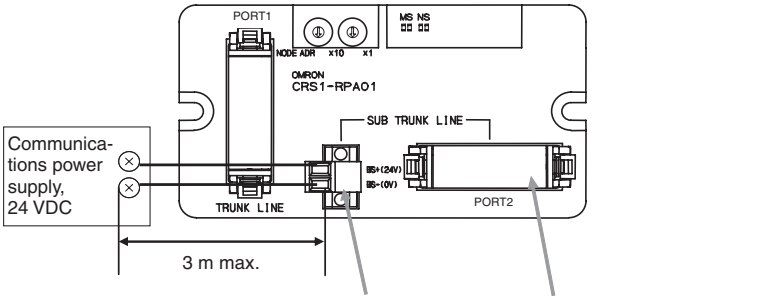
Communications power is supplied to all Slave Units through the Flat Cable.

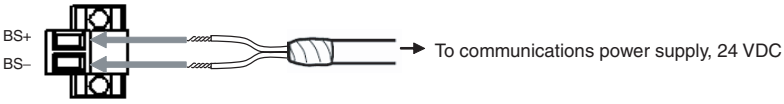


3-4-2 Connecting the Communications Power Supply

Using Flat Cable

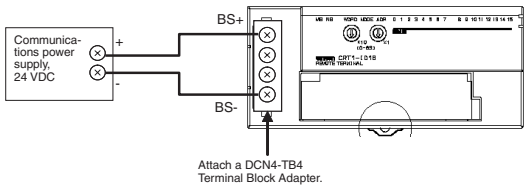
Repeater Unit Connections



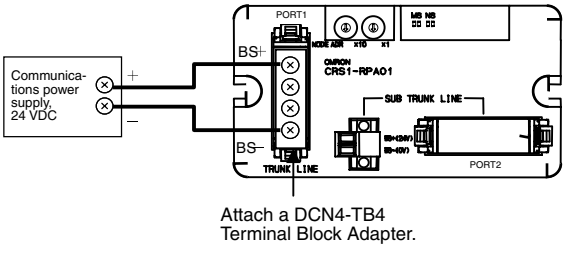


Using VCTF 2-conductor Cable

Slave Unit Connections



Repeater Unit Connections



3-4-3 Communications Power Supply Specifications

Use a commercially available power supply that meets the following specifications for the CompoNet Network communications power supply.

- 24 VDC
- A power supply capacity (i.e., output current) that exceeds the following total current consumption
  - The current consumption of all Word Slave Units and Repeater Units
  - The current consumption of all Bit Slave Units and the external I/O current consumption for all Bit Slave Units
- An isolated power supply (The AC input and DC output must be isolated.)

Note For network power supply Slave Units, the external I/O current is also provided through the Flat Cable from the communications power supply connected to the Master Unit or the Repeater Unit. When calculating the output current of the communications power supply, always include the external I/O current consumption and actual load current for network power supply Slave Units. For example, the power supply current consumption for Bit Slave Unit is expressed by the following formula.

- Input Bit Slave Units:
  Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption × number of sensors used)
- Output Bit Slave Units:
  Communications power supply current consumption = Bit Slave Unit communications current consumption + (actual load current × number of actuators used)
- I/O Bit Slave Units:
  Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption × number of sensors used) + (actual load current × number of actuators used)

Power Supply Specifications

Use a communications power supply that meets the following specifications.

Item	Specification
Output voltage	24 V DC ±10%
Output ripple	600 mVp-p
Insulation	Between output and AC power and between output and chassis ground

We recommend an OMRON S82-series Power Supply for the communications power supply for CompoNet Slave Units.

3-4-4 Current Consumption

Word Slave Units

Digital I/O Slave Units

Name	I/O capacity	Model	Communications power supply current consumption
Basic Units (transistor-type)	16 DC inputs (NPN)	CRT1-ID16	85 mA max.
	16 DC inputs (PNP)	CRT1-ID16-1	85 mA max.
	16 transistor outputs (NPN)	CRT1-OD16	85 mA max.
	16 transistor outputs (PNP)	CRT1-OD16-1	85 mA max.
Expansion Units (transistor-type)	8 DC inputs (NPN)	XWT-ID08	5 mA max.
	8 DC inputs (PNP)	XWT-ID08-1	5 mA max.
	8 transistor outputs (NPN)	XWT-OD08	5 mA max.
	8 transistor outputs (PNP)	XWT-OD08-1	5 mA max.
	16 DC inputs (NPN)	XWT-ID16	10 mA max.
	16 DC inputs (PNP)	XWT-ID16-1	10 mA max.
	16 transistor outputs (NPN)	XWT-OD16	10 mA max.
	16 transistor outputs (PNP)	XWT-OD16-1	10 mA max.

Analog I/O Slave Units

Name	I/O capacity	Model	Communications power supply current consumption
Analog Terminals	4 inputs (0 to 5 V, 1 to 5 V, 0 to 10 V, −10 to 10 V, 0 to 20 mA, 4 to 20 mA)	CRT1-AD04	175 mA
	2 outputs (0 to 5 V, 1 to 5 V, 0 to 10 V, −10 to 10 V, 0 to 20 mA, 4 to 20 mA)	CRT1-DA02	205 mA

Bit Slave Units

Name	Name	Model	Communications power supply current consumption
Bit Slave Units	IP20-conforming, 2 DC inputs, industrial standard connector (e-CON) (NPN)	CRT1B-ID02S	80 mA max. (See note 1.)
	IP20-conforming, 2 DC inputs, industrial standard connector (e-CON) (PNP)	CRT1B-ID02S-1	75 mA max. (See note 1.)
	IP20-conforming, 2 transistor outputs, industrial standard connector (e-CON) (NPN)	CRT1B-OD02S	75 mA max. (See note 2.)
	IP20-conforming, 2 transistor outputs, industrial standard connector (e-CON) (PNP)	CRT1B-OD02S-1	70 mA max. (See note 2.)
	IP54-conforming, 2 DC inputs, industrial standard connector (e-CON) (NPN)	CRT1B-ID02SP	80 mA max. (See note 1.)
	IP54-conforming, 2 DC inputs, industrial standard connector (e-CON) (PNP)	CRT1B-ID02SP-1	80 mA max. (See note 1.)
	IP54-conforming, 4 DC inputs, industrial standard connector (e-CON) (NPN)	CRT1B-ID04SP	90 mA max. (See note 1.)
	IP54-conforming, 4 DC inputs, industrial standard connector (e-CON) (PNP)	CRT1B-ID04SP-1	90 mA max. (See note 1.)
	IP54-conforming, 2 transistor outputs, industrial standard connector (e-CON) (NPN)	CRT1B-OD02SP	75 mA max. (See note 2.)
	IP54-conforming, 2 transistor outputs, industrial standard connector (e-CON) (PNP)	CRT1B-OD02SP-1	75 mA max. (See note 2.)
	IP54-conforming, 2 transistor outputs/2 transistor outputs, clamp terminal block (NPN)	CRT1B-MD04SLP	90 mA max. (See note 3.)
	IP54-conforming, 2 transistor outputs/2 transistor outputs, clamp terminal block (PNP)	RT1B-MD04SLP-1	85 mA max. (See note 3.)

Note

(1) The current consumption is for when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the number of sensors connected.

The power supply current consumption is expressed by the following formula.

Communications power supply current consumption = Bit Slave Unit current consumption + (input current + sensor current consumption) × number of sensors used

(2) The current consumption is for when all outputs are OFF, i.e., it does not include output device current consumption. The communications power supply is also used for the I/O power supply for actuators. Be sure to consider the actuator current consumption and the number of actuators connected.

The power supply current consumption is expressed by the following for-

mula.
Communications power supply current consumption = Bit Slave Unit current consumption + (output current + actuator current consumption) × number of actuators used

(3) The current consumption is for when all inputs and outputs are OFF, i.e., it does not include input and output device current consumption. The communications power supply is also used for the I/O power supply for sensors and actuators. Be sure to consider the sensor and actuator current consumption and the number of sensors and actuators connected.
The power supply current consumption is expressed by the following formula.
Communications power supply current consumption = Bit Slave Unit current consumption + (input current + sensor current consumption) × number of sensors used + (output current + actuator current consumption) × number of actuators used

Repeater Unit

Name	Model	Communications power supply current consumption
Repeater Unit	CRS1-RPT01	95 mA max.

3-4-5 Communications Power Supply Wiring Examples

Using Flat Cable

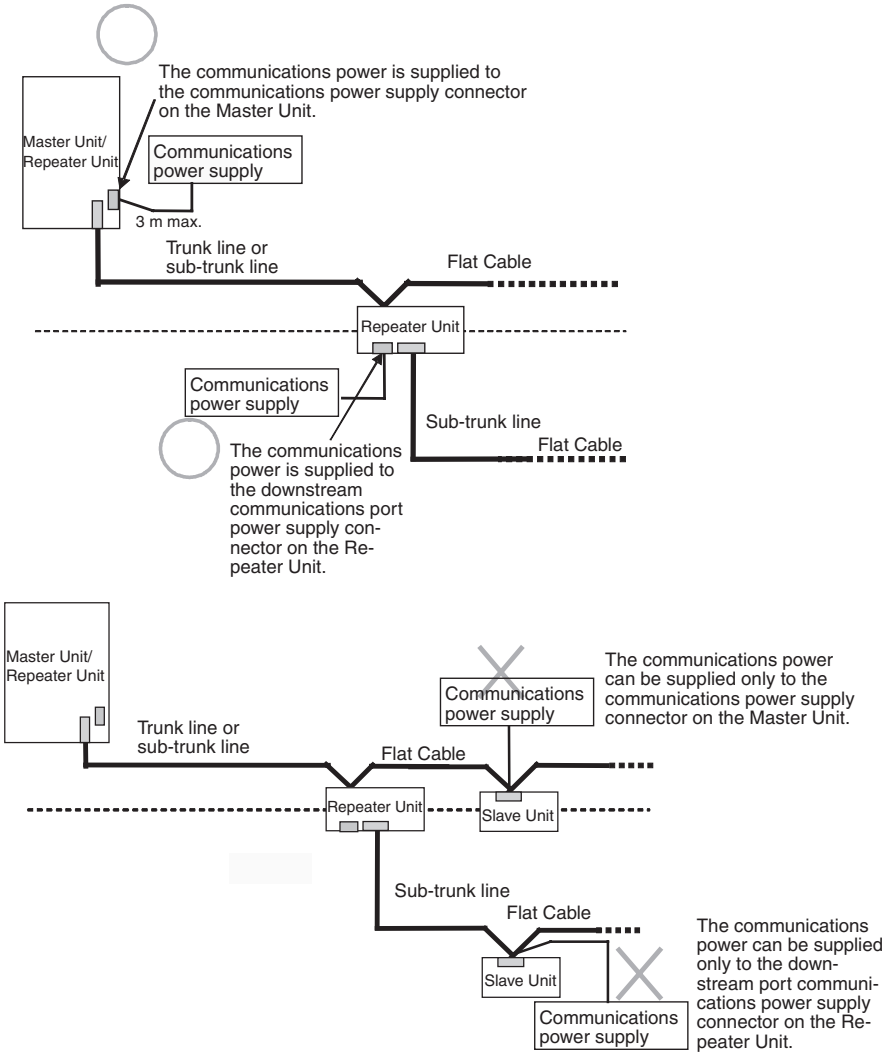
When Flat Cable is used, the Slave Unit communications power is supplied through the Flat Cable. There is no special wiring required for the communications power supply. The same communications power supply is shared for the entire trunk line or sub-trunk line.

For multi-power supply Slave Units, however, I/O power must be supplied separately.

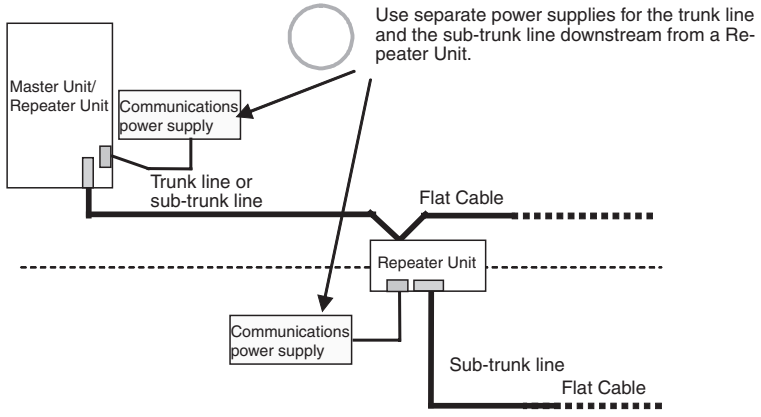
Restrictions

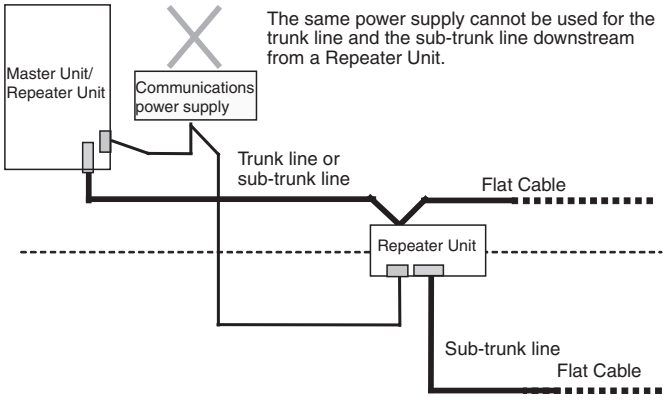
The following restrictions exist when supplying communications power through a Flat Cable.

- The communications power supply can be connected at only one location for the trunk line and one location each for the sub-trunk lines.
  Communications power to the trunk line can be supplied only through the communications power supply connector on the Master Unit.
  Communications power to a sub-trunk line can be supplied only through the downstream port communications power supply connector on the Repeater Unit.
  Communications power cannot be supplied at any other location.



- Use separate power supplies for the trunk line and for each sub-trunk line (i.e., for the trunk line or sub-trunk line upstream from a Repeater Unit and the sub-trunk line downstream from a Repeater Unit).

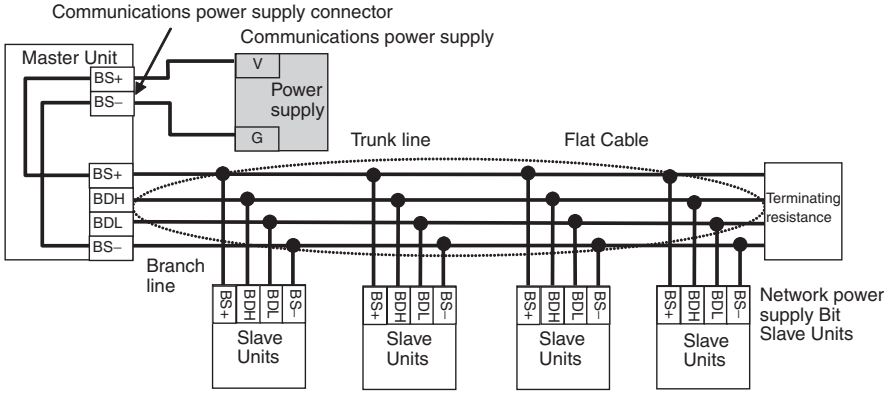




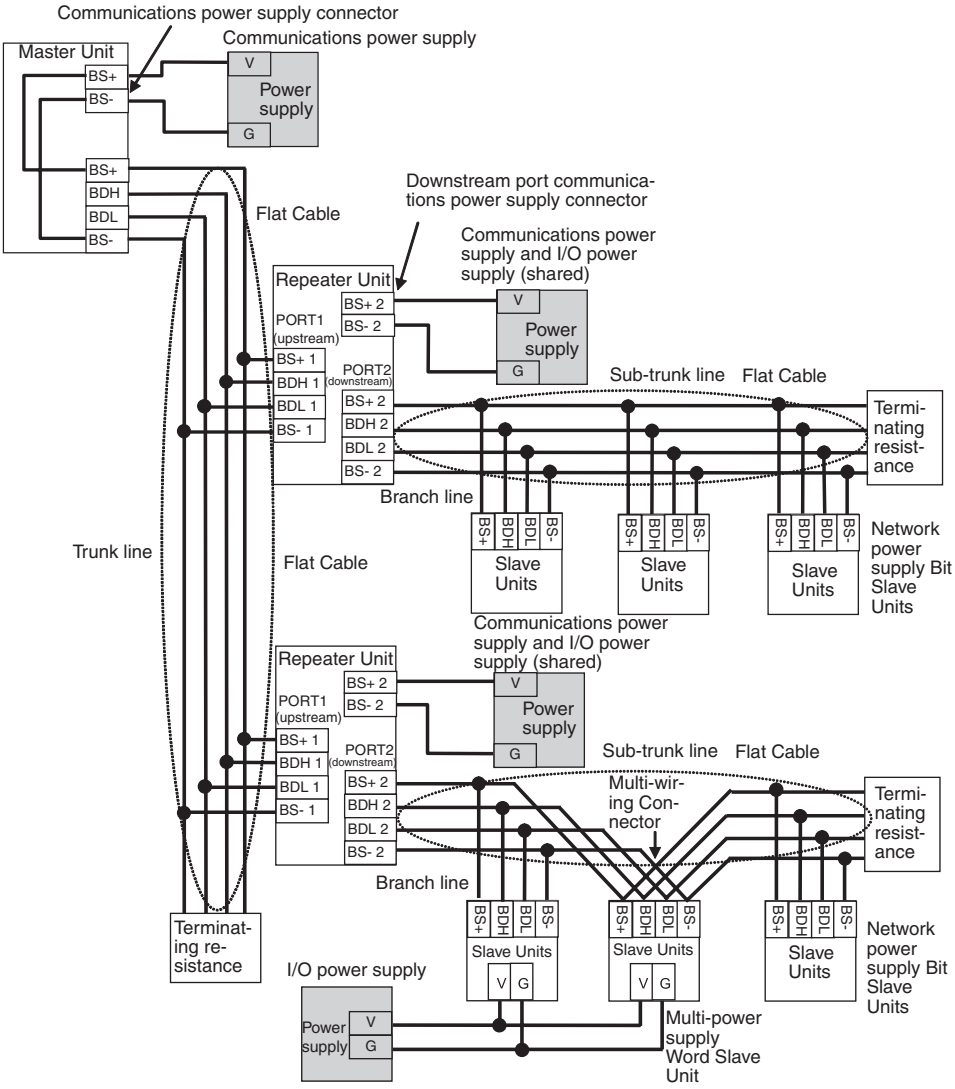
Transmission quality will not be maintained and communications errors may occur if this restriction is not observed.

Power supply wiring examples are provided below.

Not Using a Repeater Unit



Using a Repeater Unit



Note

(1) Absolutely do not supply communications power from more than one location for the trunk line or for any one sub-trunk line. The quality of communications will decrease and normal remote I/O communications may not be possible.

(2) Do not supply communications power to the trunk line and a sub-trunk line or to two sub-trunk lines from the same power supply. The quality of communications will decrease and normal remote I/O communications may not be possible.

(3) The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

VCTF 2-conductor Cable

When using VCTF 2-conductor cable, the communications power cannot be supplied through the communications cable.

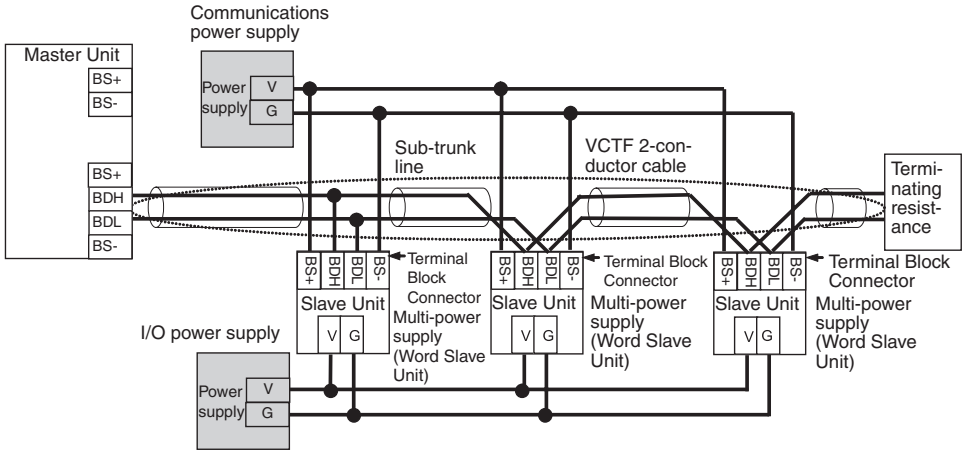
The communications power must be supplied to each Slave Unit and Repeater Unit through separate lines.

For multi-power supply Slave Units that require power for I/O, the I/O power must also be supplied separately.

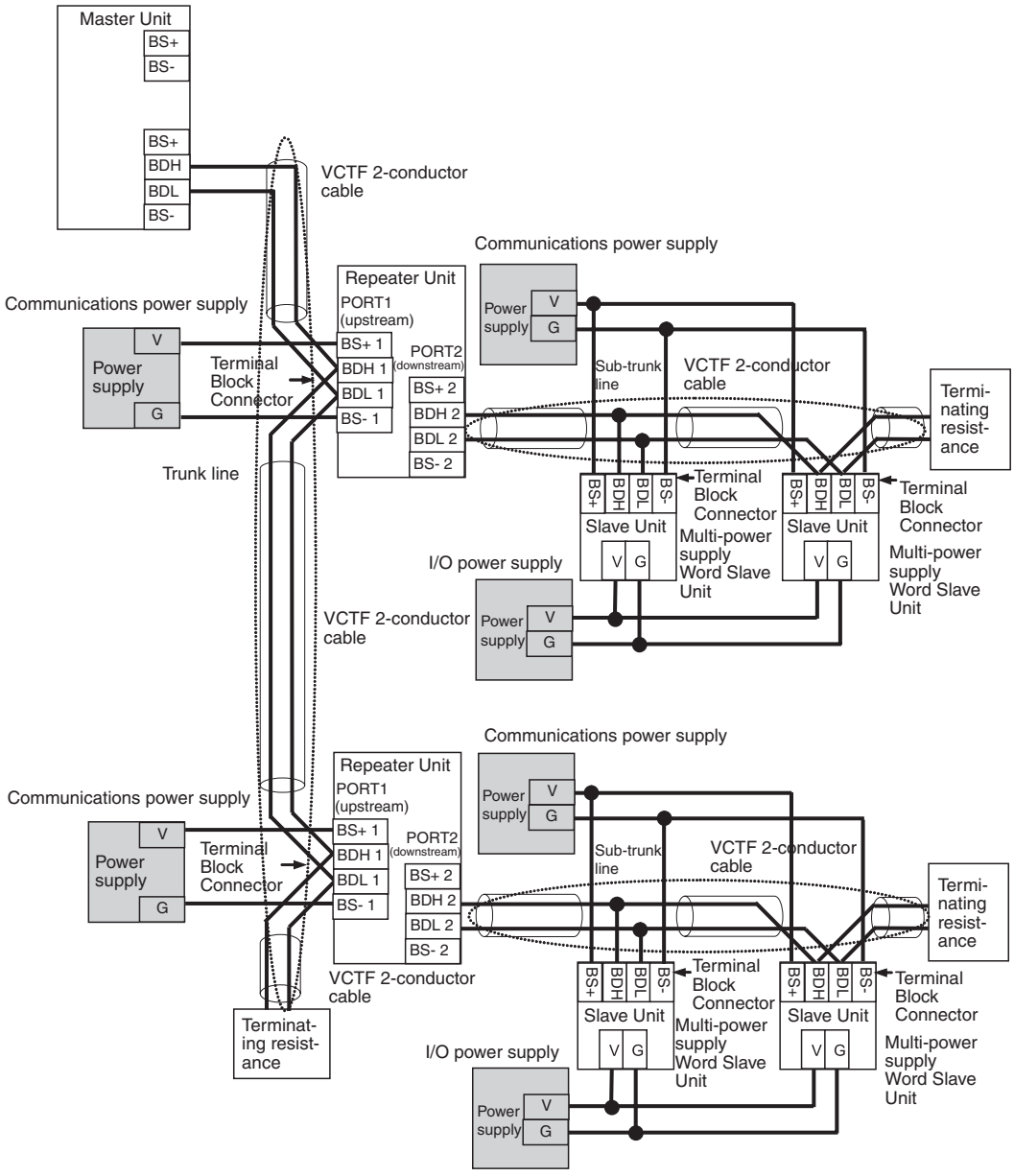
Note (a) No external power supply is required for the Master Unit.

(b) The communications power to the Repeater Unit must be supplied to the BS+A and BS-A terminals on the upstream port (port 1).

Not Using a Repeater Unit



Using a Repeater Unit



Note The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

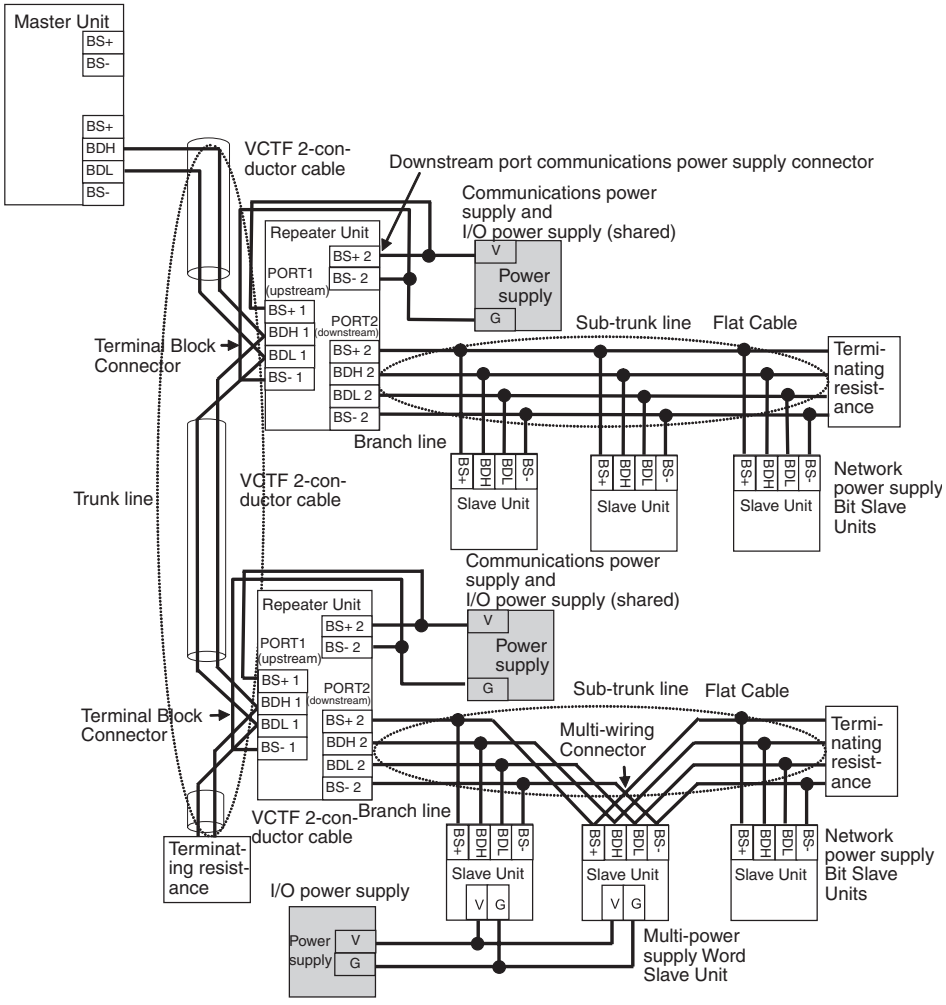
Using VCTF 2-conductor Cable and Flat Cable Together

One or more Repeater Units can be used in a CompoNet Network to use both VCTF 2-conductor cable and Standard or Sheathed Flat Cable under the same Master Unit.

Note (a) No external power supply is required for the Master Unit.

(b) As long as Flat Cable is not used both upstream and downstream from a Repeater Unit, then the same communications power supply can be used for both the upstream trunk line or sub-trunk line and the downstream sub-trunk line.

A power supply wiring example is provided below.



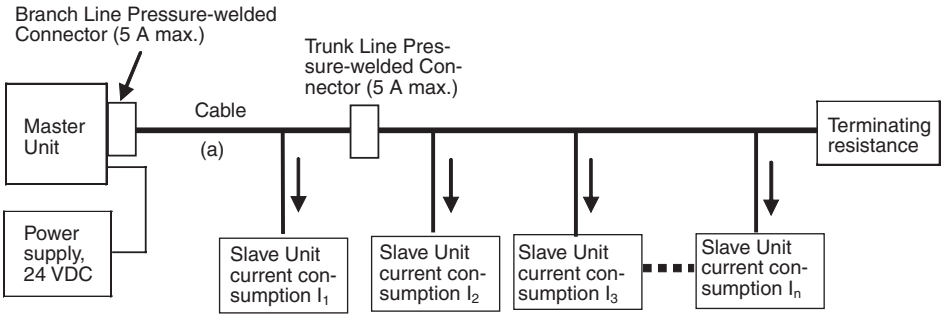
Note The I/O power supply to multi-power supply Slave Units may be a source of noise depending on the connected devices. Even when supplying the communications power supply together to all Slave Units, use a separate I/O power supply so that noise does not affect the network.

3-4-6 Precaution in Supplying Power to Slave Units

When supplying communications power and I/O power, the allowable currents of cables and connections, the voltage drop, and the capacity and location of power supplies must be considered.

Allowable Current Restrictions

Do not allow the total current consumption of all Slave Units to exceed the allowable current of the communications cables and connectors.



Allowable Currents for Cables

Select the communications cable so that the total current consumption of all Slave Units does not exceed the allowable current of the cable.

Cable allowable current $\geq I_1 + I_2 + I_3 + \cdots I_n$
(For the allowable cable current for "a" in the above diagram)

Allowable Currents for Connectors

There are limits to the allowable current for the communications power supply connectors on the Master Unit and Repeater Units, Trunk Line Pressure-welded Connectors, and Branch Line Pressure-welded Connectors. Do not allow the current flow where these connectors are used to exceed the allowable current.

Name	Model	Allowable current	Remarks
Communications power supply connectors on CS/CJ-Master Units	CS1W-CRM21	5 A	VCTF 2-conductor cable or Flat Cable
	CJ1W-CRM21		
Communications power supply connector on Repeater Unit	CRS1-RPT01		
Trunk Line Pressure-welded Connectors	DCN4-TR4		
	DCN5-TR4		
Branch Line Pressure-welded Connectors	DCN4-BR4		
	DCN5-BR4		
Multi-wiring Connector	DCN4-MD4		

Note If the allowable current is exceeded, heating and burning may result.

Voltage Drop

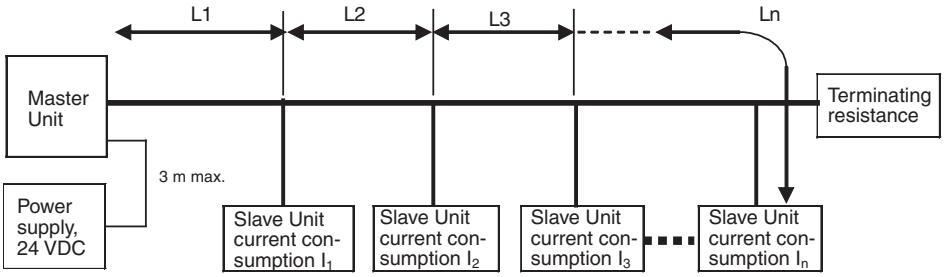
Cable Voltage Drop

The voltage drop must be considered so that the power supply voltage at the Slave Unit that is the farthest from the power supply will still be within the allowable power supply range.

The voltage drop is expressed by the following formula.

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

If the voltage drop is too large and power cannot be supplied to the farthest Slave Unit within the allowable range, add a Repeater Unit and supply power from the Repeater Unit.



■ Calculation Example

The allowable power supply voltage range for Slave Units is 14 to 26.4 VDC. If a 24-VDC power supply is used, the allowable voltage drop is 10 V.

The extended length of cable that can be used is expressed by the following equation:

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

To provide leeway when selecting the cable, use the following approximation.

$$10(V) \geq \{(I1 + I2 + I3 + \ldots + In) \times R \times L \times 2\}$$

R = Cable conductor resistance = 0.025 W/m for Flat Cable

The extended length of the cable is thus express by the following formula:

$$L\ (m) \leq 200 \div (I1 + I2 + I3 + \ldots + In) \ldots \text{For Flat Cable}$$

3-4-7 Precautions on Locating the I/O Power Supply

When installing a system, the supply methods for communications power and I/O power must be considered. Not only hardware, such as selecting the power supplies and cables based on allowable currents and voltage drop, be considered, but also system operation for power supply errors, costs, and other software issues must be considered when studying power supply methods.

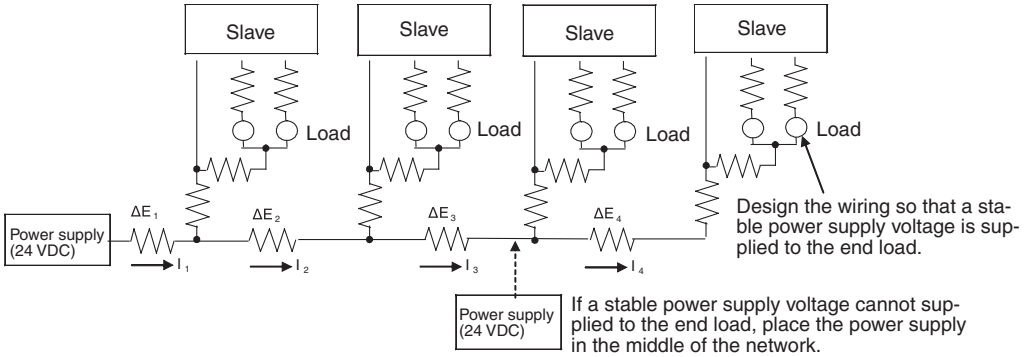
Supplying I/O Power from One Source

When supplying I/O power to the entire system from one source, the power consumed by each devices and the loads must be considered. Select the cables so that the power supply voltage for the last Slave Unit and load will be within the allowable range.

Also, give proper consideration to the power supply capacity and be sure the total line current is within the allowable current range of the cable.

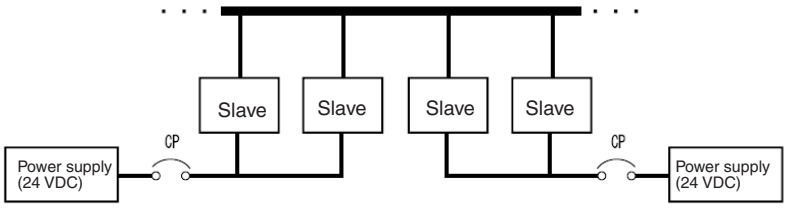
The following measures can be considered to keep the voltage drop within the allowable range when supplying power from one power supply.

- Increase the thickness of the cables.
- Increase the output voltage of the power supply.
- Shorting the wiring.
- Locate the power supply in the middle of the network.



Supplying I/O Power from Multiple Sources

Supplying I/O power from multiple power supplies instead of from one power supply enables reducing the line current, reducing the voltage drop, and decreasing the size of the cable. Using multiple power supplies should also be considered to increase system safety when power supply errors occur.



3-4-8 Other Precautions

Power Supply Errors

The location of power supplies and the grouping of Slave Units should be considered based on whether the overall system is to be stopped when a power supply error occurs.

If it is necessary to prevent the overall system from stopping to ensure system safety, consider placing power supplies in more than one location and consider the way Slave Units should be grouped when supplying power.

Cost Considerations

Also consider the power supply methods in light of the total cost, including the following items:

The capacity and number of power supplies, Cable thickness (allowable current) and length (voltage drop),

System safety, and

Wiring work.

3-5 Connecting External I/O for Slave Units

This section describes connecting external I/O to Slave Units.

3-5-1 Word Slave Units (CRT1-ID16(-1) and CRT1-OD16(-1))

Attach the following M3 crimp terminals to signal lines and then connect them to the terminal block.

Note Tighten terminal block screws to a torque of 0.5 N·m.

3-5-2 Bit Slave Units

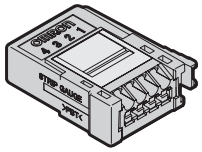
External I/O connections to Bit Slave Units are made using industrial standard sensor connectors (e-CON) and screw-less clamp terminal blocks. The external I/O connection method for each model is given in the following table.

Model	External I/O connection method
CRT1B-ID02S	Industrial standard sensor connector (e-CON)
CRT1B-ID02S-1	
CRT1B-OD02S	
CRT1B-OD02S-1	
CRT1B-ID02SP	
CRT1B-ID02SP-1	
CRT1B-OD02SP	
CRT1B-OD02SP-1	
CRT1B-ID04SP	
CRT1B-ID04SP-1	
CRT1B-MD04SLP	Screw-less clamp terminal block
CRT1B-MD04SLP-1	

Industrial Standard Sensor Connector (e-CON) Assembly, Wiring, and Installation

Input Bit Slave Units and Output Bit Slave Units use industry standard sensor connectors. When connecting a sensor or other external device, a special connector must be attached to the sensor or other external device cable.

OMRON XN2A-1430
Cable Connector



Use the following procedure to attach the Cable Connector to the sensor or other external device cable.

■ Checking the Cable Connector and Cable Wire Size

The applicable Cable Connector depends on the manufacturer and the wire size. Use the following table to check that the Cable Connector and sensor or other external device cable wire size are compatible.

Tyco Electronics Corporation

Model	Housing color	Applicable wire range
1-1473562-4	Red	AWG28 (0.08 mm^2) to AWG24 (0.2 mm^2), sheath outer diameter: 0.9 to 1.0 mm
1473562-4	Yellow	AWG24 (0.2 mm^2) to AWG22 (0.3 mm^2), sheath outer diameter: 1.0 to 1.15 mm
2-1473562-4	Blue	AWG22 (0.3 mm^2) to AWG20 (0.5 mm^2), sheath outer diameter: 1.15 to 1.35 mm

Sumitomo 3M

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

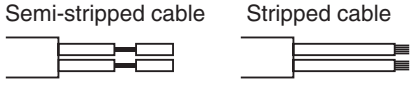
OMRON

Model	Specifications	Applicable wire range
XN2A-1430	Spring clamp type	AWG28 (0.08 mm^2) to AWG20 (0.5 mm^2), sheath outer diameter: 1.5 mm max.

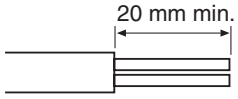
■ Preparing the Sensor or other External Device Cables

Using Tyco Electronics or Sumitomo 3M Connectors

The sensor and other external device cables for connector output with transistors are normally either semi-stripped or stripped, as shown in the following diagram.

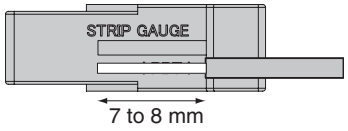


When the cables are prepared this way, a Cable Connector cannot be attached, so first cut the end and remove the cable sheath as shown in the following diagram. (Do not strip the core wires.)



Using OMRON Connectors

Align the cable with the strip gauge on the side of the connector. Remove 7 to 8 mm of the wiring sheath, and twist the exposed wires several times.



■ Inserting the Wire into the Cable Connector (Hard Wiring Procedure)

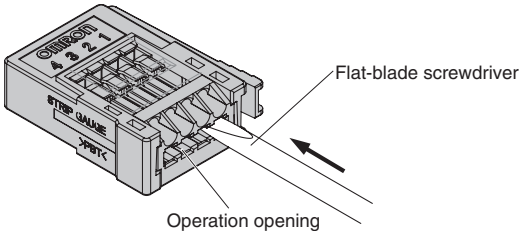
Using Tyco Electronics or Sumitomo 3M Connectors

1,2,3...

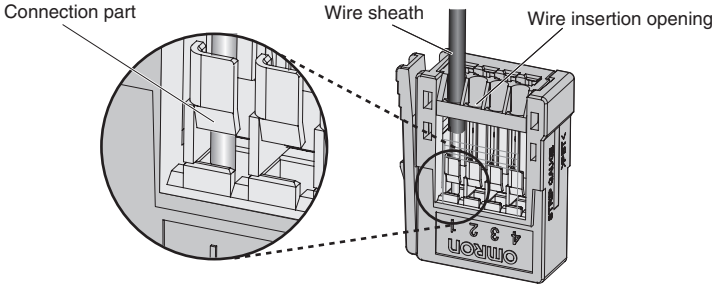
1. Insert the wire into the cover of the Cable Connector. Check that the terminal number and wire color match, and insert all the way to the back of the connector.
2. Join the cover and plug connector, using pliers or another tool to push in fully. At the same time, push in the middle of the cover straight so that it is not crooked.

Using OMRON Connectors

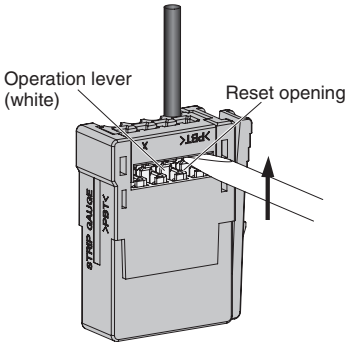
1,2,3... 1. Use a flat-blade screwdriver to push the operation lever inside the connector's operation opening until it locks, as shown in the following diagram.



2. Insert the line all the way to the back of the wire insertion opening. Check that the sheath of the line is inserted into the wire insertion opening, and that the end of the conductor has passed through the connection part.



3. Insert a flat-blade screwdriver into the reset opening and pull back the lever lightly. A click will be heard and the operation lever will return to its normal position.



4. Check that the operation lever has returned to its normal position. Lightly pull on the lines, and if there is any resistance, they are connected properly.

Note (1) When connecting a sensor, insert the wire so that the terminal number on the cover matches the sensor wire color, as shown in the following table.

	Using CRT1B-ID02S(P), CRT1B-ID04SP, CRT1B-MD04SLP		Using CRT1B-ID02S(P), CRT1B-ID04SP-1, CRT1B-MD04SLP-1	
Terminal number	3-wire sensor (without self-diagnostic output)	2-wire sensor (without self-diagnostic output)	3-wire sensor (without self-diagnostic output)	2-wire sensor (without self-diagnostic output)
1	Brown (red)	---	Brown (red)	Brown (white)
2	---	---	---	---
3	Blue (black)	Blue (black)	Blue (black)	---
4	Black (white)	Brown (white)	Black (white)	Blue (black)

(2) Wire colors have been changed according to revisions in the JIS standards for photoelectric and proximity sensors. The colors in parentheses are the wire colors prior to the revisions.

Note To remove a wire, push in the operation lever, check that the operation lever has locked, and then pull out the wire. After removing the wire, always return the operation lever to its normal position.

Wiring to Screw-less Clamp Terminal Blocks

The CRT1B-MD04SLP(-1) has a screw-less clamp terminal block.

Screw-less clamp terminal blocks can be easily wired simply by placing pin terminals on the wires.

■ Applicable Pin Terminals

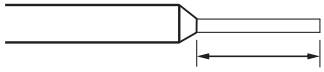
When wiring sensors or other external devices, pin terminals must be placed on the wires of the sensor or other external device.

The applicable pin terminals are listed in the following table.

Applicable wire size	Name	Crimp tool	Manufacturer
0.5 mm^2/AWG20	H0.5/14 orange	PZ6 roto	Weidmuller Co. Ltd.
0.75 mm^2/AWG18	H0.75/14 white		
1.5 mm^2/AWG16	H1.5/14 red		

Applicable Pin Terminal Conductor Length

The pin terminal conductor should be about 8 to 10 mm in length.



Conductor length: 8 to 10 mm

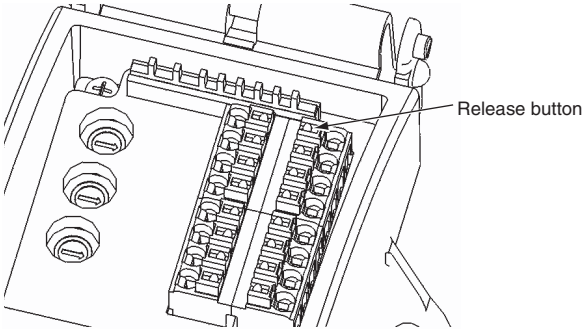
■ Wiring to the Clamp Terminal Block

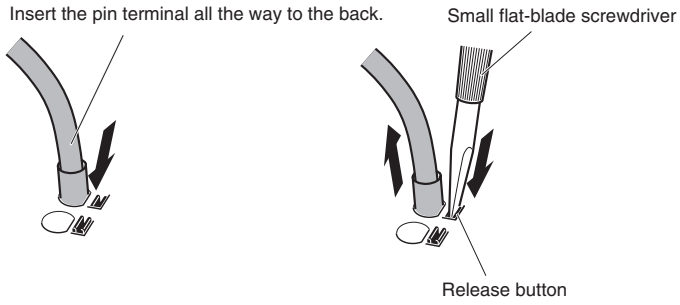
Insertion

Insert the pin terminal all the way to the back of the terminal hole.

Removal

Press down the release button next to the terminal hole with a small flat-blade screwdriver and pull out the pin terminal while the release button is down.



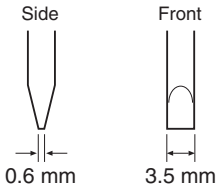


Note Press the release button with a force of 30 N or less. Applying excessive force may damage the clamp terminal block.

Use the following screwdriver when removing pin terminals.

Recommended Screwdriver

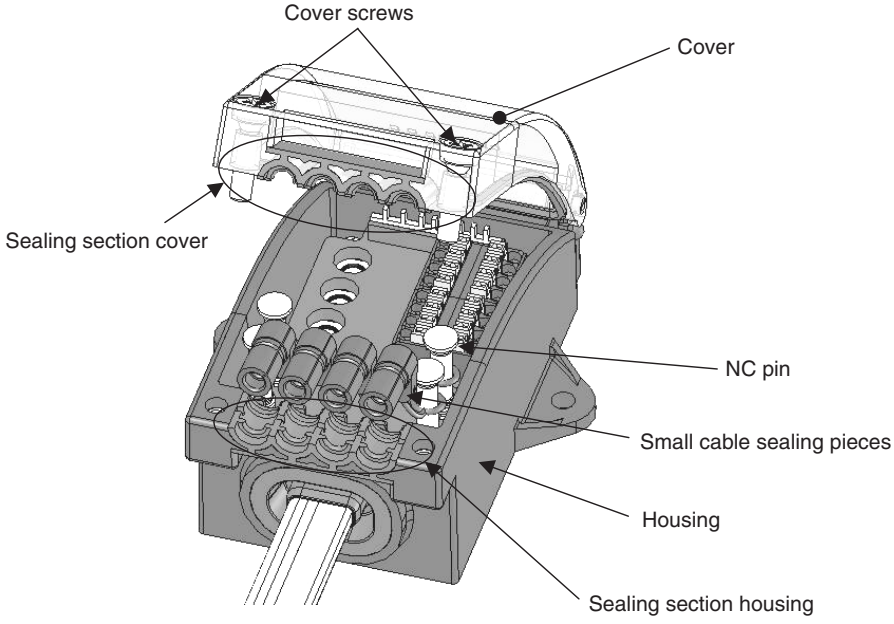
Model	Manufacturer
SD0.6 × 3.5 × 100 Flat-blade Screwdriver	Weidmuller Co. Ltd.



Connecting External I/O to Slave Units

This section describes connecting external I/O to IP54 Slave Units.

Components



External I/O is connected to the clamp terminal block and industrial standard sensor connectors (e-CON) inside the housing. Connected external I/O cables are passed through the sealing.

The cables are held between the sealing section cover and sealing section housing to ensure resistance to splashing.

For cables with smaller outer diameters, the sealing pieces can be used to ensure splash resistance.

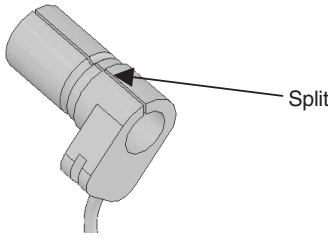
Confirming Cable Size

The range of cable outer diameters that are applicable to the sealing section is 2.2 to 6.3 mm.

The method for maintaining splash resistance at the sealing section depends on the size of cable that is being used.

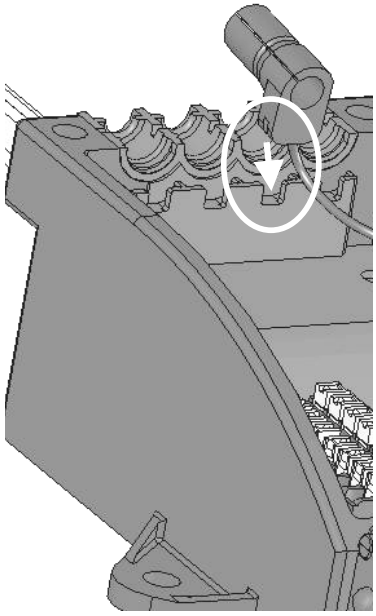
Cable outer diameter	Small cable sealing piece
2.2 to less than 3.6 mm	Required.
3.6 to 6.3 mm	Not required.

Using the Small Cable Sealing Pieces



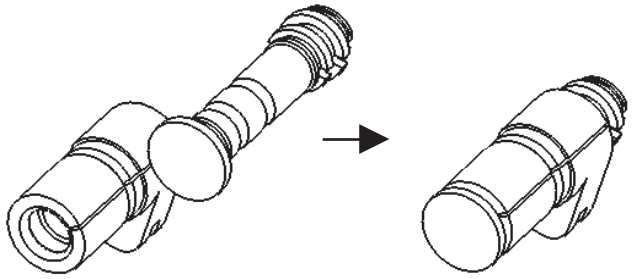
Expand the split in the sealing piece and insert the cable.

Place the groove on the sealing pieces onto the inside of the housing to secure it. (See following diagram.)



Handling Unconnected Terminals

For terminals that are not connected, insert an NC pin into the small cable sealing piece as shown in the following diagram. Then secure the sealing piece onto the housing as described above.



Tightening the Cover

Finally, tighten the cover screws.

The tightening torque is 0.8 to 1.0 N·m.

SECTION 4
Basic Specifications of Slave Units

This section provides the basic specifications of the Slave Units.

4-1 Basic Specifications of Slave Units

4-1-1 Communications Specifications

Item	Specification
Communications protocol	CompoNet Network protocol
Types of communications	Remote I/O communications (programless, constant sharing of data with Slave Units) and message communications (explicit message communications as required with Slave Units and FINS message communications as required with PLCs)
Baud rate	4 Mbits/s, 3 Mbits/s, 1.5 Mbits/s, 93.75 kbits/s
Modulation	Base-band
Coding	Manchester code
Error control	Manchester code rules, CRC
Communications media	The following media can be used. • VCTF 2-conductor cable (JIS C 3306, 2-conductor) • Standard Flat Cable (DCA4-4F10) • Sheathed Flat Cable (DCA5-4F10) **Note** VCTF 2-conductor cable, Standard Flat Cable, and Sheathed Flat Cable are all different types of cable. To use more than one type of cable, they must be separated on the trunk line and a sub-trunk line or on different sub-trunk lines.
Communications distance and wiring	Refer to *1-2-1 Cable Types, Baud Rates, and Maximum Distances* in the *Master Unit Operation Manual*.
Connectable Master Units	CompoNet Master Units
Connectable Slave Units	CompoNet Slave Units
Maximum I/O capacity	Word Slave Units: 1,024 input and 1,024 outputs (2,048 I/O points total) Bit Slave Units: 256 inputs and 256 outputs (512 I/O points 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 without Repeater Units (one trunk line or sub-trunk line)	32 nodes
Applicable node addresses	Word Slave Units: IN0 to IN63 and OUT0 to OUT63 Bit Slave Units: IN0 to IN127 and OUT0 to OUT127 Repeater Units: 0 to 63
Repeater Unit application conditions	Up to 64 Repeater Units can be connected per network.When Repeater Units are connected in series from the Master Unit, up to 2 extra segment layers can be created (i.e., up to 2 Repeater Units are allowed between a Slave Unit and the Master Unit).
Signal lines	Two lines: BDH (communications data high) and BDL (communications data low)
Power lines	Two lines: BS+ and BS- (power for communications and internal Slave Unit circuits) • Power is supplied from the Master Unit and Repeater Units.
Connection forms	Flat Cable at baud rate of 93.75 kbits/s: No restrictions Other cables or baud rates: Trunk line and branch lines
	Connections for Slave Units and Repeater Units: T-branch or multidrop connections

4-1-2 Performance Specifications

Item	Specification
Communications power supply voltage	14 to 26.4 VDC
I/O power supply voltage	20.4 to 26.4 VDC (24 VDC –15%/+10%)
Noise immunity	Conforms to IEC 61000-4-4 2kV (power line)
Vibration resistance	10 to 150 Hz with double-amplitude of 0.7 or 50 m/s^2
Shock resistance	150 m/s^2
Dielectric strength	500 VAC (between isolated circuits)
Insulation resistance	20 MΩ min. (between isolated circuits)
Ambient operating temperature	–10 to 55°C
Ambient operating humidity	25% to 85% (with no condensation)
Ambient operating atmosphere	No corrosive gases
Storage temperature	–25 to 65°C
Storage humidity	25% to 85% (with no condensation)
Installation	Bit Slave Units: Secured with M4 screws Other Units: 35-mm DIN Track

4-1-3 Communications Indicators

The communications indicators have the following meanings.

MS (Module Status): Indicates the status of the node with a two-color LED (green/red).

MS (Module Status): Indicates the status of communications with a two-color LED (green/red).

Name	Indicator status	Node/communications status	Meaning
MS	Lit green.	Normal status	The Unit is operating normally.
	Lit red.	Fatal error	A hardware error has occurred in the Unit. The watchdog timer has timed-out.
	Flashing red.	Non-fatal error	There is an error in the settings.
	Not lit.	Power OFF/Startup	The power supply is OFF, the Unit is being reset, or the Unit is being initialized.
NS	Lit green.	Online and participating	Normal communications are in progress and the node is participating in the network.
	Flashing green.	Online but not participating	Normal communications are in progress but the node is not yet participating in the network.
	Lit red.	Fatal communications error	The same address has been set for more than one node.
	Flashing red.	Non-fatal communications error	Polling has timed out. The network has timed out.
	Not lit.	Power OFF/Startup	The power supply is OFF, the Unit is being reset, or the Unit is being initialized.

Note When flashing, indicators are lit for 0.5 s and not lit for 0.5 s.

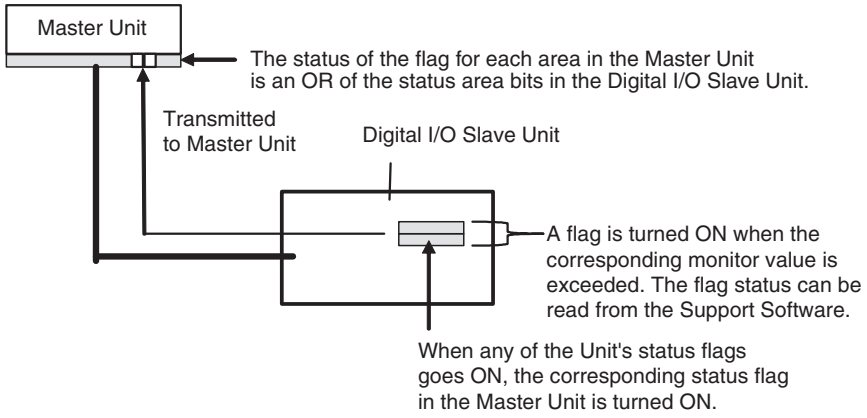
SECTION 5
Digital I/O Slave Units

This section describes the Digital I/O Slave Units.

5-1 Status Areas

A Digital 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 threshold values set by the user for each function in that Unit. For each area, a corresponding status flag in the Master Unit will be turned ON if any flag in the status area in the Digital I/O Slave Unit turns ON. Bit 12 in the Master Unit corresponds to the Warning Status Area and bit 13 corresponds to the Alarm Status Area.

The Digital I/O Slave Unit's status area information can be read from the CompoNet Support Software.



Warning Status Area

The Digital I/O Slave Unit's Warning Status Area contains the following 16 bits. These bits indicate minor errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	Reserved	---
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Monitors the voltage set as the threshold for the network power voltage monitor function.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Monitors the power ON time warning value set as the threshold for the Unit ON Time Monitor function.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Operation Time Monitor Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the operation time monitor function is exceeded.
9	Connected Device Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the contact operation monitor function or the total ON time monitor function is exceeded.
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Alarm Status Area

The Digital I/O Slave Unit's Alarm Status Area contains the following 16 bits. These bits indicate serious errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	EEPROM Data Error Flag OFF: Normal ON: Error occurred	Turns ON when there is an error in the EEPROM data.
2	Reserved	---
3	Reserved	---
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	I/O Power Supply Status Flag 1 OFF: I/O power is ON ON: I/O power is not ON.	Turns ON when I/O power is not being supplied.
9	I/O Power Supply Status Flag 2 OFF: I/O power is ON ON: I/O power is not ON.	Turns ON when I/O power is not being supplied to the Expansion Unit.
10	Reserved	---
11	Reserved	---
12	Operation Time Configuration Flag OFF: Normal ON: Error	Turns ON when a threshold value is set for the operation time monitor function between a Basic Unit and Expansion Unit (if an Expansion Unit is connected).
13	Reserved	---
14	Reserved	---
15	Reserved	---

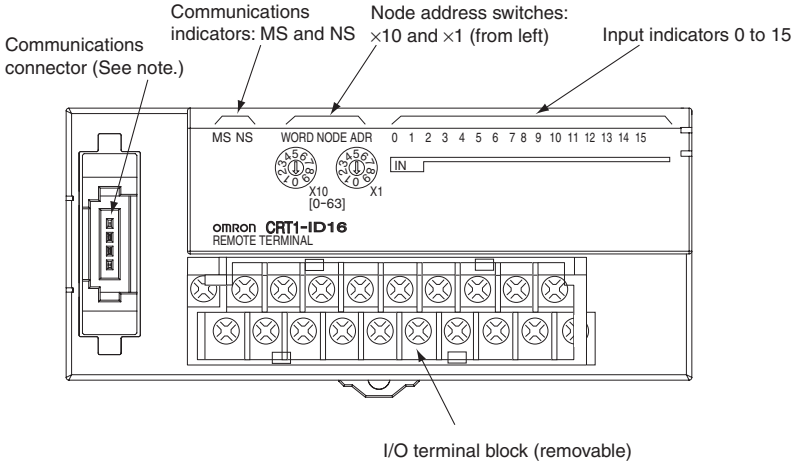
5-2 Basic Units

5-2-1 16-point DC Input Units (CRT1-ID16/CRT1-ID16-1)

Input Section Specifications

Item	Specification	
Model	CRT1-ID16	CRT1-ID16-1
I/O capacity	16 inputs	
Internal I/O common	NPN	PNP
ON voltage	15 VDC min. (between each input terminal and the V terminal)	15 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max. (between each input terminal and the V terminal)	5 VDC max. (between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA max./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	16 inputs/common	
Isolation method	Photocoupler	
Input indicator	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Communications power supply current consumption	85 mA max.	
Weight	141 g max.	

Component Names and Functions



Note A Branch Line Pressure-welded Connector or Terminal Block Adapter (DCN4-TB4) can be connected to the communications connector.

Indicator Section

Communications Indicators Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

The meanings of the I/O indicators are given in the following table.

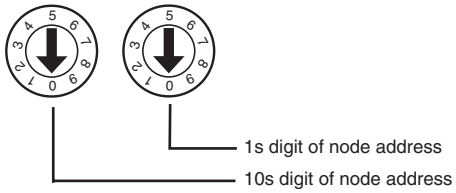
Name	LED status	I/O status	Meaning
0 to 15	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.

Setting the Node Address

The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

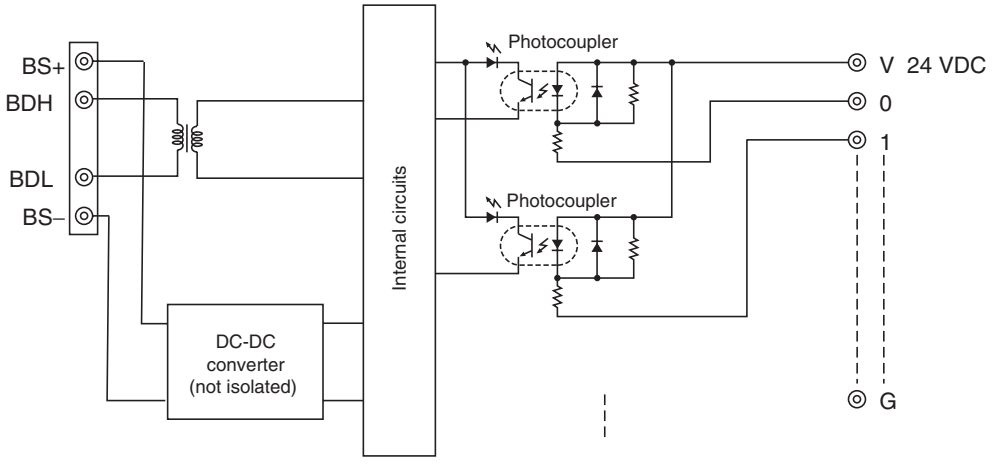
If an illegal address is set, the software setting (default: 0) will be used at start-up.

The setting on the rotary switches is read when power is turned ON.

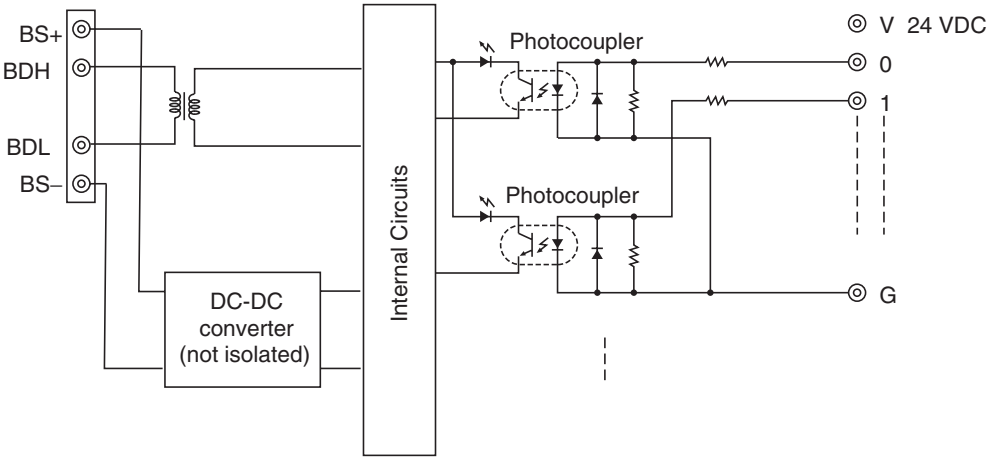


Internal Circuits

CRT1-ID16 (NPN)

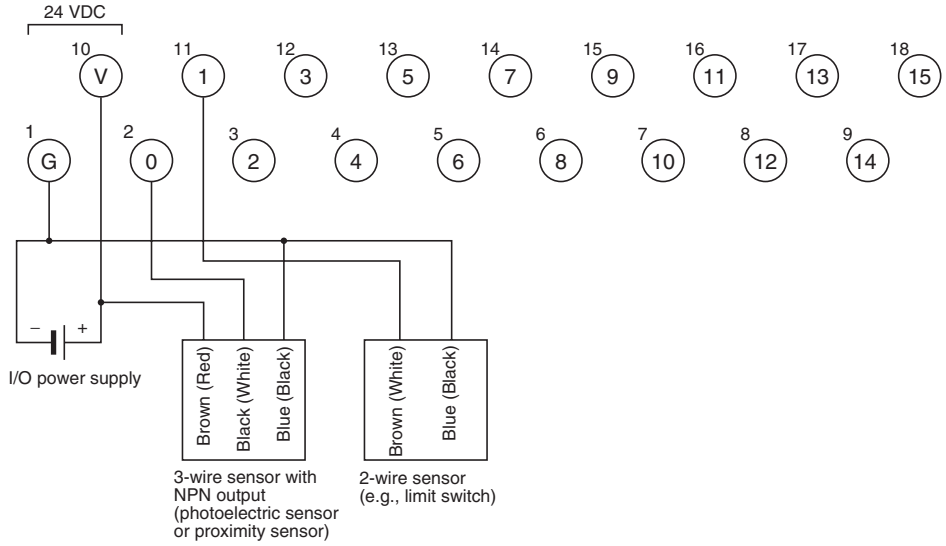


CRT1-ID16-1 (PNP)

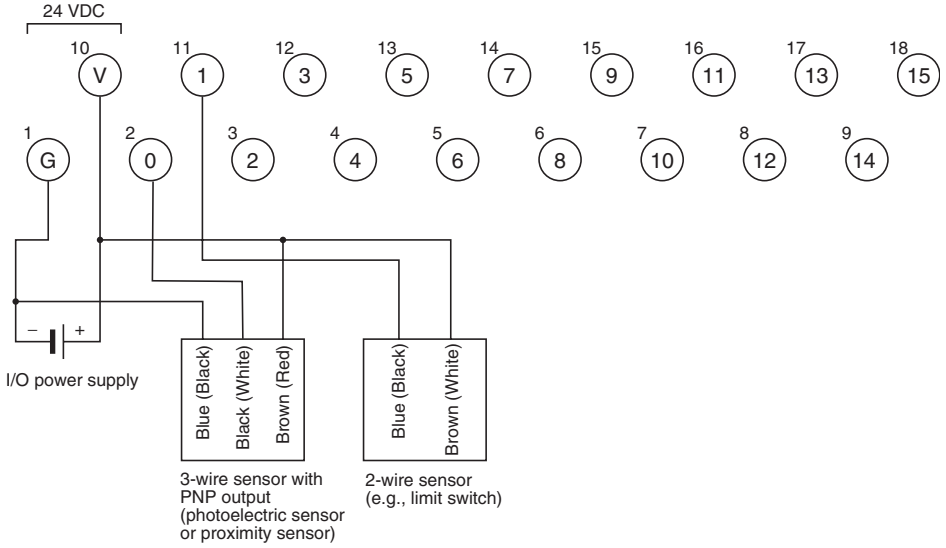


Wiring

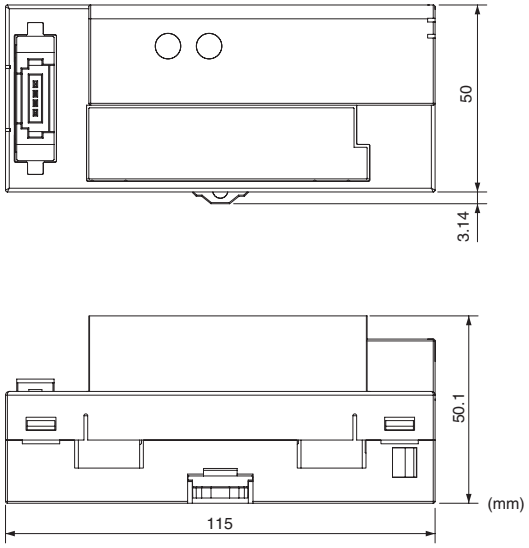
CRT1-ID16 (NPN)



CRT1-ID16-1 (PNP)



Dimensions (Same for CRT1-ID16 and CRT1-ID16-1)

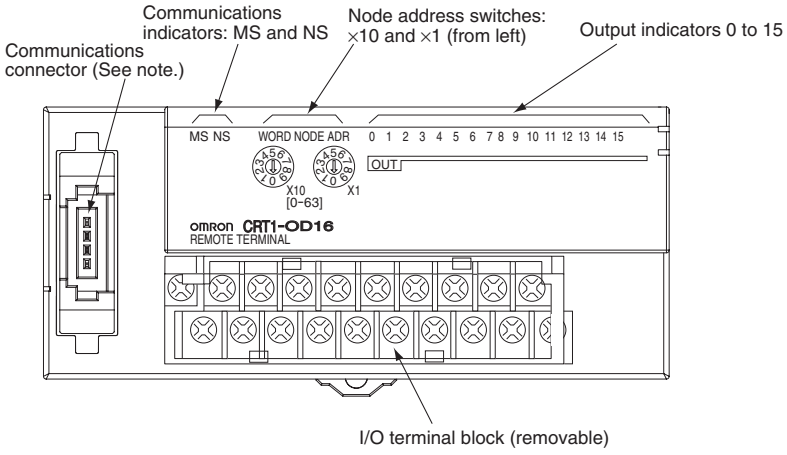


5-2-2 16-point Transistor Output Units (CRT1-OD16/CRT1-OD16-1)

Output Section Specifications

Item	Specification	
Model	CRT1-OD16	CRT1-OD16-1
I/O capacity	16 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.5 A/output, 4 A/common	
Residual voltage	1.2 V max.(0.5 A DC, between each output terminal and the G terminal)	1.2 V max.(0.5 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	16 outputs/common	
Isolation method	Photocoupler	
Output indicators	LED (yellow)	
Installation	DIN Track	
Power supply type	Multi-power supply	
Communications power supply current consumption	85 mA max.	
Output handling for communications errors	Select either hold or clear from CompoNet Support Software.	
Weight	141 g max.	

Component Names and Functions



Note A Branch Line Pressure-welded Connector or Terminal Block Adapter (DCN4-TB4) can be connected to the communications connector.

Indicator Section

Communications Indicators Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

The meanings of the I/O indicators are given in the following table.

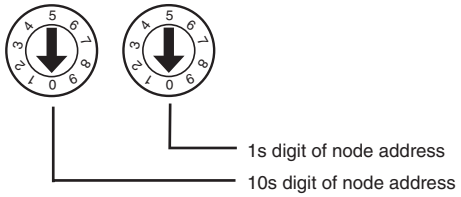
Name	LED status	I/O status	Meaning
0 to 15	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.

Setting the Node Address

The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

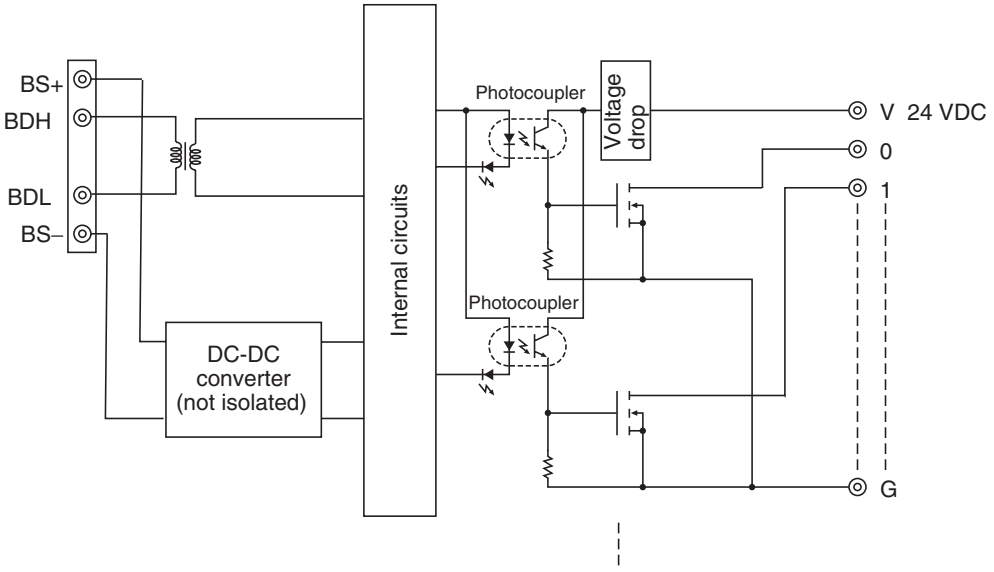
If an illegal address is set, the software setting (default: 0) will be used at start-up.

The setting on the rotary switches is read when power is turned ON.

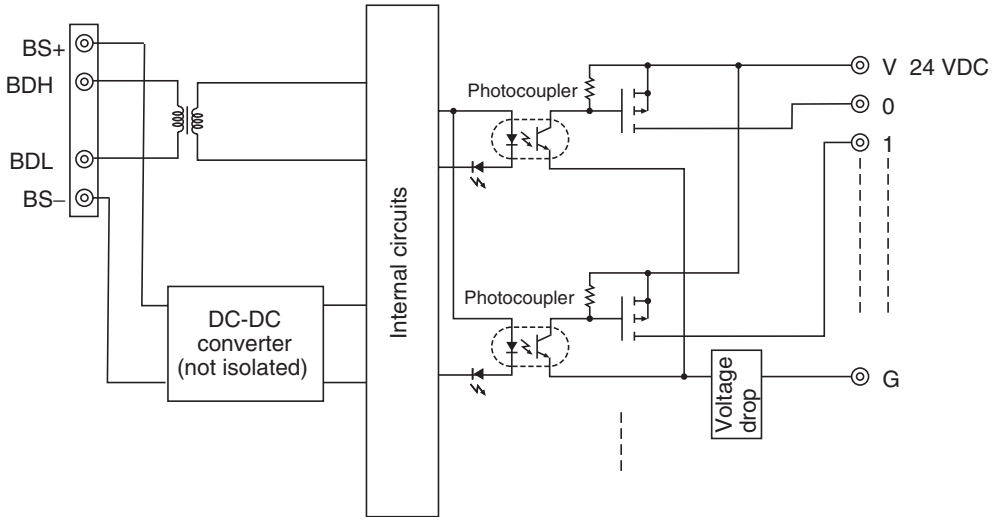


Internal Circuits

CRT1-OD16 (NPN)

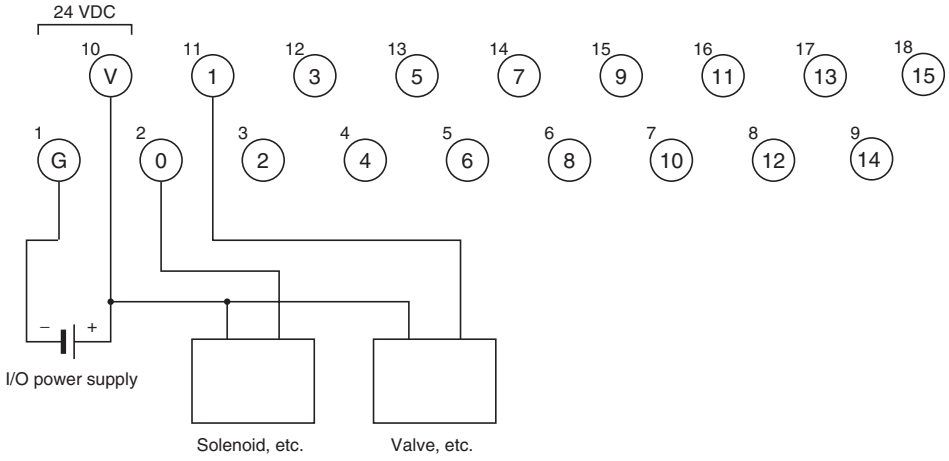


CRT1-OD16-1 (PNP)

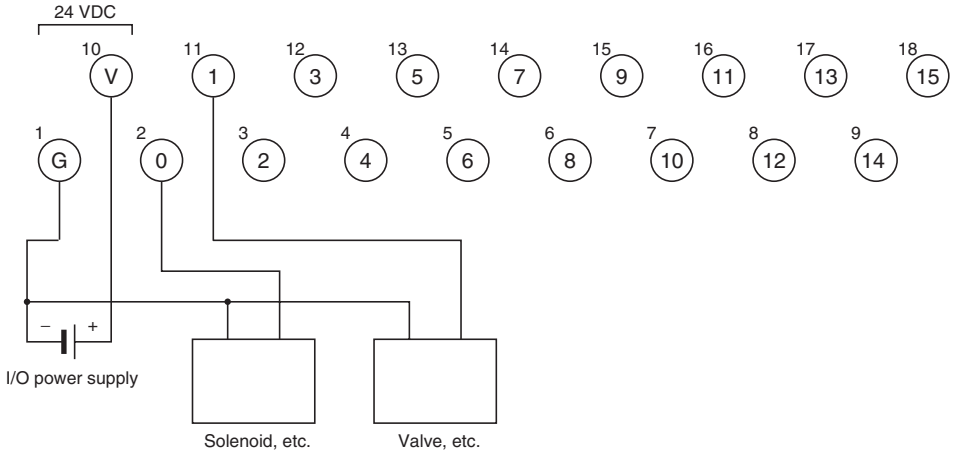


Wiring

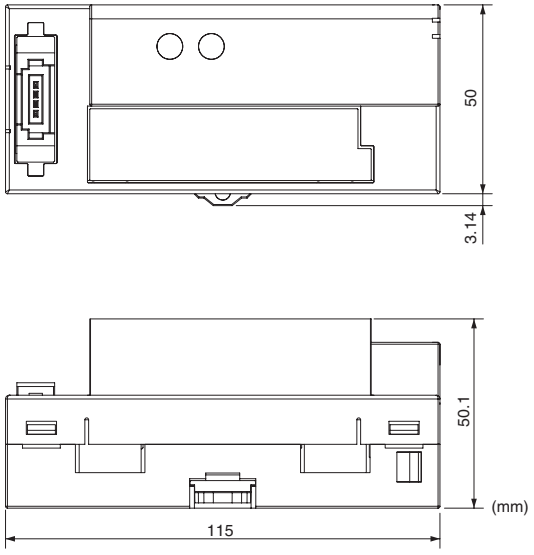
CRT1-OD16 (NPN)



CRT1-OD16-1 (PNP)



Dimensions (Same for CRT1-OD16 and CRT1-OD16-1)



5-3 Expansion Units

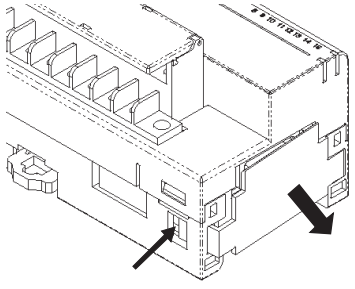
One Expansion Unit can be combined with one Basic Unit.

The following Expansion Units are available. They can be combined in various ways for flexible I/O capacity expansion.

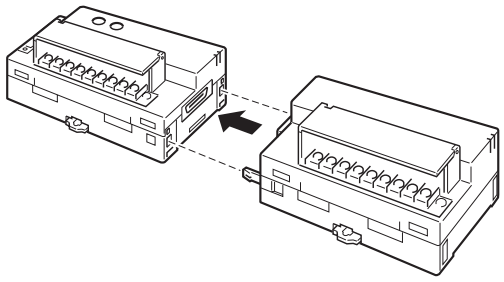
Expansion Unit	Model		Input capacity	Output capacity
Expansion Unit	XWT-ID08	8 DC inputs (NPN)	8	0
	XWT-ID08-1	8 DC inputs (PNP)	8	0
	XWT-OD08	8 transistor outputs (NPN)	0	8
	XWT-OD08-1	8 transistor outputs (PNP)	0	8
	XWT-ID16	16 DC inputs (NPN)	16	0
	XWT-ID16-1	16 DC inputs (PNP)	16	0
	XWT-OD16	16 transistor outputs (NPN)	0	16
	XWT-OD16-1	16 transistor outputs (PNP)	0	16

Installing Expansion Units

1,2,3... 1. Remove the cover from the right side of the Basic Unit.



2. Align the connector on the Expansion Unit with the connector on the Basic Unit and press the Units together.



3. Press the Expansion Unit and Basic Unit together until you hear them lock in place to ensure that the connectors are properly mated.

I/O Power Supply

If an Expansion Input Unit is connected to a Basic Input Unit, then I/O power must be supplied only to the Basic Unit.

If any other combination of Unit is used, I/O power must be supplied to both the Basic Unit and Expansion Unit. This includes connecting an Expansion Input Unit to a Basic Output Unit, an Expansion Output Unit to a Basic Input Unit, or an Expansion Output Unit to a Basic Output Unit.

Refer to the following table and write the I/O power correctly when connecting an Expansion Unit.

Combination	I/O power supply to Expansion Slave Unit
Basic Input Unit with Expansion Input Unit Example: CRT1-ID16 + XWT-ID16	Not required (Expansion Slave Unit uses the same I/O power supply as the Basic Slave Unit.)
Basic Input Unit with Expansion Output Unit Example: CRT1-ID16 + XWT-OD16	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Input Unit Example: CRT1-OD16 + XWT-ID16	Required (I/O power must be supplied to both Units.)
Basic Output Unit with Expansion Output Unit Example: CRT1-OD16 + XWT-OD16	Required (I/O power must be supplied to both Units.)

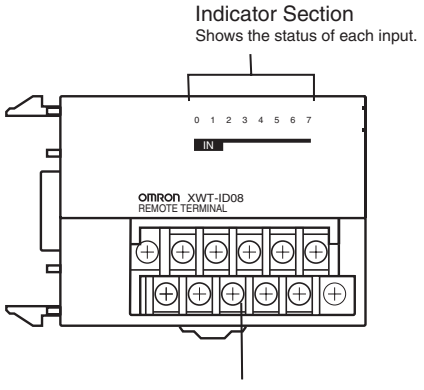
Note Always turn OFF the power supply before connecting an Expansion Unit.

5-3-1 8-point DC Input Units (XWT-ID08/XWT-ID08-1)

Input Section Specifications

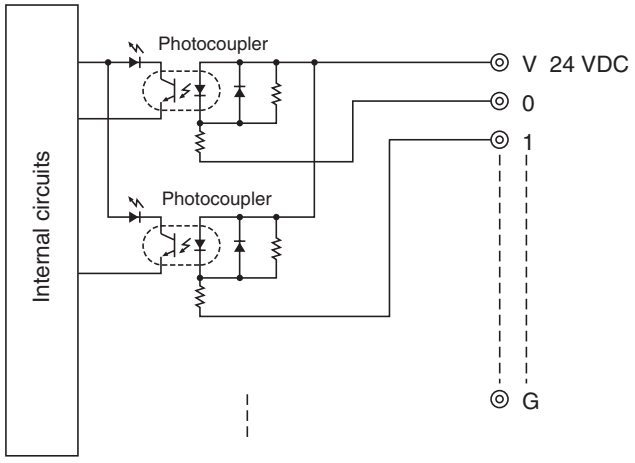
Item	Specification	
Model	XWT-ID08	XWT-ID08-1
Internal I/O common	NPN	PNP
I/O capacity	8 inputs	
ON voltage	15 VDC min. (between each input terminal and the V terminal)	15 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max.(between each input terminal and the V terminal)	5 VDC max.(between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA max./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 inputs/common	

Component Names and Functions (Same for XWT-ID08 and XWT-ID08-1)

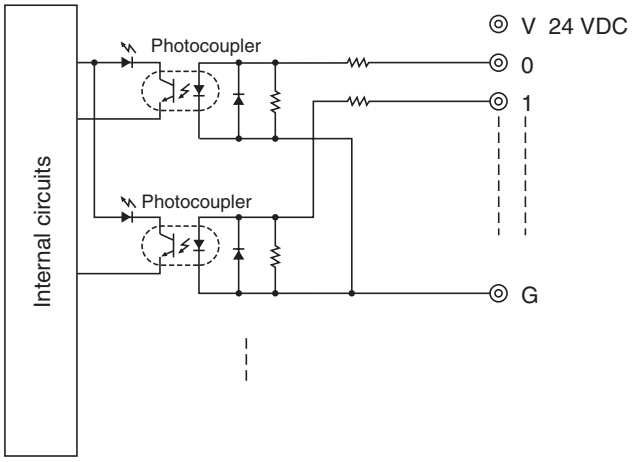


Internal Circuits

XWT-ID08 (NPN)

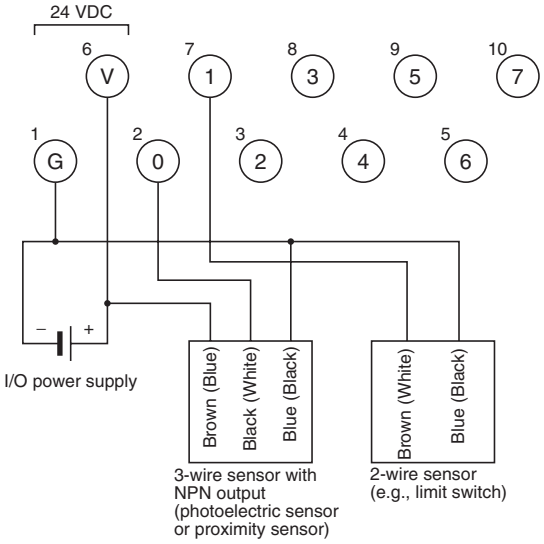


XWT-ID08-1 (PNP)

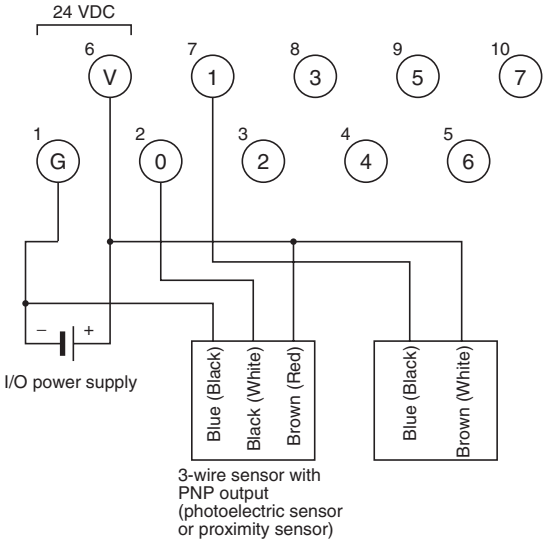


Wiring

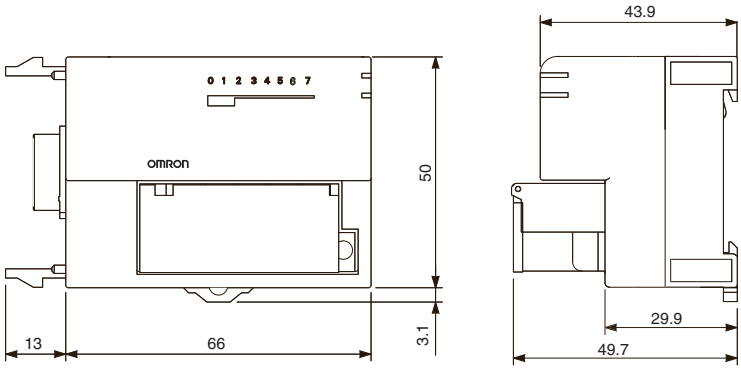
XWT-ID08 (NPN)



XWT-ID08-1 (PNP)



Dimensions (Same for XWT-ID08 and XWT-ID08-1)

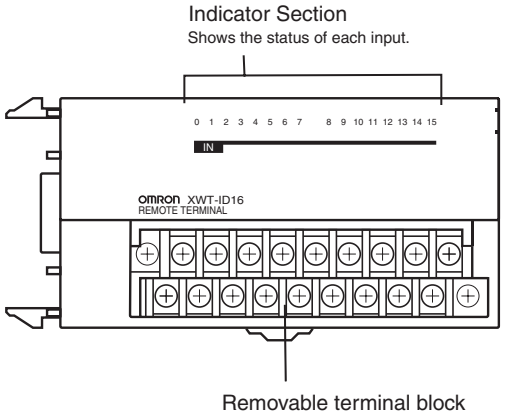


5-3-2 16-point DC Input Units (XWT-ID16/XWT-ID16-1)

Input Section Specifications

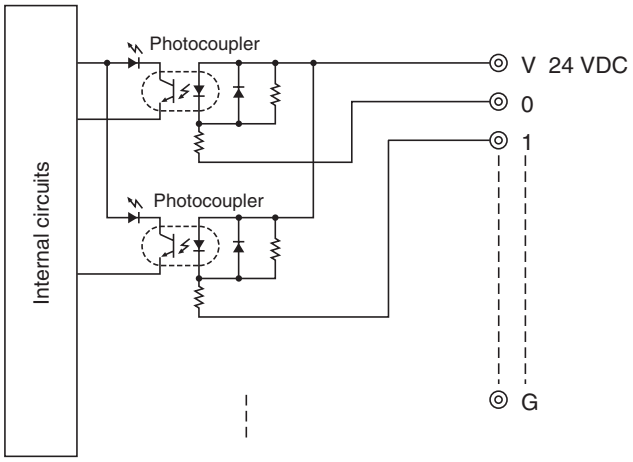
Item	Specification	
Model	XWT-ID16	XWT-ID16-1
Internal I/O common	NPN	PNP
I/O capacity	16 inputs	
ON voltage	15 VDC min. (between each input terminal and the V terminal)	15 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max.(between each input terminal and the V terminal)	5 VDC max.(between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA max./input	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	16 inputs/common	

Component Names and Functions (Same for XWT-ID16 and XWT-ID16-1)

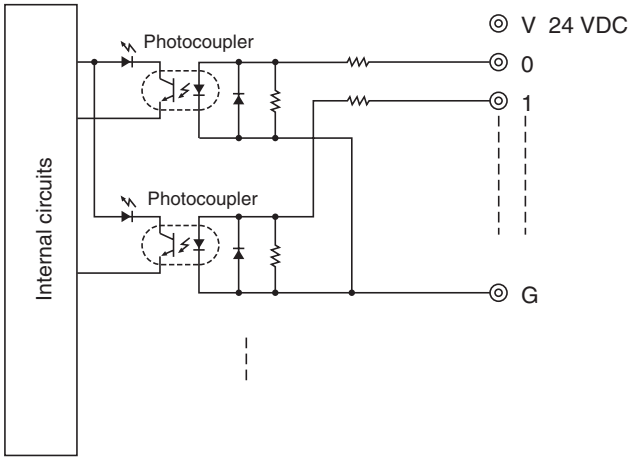


Internal Circuits

XWT-ID16 (NPN)

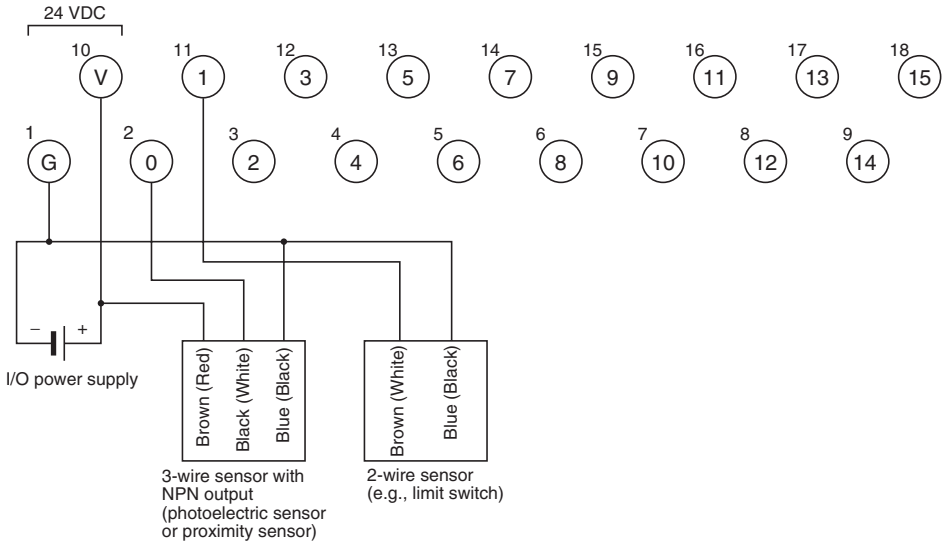


XWT-ID16-1 (PNP)

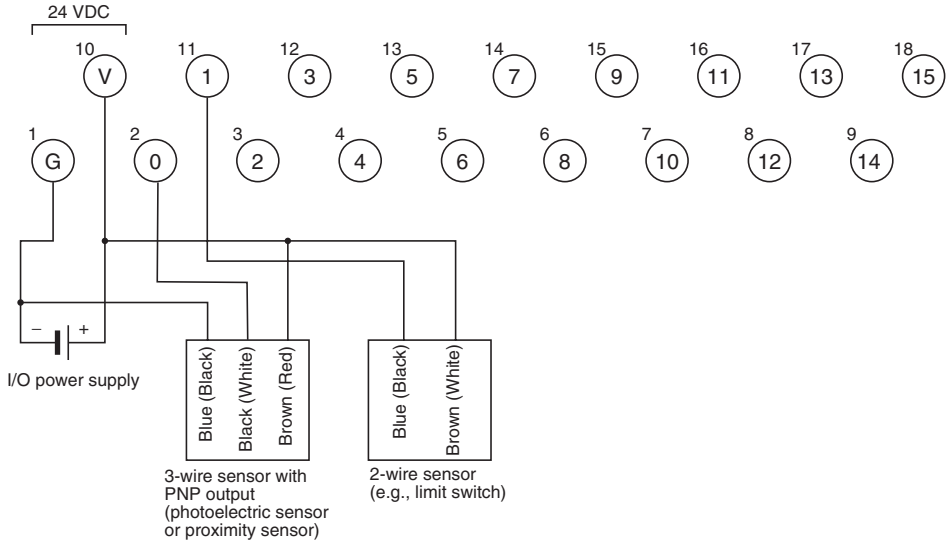


Wiring

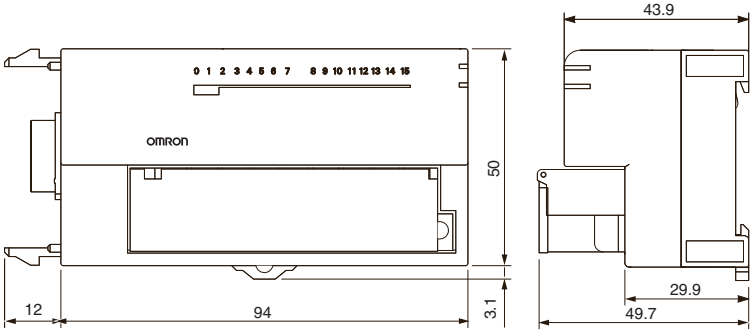
XWT-ID16 (NPN)



XWT-ID16-1 (PNP)



Dimensions (Same for XWT-ID16 and XWT-ID16-1)

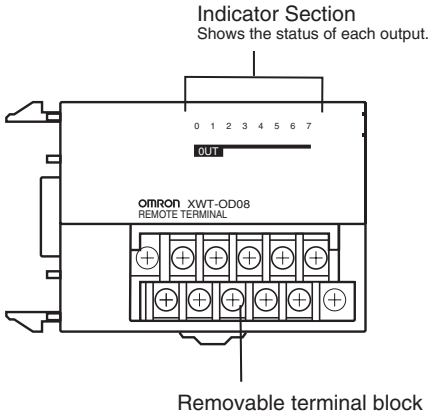


5-3-3 8-point Transistor Output Units (XWT-OD08/XWT-OD08-1)

Output Section Specifications

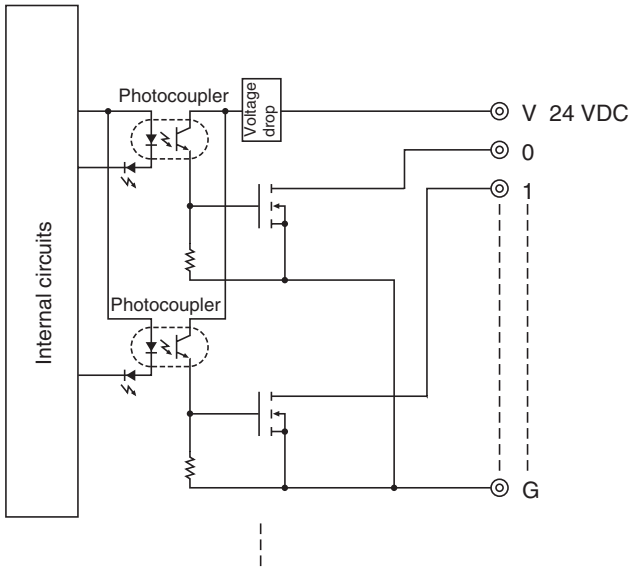
Item	Specification	
Model	XWT-OD08	XWT-OD08-1
Internal I/O common	NPN	PNP
I/O capacity	8 outputs	
Rated output current	0.5 A/output, 2.0 A/common	
Residual voltage	1.2 V max.(0.5 A DC, between each output terminal and the G terminal)	1.2 V max.(0.5 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	0.1 mA max.
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	8 outputs/common	

Component Names and Functions (Same for XWT-OD08 and XWT-OD08-1)

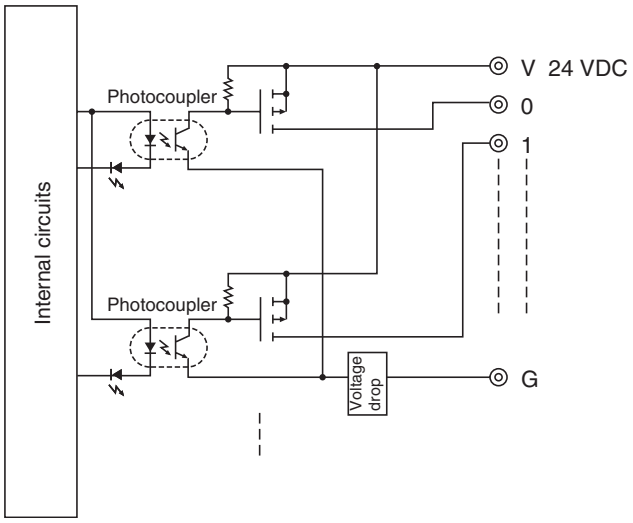


Internal Circuits

XWT-OD08 (NPN)

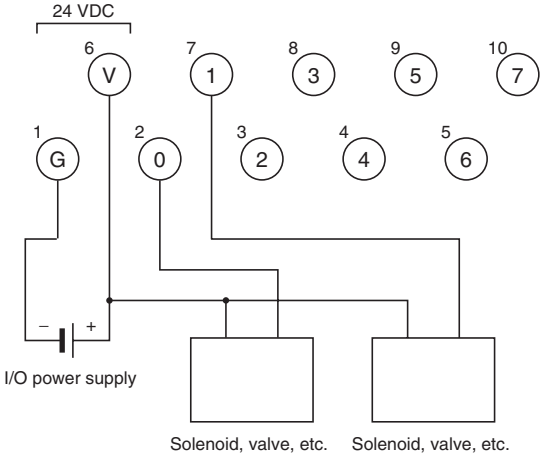


XWT-OD08-1 (PNP)

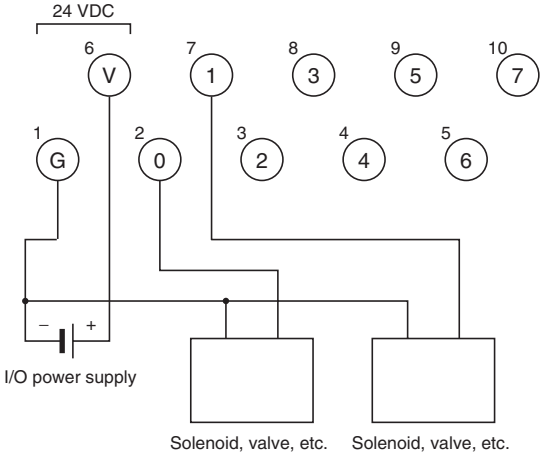


Wiring

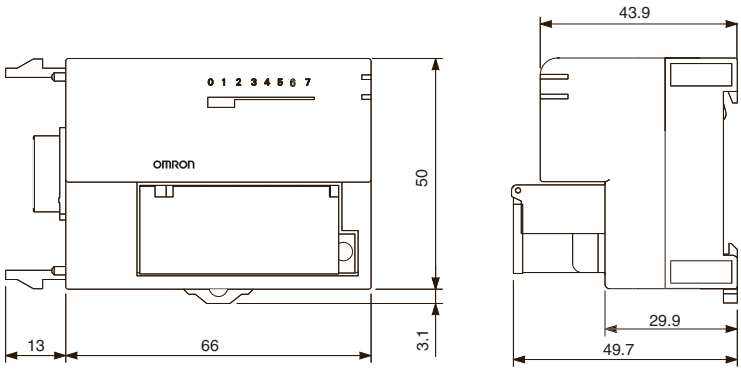
XWT-OD08 (NPN)



XWT-OD08-1 (PNP)



Dimensions (Same for XWT-OD08 and XWT-OD08-1)

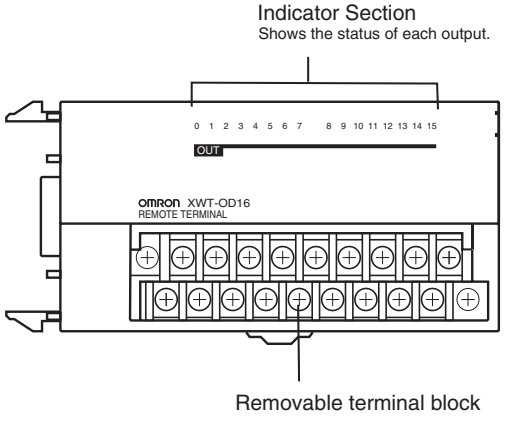


5-3-4 16-point Transistor Output Units (XWT-OD16/XWT-OD16-1)

Output Section Specifications

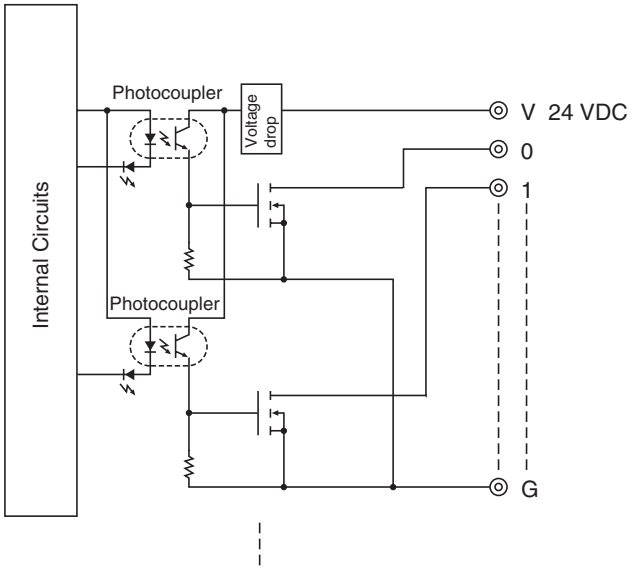
Item	Specification	
Model	XWT-OD16	XWT-OD16-1
Internal I/O common	NPN	PNP
I/O capacity	16 outputs	
Rated output current	0.5 A/output, 4.0 A/common	
Residual voltage	1.2 V max. (0.5 A DC, between each output terminal and the G terminal)	1.2 V max. (0.5 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	0.1 mA max.
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	16 outputs/common	

Component Names and Functions (Same for XWT-OD16 and XWT-OD16-1)

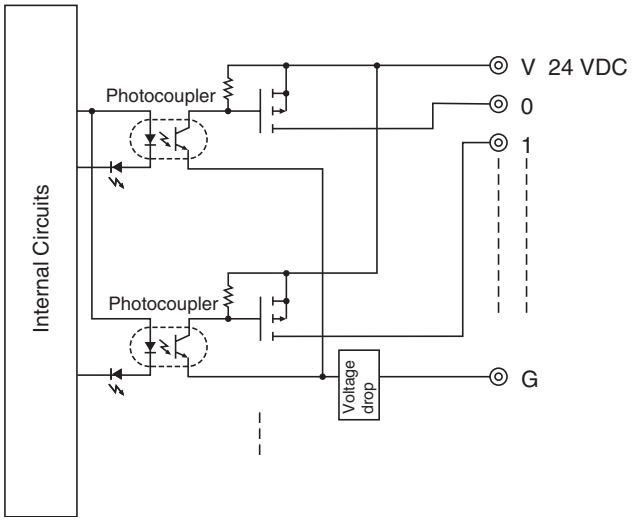


Internal Circuits

XWT-OD16 (NPN)

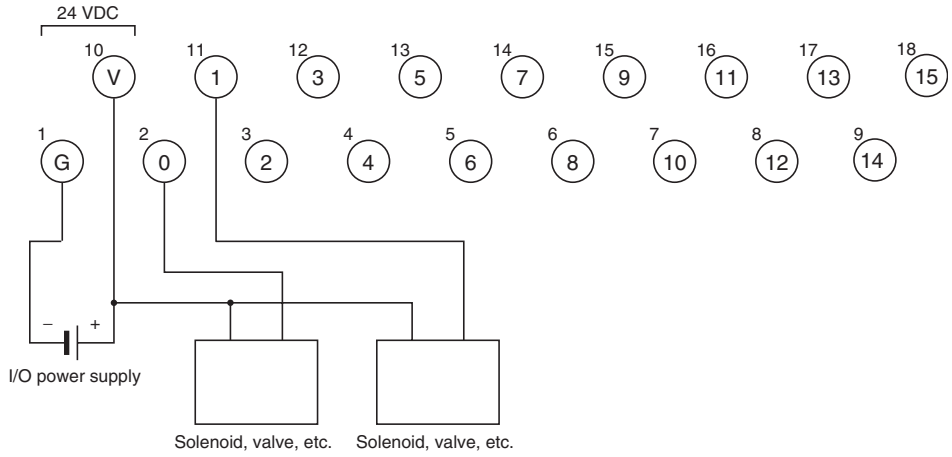


XWT-OD16-1 (PNP)

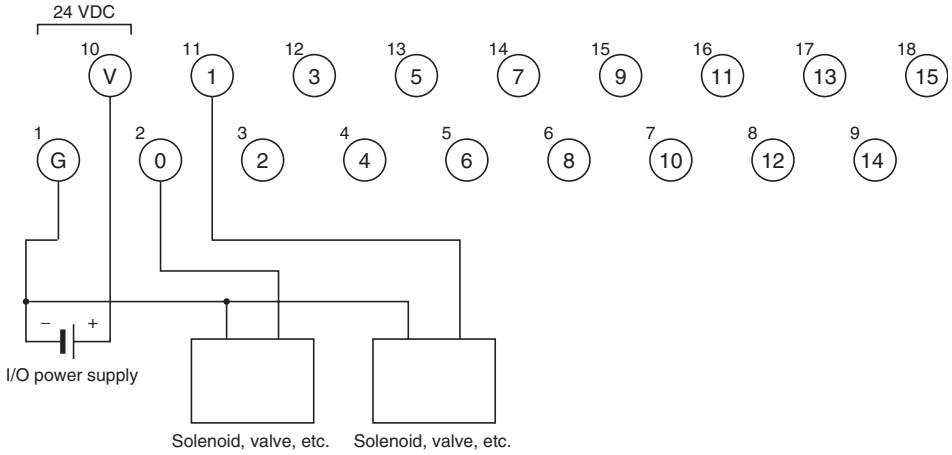


Wiring

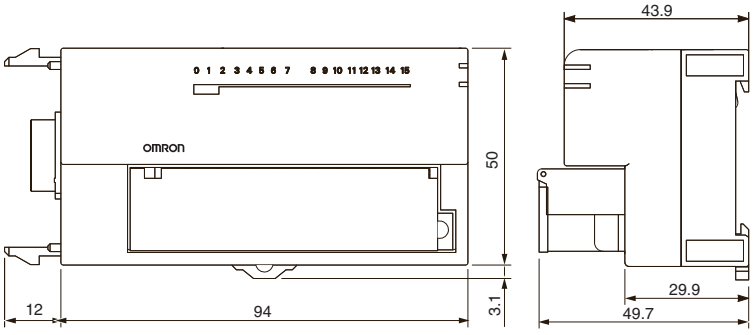
XWT-OD16 (NPN)



XWT-OD16-1 (PNP)



Dimensions (Same for XWT-OD16 and XWT-OD16-1)



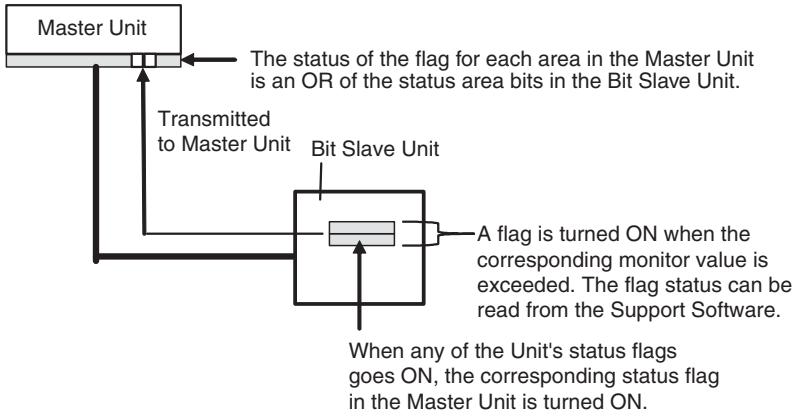
SECTION 6
Bit Slave Units

This section describes the Bit Slave Units.

6-1 Status Areas

A Bit 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 threshold values set by the user for each function in that Unit. For each area, a corresponding status flag in the Master Unit will be turned ON if any flag in the status area in the Bit Slave Unit turns ON. Bit 12 in the Master Unit corresponds to the Warning Status Area and bit 13 corresponds to the Alarm Status Area.

The Bit Slave Unit's status area information can be read from the CompoNet Support Software.



Warning Status Area

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

Bit	Content	Description
0	Reserved	---
1	Reserved	---
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Monitors the voltage set as the threshold for the network power voltage monitor function.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Monitors the power ON time warning value set as the threshold for the Unit ON Time Monitor function.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Operation Time Monitor Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the operation time monitor function is exceeded.
9	Connected Device Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the contact operation monitor function or the total ON time monitor function is exceeded.
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Alarm Status Area

The Bit Slave Unit's Alarm Status Area contains the following 16 bits. These bits indicate serious errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	EEPROM Data Error Flag OFF: Normal ON: Error occurred	Turns ON when there is an error in the EEPROM data.
2	Reserved	---
3	Reserved	---
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Reserved	---
9	Reserved	---
10	Sensor Power Short-circuit Detection Flag OFF: Normal ON: Short-circuit	Turns ON when there is a short in the power supply connection to the connected devices, including wiring mistakes and connected device failure.
11	External Load Short-circuit Detection Flag OFF: Normal ON: Short-circuit	Turns ON when there is a short in the external load connection, including wiring mistakes and connected device failure.
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

6-2 IP20 Bit Slave Units

6-2-1 Two-point DC Input Units (CRT1B-ID02S/CRT1B-ID02S-1)

Input Section Specifications

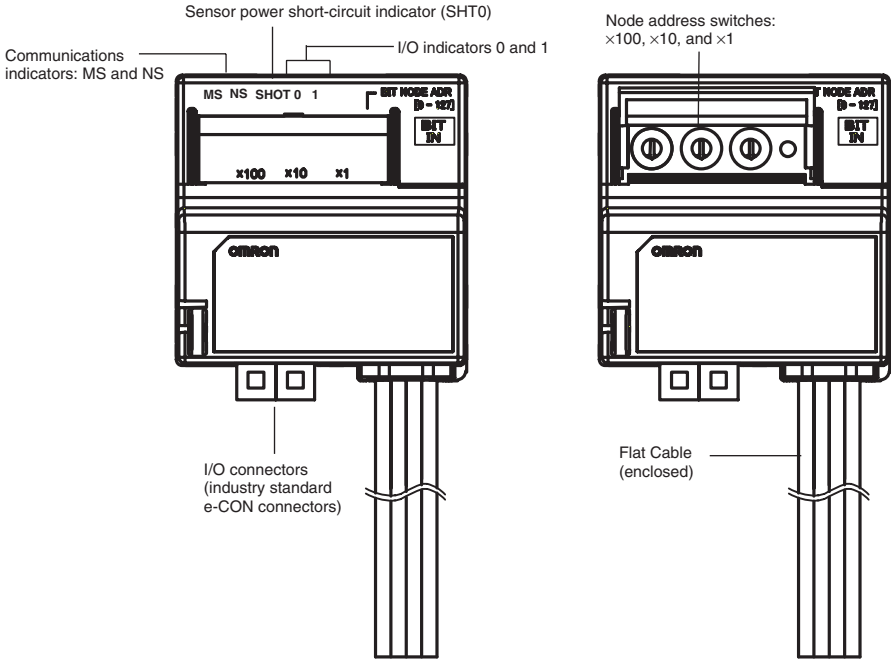
Item	Specification	
Model	CRT1B-ID02S	CRT1B-ID02S-1
I/O capacity	2 inputs	
Internal I/O common	NPN	PNP
ON voltage	10.5 VDC min. (between each input terminal and the V terminal)	10.5 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max. (between each input terminal and the V terminal)	5 VDC max. (between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	3.0 mA max./input (at 10.5 VDC)	
Sensor power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage – 1 V (min.)	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	2 inputs/common	
Sensor power short-circuit detection	Detected.	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	80 mA max.	75 mA max.
Weight	59 g max.	59 g max.

Note The current consumption is for Bit Slave Unit communications current when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the number of sensors connected in addition to the communications power.

The power supply current consumption is expressed by the following formula.

Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption × number of sensors used)

Component Names and Functions



Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

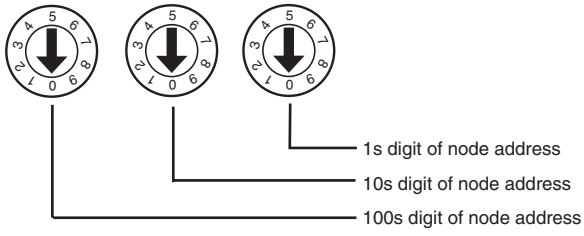
The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 1	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.
SHT0	Lit red.	Sensor power short-circuit	The sensor power supply is short-circuited.

Setting the Node Address

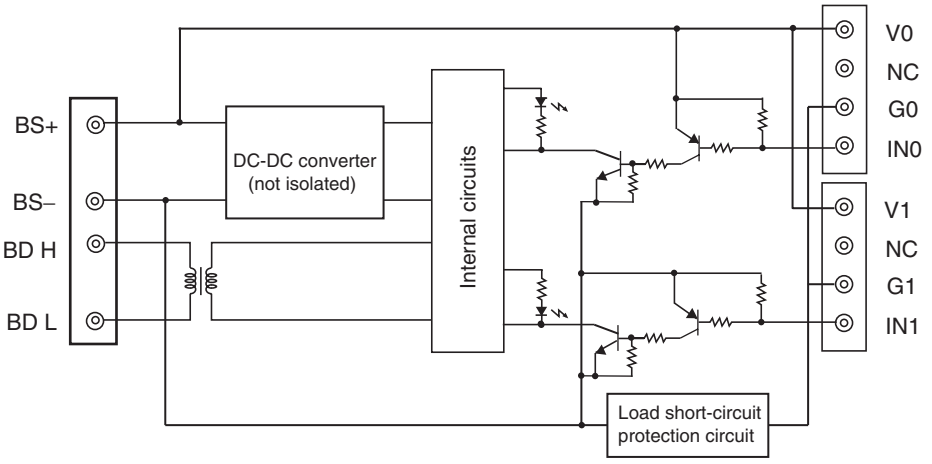
The node address is set as a decimal number with the 100s digit set on the left rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the right rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup.

The setting on the rotary switches is read when power is turned ON.

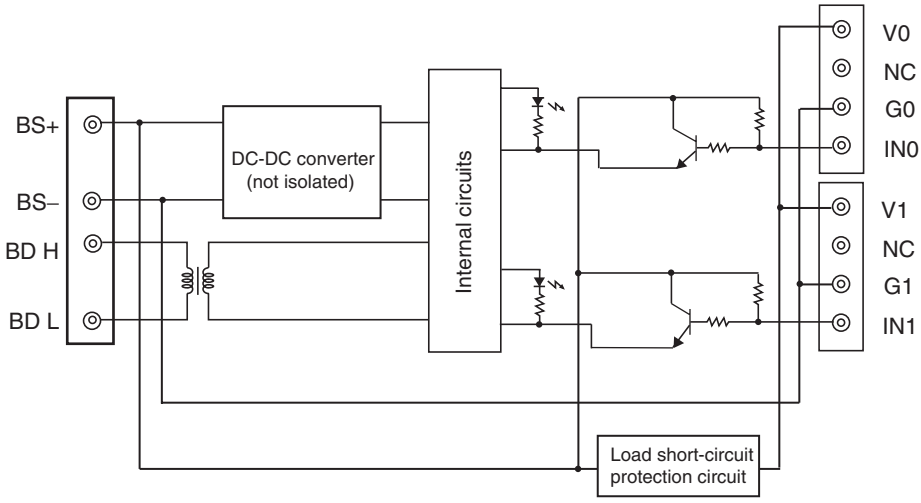


Internal Circuits

CRT1B-ID02S



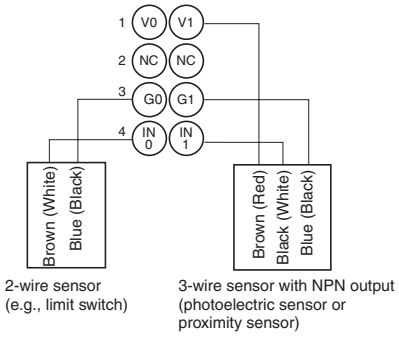
CRT1B-ID02S-1



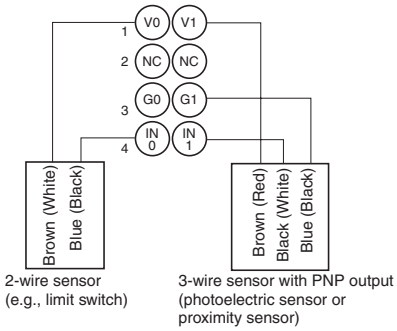
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

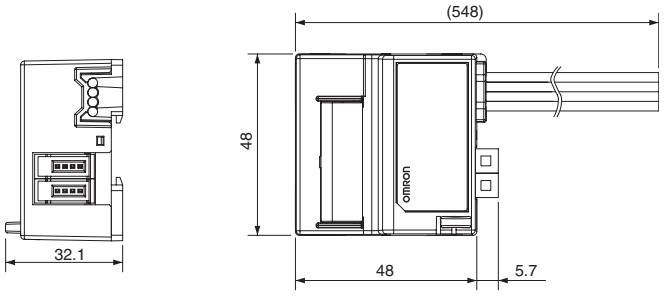
CRT1B-ID02S



CRT1B-ID02S-1



Dimensions (Same for CRT1B-ID02S and CRT1B-ID02S-1)



6-2-2 Two-point Transistor Output Units (CRT1B-OD02S/CRT1B-OD02S-1)

Output Section Specifications

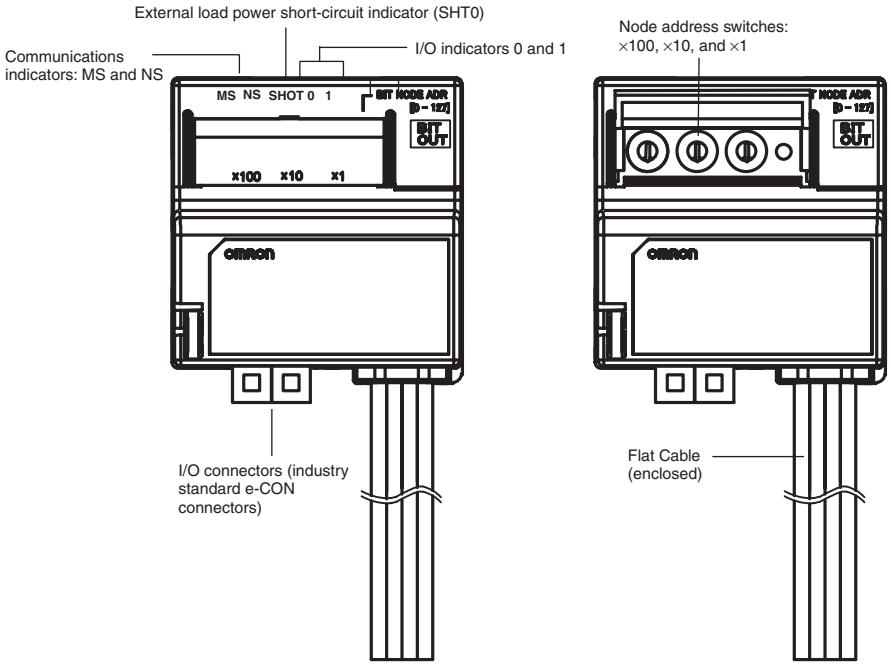
Item	Specification	
Model	CRT1B-OD02S	CRT1B-OD02S-1
I/O capacity	2 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.2 A/output	
Load power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage − 1.2 V (min.)	
Residual voltage	1.2 V max. (0.2 A DC, between each output terminal and the G terminal)	1.2 V max. (0.2 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	2 outputs/common	
External load power short-circuit detection	Detected	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP20	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	75 mA max.	70 mA max.
Weight	59 g max.	59 g max.

Note The current consumption is for Bit Slave Unit communications current when all outputs are OFF, i.e., it does not include the output device load current consumption. The communications power supply is also used for the I/O power supply for actuators. Be sure to consider the actuator load current consumption and the number of sensors connected in addition to the communications power.

The power supply current consumption is expressed by the following formula.

Communications power supply current consumption = Bit Slave Unit communications current consumption + (actual load current × number of actuators used)

Component Names and Functions



Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

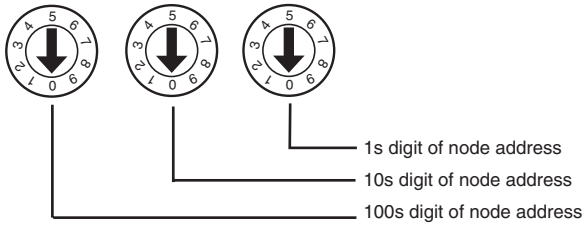
The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 1	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.
SHT0	Lit red.	Load power short-circuit detection	The load power supply is short-circuited.

Setting the Node Address

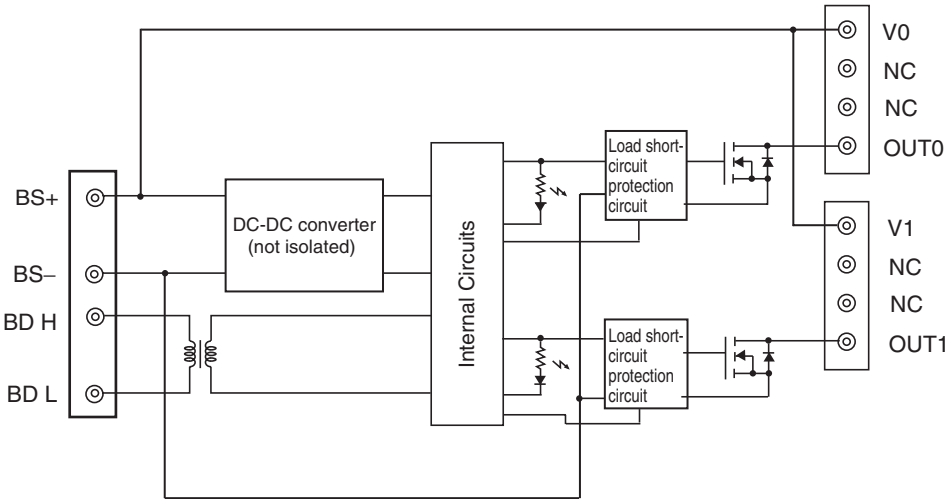
The node address is set as a decimal number with the 100s digit set on the left rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the right rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup.

The setting on the rotary switches is read when power is turned ON.

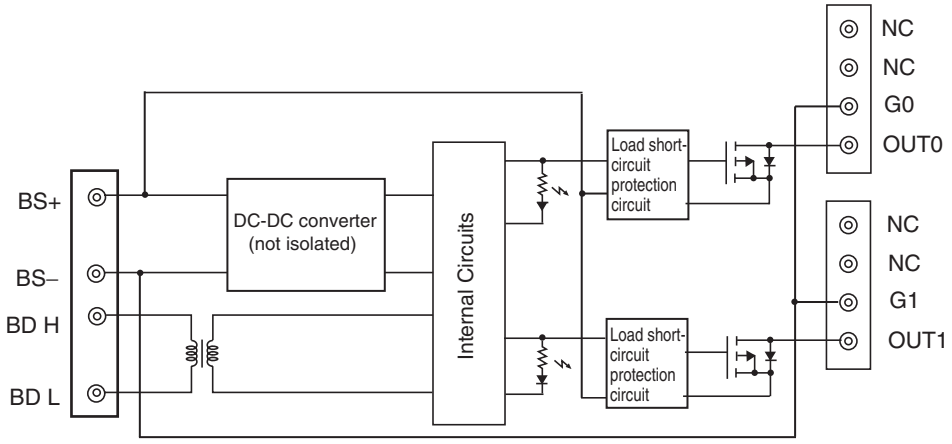


Internal Circuits

CRT1B-OD02S



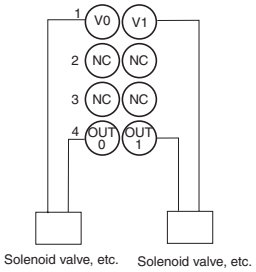
CRT1B-OD02S-1



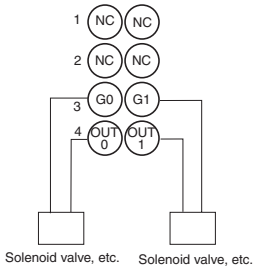
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

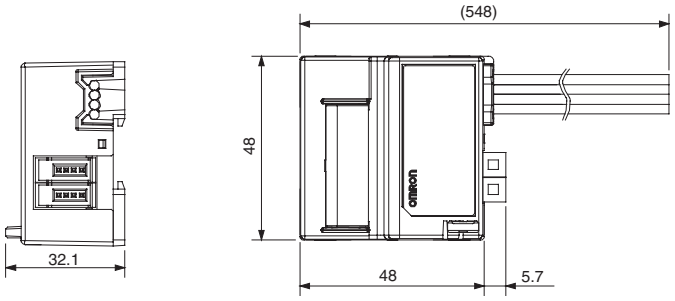
CRT1B-OD02S



CRT1B-OD02S-1



Dimensions (Same for CRT1B-OD02S and CRT1B-OD02S-1)



6-3 IP54 Bit Slave Units

6-3-1 Two-point DC Input Units (CRT1B-ID02SP/CRT1B-ID02SP-1)

Input Section Specifications

Item	Specification	
Model	CRT1B-ID02SP	CRT1B-ID02SP-1
I/O capacity	2 inputs	
Internal I/O common	NPN	PNP
ON voltage	10.5 VDC min. (between each input terminal and the V terminal)	10.5 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max. (between each input terminal and the V terminal)	5 VDC max. (between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	3.0 mA max./input (at 10.5 VDC)	
Sensor power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage – 1 V (min.)	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	2 inputs/common	
Sensor power short-circuit detection	Detected (input section).	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP54	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	80 mA max.	80 mA max.
Weight	168 g max.	168 g max.

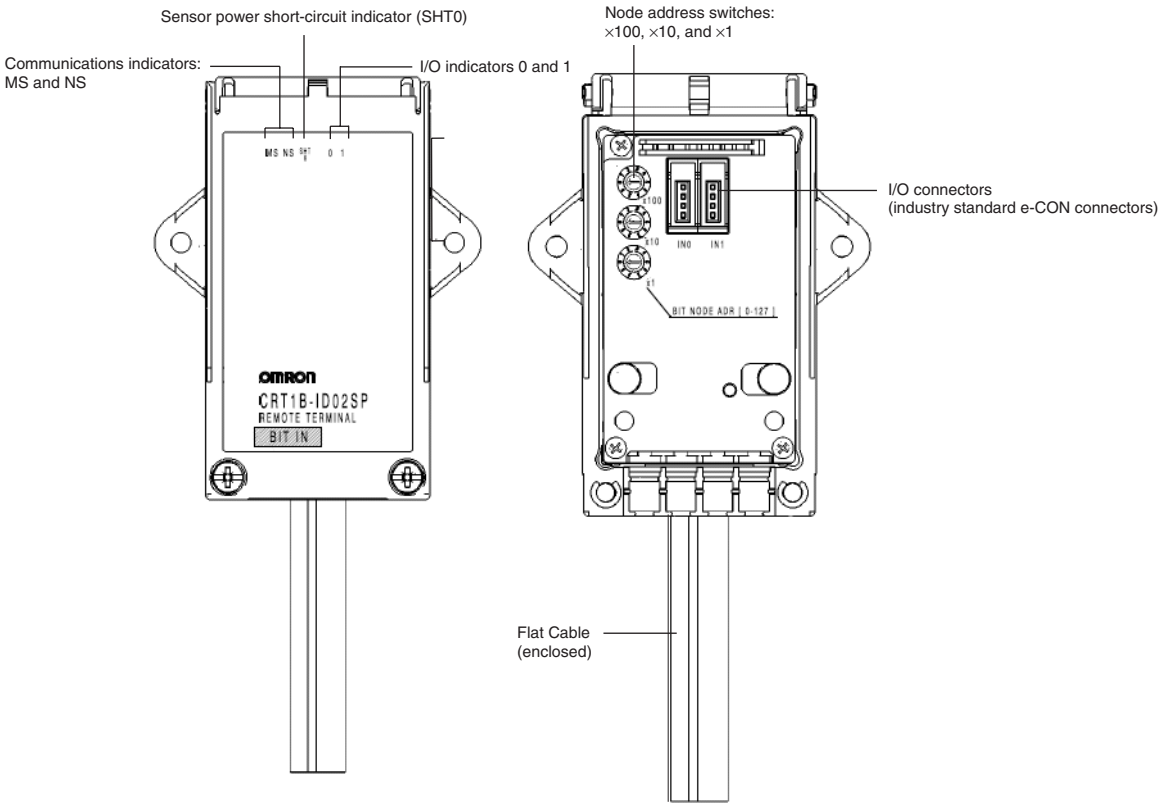
Note The current consumption is for Bit Slave Unit communications current when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the number of sensors connected in addition to the communications power.

The power supply current consumption is expressed by the following formula.

Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption × number of sensors used)

Component Names and Functions

CRT1B-ID02SP/CRT1B-ID02SP-1



Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

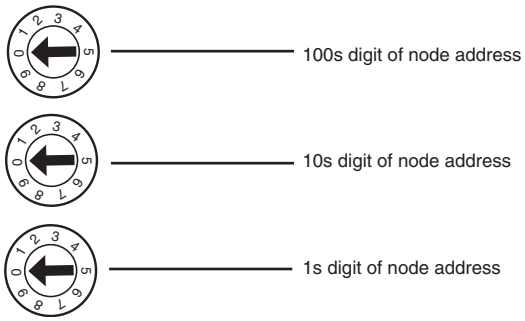
The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 1	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.
SHT0	Lit red.	Sensor power short-circuit	The sensor power supply is short-circuited.

Setting the Node Address

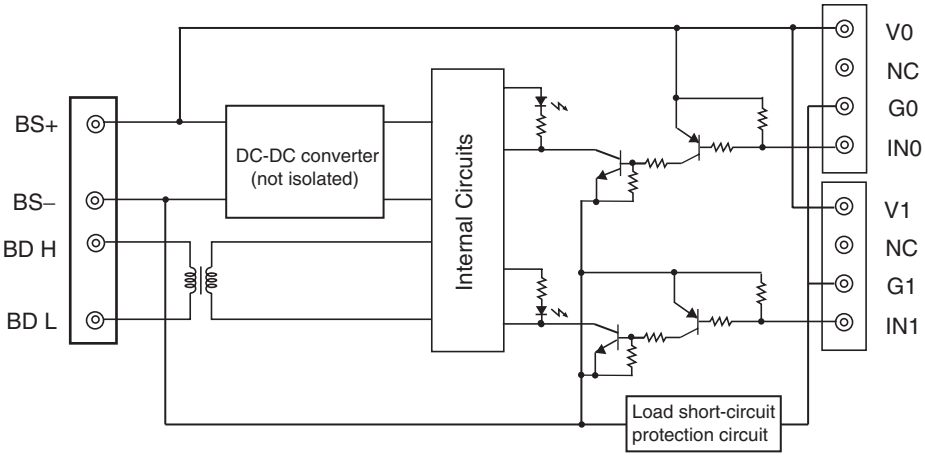
The node address is set as a decimal number with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup.

The setting on the rotary switches is read when power is turned ON.

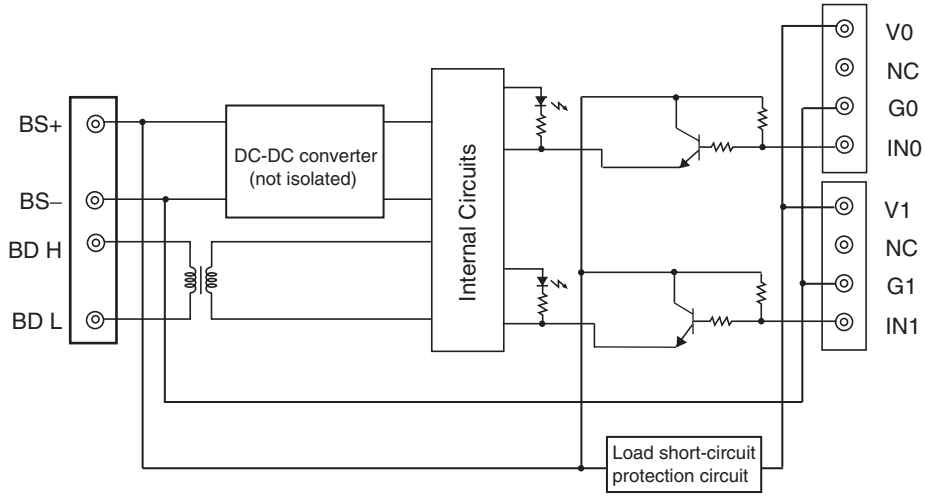


Internal Circuits

CRT1B-ID02SP



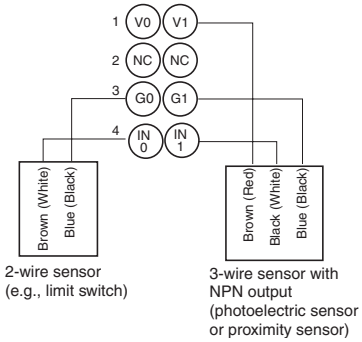
CRT1B-ID02SP-1



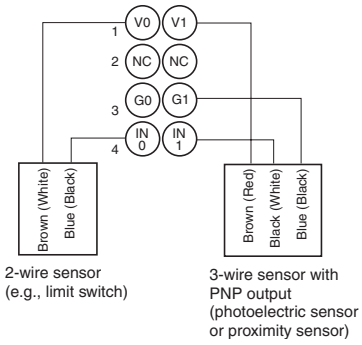
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

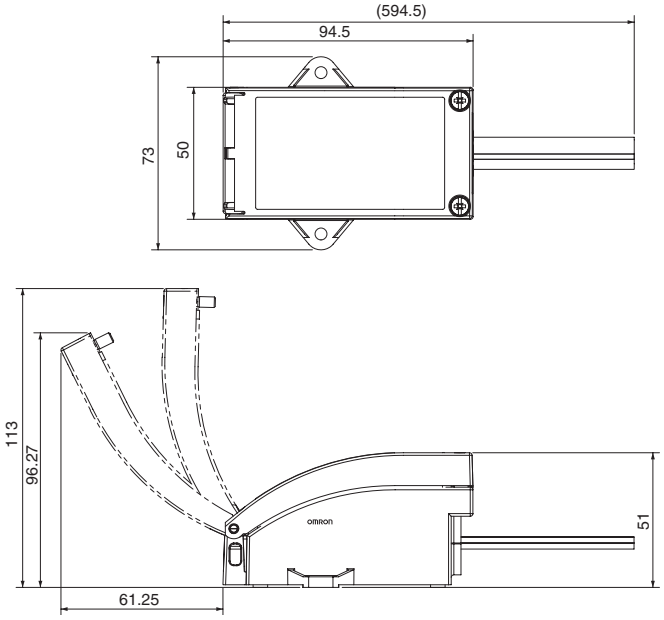
CRT1B-ID02SP



CRT1B-ID02SP-1



Dimensions (Same for CRT1B-ID02SP and CRT1B-ID02SP-1)



6-3-2 Two-point Transistor Output Units (CRT1-OD02SP/CRT1-OD02SP-1)

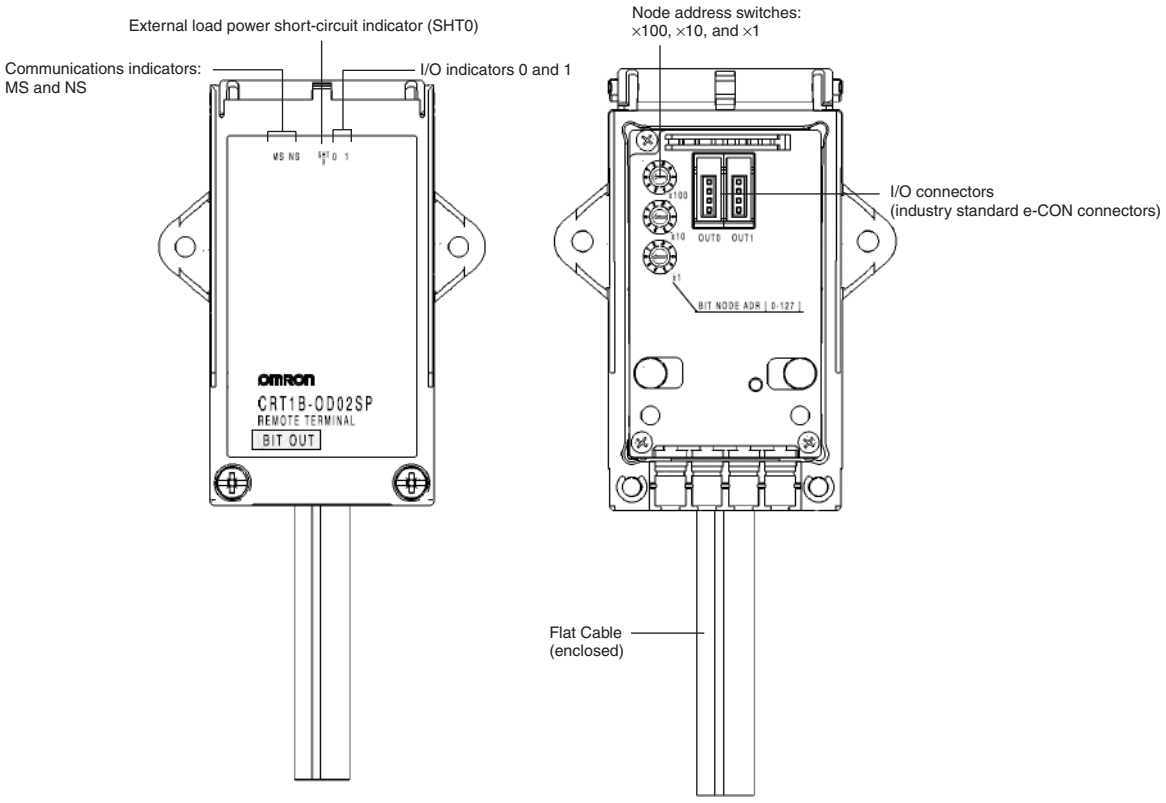
Output Section Specifications

Item	Specification	
Model	CRT1B-OD02SP	CRT1B-OD02SP-1
I/O capacity	2 outputs	
Internal I/O common	NPN	PNP
Rated output current	0.2 A/output	
Load power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage − 1.2 V (min.)	
Residual voltage	1.2 V max. (0.2 A DC, between each output terminal and the G terminal)	1.2 V max. (0.2 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	2 outputs/common	
External load power short-circuit detection	Detected	
Isolation method	No isolation	
Output indicators	LEDs (yellow)	
Degree of protection	IEC standard IP54	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	75 mA max.	75 mA max.
Weight	169 g max.	169 g max.

Note The current consumption is for Bit Slave Unit communications current when all outputs are OFF, i.e., it does not include the output device load current consumption. The communications power supply is also used for the I/O power supply for actuators. Be sure to consider the actuator load current consumption and the number of sensors connected in addition to the communications power.
The power supply current consumption is expressed by the following formula.
Communications power supply current consumption = Bit Slave Unit communications current consumption + (actual load current × number of actuators used)

Component Names and Functions

CRT1B-OD02SP/CRT1B-OD02SP-1



Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

I/O Indicators

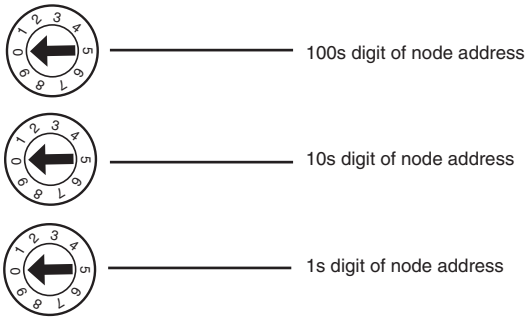
The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 1	Lit yellow.	Output ON	The output is ON.
	Not lit.	Output OFF	The output is OFF.
SHT0	Lit red.	Load power short-circuit detection	The load power supply is short-circuited.

Setting the Node Address

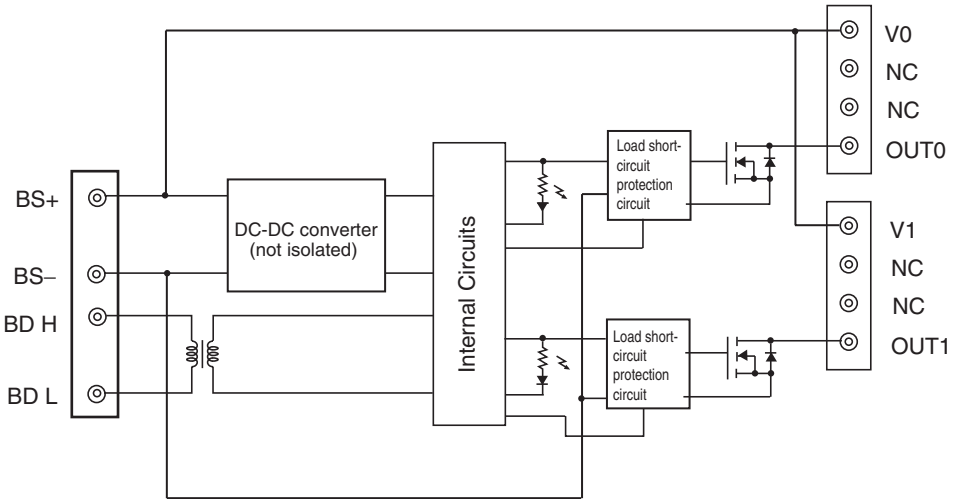
The node address is set as a decimal number with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup.

The setting on the rotary switches is read when power is turned ON.

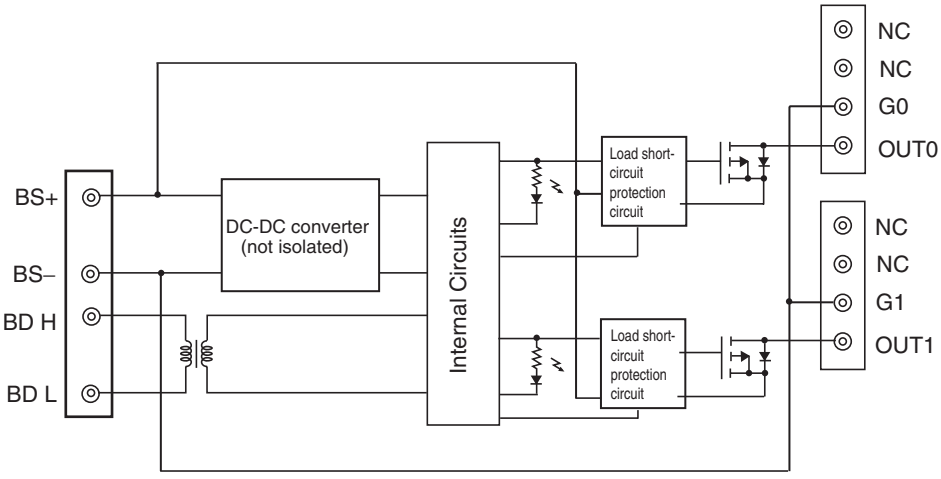


Internal Circuits

CRT1B-OD02SP



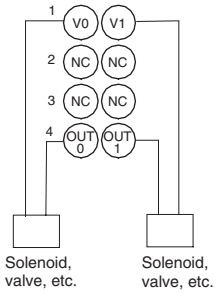
CRT1B-OD02SP-1



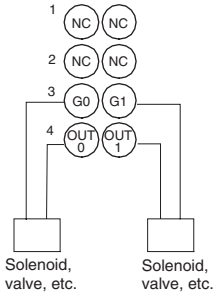
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

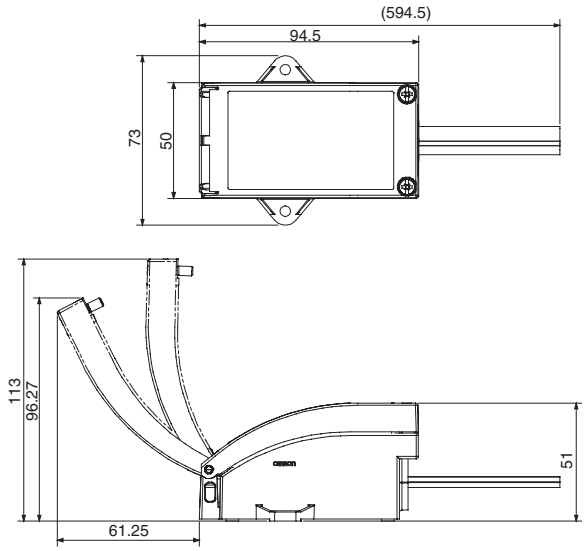
CRT1B-OD02SP



CRT1B-OD02SP-1



Dimensions (Same for CRT1B-OD02SP and CRT1B-OD02SP-1)



6-3-3 Four-point DC Input Units (CRT1B-ID04SP/CRT1B-ID04SP-1)

Specification

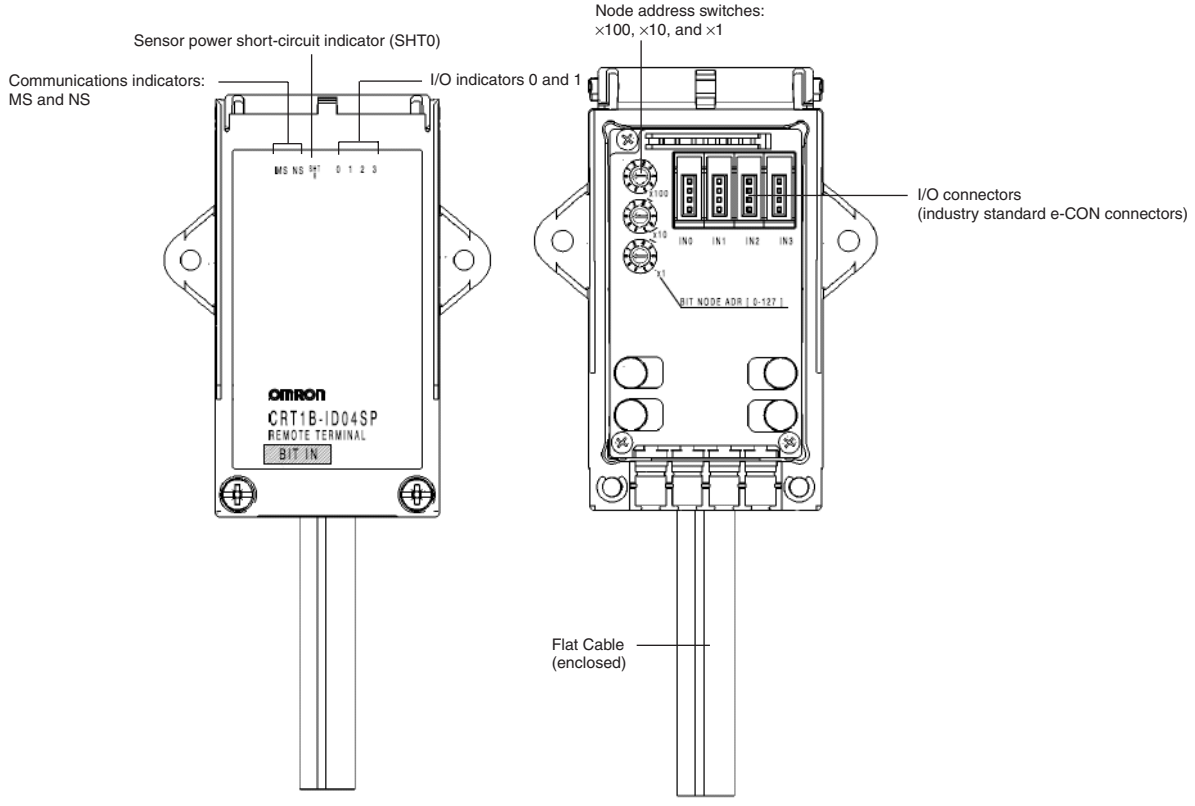
Item	Specification	
Model	CRT1B-ID04SP	CRT1B-ID04SP-1
I/O capacity	4 inputs	
Internal I/O common	NPN	PNP
ON voltage	10.5 VDC min. (between each input terminal and the V terminal)	10.5 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max. (between each input terminal and the V terminal)	5 VDC max. (between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	3.0 mA max./input (at 10.5 VDC)	
Sensor power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage − 1 V (min.)	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	4 inputs/common	
Sensor power short-circuit detection	Detected	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	

Item	Specification	
Degree of protection	IEC standard IP54	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	90 mA max.	90 mA max.
Weight	171 g	171 g

Note The current consumption is for Bit Slave Unit communications current when all inputs are OFF, i.e., it does not include input device current consumption. The communications power supply is also used for the I/O power supply for sensors. Be sure to consider the sensor current consumption and the number of sensors connected in addition to the communications power.
The power supply current consumption is expressed by the following formula.
Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption × number of sensors used)

Component Names and Functions

CRT1B-ID04SP/CRT1B-ID04SP-1



Communications Indicators Refer to *SECTION 4 Basic Specifications of Slave Units*.

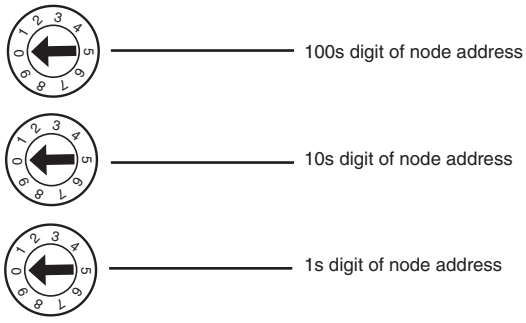
I/O Indicators

The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 3	Lit yellow.	Input ON	The input is ON.
	Not lit.	Input OFF	The input is OFF.
SHT0	Lit red.	Sensor power short-circuit	The sensor power supply is short-circuited.

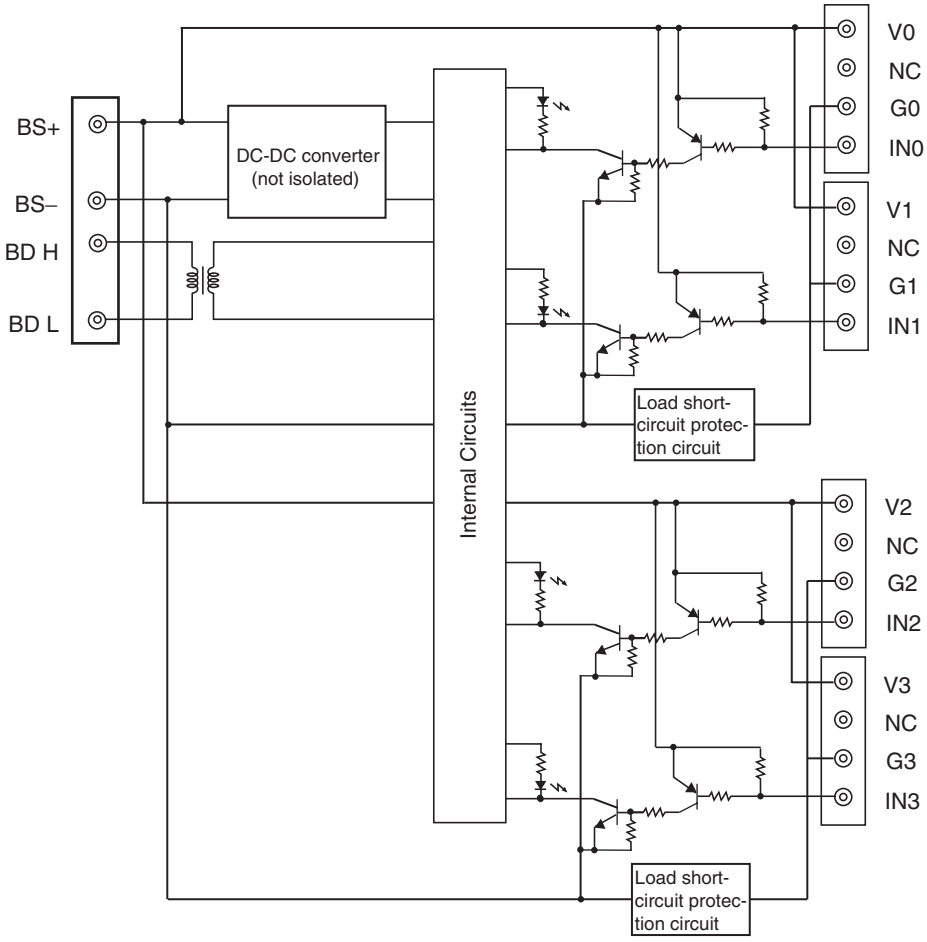
Setting the Node Address

The node address is set as a decimal number with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup. The setting on the rotary switches is read when power is turned ON.

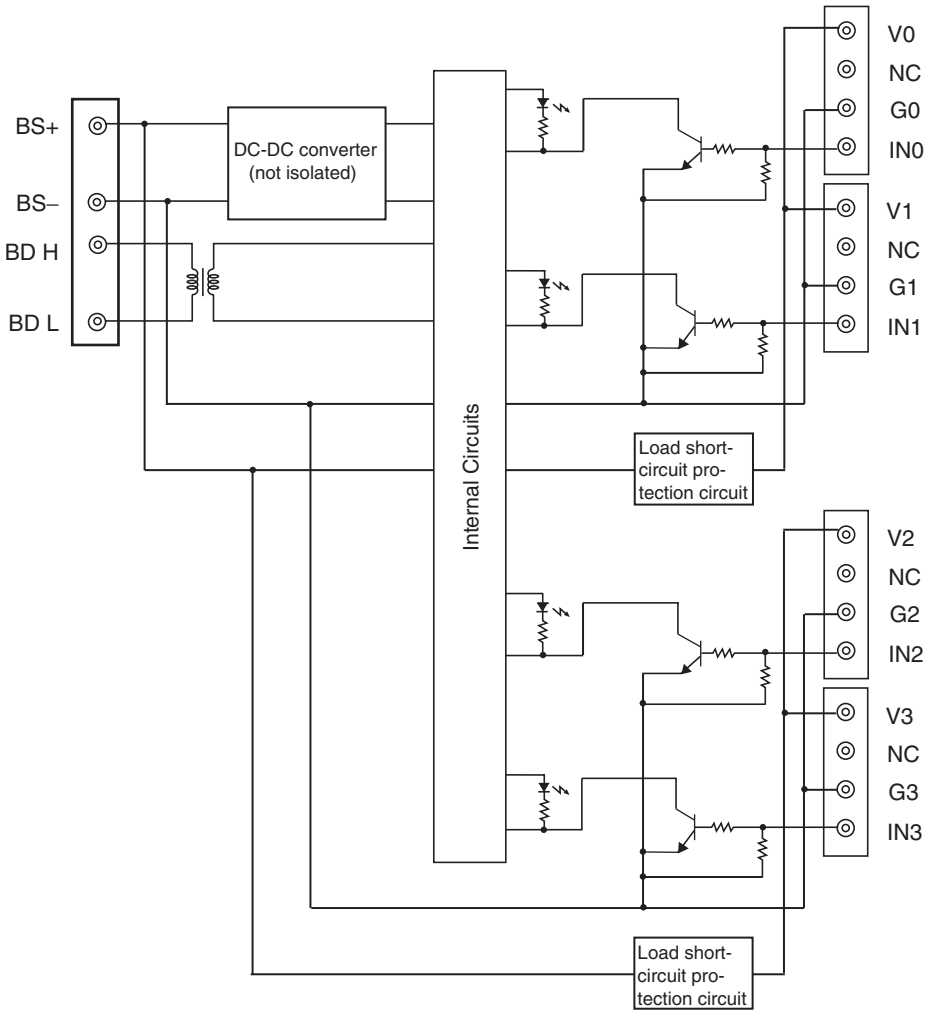


Internal Circuits

CRT1B-ID04SP



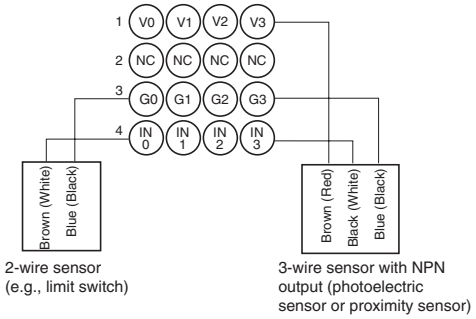
CRT1B-ID04SP-1



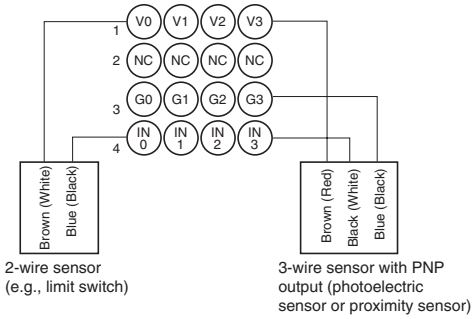
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

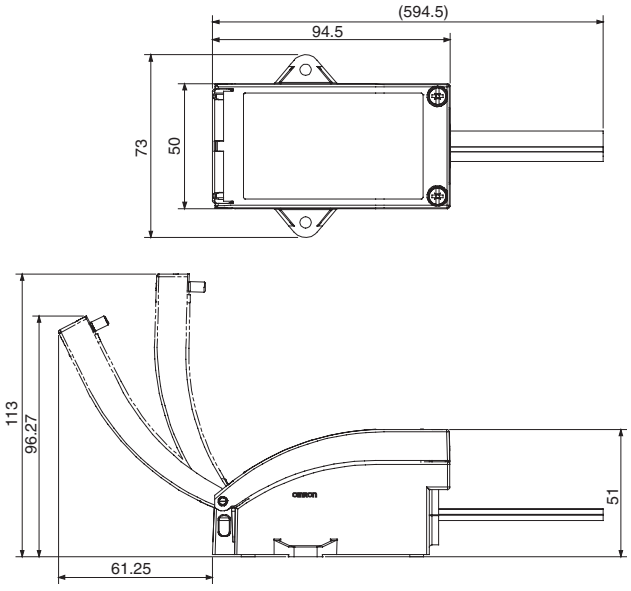
CRT1B-ID04SP



CRT1B-ID04SP-1



Dimensions (Same for CRT1B-ID04SP and CRT1B-ID04SP-1)



6-3-4 Two-point DC Input/Two-point Transistor Output Units (CRT1B-MD04SLP/CRT1B-MD04SLP-1)

Specifications

Item	Specification	
Model	CRT1B-MD04SLP	CRT1B-MD04SLP-1
I/O capacity	2 inputs/2 outputs	
Internal I/O common	NPN	PNP
ON voltage	10.5 VDC min. (between each input terminal and the V terminal)	10.5 VDC min. (between each input terminal and the G terminal)
OFF voltage	5 VDC max. (between each input terminal and the V terminal)	5 VDC max. (between each input terminal and the G terminal)
OFF current	1 mA max.	
Input current	3.0 mA max./input (at 10.5 VDC)	
Sensor power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage – 1 V (min.)	
ON delay	1.5 ms max.	
OFF delay	1.5 ms max.	
Rated output current	0.2 A/output	
Load power supply voltage	Communications power supply voltage + 0 V (max.) Communications power supply voltage – 1.2 V (min.)	
Residual voltage	1.2 V max.(0.2 A DC, between each output terminal and the G terminal)	1.2 V max.(0.2 A DC, between each output terminal and the V terminal)
Leakage current	0.1 mA max.	
ON delay	0.5 ms max.	
OFF delay	1.5 ms max.	
Number of circuits per common	2 outputs/common, 2 inputs/common	
Sensor power short-circuit detection	Detected (input section).	
External load power short-circuit detection	Detected (output section).	
Isolation method	No isolation	
Input indicators	LEDs (yellow)	
Degree of protection	IEC standard IP54	
Installation	Screw installation (M4)	
Power supply type	Network power supply	
Communications power supply current consumption (See note.)	90 mA max.	85 mA max.
Weight	181 g max.	181 g max.

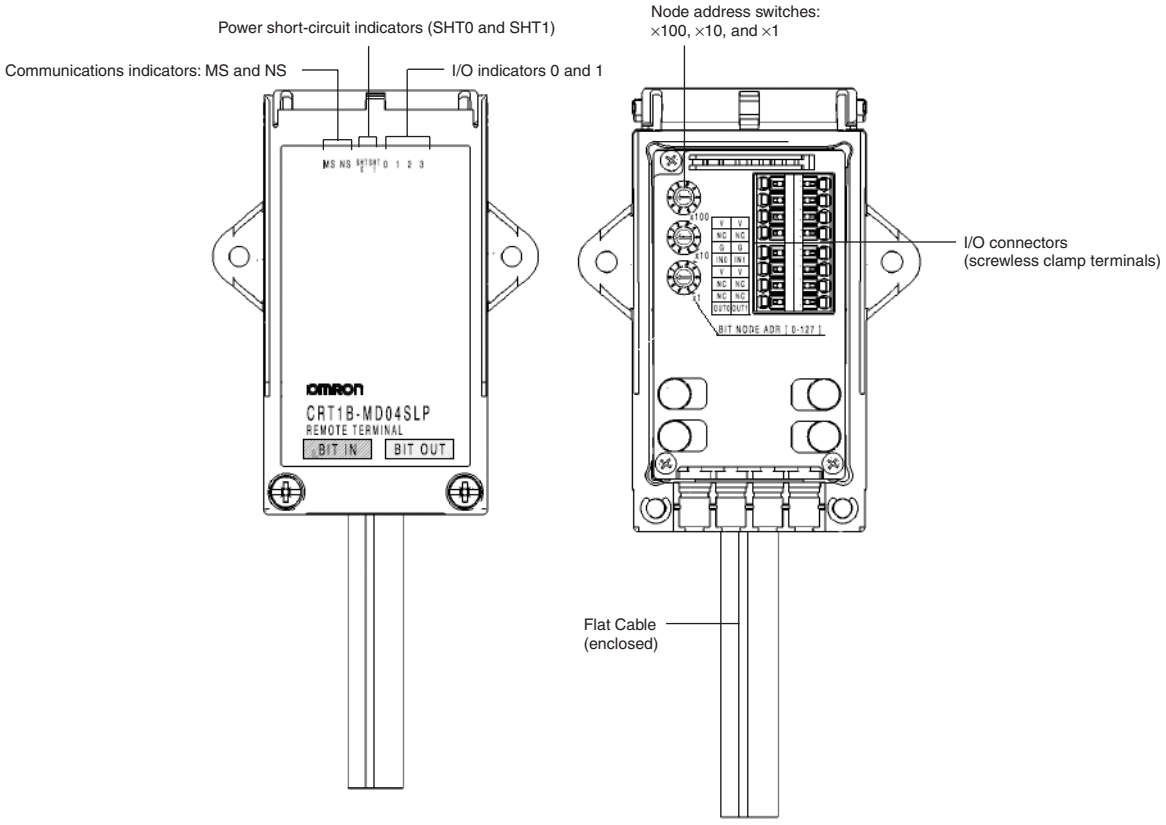
Note The current consumption is for Bit Slave Unit communications current when all inputs and outputs are OFF, i.e., it does not include input device current consumption or output load current consumption. The communications power supply is also used for the I/O power supply for sensors and actuators. Be sure to consider the sensor and actuator current consumption and the number of sensors and actuators connected.

The power supply current consumption is expressed by the following formula.

Communications power supply current consumption = Bit Slave Unit communications current consumption + (Bit Slave Unit input current × number of inputs used) + (sensor current consumption x number of sensors used) + (actual load current x number of actuators used)

Component Names and Functions

CRT1B-MD04SLP/CRT1B-MD04SLP-1



Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

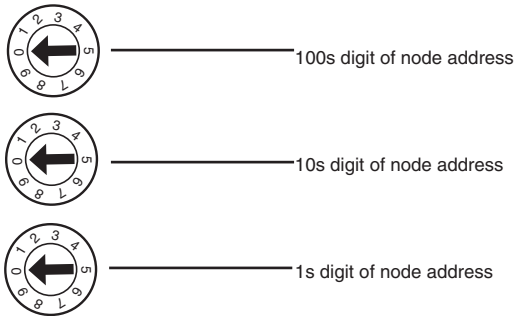
I/O Indicators

The meanings of the I/O indicators are given in the following table.

Name	LED status	I/O status	Meaning
0 to 3	Lit yellow.	Input/output ON	The input/output is ON.
	Not lit.	Input/output OFF	The input/output is OFF.
SHT0	Lit red.	Sensor power short-circuit	The sensor power supply is short-circuited.
SHT1	Lit red.	Load power short-circuit detection	The load power supply is short-circuited.

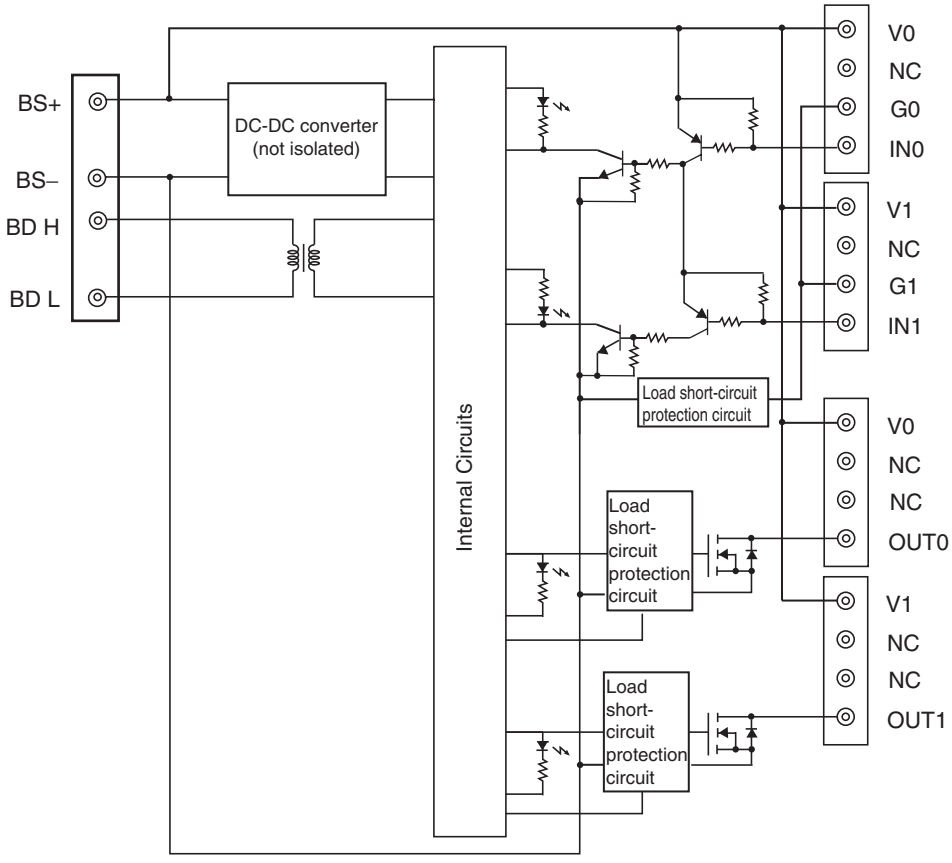
Setting the Node Address

The node address is set as a decimal number with the 100s digit set on the top rotary switch, the 10s digit set on the middle rotary switch, and the 1s digit set on the bottom rotary switch. If an illegal address is set, the software setting (default: 0) will be used at startup. The setting on the rotary switches is read when power is turned ON.

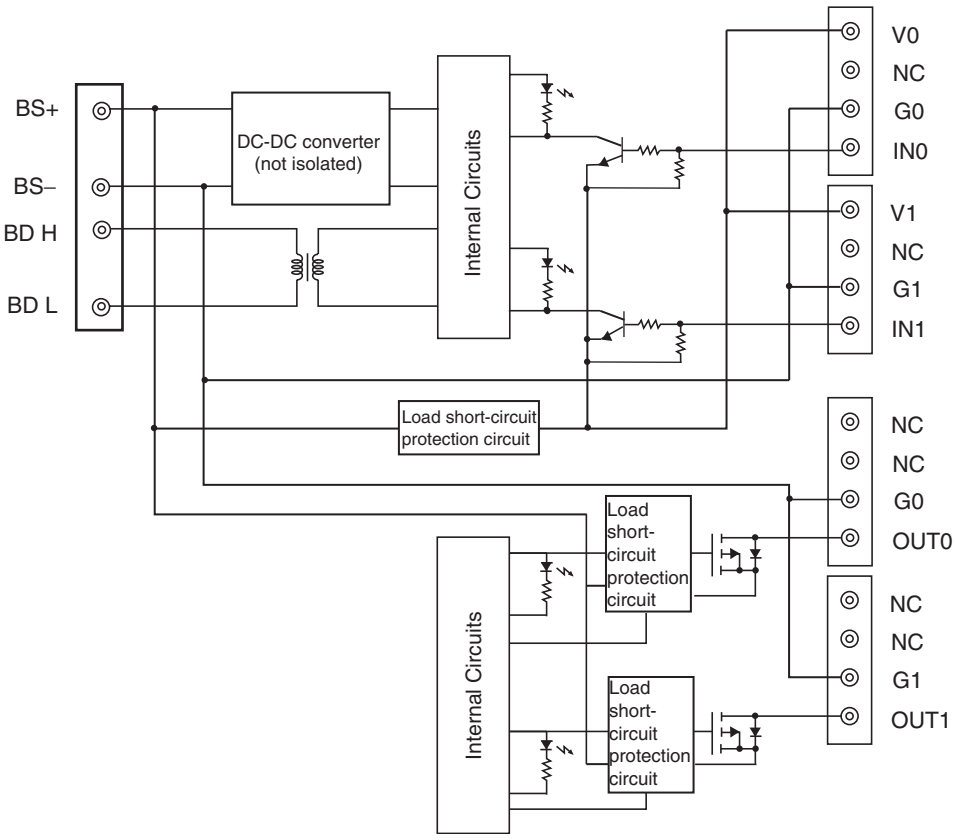


Internal Circuits

CRT1B-MD04SLP



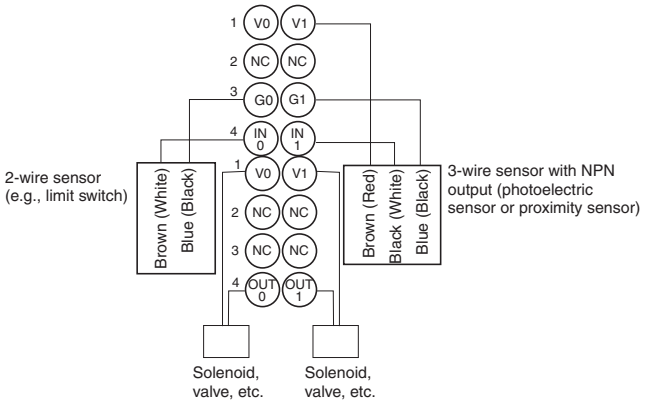
CRT1B-MD04SLP-1



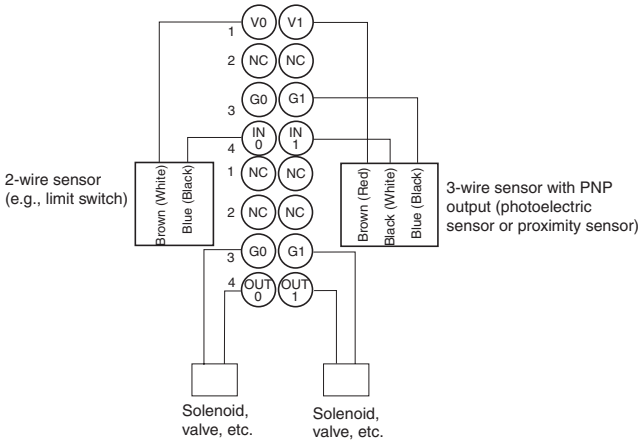
Wiring

The I/O connector section uses industry standard connectors (e-CON). Pins arrangements and signals are shown below.

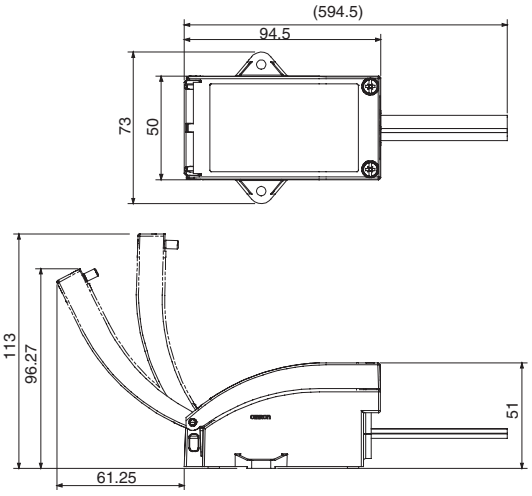
CRT1B-MD04SLP



CRT1B-MD04SLP-1



Dimensions (Same for CRT1B-MD04SLP and CRT1B-MD04SLP-1)



SECTION 7
Analog I/O Slave Units

This section describes the Analog I/O Slave Units.

7-1 Overview of Analog I/O Slave Units

This section provides an overview of Analog I/O Slave Units, including details on functions and setting methods for each Unit. Refer to *7-4 Analog Input Slave Units* and *7-5 Analog Output Slave Units* for details on functions and setting methods.

7-1-1 Analog I/O Slave Units

CompoNet Analog I/O Slave Units combine the functions supported by all CompoNet Units (backup, restore, online replacement, and other functions) with various functions unique Analog I/O Slave Units (such as scaling and peak/bottom hold function).

Analog Input Slave Units are also able to internally perform math on analog input values, which previously required ladder programming in the CPU Unit. Analog data or temperature data can be selected from the six values obtained from math operations and allocated in the Master Unit in combination with Generic Status Flags or other status information. The CompoNet Support Software can be used to easily allocate status information, monitor and set unique Analog I/O Slave Unit functions, and monitor operation.

7-1-2 List of Data Processing Functions

The following tables list the data processing functions that can be used with Analog I/O Slave Units. Refer to *7-4-3 Functions and Settings* for details on functions and setting methods.

CRT1-AD04 Analog Input Slave Unit

Function	Details
Moving average	Calculates the average of the past eight analog input values, and produces a stable input value even when the input value is unsteady.
Setting the number of AD conversion points	By reducing the number of input conversion points, the conversion cycle speed can be increased. For details, refer to *7-4-4 Calculating the Conversion Cycle.*
Scaling	Performs scaling. Scaling allows conversion of values between 0 and 6,000 into values using the industry unit required by the user. It reduces the number of operations requiring ladder programming in the CPU Unit. Scaling also supports an offset function for compensating for mounting errors in sensors and other devices.
Peak/bottom hold	Holds the maximum and minimum analog input values.
Top/valley hold	Holds the top and valley values for analog input values.
Rate of change	Calculates the rate of change for analog input values.
Comparator	Compares the analog input value or an analog value after math processing (value for peak, bottom, top, valley, rate of change) with the four set values HH, H, L, and LL, and indicates the result with the Analog Status Flags.
Disconnected line detection	Detects disconnections of analog inputs. (Valid only for the input ranges 4 to 20 mA and 1 to 5 V)
User adjustment	Adjusts the input when an offset occurs in the input voltage or current.
Cumulative counter	Calculates an approximation to the integral of analog input values over time.

CRT2-DA02 Analog Output Slave Units

Function	Details
Scaling	Performs scaling. Scaling allows conversion of values between 0 and 6,000 into values using the industry unit required by the user. It reduces the number of operations required in ladder programming in the Master Unit.
User adjustment	Adjusts the output when an offset occurs in the output voltage or current.
Cumulative counter (maintenance function)	Calculates an approximation to the integral of analog output values over time.
Communications error output setting	Sets the value output when a communications error occurs for each output.

7-1-3 Data Processing Flowcharts for Analog Input Slave Units

Analog Input Value

The following math operations can be performed on the external analog input value or temperature input value. The values obtained after processing (analog input values) can be allocated as I/O in the Master Unit.

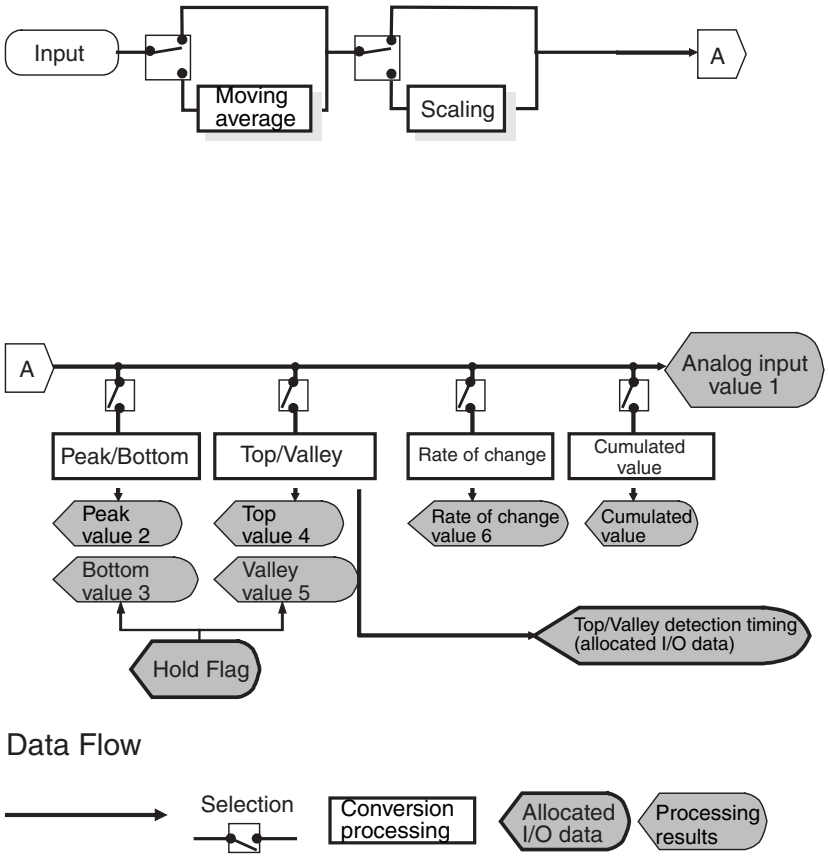
- Scaling to desired industry unit
- Moving average processing

Other Operation Results

After moving average and scaling processing, the analog input value can be processed using the following operations. The values after processing are called peak value, bottom value, top value, valley value, rate of change, and cumulated value.

- Peak/hold operation
- Top/valley operation
- Rate of change operation
- Cumulative operation (maintenance function)

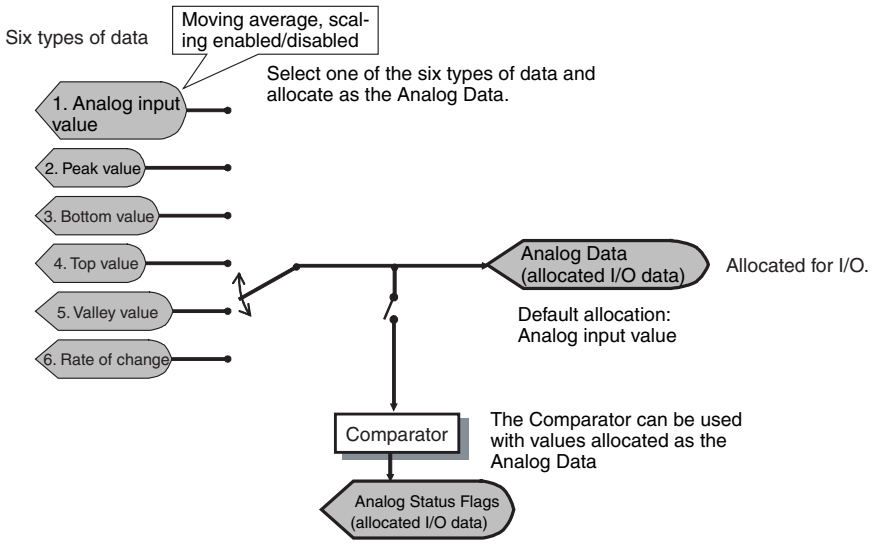
Analog processing is performed according to the following flowchart.



7-1-4 Selecting Data for Analog Input Slave Units

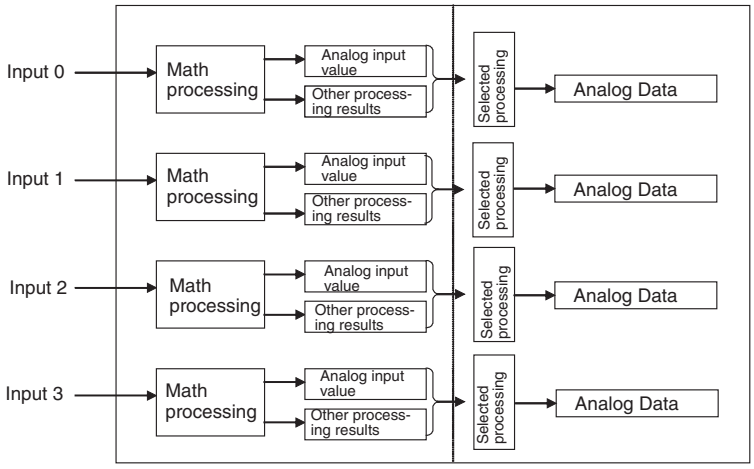
After performing math operations, select one out of the six resulting values to allocate in the Master Unit, from the analog input value, peak value, bottom value, top value, valley value, and rate of change. The selected data is referred to as “analog data” and can be allocated in the Master Unit individually or in combination with Status Flags. The data is selected using the CompoNet Support Software. For Analog Data comparator operations with four alarm set values can be performed (comparator function).

Flow of Data in Analog Input Slave Units



Note By default, the input analog value is allocated for I/O without modification.

For Inputs 0 to 3, the Analog Data can be separately selected, as shown in the following diagram.



7-1-5 I/O Data

Analog Input Slave Units (CRT1-AD04)

Analog Input Slave Units support the following four types of input data, and one type of output data. The required data can be allocated for I/O.

Input Data

I/O data	Details
Analog Data (8 input bytes)	• Used to monitor analog data. • Select one type of data from the analog input value, peak value, bottom value, top value, valley value, and rate of change. (Default allocation: Analog input value) **Note** The comparator can be used with Analog Data 1 or Temperature Data 1.
Top/Valley Detection Timing Flags (4 input bytes)	Top/Valley Detection Timing Flags are allocated in one word. These flags are used to time reading the values held as the top and valley values when both the top and valley values are allocated at the same time.

I/O data	Details
Analog Status Flags (4 input bytes)	Used to allocate the bits for the Comparator Result Flag, Top/Valley Detection Timing Flag, and Disconnected Line Detection Flag. The function of each bit is as follows: • Comparator Result Flags Allow control of the judgement results only, without allocating analog values • Top/Valley Detection Timing Flags Used to time reading the values held as the top and valley values when both the top and value values are allocated at the same time. • Disconnected Line Detection Flags Disconnections can be detected even when the analog values are not allocated.
Analog Data + Top/Valley Detection Timing Flags (10 input bytes)	The Top/Valley Detection Timing Flags (2 bytes) are allocated following the Analog Data (8 bytes).

Output Data

I/O data	Details
Hold Flags (2 output bytes)	Used with each of the hold functions (peak, bottom, top, and valley) to control the execution timing of hold functions from the Master Unit.

Analog Output Slave Units (CRT1-DA02)

Analog Output Slave Units support one type of output data.

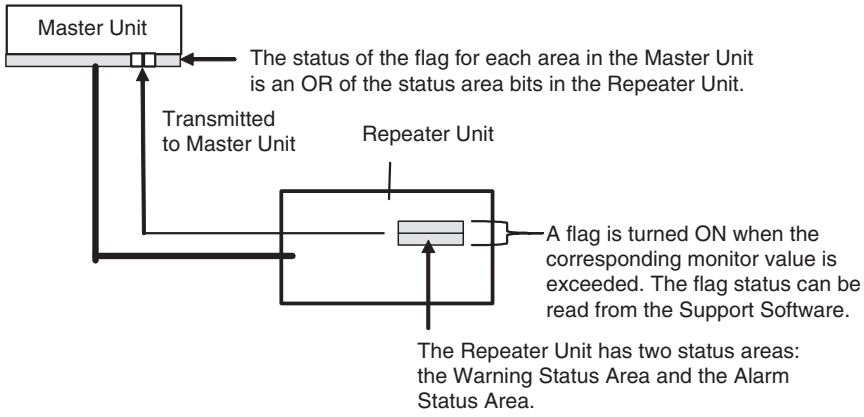
Output Data

Data Type	Details
Output data (4 output bytes)	Used to allocate two words of analog output data.

7-2 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 threshold/monitor values set for each function in that Unit. For each area, a corresponding status flag in the Master Unit will be turned ON if any flag in the status area in the Analog I/O Slave Unit turns ON. Bit 12 in the Master Unit corresponds to the Warning Status Area and bit 13 corresponds to the Alarm Status Area.

The Analog I/O Slave Unit's status area information can be read from the CompoNet Support Software.



CRT1-AD04

Warning Status Area

The Analog Input Slave Unit's Warning Status Area contains the following 16 bits. These bits indicate minor errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	Reserved	---
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Turns ON when the voltages drops below the voltage set for the network power voltage monitor function.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the Unit ON Time Monitor function is exceeded.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Analog Range Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (exceeded set monitor value)	Turns ON when the analog data exceeds the displayable range or when the monitor value set for the comparator function is exceeded.
9	Cumulated Counter Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (exceeded set monitor value)	Turns ON when cumulated value exceeds the set monitor value.
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Alarm Status Area

The Analog Input Slave Unit's Alarm Status Area contains the following 16 bits. These bits indicate serious errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	EEPROM Data Error Flag OFF: Normal ON: Error	Turns ON then there is an error in the EEPROM data.
2	Reserved	---
3	Reserved	---
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Disconnected Line Detection Flag OFF: Normal ON: Disconnected line detected	Turns ON then the line is disconnected, including wiring mistakes and connected device failure.
9	Analog Hardware Error Flag OFF: Normal ON: Error	Turns ON when there is an error in the analog circuits in the Unit.
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

CRT1-DA02

Warning Status Area

The Analog Output Slave Unit's Warning Status Area contains the following 16 bits. These bits indicate minor errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	Reserved	---
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Monitors the voltage set for the network power voltage monitor function.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Monitors the power ON time warning value set for the Unit ON Time Monitor function.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Error Output Flag OFF: Normal ON: Output is incorrect	Turns ON when the value set for the communications error output function is being output.
9	Cumulated Counter Exceeded Flag OFF: Within range (below set monitor value) ON: Out-of-range (exceeded set monitor value)	Turns ON when cumulated value exceeds the set monitor value.
10	Reserved	---

Bit	Content	Description
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Alarm Status Area

The Analog Output Slave Unit's Alarm Status Area contains the following 16 bits. These bits indicate serious errors in the Unit.

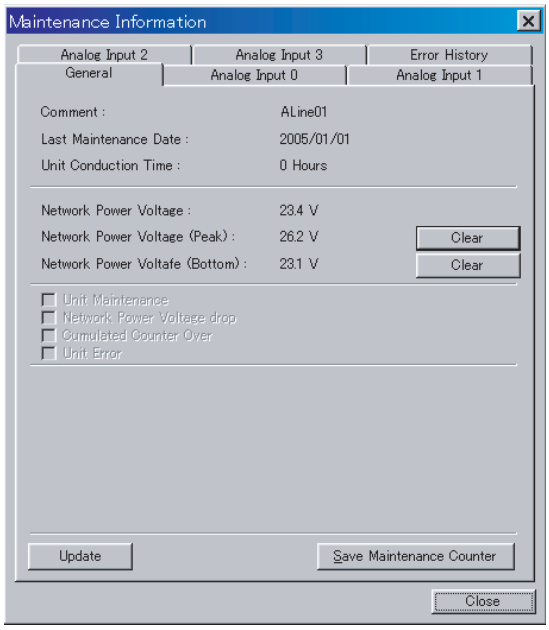
Bit	Content	Description
0	Reserved	---
1	EEPROM Data Error Flag OFF: Normal ON: Error	Turns ON then there is an error in the EEPROM data.
2	Reserved	---
3	Reserved	---
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Reserved	---
9	Analog Hardware Error Flag OFF: Normal ON: Error	Turns ON when there is an error in the analog circuits in the Unit.
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

7-3 Maintenance Information Window

This section describes the Maintenance Information Window, which can be used to monitor the status of Analog I/O Slave Units. The Monitor Device Window can be used to check the same Slave status information. Refer to the Maintenance Information Window in this section for examples.

7-3-1 Checking Maintenance Information

The Maintenance Mode Window can be opened in two ways: 1) Right-click the Main Window to display the popup menu and select ***Maintenance Information***, or 2) Open the Maintenance Mode Window and double-click the desired Slave Unit's icon.



Item	Description
Comment	Displays up to 32 characters of text set as the Unit name.
Last Maintenance Date	Displays the last maintenance date that was set.
Unit Conduction Time	Displays the total time that the Unit has been ON (cumulative power ON time).
Present Value Not in screen shot	Displays the present analog value (same for all models): Peak, bottom, top, valley, rate of change, total time in set temperature range, top/valley count, or cumulated counter. Displays data obtained from the analog value. Refer to the descriptions of individual functions for setting methods.
Network Power Voltage	Displays the present network power supply voltage.
Network Power Voltage (Peak)	Displays the maximum power supply voltage up to the present time.
Network Power Voltage (Bottom)	Displays the minimum power supply voltage up to the present time.
Update Button	Click this Button to update the Maintenance information.
Save Maintenance Counter Button	This button saves the Maintenance Counter value in the Unit. If this function is used, the previous value will be retained when the power supply is turned OFF and ON again.

Note Always update the information when the parameters have been edited or set.

Status Check Boxes

The flags (check boxes) shown in the following table will be turned ON when the corresponding error occurs.

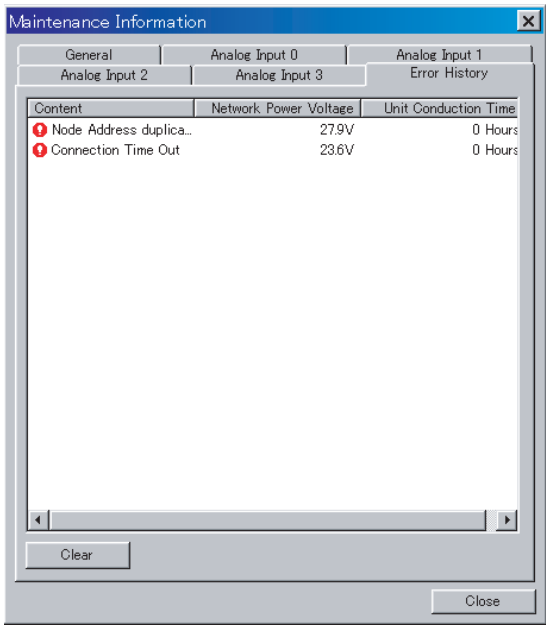
Item	Description
Unit Maintenance	ON when the total Unit ON time exceeds the set value.
Network Power Voltage drop	ON when the network power supply voltage falls below the set value.

Item	Description
Cumulated Counter Over	ON when any one of the input's cumulative counter values exceeds the set value.
Unit Error	ON when a Unit Error has occurred in an Analog Unit.
Threshold Cumulated Counter Over	ON when the cumulative counter value exceeds the set value.
Cumulated Counter Overflow	ON when there is an overflow in the cumulative counter value.
Cumulated Counter Underflow	ON when there is an underflow in the cumulative counter value.

Status Boxes Displayed for the CRT1-AD04□ Only

Item	Description
Over Range/Under Range	ON when the analog data is above or below the displayable range.
Alarm Over/Warning Over	ON when the analog data is above or below the monitoring set values set in the comparator function.
Broken wire	ON when a wire is broken or disconnected. (Used only for Analog Input Slave Units when the input range is 1 to 5 V or 4 to 20 mA.)

Error History Window



Item	Description
Content	Displays the contents of the communications errors that have occurred.
Network Power Voltage	Displays the power supply voltage being supplied when the error occurred.
Unit Conduction Time	Displays the total time that the network power supply had been ON when the error occurred.

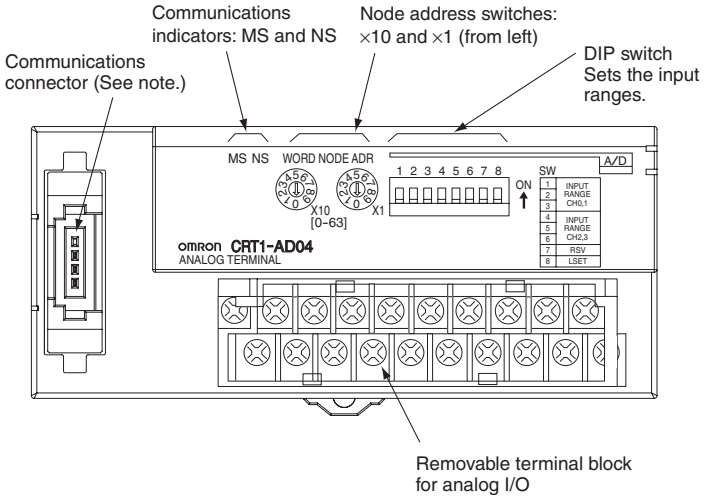
7-4 Analog Input Slave Units

7-4-1 Four-point Analog Input Slave Unit

General Specifications

Item		Specifications	
		Voltage input	Current input
Model		CRT1-AD04	
Input signal ranges		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		1 M Ω min.	Approximately 250 Ω
Resolution		1/6,000 (full scale)	
Overall accuracy	25°C	±0.3% FS	±0.4% FS
	–10 to 55°C	±0.6% FS	±0.8% FS
Analog conversion cycle		4 ms max./ 4 points	
AD conversion data		–10 to 10 V range: F448 to 0BB8 hex full scale (–3,000 to 3,000) Other ranges: 0000 to 1770 hex full scale (0 to 6,000) AD conversion range: ±5% FS of the above data ranges.	
Isolation method		Photocoupler isolation (between input and communications lines) No isolation between input signal wires	
Mounting		DIN Track mounting	
Power supply type		Multi-power supply	
Communications power current consumption		175 mA max.	
Weight		153 g	

Component Names and Functions



Note A Branch Line Pressure-welded Connector or Terminal Block Adapter (DCN4-TB4) can be connected to the communications connector.

Indicator Section

Communications Indicators

Refer to *SECTION 4 Basic Specifications of Slave Units*.

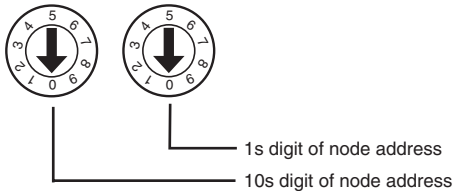
Switch Settings

Setting the Node Address

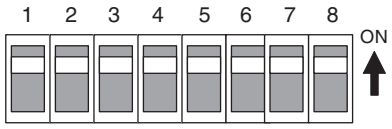
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (Set to between 0 and 63.)

If an illegal address is set, the software setting (default: 0) will be used at start-up.

The setting on the rotary switches is read when power is turned ON.



Setting the Input Ranges



Pin No.	Setting	Specifications
1	Input Slave Unit: Input range setting for Inputs 0 and 1. (The same range is used for both inputs.)	Default setting: All pins OFF
2		
3		
4	Input Slave Unit: Input range setting for Inputs 2 and 3. (The same range is used for both inputs.)	Default setting: All pins OFF
5		
6		
7	Always OFF.	Always set this pin to OFF. Malfunctions may occur if it is set to ON.
8	Range setting method	OFF: Use Support Software. ON: Use DIP switch.

Note

1. Always use the default setting (OFF) for pin 7.
2. Always set pin 8 to ON if the DIP switch is used to set the ranges. If this pin is OFF, the DIP switch settings will not be enabled.
3. The DIP switch settings are read when the power is turned ON.

■ **Inputs 0 and 1 (Shared Setting)**

Input range	Pin 1	Pin 2	Pin 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
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON
Cannot set for other ranges.	---	---	---

■ **Inputs 2 and 3 (Shared Setting)**

Input range	Pin 4	Pin 5	Pin 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
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON
Cannot set for other ranges.	---	---	---

Note When the DIP switch is used to set the input ranges (pin 8 ON), the input signal ranges will always be the same for Inputs 0 and 1 and for Inputs 2 and 3. If it is necessary to set separate input signal ranges for Inputs 0 to 3, use the CompoNet Support Software to make the settings rather than the DIP switch. When pin 8 is OFF, the other DIP switch settings are disabled.

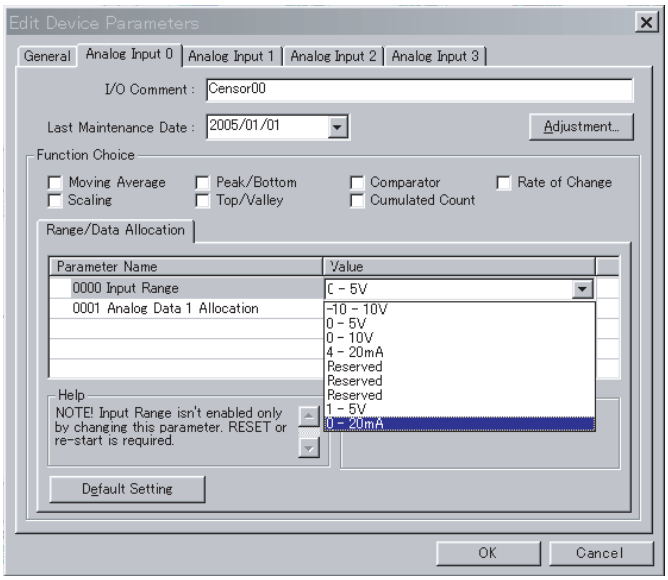
Setting the Input Range from the CompoNet Support Software

Use the following procedure to set the input range for each input using the CompoNet Support Software.

1,2,3...

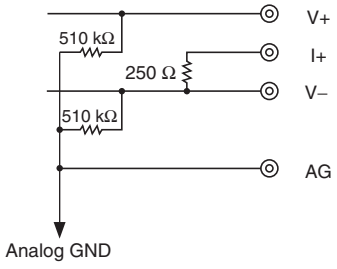
1. Double-click the icon of the Slave to be set in the Main Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus)
2. Select the Tab Page for the input where the range is to be changed.

3. Select the desired range from the pull-down menu in the *Input Range* field.



4. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Internal Circuits

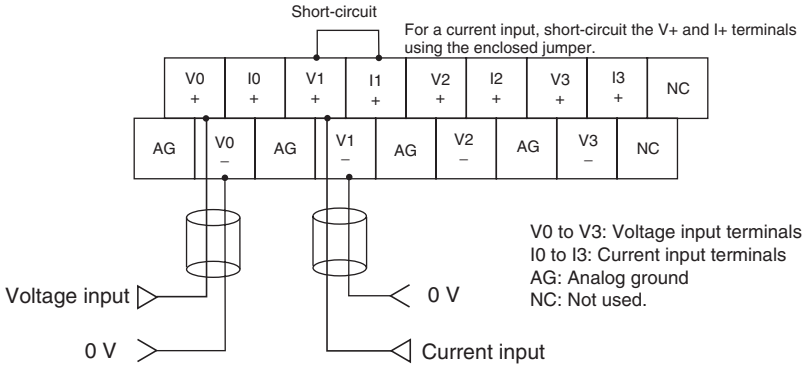


Terminal Arrangements

Communications Connector

BS+	Communications power supply +
BDH	Communications data high
BDL	Communications data low
BS–	Communications power supply –

Analog I/O Terminal Block



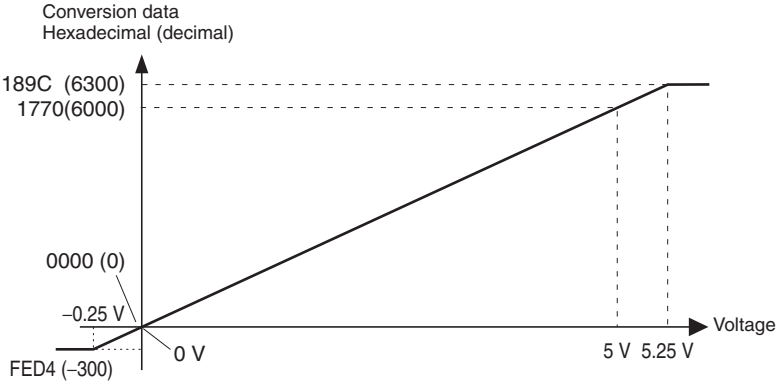
Input Range and Conversion Data

The analog data that is input can be converted to digital data according to the input range, as described here. If the input exceeds the input range, the AD conversion data will be fixed at the upper or Low Limit.

CRT1-AD04 Input Ranges

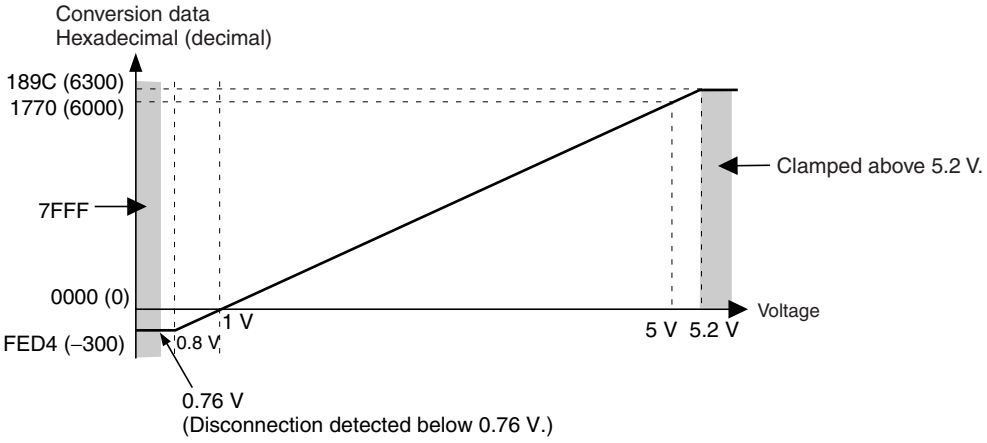
■ **Input Range: 0 to 5 V**

The voltage range 0 to 5 V corresponds to 0000 to 1770 hex (0 to 6,000). The convertible data range is FED4 to 189C hex (–300 to 6,300). Negative voltages are expressed as two's complements (16 bits). When a disconnection occurs, the data equivalent to 0 V input will be used (0000 hex).



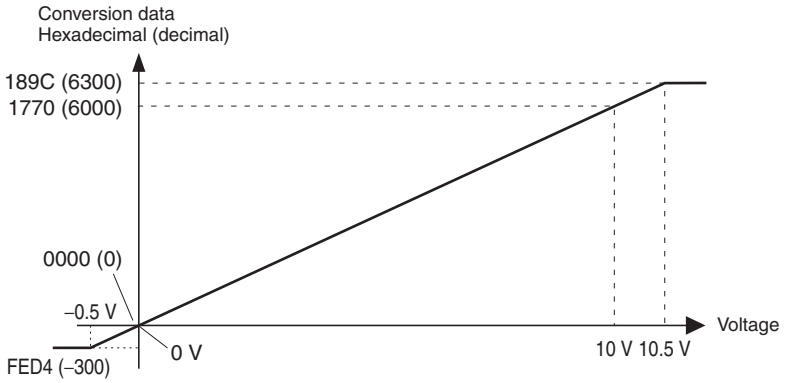
■ **Input Range:1 to 5 V**

The voltage range 1 to 5 V corresponds to 0000 to 1770 hex (0 to 6,000). The convertible data range is FED4 to 189C hex (–300 to 6,300). If the input voltage falls below the input range (input voltage less than 0.76 V), a disconnection is detected and the data is set to 7FFF hex.



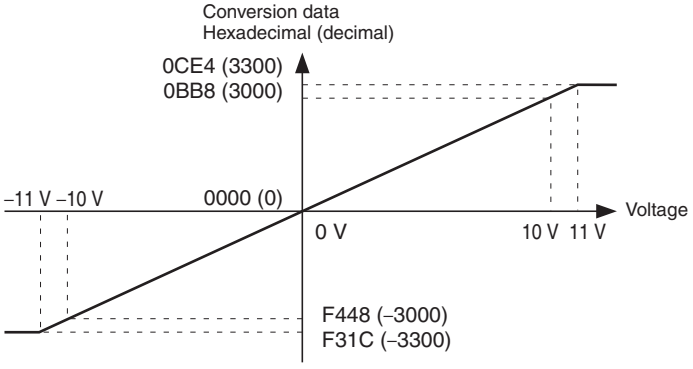
■ **Input Range: 0 to 10 V**

The voltage range 0 to 10 V corresponds to 0000 to 1770 hex (0 to 6,000). The convertible data range is FED4 to 189C hex (–300 to 6,300). Negative voltages are expressed as two's complements (16 bits). When a disconnection occurs, the data equivalent to 0 V input will be used (0000 hex).



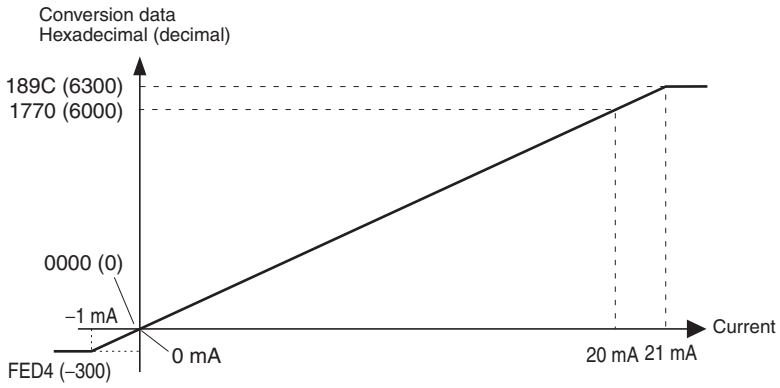
■ **Input Range: –10 to 10 V**

The voltage range –10 to 10 V corresponds to F448 to 0BB8 hex (–3,000 to 3,000). The convertible data range is F31C to 0CE4 hex (–3,300 to 3,300). Negative voltages are expressed as two's complements (16 bits). When a disconnection occurs, the data equivalent to 0 V input will be used (0000 hex).



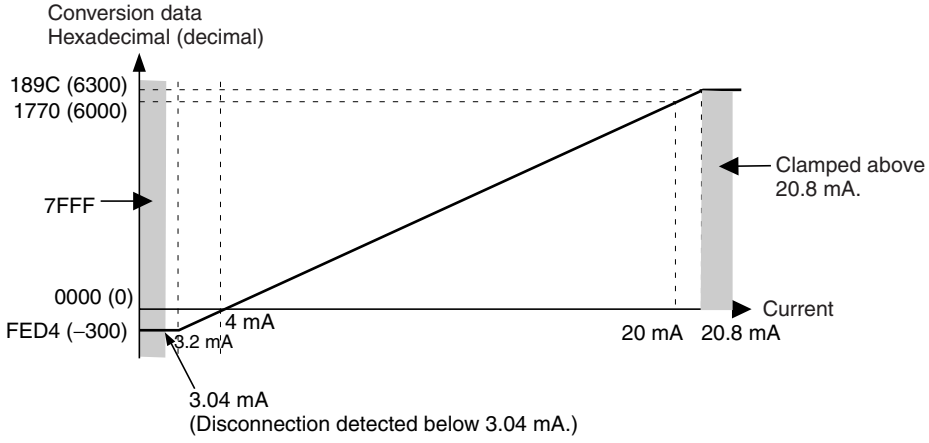
■ **Input Range: 0 to 20 mA**

The current range 0 to 20 mA corresponds to 0000 to 1770 hex (0 to 6,000). The convertible data range is FED4 to 189C hex (–300 to 6,300). Negative currents are expressed as two's complements (16 bits). When a disconnection occurs, the data equivalent to 0 mA input will be used (0000 hex).



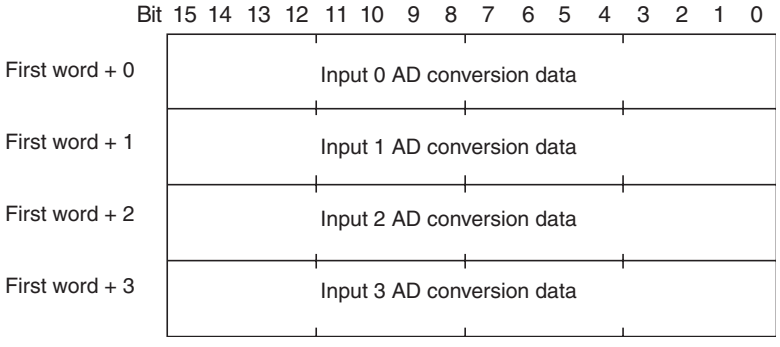
■ **Input Range: 4 to 20 mA**

The current range 4 to 20 mA corresponds to 0000 to 1770 hex (0 to 6,000). The convertible data range is FED4 to 189C hex (–300 to 6,300). If the input current is below the input range (input current less than 3.04 mA), a disconnection is detected and the data is set to 7FFF hex.



AD Conversion Data

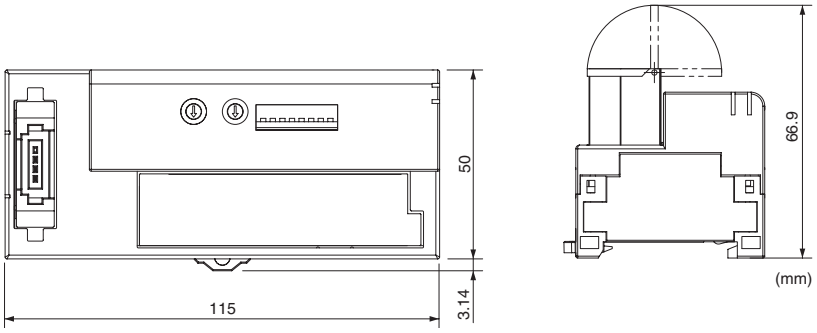
Negative AD conversion data is expressed as two's complements. The NEG instruction (two's complement conversion) can be used to obtain the absolute value of the two's complement.



Conversion Speed

The AD conversion data for 4 input points is refreshed every 3.82 ms max., although the conversion speed will vary depending on the functions and number of AD conversion points being used. Refer to *7-4-4 Calculating the Conversion Cycle* for details.

Dimensions



7-4-2 I/O Data Allocation Methods

Allocating I/O Data

Use one of the following methods to select the data for allocating in the Master Unit for remote I/O communications.

1. Allocating only the analog input values (default I/O data)
2. Allocating a combination of data, such as the Status Flags, in addition to the analog input values using the CompoNet Support Software

■ **Default I/O Data**

When using the Analog Input Slave Unit's default settings, only the analog input values are selected as the I/O data and allocated in the four words (eight bytes) of the Master Unit's input Area, as shown in the following diagram.

15	0
Analog input value for Input 0	
Analog input value for Input 1	
Analog input value for Input 2	
Analog input value for Input 3	

■ **Allocating I/O Data Using the CompoNet Support Software**

The analog data can be combined with other data, such as the Status Flags, and allocated in the Master Unit. Select the required data from the CompoNet Support Software drop-down menu.

Example: Allocating Analog Data + Top/Valley Detection Timing Flags in the Master Unit.

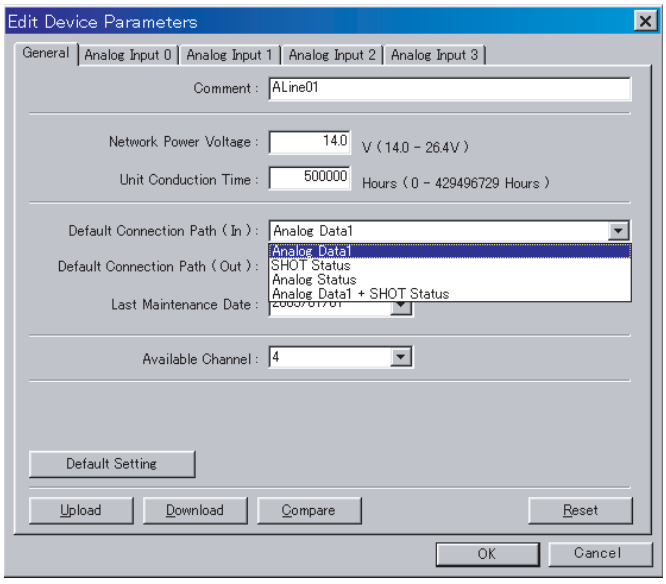
15	8	7	0
Analog Data 1 for Input 0			
Analog Data 1 for Input 1			
Analog Data 1 for Input 2			
Analog Data 1 for Input 3			
Top Detection Timing Flag		**Valley Detection Timing Flag**	

The following procedure can be used to allocate data with the CompoNet Support Software.

Setting Using the CompoNet Support Software

1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window to open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Click the **General** Tab and select the desired I/O data (pattern) from the pull-down menu under the *Default Connection Path (In)* field. In the following example, Analog Data1 is selected.



3. Click the **Download** Button and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

Specifying the Analog Data

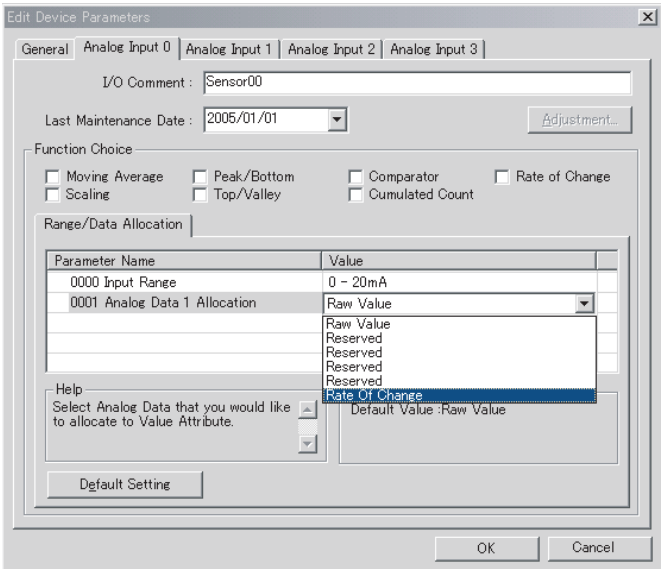
One of the following six processed values can be selected as the analog data: Raw Value, Peak, Bottom, Top, Valley, and Rate of Change. These values can be selected alone or in combination with the Status Flags. The procedure to specify the analog data is given below.

Setting Using the CompoNet Support Software

1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window to open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

2. Select the tab page for the analog input that is to be set, and select the value to be allocated from the drop-down list for the *Analog Data 1 Allocation.*



3. Return to the General Tab Page, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

I/O Data

Analog Data

Analog Data is used to monitor analog values. Analog input value is allocated as the default setting, but any one of analog input value, peak value, bottom value, top value, valley value or rate of change can be selected as allocation data.

Note The comparator function can be used for the data allocated in Analog Data.

The data format used for allocating data in the Master Unit is shown below. Data is allocated as two's complements (8 bytes = 4 words).

15	0
Analog Data 1 for Input 0	
Analog Data 1 for Input 1	
Analog Data 1 for Input 2	
Analog Data 1 for Input 3	

Top/Valley Detection Timing Flags (Shot Status)

These flags turn ON for the one-shot time when detecting the top or valley for the top/valley hold function.

These flags are used to time reading the values held as the top and valley values at the Master Unit. The following data format is used when these flags are allocated in the Master Unit (2 bytes = 1 word).

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0
+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0

The details of each byte are shown in the following table.

Byte	Abbreviation	Name	Details
+0	V_STx	Valley Detection Timing Flag	Turns ON when a valley is detected by the valley hold function and then turns OFF after the one-shot time has elapsed.
+1	T_STx	Top Detection Timing Flag	Turns ON when a top is detected by the top hold function and then turns OFF after the one-shot time has elapsed.

Note The one-shot time can be changed. For details, refer to the one-shot time settings for the top/valley hold function.

Analog Status Flags

The Analog Status Flags include allocations for the Comparator Result Flag, the Top/Valley Detection Timing Flags, and the Disconnected Line Detection Flags. These flags are used for detection and monitoring.

The data format used for each byte when these flags are allocated in the Master Unit is shown below (4 bytes = 2 words).

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
+0	**BW0**	**T_ST0**	**V_ST0**	**HH0**	**H0**	**PS0**	**L0**	**LL0**	**Input 0**
+1	**BW1**	**T_ST1**	**V_ST1**	**HH1**	**H1**	**PS1**	**L1**	**LL1**	**Input 1**
+2	**BW2**	**T_ST2**	**V_ST2**	**HH2**	**H2**	**PS2**	**L2**	**LL2**	**Input 2**
+3	**BW3**	**T_ST3**	**V_ST3**	**HH3**	**H3**	**PS3**	**L3**	**LL3**	**Input 3**

The details for each bit are shown in the following table.

Bit	Abbreviation	Name		Details
0	LLx	Comparator result	Low Low Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data drops below the Low Low Limit alarm setting.
1	Lx		Low Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data drops below the Low Limit alarm setting.
2	PSx		Normal Flag (pass signal)	Turns ON when none of the alarms (High High Limit, High Limit, Low Low Limit, and Low Limit) have been output.
3	Hx		High Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data exceeds the High Limit alarm setting.
4	HHx		High High Limit Alarm Flag	Turns ON when the value of data allocated in Analog Data exceeds the High High Limit alarm setting.

Bit	Abbreviation	Name		Details
5	V_STx	Top/valley detection timing	Valley Detection Timing Flag	Used with the valley hold function. Turns ON when a valley is detected, and turns OFF after the one-shot time has lapsed.
6	T_STx		Top Detection Timing Flag	Used with the top hold function. Turns ON when a top is detected, and turns OFF after the one-shot time has lapsed.
7	BWx	Disconnected Line Detection Flag		Turns ON when a disconnection is detected.

Analog Data + Top/Valley Detection Timing Flags (Analog Data + Shot Status)

This data pattern consists of Analog Data followed by the Top/Valley Detection Timing Flags and is allocated in the Master Unit using the following data format (10 bytes = 5 words).

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0 +1	Analog Data 1 for Input 0							
+2 +3	Analog Data 1 for Input 1							
+4 +5	Analog Data 1 for Input 2							
+6 +7	Analog Data 1 for Input 3							
+8	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0
+9	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0

Hold Flags (Output)

Hold Flags are used with the peak/bottom hold and top/valley hold functions. The Hold Flags are used to control the hold execution timing from the Master Unit and are allocated in the Master Unit using the following data format (2 bytes).

Note A delay may occur between when the Master Unit's power is turned ON until notification of the Hold Flag status is sent to the Slave.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
+0					HD3	HD2	HD1	HD0
+1								

The details for each bit are shown in the following table.

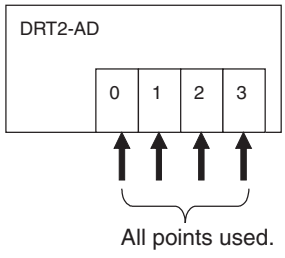
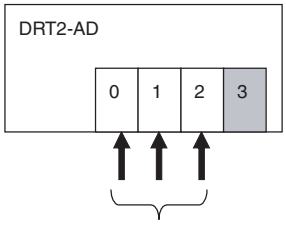
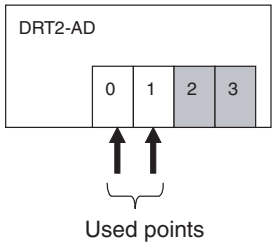
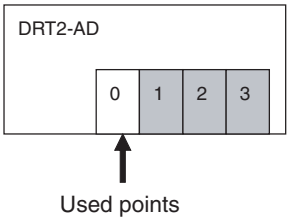
Bit	Abbreviation	Name	Details
0	HD0	Hold Flag for Input 0	The hold function is performed for Analog Input 0 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.
1	HD1	Hold Flag for Input 1	The hold function is performed for Analog Input 1 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.

Bit	Abbreviation	Name	Details
2	**HD2**	Hold Flag for Input 2	The hold function is performed for Analog Input 2 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.
3	**HD3**	Hold Flag for Input 3	The hold function is performed for Analog Input 3 while this flag is ON. The hold function stops and the last value is held when the flag goes OFF.

7-4-3 Functions and Settings

Setting the Number of AD Conversion Points

Normally, when using a four-point Input Unit, the values for the four inputs are converted in sequence. The setting can be changed, however, so that unused inputs are not converted. By reducing the number of conversion points, the conversion cycle speed is increased. For details on conversion cycle time, refer to *7-4-4 Calculating the Conversion Cycle.*

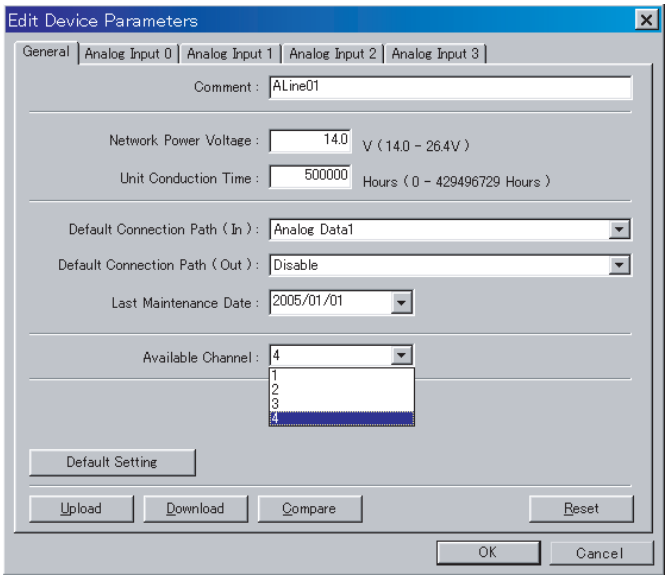
Conversion points	Details
4 points (default)	Converting Inputs 0 to 3. 
3 points	Converting Inputs 0 to 2. 
2 points	Converting Inputs 0 and 1. 
1 point	Converting Input 0 only. 

Note Four points of input analog data are used regardless of the setting of the number of AD conversion points.

Setting Using the CompoNet Support Software

1,2,3...

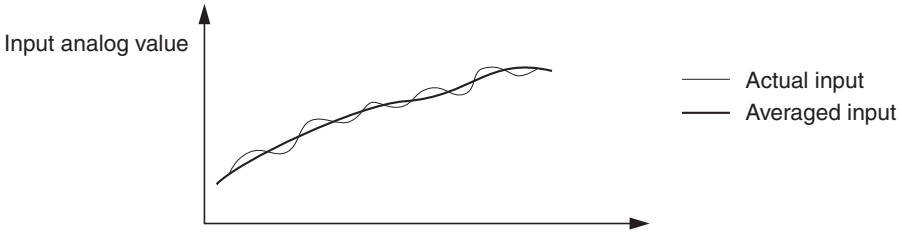
1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Click the **General** Tab and select the number of conversion points from the pull-down menu under the *Available Channel* field. In the following example, all four points are selected for conversion.



3. Click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the OK Button and exit the window.

Moving Average Processing

This function calculates the average value (moving average) of the previous eight inputs, and uses the resulting value as conversion data. When the input value fluctuates frequently, averaging can be used to produce a stable input value, as shown in the following diagram.

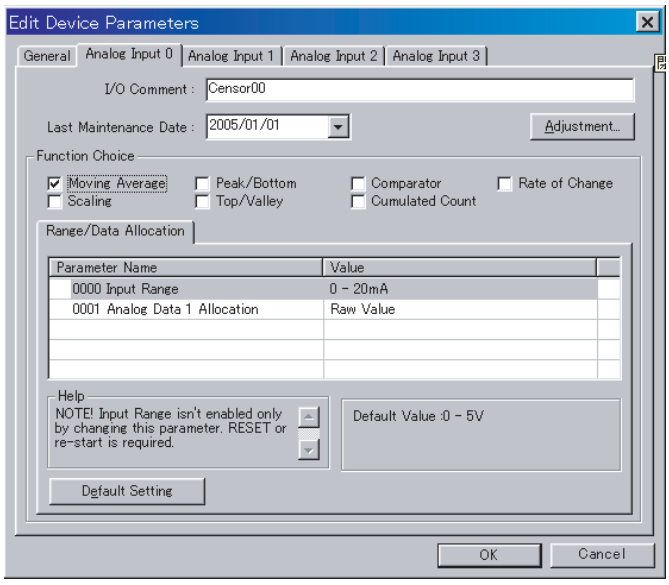


Setting Using the CompoNet Support Software

1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the input where moving average processing is to be performed, and select ***Moving Average*** under the *Function Choice*

heading.



3. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

Scaling

The default setting is used to perform AD conversion of analog input values, scaling them to a count between 0 and 6,000. Scaling can be used to change scaled values that correspond to the input signal range into other values required by the user (industry unit values). Scaling also eliminates the need for ladder programming in the Master Unit to perform math operations. The following two methods of input scaling can be used.

Default Scaling

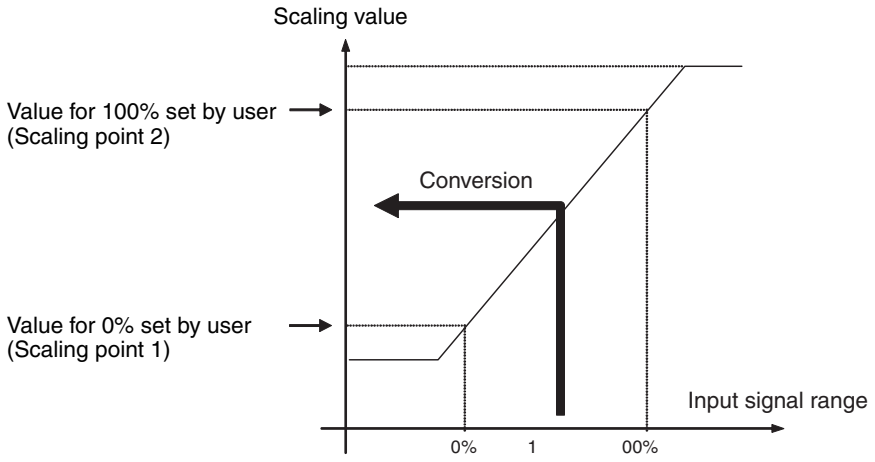
Analog input values (count values) are converted to the original voltage and current values. The units used are mV or μA. When default scaling is selected, scaling is performed according to the range used, as shown in the following table.

Input range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V (AD04 only)	0 to 20 mA	4 to 20 mA
100%	5,000 mV	10,000 mV	5,000 mV	10,000 mV	20,000 μA	20,000 μA
0%	0000 mV	0000 mV	1,000 mV	–10,000 mV	0000 μA	4,000 μA
Disconnected line	0000 hex	0000 hex	7FFF hex	0000 hex	0000 hex	7FFF hex

User Scaling

Analog input values (count values) are scaled to user-defined values. The conversion values for 100% and 0% are set using the CompoNet Support Software.

Input range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V (AD04 only)	0 to 20 mA	4 to 20 mA
100%	Set using CompoNet Support Software (–28,000 to 28,000)					
0%	Set using CompoNet Support Software (–28,000 to 28,000)					
Disconnected line	0000 hex	0000 hex	7FFF hex	0000 hex	0000 hex	7FFF hex

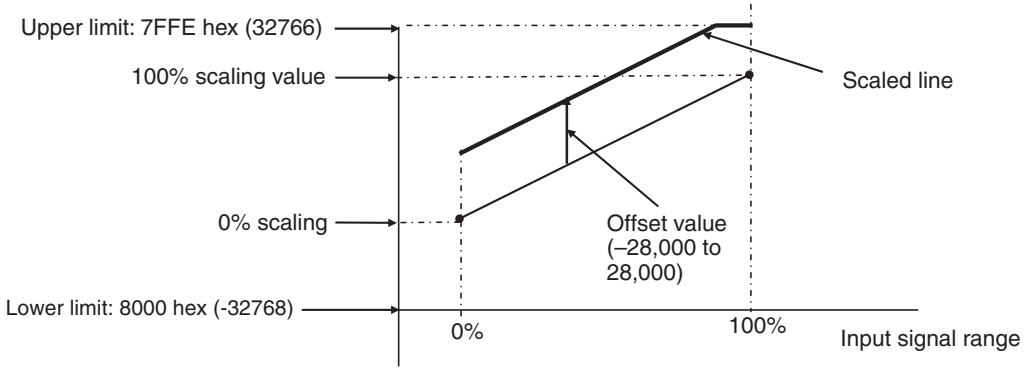


Note Reverse scaling, where the 0% scaling value is higher than the 100% scaling value, is also supported.

Offset Compensation

Scaling analog input values of linear sensors to distances produces mounting error in the sensor. Offset compensation compensates for error that occurs during scaling. The offset amount is added to the scaled line before processing, as shown in the following diagram. The offset (error) value can be input between –28,000 to 28,000, but make sure that underflow or overflow does not occur. The High Limit is 7FFE hex and the Low Limit is 8000 hex.

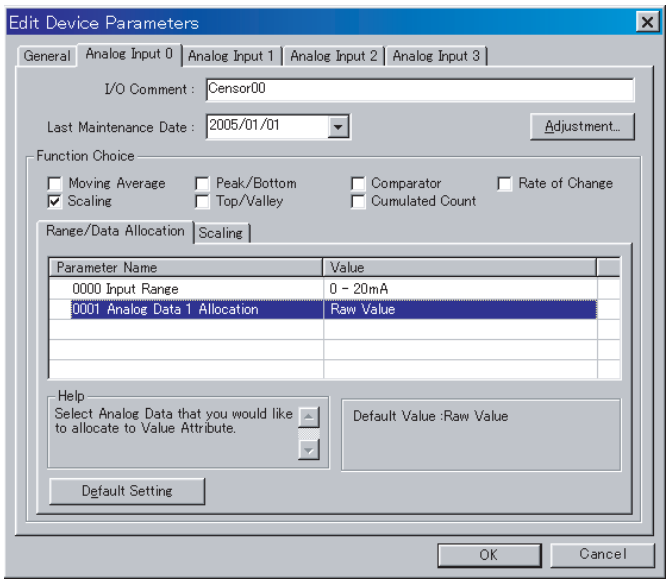
Note The offset value can be set even when using default scaling.



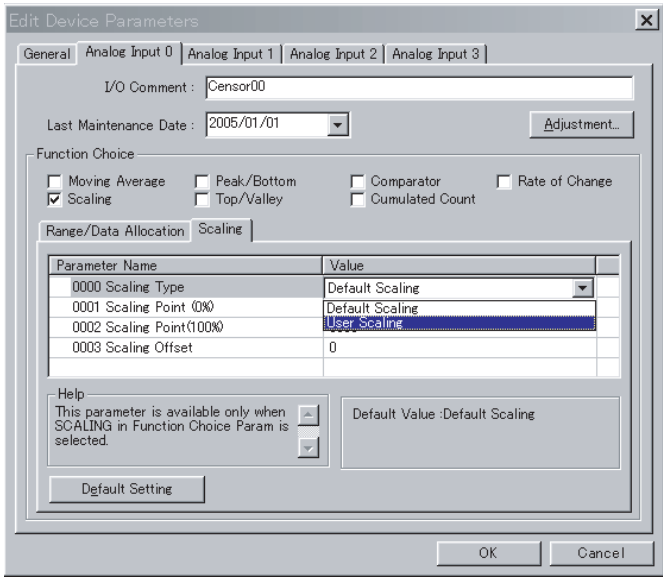
Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

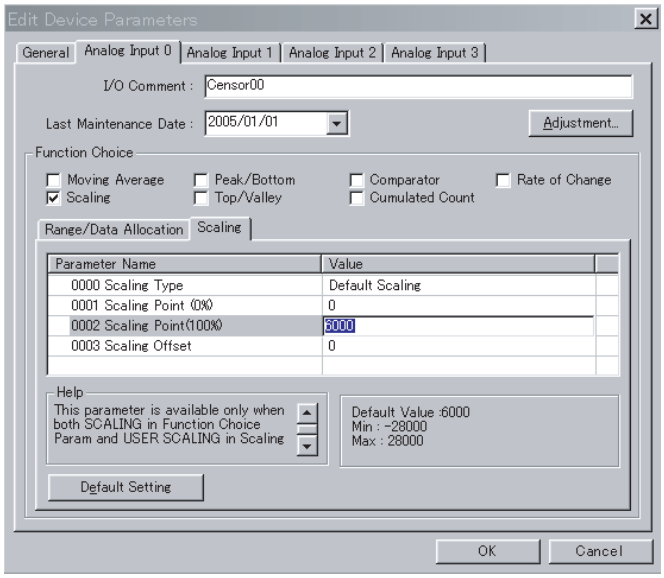
2. Select the Tab Page for the input where scaling is to be performed, and select ***Scaling*** under the *Function Choice* heading.



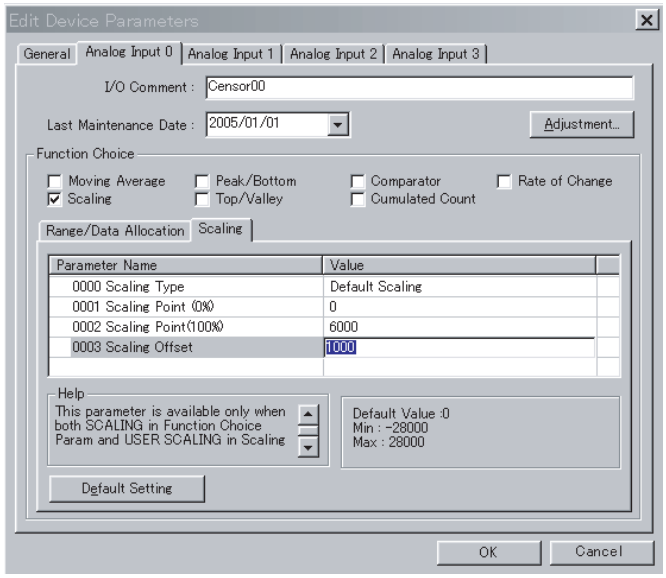
3. Click the **Scaling** Tab, and select either ***Default Scaling*** *or* ***User Scaling***. *User Scaling* is selected in the following example.



4. For user scaling, set the 0% value in the *Scaling point 1* field, and set the 100% value in the *Scaling point 2* field.



5. For offset compensation, set the offset value in the *Scaling Offset* field. Also select either ***Default Scaling*** or ***User Scaling*** in the *Scaling Type* field.

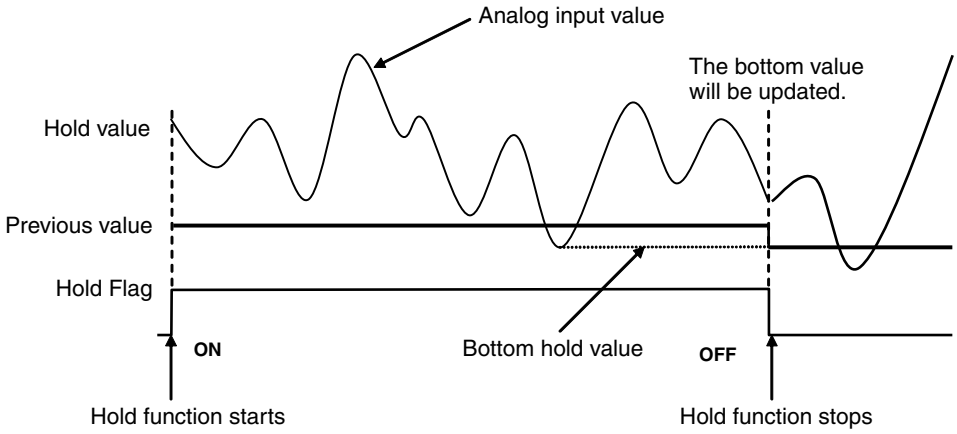


6. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

Peak/Bottom Hold

Peak/bottom hold is used to hold the maximum (peak) value or minimum (bottom) value of the analog input value. When the Hold Flag (output) allocated in the OUT Area turns ON, the hold function starts, searching for the peak or bottom value until the Hold Flag turns OFF. (The peak/bottom value is refreshed when the Hold Flag turns OFF.) The comparator function can be used to compare the peak or bottom values allocated as analog data. (Refer to details on the comparator function.)

■ **Example of Bottom Hold**

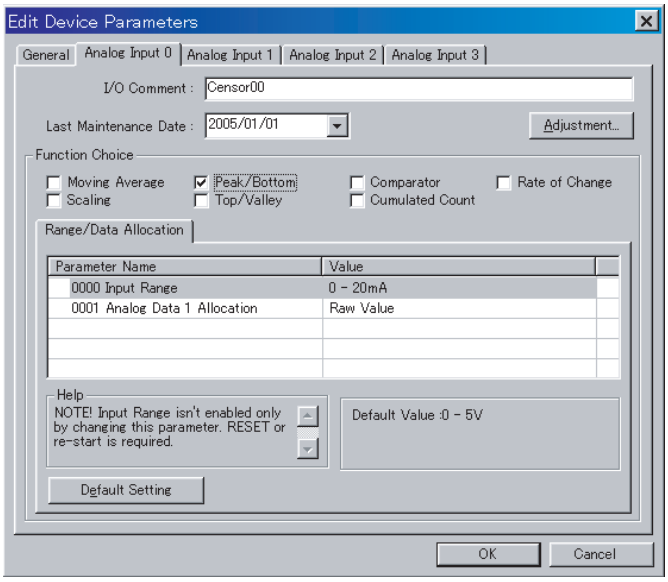


Note A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of the flag's status is actually sent to the Slave. Therefore, even when the Hold Flag is ON, the first analog data transmitted to the Master Unit when the CPU Unit power is turned ON may be the data from when the Hold Flag was OFF. To collect peak/bottom hold data using the Hold Flag at the Master Unit, configure a ladder program that considers the transmission delay when the Hold Flag is turned ON, then enables the peak/bottom hold values after a fixed time interval.

Setting Using the CompoNet Support Software

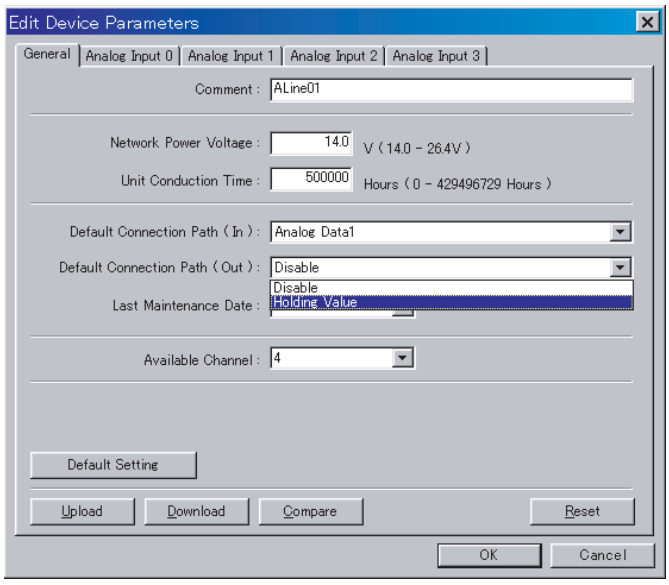
1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the input where peak/bottom hold is to be set, and select ***Peak/Bottom Hold*** under the *Function Choice* heading.



3. To allocate the Hold Flags (output) in the default connection path, click the **General** Tab and select ***Holding Value*** from the pull-down menu in the *De-*

fault Connection Path (Out) field.



4. Click the **Download** Button and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

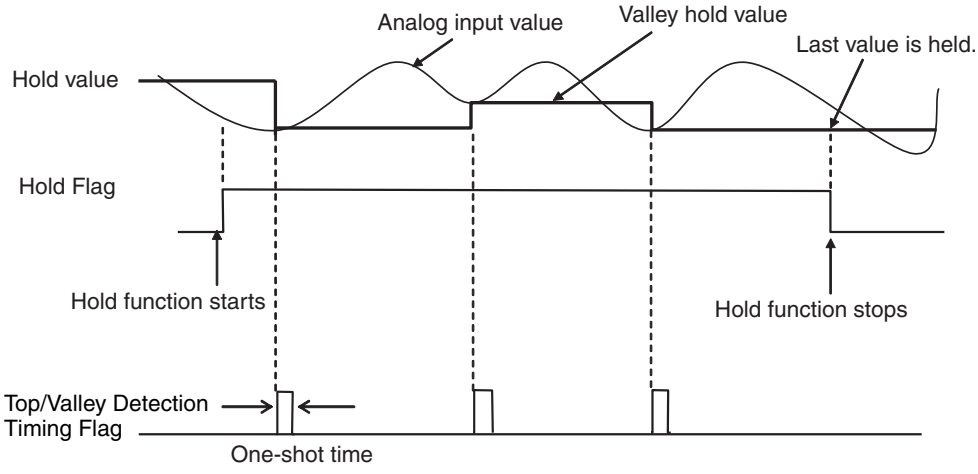
Top/Valley Hold

Top/valley hold is used to hold the top and valley values of the analog input value.

Analog values that fluctuate more than twice the hysteresis value are monitored, and the top or valley values are held. The top or valley value is allocated along with the Top/Valley Detection Timing Flags, which can be used to check the hold timing.

When the Hold Flag (output) allocated in the OUT Area turns ON, the hold function starts, refreshing the top or valley value until the Hold Flag turns OFF. (The last value is held when the Hold Flag turns OFF, but the next time the Hold Flag turns ON, the hold value is initialized as soon as a top or valley occurs.) The comparator can be used to compare the top or valley value allocated as analog data. (Refer to details on the comparator function.)

■ Example of Valley Hold



Note

1. A delay in network transmission time will occur from the time the Hold Flag turns ON (or OFF) in the Master Unit's ladder program until notification of

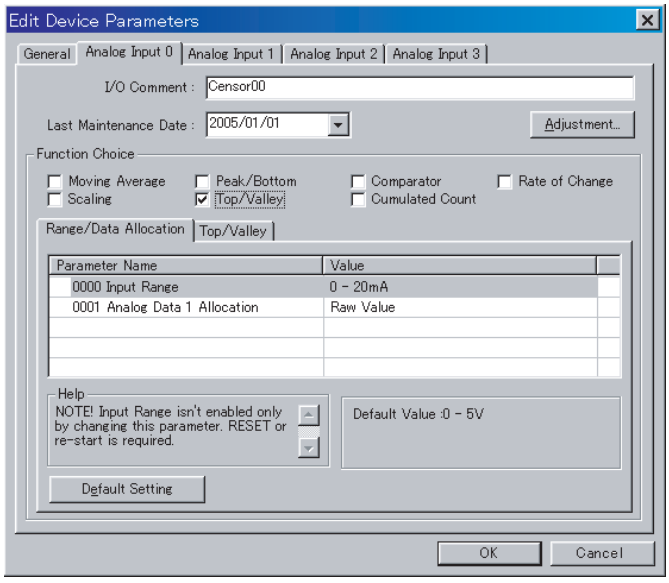
the flag's status is actually sent to the Slave. Therefore, even when the Hold Flag is ON, the first analog data transmitted to the Master Unit when the CPU Unit power is turned ON may be the data from when the Hold Flag was OFF. To collect top/valley hold data using the Hold Flag at the Master Unit, configure a ladder program which considers the transmission delay time when the Hold Flag is turned ON, then enables the top/valley hold values after a fixed time interval.

2. The time that the Top/Valley Detection Timing Flags are ON can be adjusted by setting the one-shot time. Use the CompoNet Support Software to set the one-shot time (the setting range is 1 to 65535 ms).
3. If the Hold Flag turns OFF during the time the Top/Valley Detection Timing Flag is set to be ON, both flags will turn OFF simultaneously.

Setting Using the CompoNet Support Software

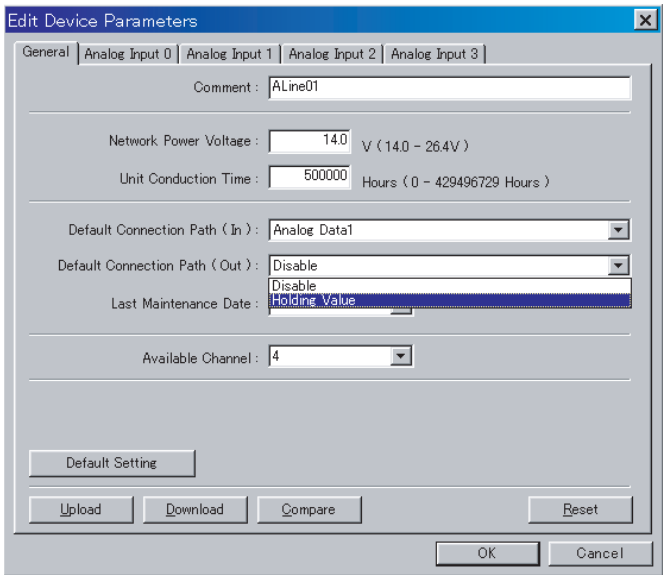
1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the input where top/valley hold is to be set, and select ***Top/Valley Hold*** under the *Function Choice* heading.



3. To allocate the Hold Flag (output) in the default connection path, click the **General** Tab, and select ***Holding Value*** from the pull-down menu in the

Default Connection Path (Out) field.

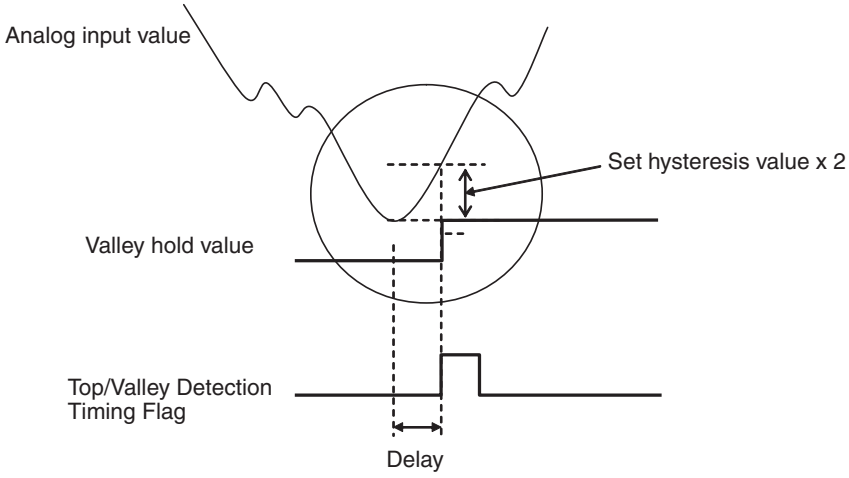


4. Click the **Download** Button, and then click the **Reset** Button to reset the Unit.

Hysteresis Setting

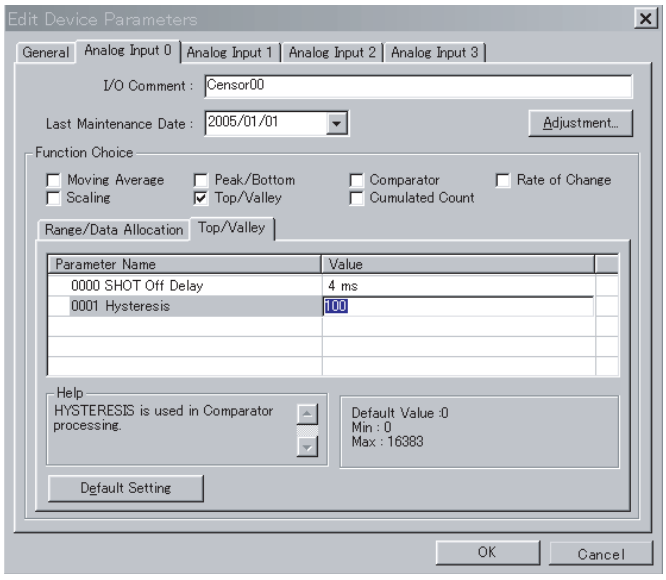
The hysteresis value can be set using the CompoNet Support Software to prevent detection of top or valley values that occur due to minor fluctuations in the analog input value. This will cause the start of data holding to be delayed after the actual top or valley value occurs, as shown in the following diagram.

■ **Timing for Setting Data**



■ Setting Hysteresis Using the CompoNet Support Software

1,2,3... 1. Input the value for hysteresis in the *Hysteresis* field in the **Top/Valley** Tab under the *Function Choice* heading.

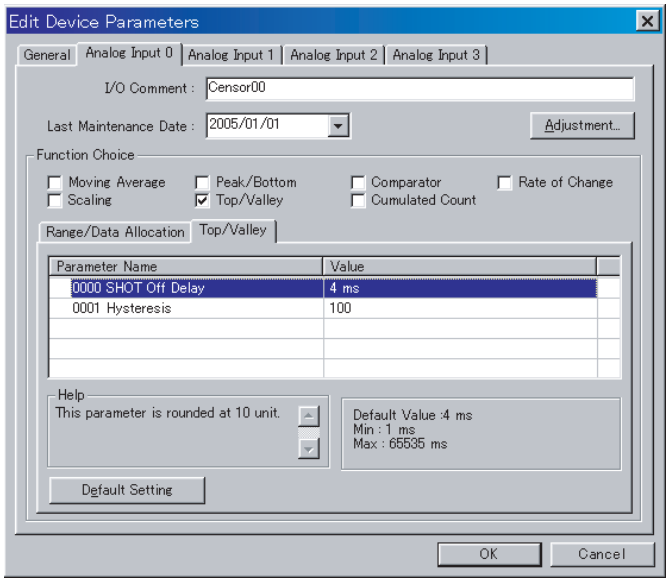


2. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
3. Click the **OK** Button and exit the window.

Note The hysteresis value set for the top/valley hold function is also used by the comparator function.

One-shot Time Setting

1,2,3... 1. Input the desired value in the *SHOT Off Delay* field of the **Top/Valley** Tab under the *Function Choice* heading.

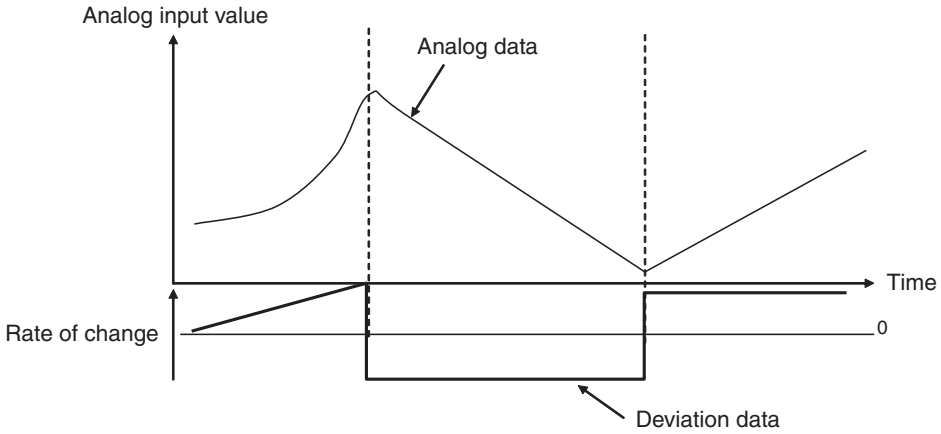


2. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
3. Click the **OK** Button and exit the window.

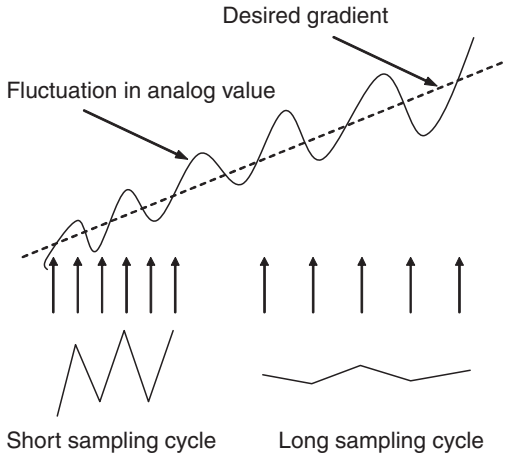
Rate of Change Calculation

The rate of change can be obtained for each sampling cycle set for the analog input data. This function calculates the difference between each set sampling cycle and value obtained in the previous cycle. The default setting for the sampling cycle is 100 ms and the sampling cycle setting range depends on the model, as shown in the following table.

Model	Sampling cycle setting range
CRT1-AD04	10 to 65,530 ms (Set in 10-ms units.)



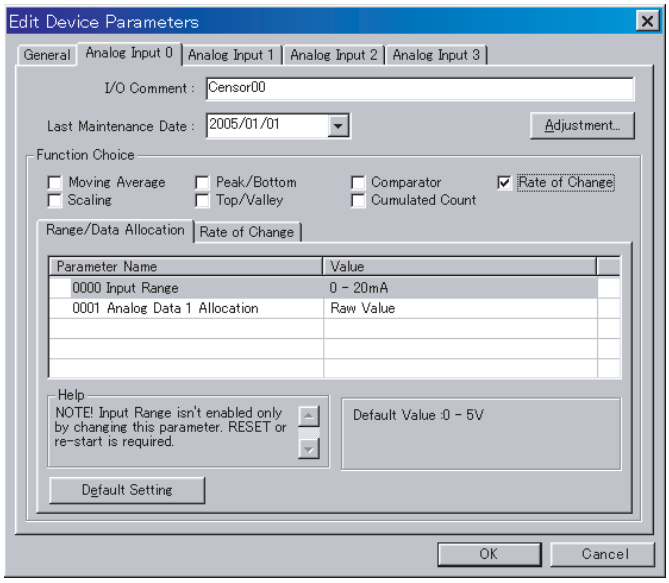
Note If the sampling cycle is set to a small value, the rate of change will be sensitive to small changes. If the analog data is subject to minute fluctuations, and the sampling cycle is shorter than the cycle of fluctuation, the fluctuation will be regarded as the rate of change. To prevent this occurring, use moving average processing, which will set a longer sampling cycle.



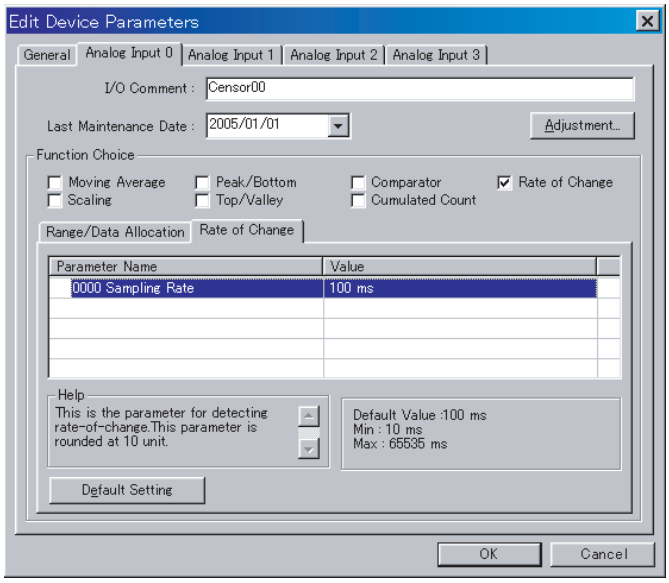
Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Main Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

2. Select the Tab Page for the input where rate of change is to be set, and select ***Rate of Change*** under the *Function Choice* heading.



3. To set the sampling cycle, click the **Rate of Change** Tab and input the desired value for the sampling cycle in the *Sampling Rate* field.

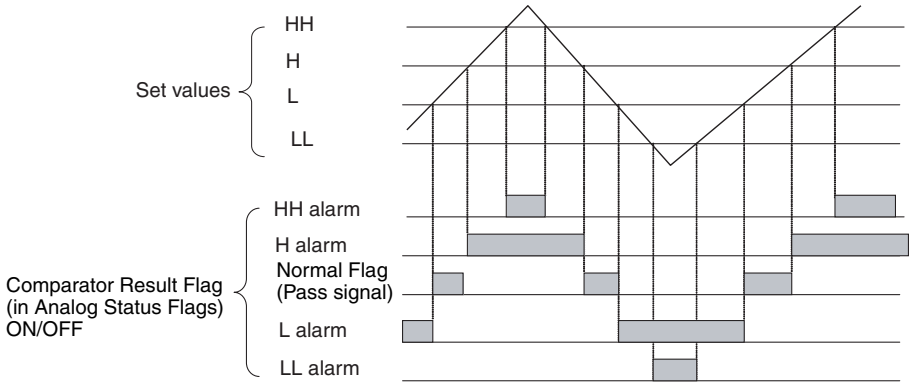


4. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Comparator

When the High High Limit, High Limit, Low Low Limit, and Low Limit are set in the Slave, a flag will turn ON when a value exceeds the setting range. The four set values are High High Limit (HH), High Limit (H), Low Low Limit (LL), and Low Limit (L), and the values are compared with those in Analog Data. When each of these values is exceeded, the Comparator Result Flag in the area for Analog Status Flags turns ON. If an alarm does not occur, the Normal

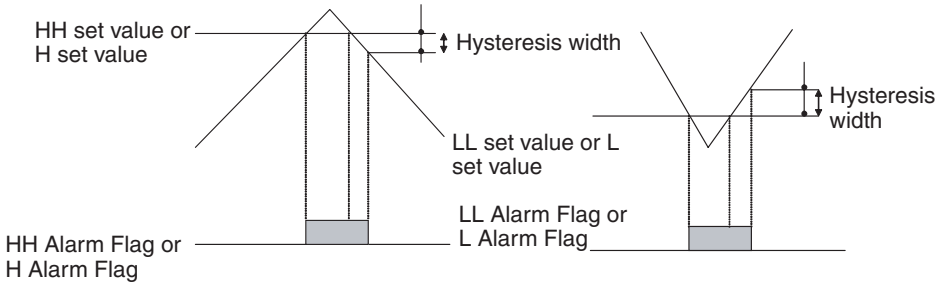
Flag (pass signal) turns ON.



Note When the analog input value changes faster than the conversion cycle, the High Limit alarm may turn ON without the Normal Flag (pass signal) turning ON for the Low Limit alarm. Configure ladder programs to prevent this occurring.

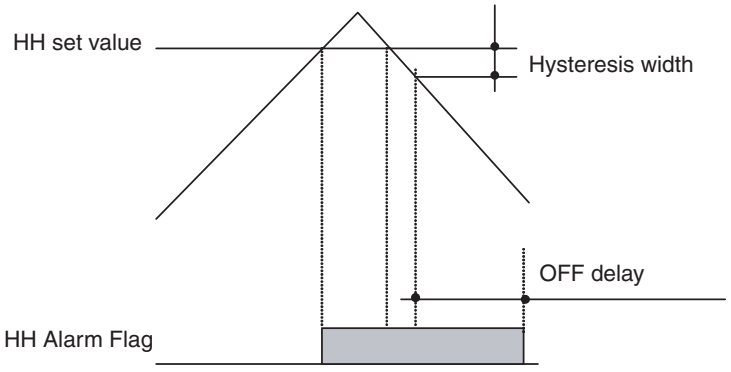
Setting Hysteresis

The Comparator Result Flag turns OFF when the value is lower than the hysteresis width (H or HH alarm occurs) or exceeds it (L or LL alarm occurs), as shown in the following diagram. If the analog value fluctuates around the threshold, and the flag repeatedly turns ON or OFF, setting hysteresis will stabilize the flag operation.



OFF Delay

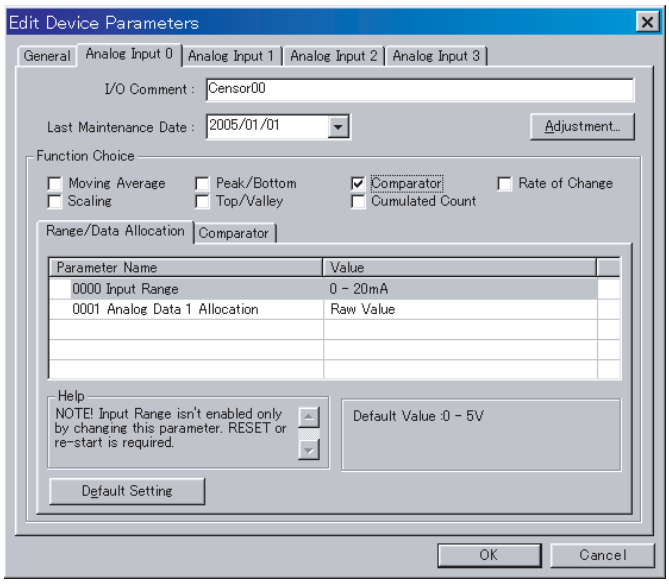
The time until the Comparator Result Flag turns OFF can be extended. For example, even if the Flag is ON momentarily, the OFF delay can be set so that the Master Unit can receive notification of the Flag's status.



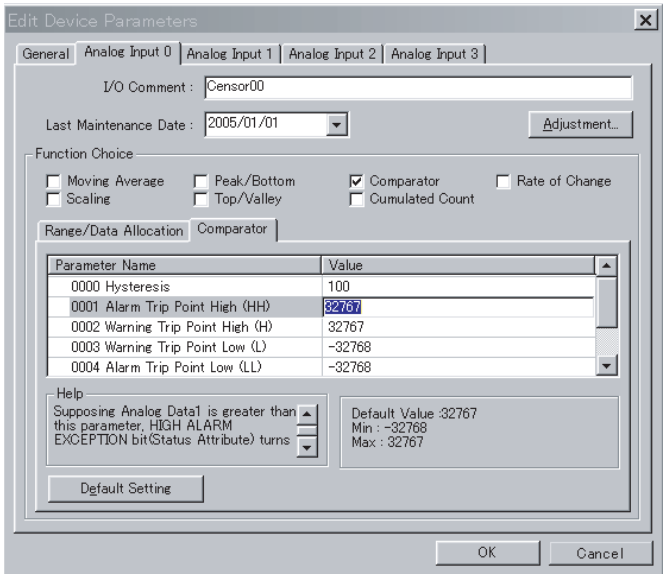
Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Main Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

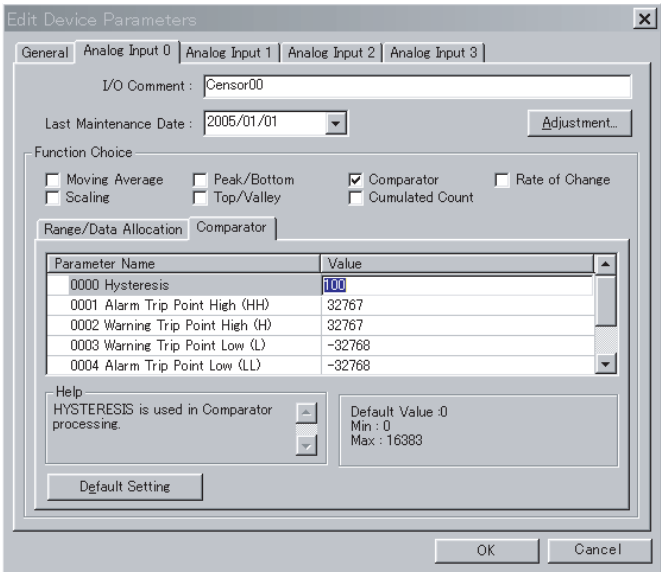
2. Select the Tab Page for the input where the comparator function is to be set, and select ***Comparator*** under the *Function Choice* heading.



3. Click the **Comparator** Tab and set each of the alarm values. The example here shows the setting for *Alarm Trip Point High* (HH limit set value).

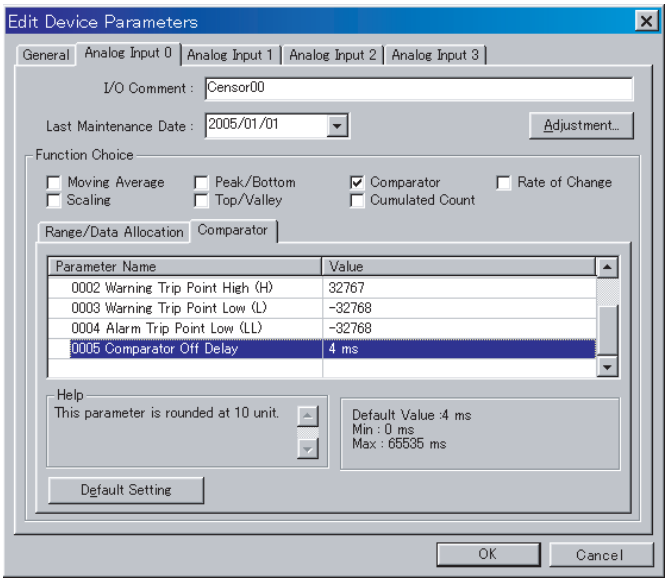


4. To set the hysteresis value, input the desired value in the *Hysteresis* field.



Note The hysteresis value set for the comparator function is also used by the top/valley hold function.

5. To set the OFF delay function, input the desired value in the *Comparator Off Delay* field.



6. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

Disconnected Line Detection

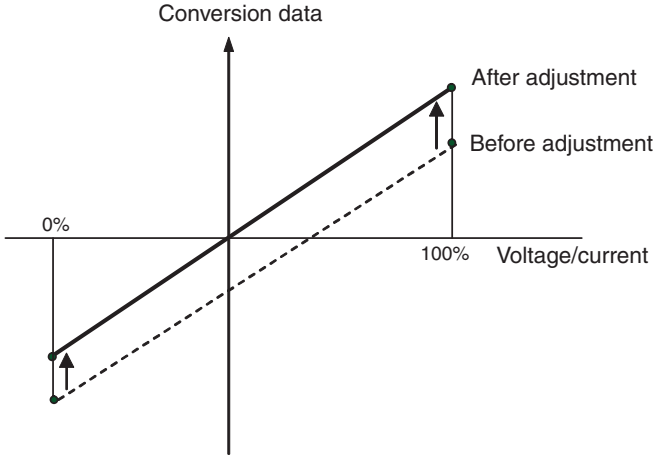
When a disconnection occurs in an analog input line (voltage input or current input), the Disconnected Line Detection Flag turns ON for each input that is valid in the number of AD conversion points. The Disconnected Line Detection Flags are included in the Analog Status Flags.

When Disconnected Line Detection is enabled, the value of AD conversion data is set to 7FFF hex. When the input returns to a value within the range that can be converted, the Disconnected Line Detection function will automatically be turned OFF, and normal data conversion will occur.

Disconnected Line detection is supported for input ranges of 1 to 5 V or 4 to 20 mA only. With the 1 to 5 V input range, an disconnected line condition is detected when the input voltage is below 0.76 V (less than 6%). With the 4 to 20 mA input range, an disconnected line condition is detected when the input current is below 3.04 mA.

User Adjustment

Depending on factors such as the characteristics and connection methods of the input device, the input can be adjusted to compensate for error in the input voltage or current. The following diagram shows when compensation is applied to the conversion line at the two points for 0% and 100%.



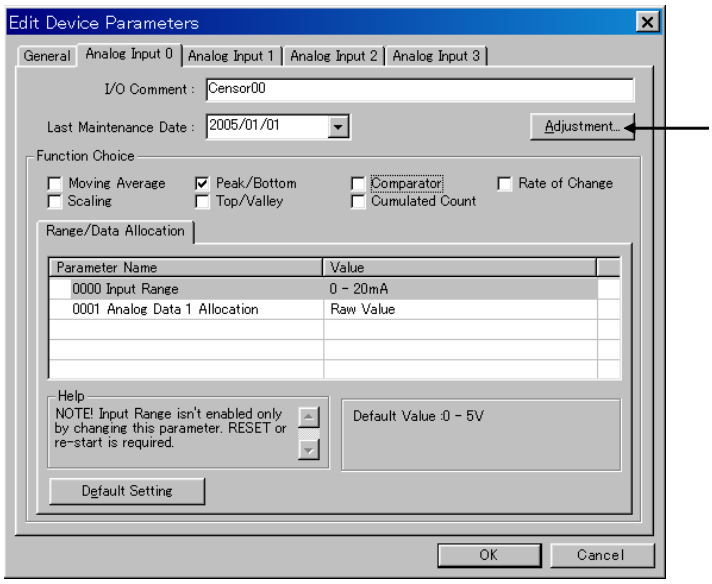
The following table shows the input ranges that support user adjustment.

Input range	Low Limit	High 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 –9.0 V	9.0 to 11 V
4 to 20 mA	3.2 to 4.8 mA	19.2 to 20.8 mA
0 to 20 mA	–1.0 to 1.0 mA	19 to 21 mA

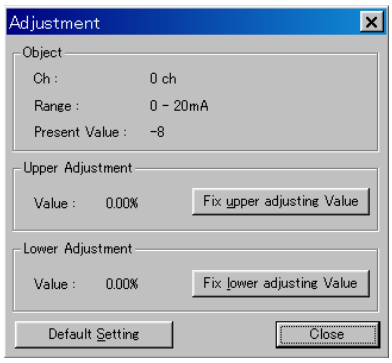
Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

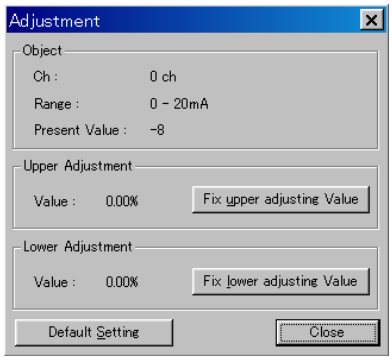
2. Select the Tab Page for the input to be adjusted, and click the **Adjustment** Button. (At the same time set the input range again.)



3. Input the voltage (or current) transmitted from the connected device to the Unit's input terminal that is equivalent to the 100% value.
4. Click the **Fix upper adjusting value** Button, and input the adjusted value.



5. Input the voltage (or current) transmitted from the connected device to the Unit's input terminal that is equivalent to the 0% value.
6. Click the **Fix lower adjusting value** Button, and input the adjusted value.



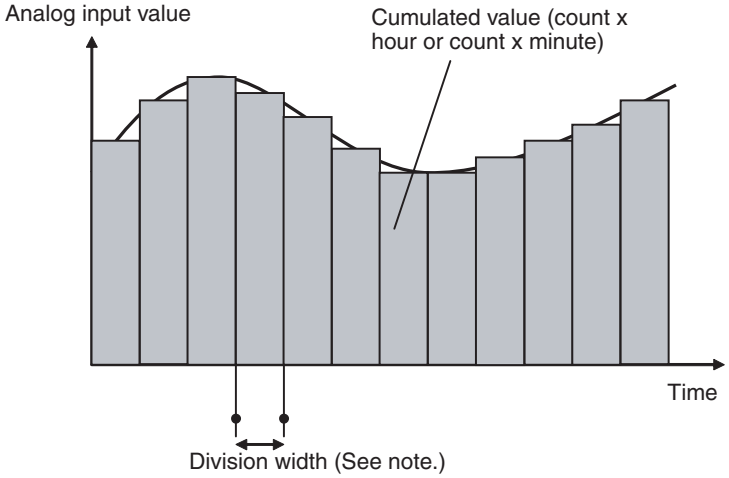
7. To return an adjusted value to the default setting, click the **Default Setting** Button.
8. Close the Adjustment Window, return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.

9. Click the **OK** Button and exit the window.

Cumulative Counter

The cumulative counter calculates an approximation to the integral of analog input values over time. The cumulated value can be calculated in “count hours” (by selecting “hours”) or “count minutes” (by selecting “minutes”). The count value is the analog input value in the industry unit obtained after scaling. For example, 100.0 count hours indicates a value equivalent to an analog input value of 100 counts continuing for one hour. The counter range for a four-byte area (two words) for count hours or count minutes is –214,748,364.8 to +214,748,364.7. Data is displayed on the CompoNet Support Software in units of 0.1 hour or minute.

Monitor values can also be set in the Unit. When the cumulated count value exceeds the set monitor value, the Cumulative Counter Flag in the area for Generic Status Flags turns ON.



Note The following table shows the divisions for the cumulative counter.

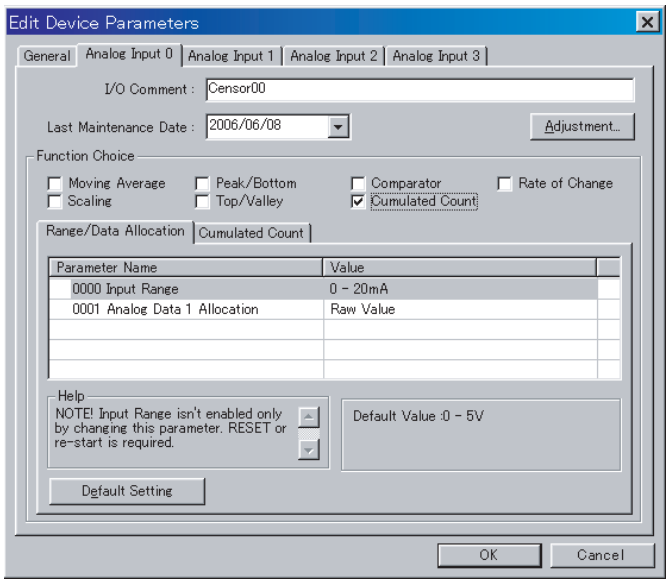
CRT1-AD04

Unit	Divisions
Hour	3.6 s (1/1,000 hour)
Minute	60 ms (1/1,000 minute)

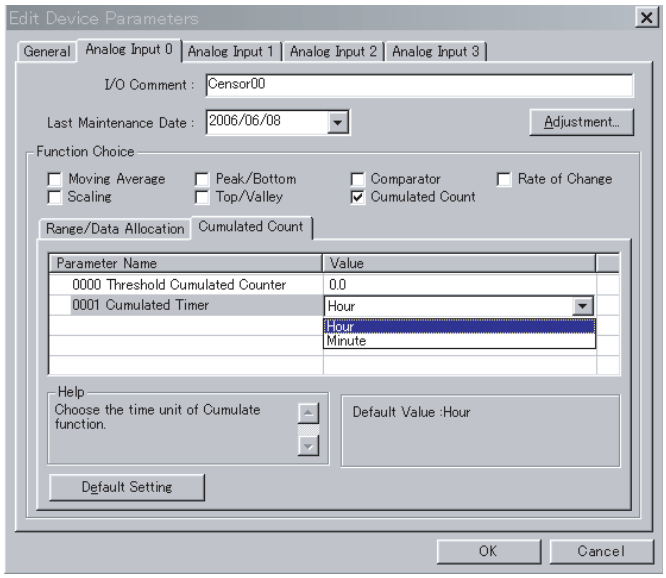
Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

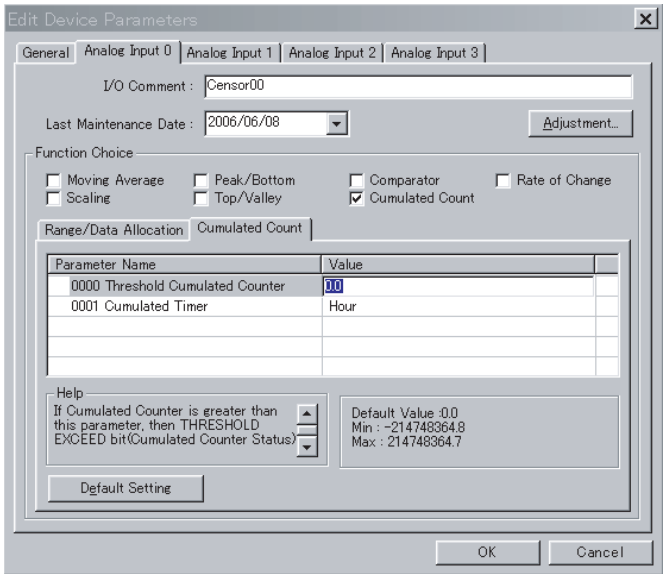
2. Select the Tab Page for the input where the cumulative counter is to be set, and select ***Cumulated Count*** under the *Function Choice* heading.



3. To set the counter unit, click the **Cumulated Count** Tab and select ***Hour*** or ***Minute*** from the pull-down menu in the *Cumulated Timer* field.



4. To set the monitor value, click the **Cumulated Count** Tab, and input the desired value in the *Threshold Cumulated Counter* field.



5. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

Last Maintenance Date

The last maintenance date can be set in the Unit separately for the Unit and the connected devices. It enables the user to easily determine the next maintenance date. The date can be set using the CompoNet Support Software.

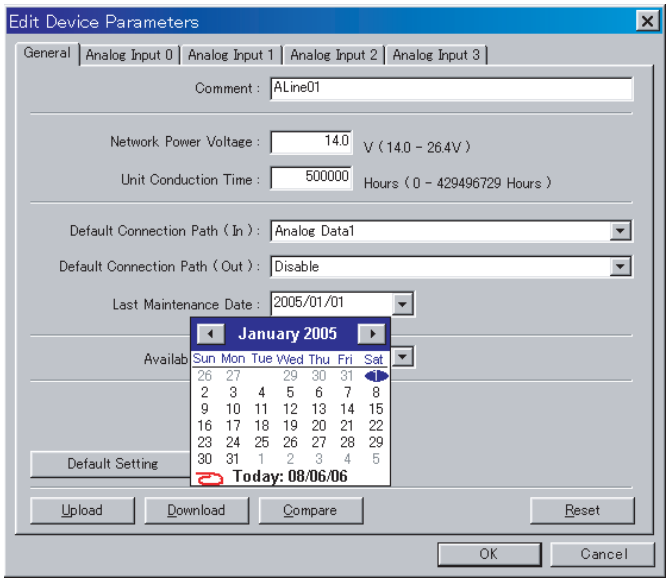
Setting Using the CompoNet Support Software

■ Setting the Last Maintenance Date of the Unit

1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Click the **General** Tab, and select the applicable date from the pull-down menu in the *Last Maintenance Date* field. (To enter the current date, select

Today, which is at the bottom of the pull-down menu.)

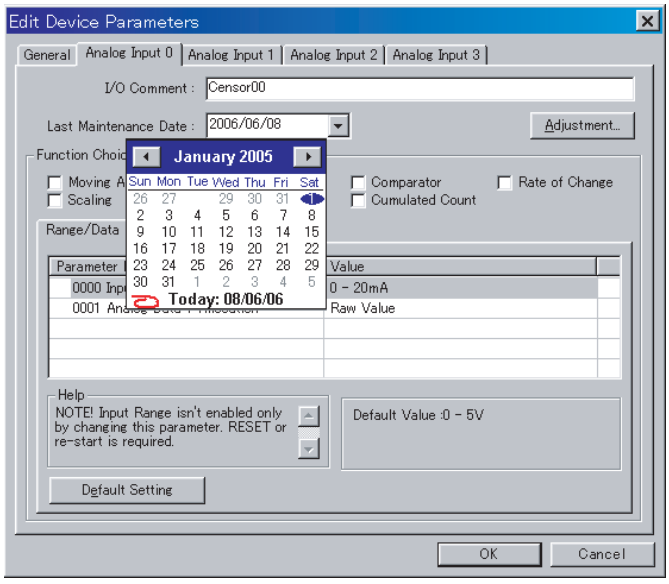


3. Click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

■ Setting the Last Maintenance Date of the Connected Device

1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Click the Tab Page for the input that is connected to a connecting device requiring the last maintenance date to be set. Select the applicable date from the pull-down menu in the *Last Maintenance Date* field. (To enter the current date, select ***Today***, which is at the bottom of the pull-down menu.)



3. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

7-4-4 Calculating the Conversion Cycle

The conversion cycle speed can be improved by setting the number of AD conversion points, but will vary with the use of the math operations. Use the following table and formula to calculate the conversion cycle time.

Formula

AD conversion cycle time = AD base conversion time +Σ (Additional time for each function)

AD base conversion time: Cycle time when the math operation is not used at all. The value for each conversion point from 1 to 4 is different.

Additional time for each function: The additional time that is required when math operations are used.

The following table shows the AD base conversion times (unit: ms).

Time	1 point	2 points	3 points	4 points
Max	1.66	2.42	3.21	3.82
Min	0.68	0.81	1.47	2.03
Average	0.88	1.60	2.32	3.07

Note The DeviceNet communications cycle is 4 ms.

The following table shows the additional time required for each function (unit: ms).

Math operation	Additional time for each point
Moving average	0.045
Scaling	0.055
Peak/bottom hold	0.025
Top/valley hold	0.070
Comparator	0.065
Rate of change	0.030
Cumulative counter	0.035

Calculation Example

When using three points, and applying scaling to the first and second inputs, and the cumulative counter to the third input, the maximum AD conversion cycle time can be obtained by using the following formula.

Formula: 3.21 + (0.055 x 2) + 0.035 = 3.355 ms

7-5 Analog Output Slave Units

7-5-1 Two-point Analog Output Slave Unit

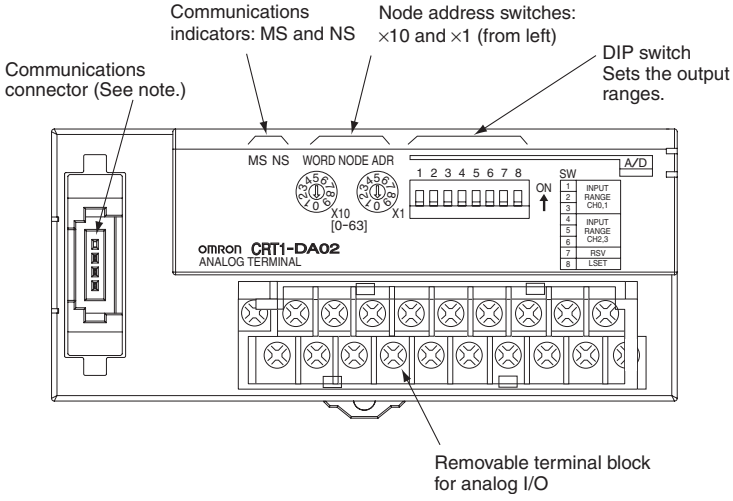
General Specifications

Item		Specifications	
		Voltage output	Current output
Model		CRT1-DA02	
Output signal ranges		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 allowable load resistance		1 kΩ min.	600 Ω max.
Resolution		1/6,000 (full scale)	
Overall accuracy	25°C	±0.4% FS	±0.4% FS (See note.)
	–10 to 55°C	±0.8% FS	±0.8% FS (See note.)

Item	Specifications	
	Voltage output	Current output
Conversion time	2 ms/ 2 points	
DA conversion data	–10 to 10 V range: F448 to 0BB8 hex full scale (–3,000 to 3,000) Other ranges: 0000 to 1770 hex full scale (0 to 6,000) DA conversion range: ±5% FS of the above data ranges.	
Isolation method	Photocoupler isolation (between output and communications lines) No isolation between output signal wires.	
Mounting	DIN Track mounting	
Power supply type	Multi-power supply	
Communications power current consumption	At 24 V: 125 mA max., at 14 V: 205 mA max.	
Weight	155 g	

Note The specified accuracy does not apply below 0.2 mA when using the 0 to 20 mA range.

Component Names and Functions



Note A Branch Line Pressure-welded Connector or Terminal Block Adapter (DCN4-TB4) can be connected to the communications connector.

Indicator Section

Communications Indicators Refer to *SECTION 4 Basic Specifications of Slave Units*.

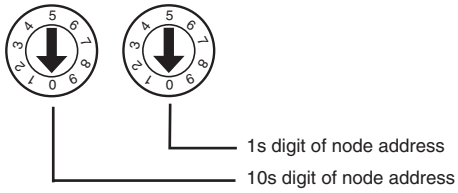
Switch Settings

Setting the Node Address

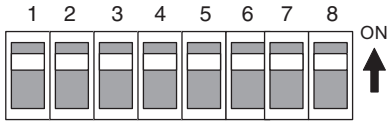
The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (Set to between 0 and 63.)

If an illegal address is set, the software setting (default: 0) will be used at start-up.

The setting on the rotary switches is read when power is turned ON.



Setting the Output Ranges



Each pin is set according to the following table.

Pin No.	Setting	Specifications
1	Sets output range for Output 0	Default setting: All pins OFF
2		
3		
4	Sets output range for Output 1	Default setting: All pins OFF
5		
6		
7	Always OFF.	Always set this pin to OFF. Unexpected operation may result if it is turned ON.
8	Range setting method	OFF: Use Support Software. ON: Use DIP switch.

Note
1. Always use the default setting (OFF) for pin 7.
2. Always set pin 8 to ON if the DIP switch is used to set the range. If this pin is OFF, the DIP switch settings will not be enabled.
3. The DIP switch settings are read when the power is turned ON.

■ **Output 0 Range**

Signal range	Pin 1	Pin 2	Pin 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
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

Note Do not set pins 1 to 3 to any settings other than those shown above.

■ **Output 1 Range**

Signal range	Pin 4	Pin 5	Pin 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
4 to 20 mA	OFF	OFF	ON
0 to 20 mA	ON	OFF	ON

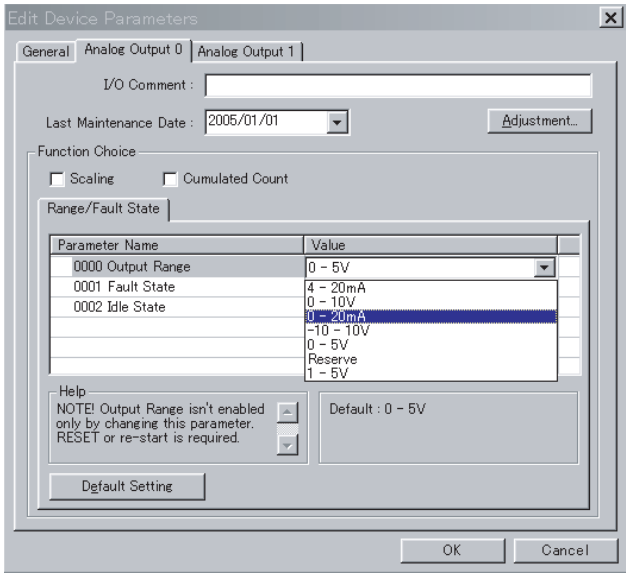
Note Do not set pins 1 to 3 to any settings other than those shown above.

Setting Using the CompoNet Support Software

Use the following procedure to set the output range for each output using the CompoNet Support Software.

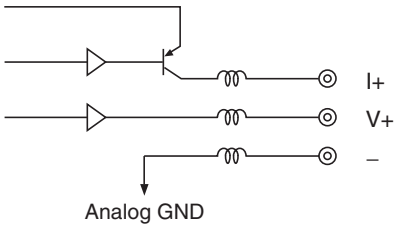
1,2,3...

1. Double-click the icon of the Slave to be set in the Main Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the output where the range is to be changed.
3. Click the *Output Range* field, and select the desired range.



4. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
5. Click the **OK** Button and exit the window.

Internal Circuits



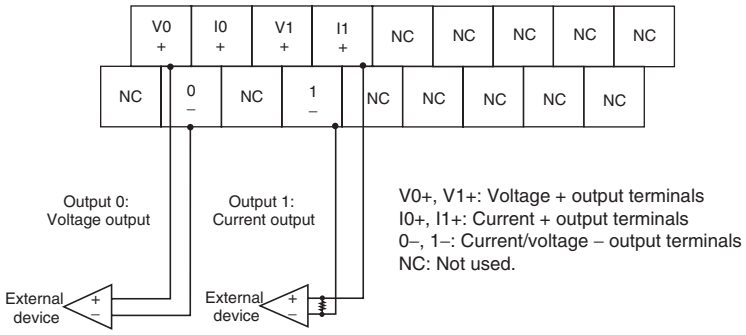
The negative terminals for output 0 and output 1 are connected internally.

Wiring

Communications Connector

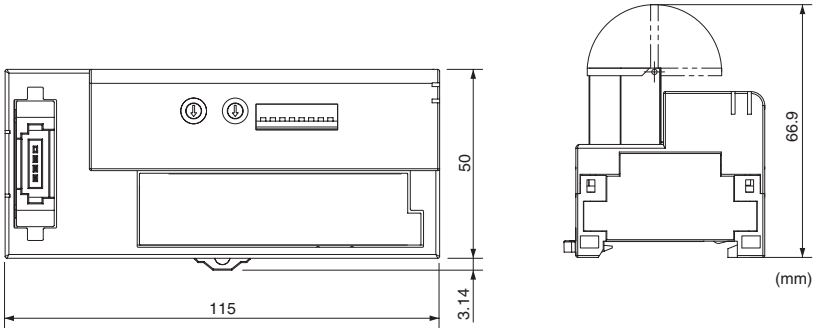
BS+	Communications power supply +
BDH	Communications data high
BDL	Communications data low
BS–	Communications power supply –

Analog I/O Terminal Block



Note: Both the voltage and current output signal ranges are determined by the DIP switch settings or CompoNet Support Software settings.

Dimensions

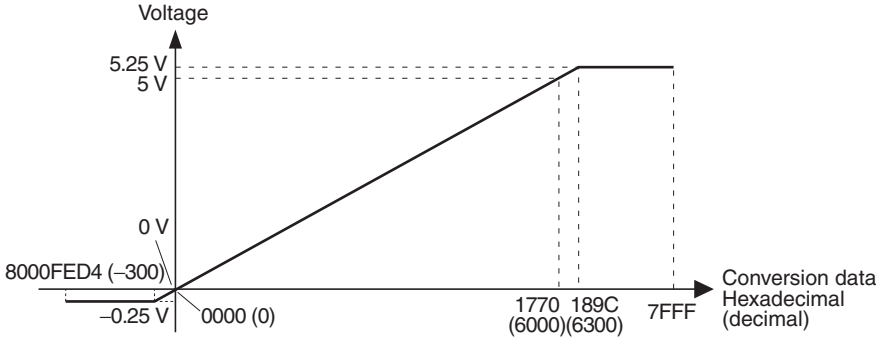


Output Range and Conversion Data

The digital values that are output are converted to analog data according to the output range used, as shown below. When the value exceeds the output range, the DA conversion data is fixed at the High Limit or Low Limit set value.

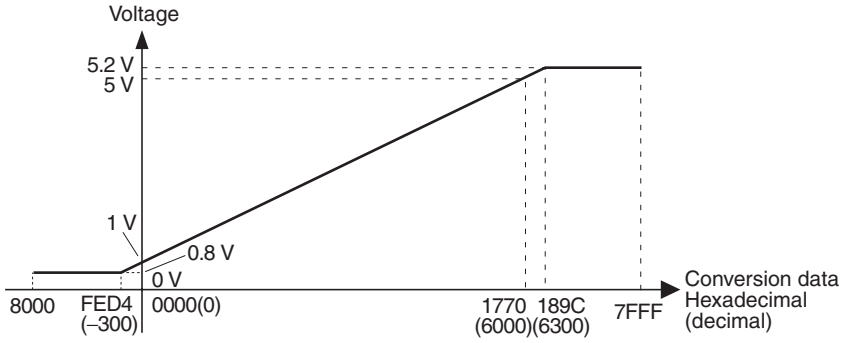
Output Range: 0 to 5 V

The values 0000 to 1770 hex (0 to 6,000) correspond to the voltage range 0 to 5 V. The output range is –0.25 to 5.25 V.



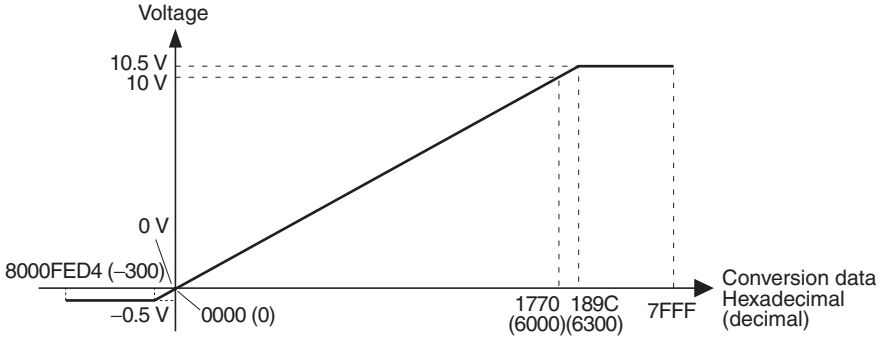
Output Range: 1 to 5 V

The values 0000 to 1770 hex (0 to 6,000) correspond to the voltage range 1 to 5 V. The output range is 0.8 to 5.2 V.



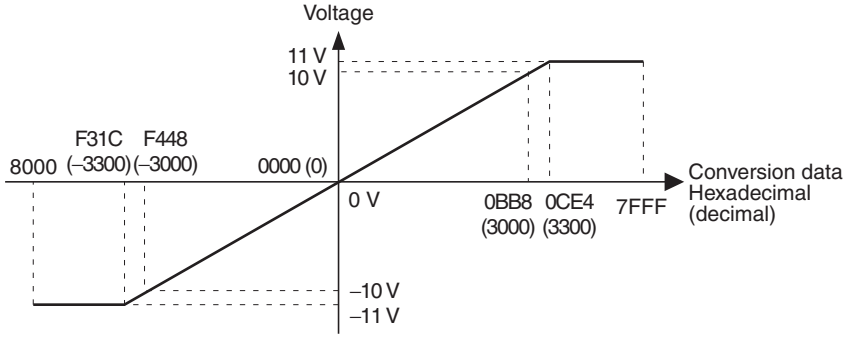
Output Range: 0 to 10 V

The values 0000 to 1770 hex (0 to 6,000) correspond to the voltage range 0 to 10 V. The output range is –0.5 to 10.5 V.



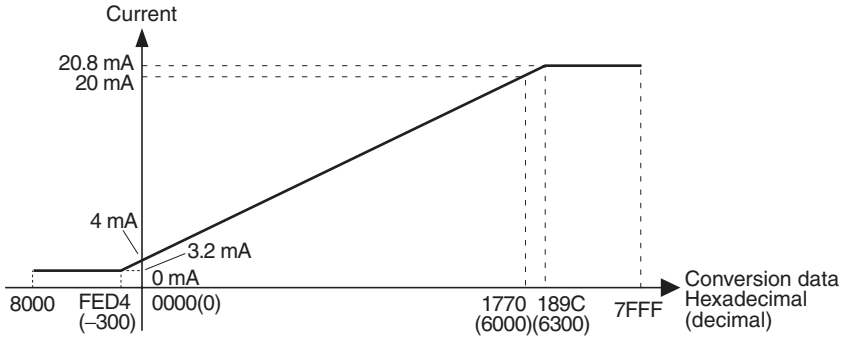
Output Range: –10 to 10 V

The values F448 to 0BB8 hex (–3,000 to 3,000) correspond to the voltage range –10 to 10 V. The output range is –11 to 11 V. Negative voltages are specified as two's complements (16 bits).



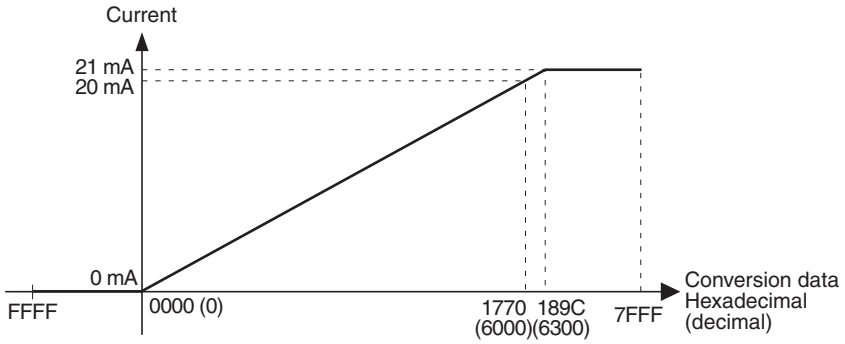
Output Range: 4 to 20 mA

The values 0000 to 1770 hex (0 to 6,000) correspond to the current range 4 to 20 mA. The output range is 3.2 to 20.8 mA.



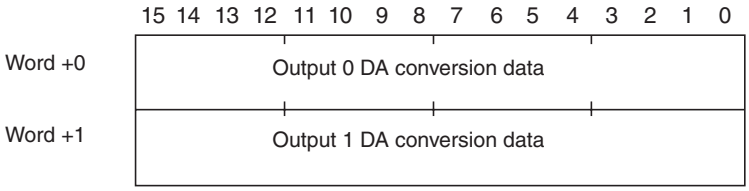
Output Range: 0 to 20 mA

The values 0000 to 1770 hex (0 to 6,000) correspond to the current range 0 to 20 mA. The output range is 0 to 21 mA.



DA Conversion Data

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



When outputting 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. If SW7 is used, the DA conversion data is specified as signed binary.

Note Pulses may be output if the power supply to the Analog Output Unit is turned ON and OFF excessively. When controlling an output device like an inverter, be sure the output device is OFF before turning the power supply to the Analog Output Unit ON or OFF.

7-5-2 I/O Data Types and Allocation Methods

I/O Data Allocated in the Master Unit

The Analog Output Unit has only one type of output data. The output data is allocated by default, so there is no need to change the setting. Two words (4 bytes) of output data is allocated. The data is output as two's complements.

15	8	7	0
Analog output value for Output 0			
Analog output value for Output 1			

7-5-3 Functions and Setting Methods

Scaling

The default setting is used to perform DA conversion, converting analog output values that have been scaled to a count of 0 to 6,000 into corresponding digital values in the output signal range. Scaling can be used to change scaled values that correspond to the output signal range into other values required by the user (industry unit values). Scaling also eliminates the need for ladder programming in the Master Unit to perform math operations. The following two methods of scaling can be used.

Default Scaling

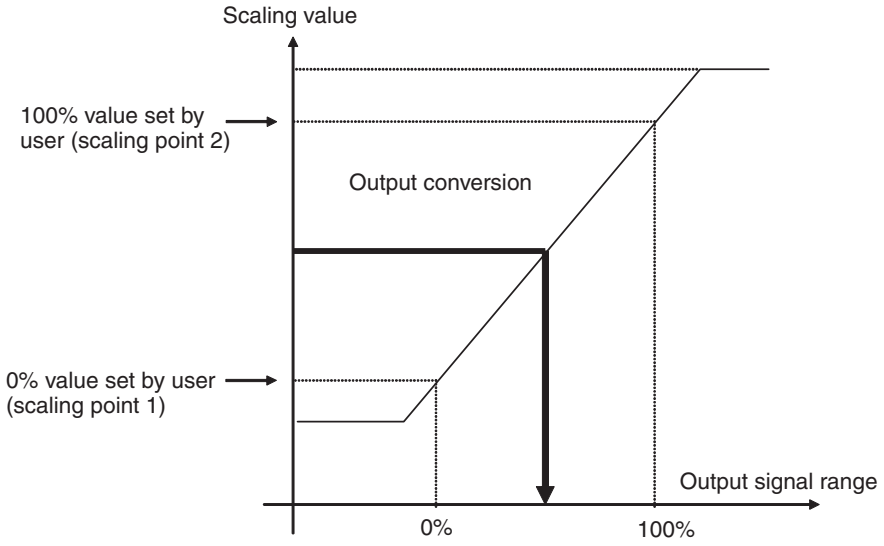
Default scaling converts analog output values into voltage or current values. The units used are mV or μA. When default scaling is selected, scaling is performed according to the output range, as shown in the following table.

Output range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V	0 to 20 mA	4 to 20 mA
100%	5,000 mV	10,000 mV	5,000 mV	10,000 mV	20,000 μA	20,000 μA
0%	0000 mV	0000 mV	1,000 mV	–10,000 mV	0000 μA	4,000 μA
Disconnected line	---	---	7FFF hex	---	---	7FFF hex

User Scaling

User scaling allows analog output values to be scaled to user-defined values. The conversion values for 100% and 0% are set using the CompoNet Support Software.

Input range	0 to 5 V	0 to 10 V	1 to 5 V	–10 to 10 V	0 to 20 mA	4 to 20 mA
100%	Set using CompoNet Support Software (–28,000 to 28,000)					
0%	Set using CompoNet Support Software (–28,000 to 28,000)					
Disconnected line	---	---	7FFF hex	---	---	7FFF hex

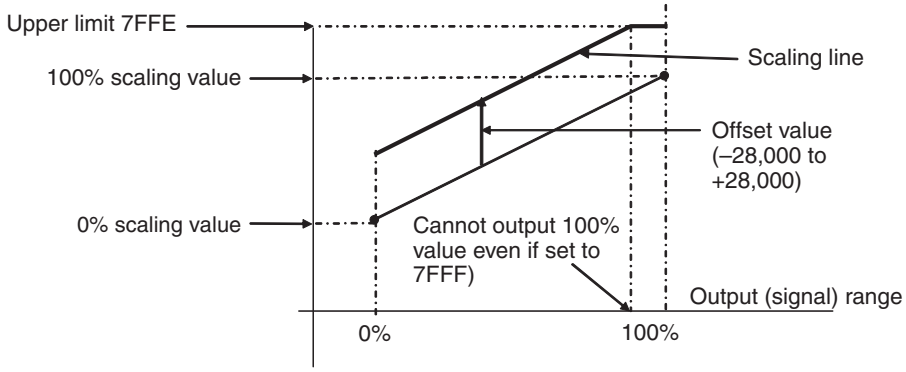


Note Reverse scaling, where the 0% scaling value is higher than the 100% scaling value, is also supported.

Offset Compensation

Offset compensation is used to compensate for error that occurs during scaling. The offset amount is added to the scaled line before processing, as shown in the following diagram. The offset (error) value can be input between –28,000 and 28,000, but if underflow or overflow occurs in the scaled line, the 100% or 0% output will not be possible. The High Limit is 7FFE hex and the Low Limit is 8000 hex.

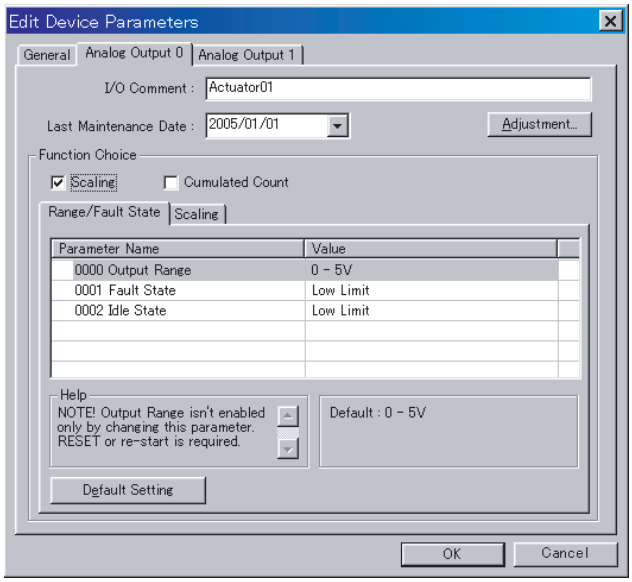
Note The offset value can be set even when using default scaling.



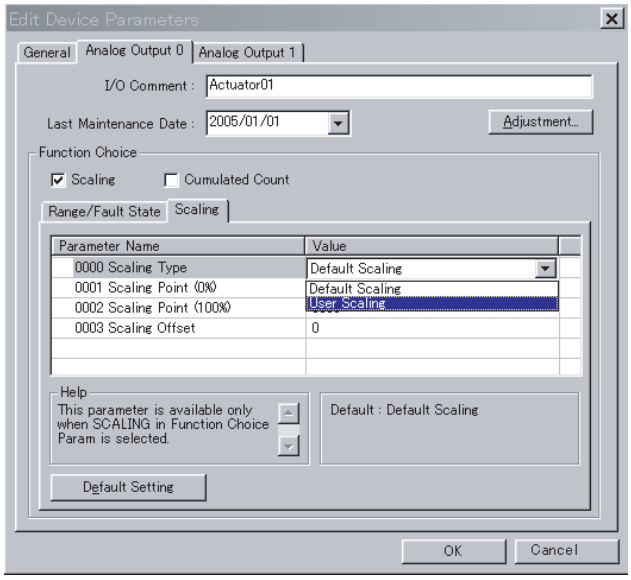
Setting Using the CompoNet Support Software

1,2,3...

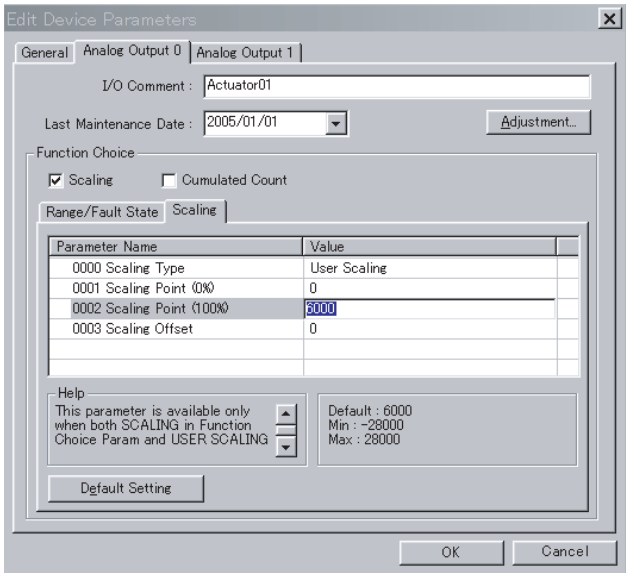
1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the output where scaling is to be performed, and select ***Scaling*** under the *Function Choice* heading.



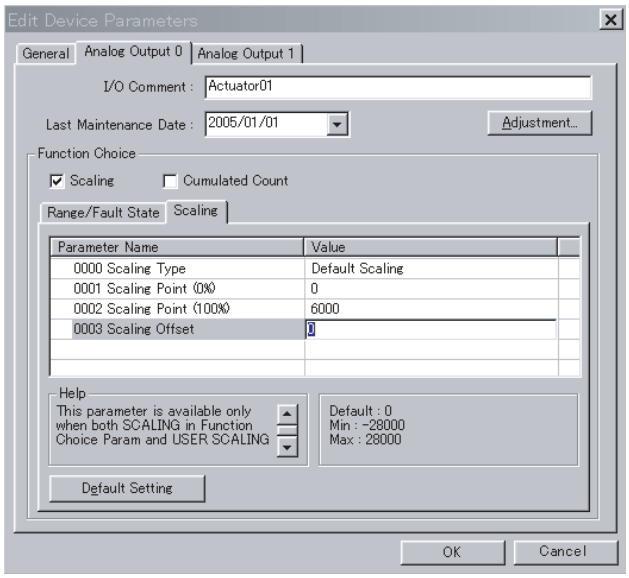
3. To select the scaling type, click the **Scaling** Tab, and select either ***Default Scaling*** or ***User Scaling***. The following example shows when *User Scaling* is selected.



4. For user scaling, set the 0% value in the *Scaling point 1* field, and set the 100% value in the *Scaling point 2* field.



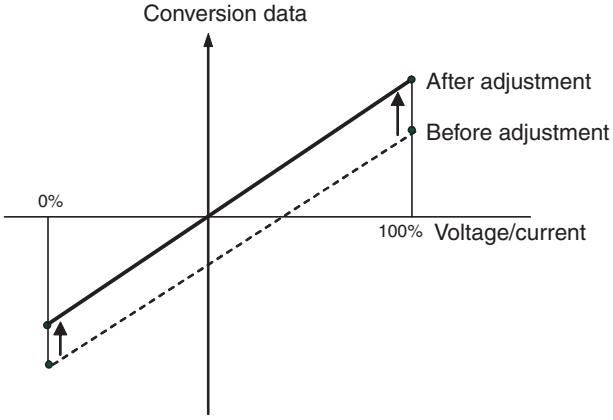
5. For offset compensation, set the offset value in the *Scaling Offset* field. Also select either ***Default Scaling*** or ***User Scaling*** in the *Scaling Type* field.



6. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

User Adjustment

Depending on factors such as the characteristics and connection methods of the output device, the output can be adjusted to compensate for error in the final output. The following diagram shows when compensation is applied to the conversion line at the two points for 0% and 100%.



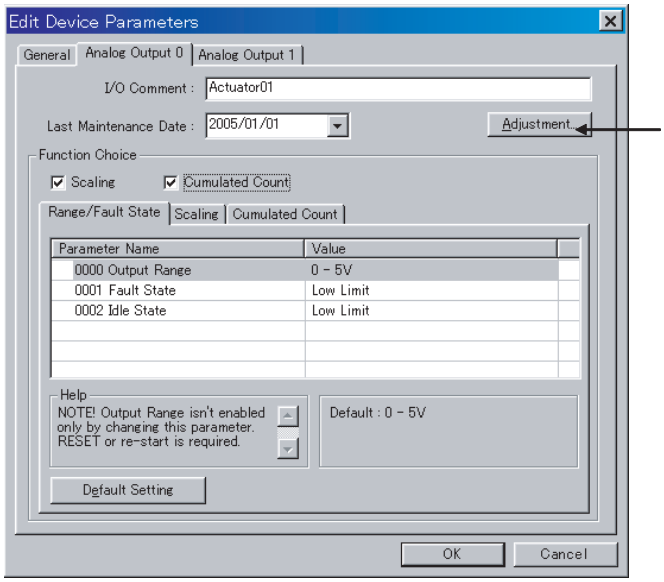
The ranges supported for adjustment (–5% to +5%) are shown in the following table. If adjustment cannot be performed within the following ranges, check the method being used to connect the output device.

Output range	Low Limit	High 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 –9.0 V	9.0 to 11 V
4 to 20 mA	3.2 to 4.8 mA	19.2 to 20.8 mA
0 to 20 mA	0.2 to 1.0 mA	19 to 21 mA

Setting Using the CompoNet Support Software

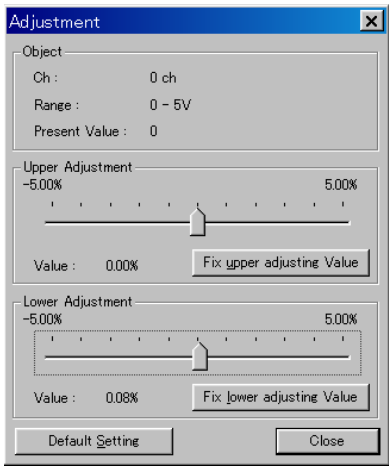
1,2,3...

1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the output to be adjusted, and click the **Adjustment** Button. (At the same time set the output range again.)



Adjusting the Low Limit

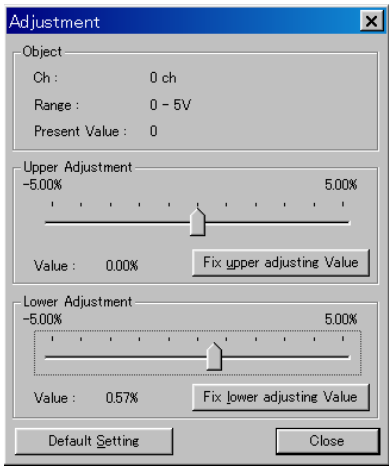
3. Output the value that is equivalent to 0% from the Master Unit. Always perform adjustment with the 0% value.
4. Adjust the analog value that is output from the terminal using the Low Limit slide bar, as shown in the following window. Repeat adjustments until the correct 0% value is output from the output device. After compensation is completed, click the **Fix lower adjusting value** Button.



5. To return to the default settings, click the **Default Setting** Button.
6. Close the Adjustment Window, return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
7. Click the **OK** Button and exit the window.

Adjusting the High Limit

8. Output the value from the Master Unit that is equivalent to the Output Unit's maximum (100%) value. Adjustment using the 100% value is highly recommended, but can be performed using a lower value.
9. Adjust the analog value that is output from the terminal using the High Limit slide bar, as shown in the following window. Repeat adjustments until the correct 100% value is output from the output device. After compensation is completed, click the **Fix upper adjusting value** Button.

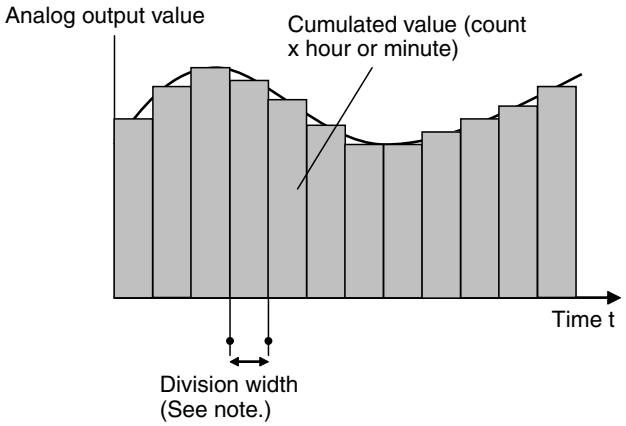


Note If the High Limit adjustment is not performed for the 100% value, a discrepancy will occur when the Low Limit is adjusted, so always adjust the Low Limit of Output Slave Units before adjusting the High Limit.

Cumulative Counter

The cumulative counter calculates an approximation to the integral of analog output values over time. The cumulated value can be calculated in "count hours" (by selecting "hours") or "count minutes" (by selecting "minutes"). The count value is the analog output value in the industry unit obtained after scaling. For example, 100.0 count hours indicates a value equivalent to an analog output value of 100 counts continuing for one hour. The counter range for a two-word area (four bytes) for count hours or count minutes is –214,748,364.8 to 214,748,364.7. Data is displayed on the CompoNet Support Software in units of 0.1 hours or minutes.

Monitor values can also be set in the Unit. When the cumulated count value exceeds the set monitor value, the Cumulative Counter Flag in the area for Generic Status Flags turns ON.



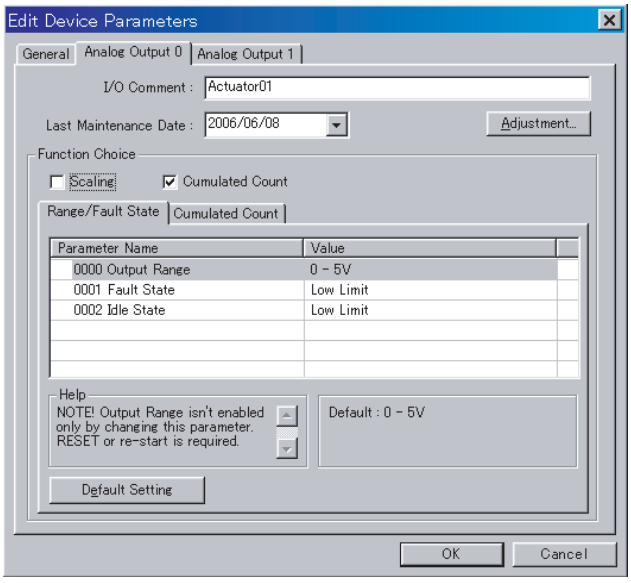
Note The following table shows the divisions for the cumulative counter.

Unit	Divisions
Hour	3.6 s (1/1,000 hour)
Minute	60 ms (1/1,000 minute)

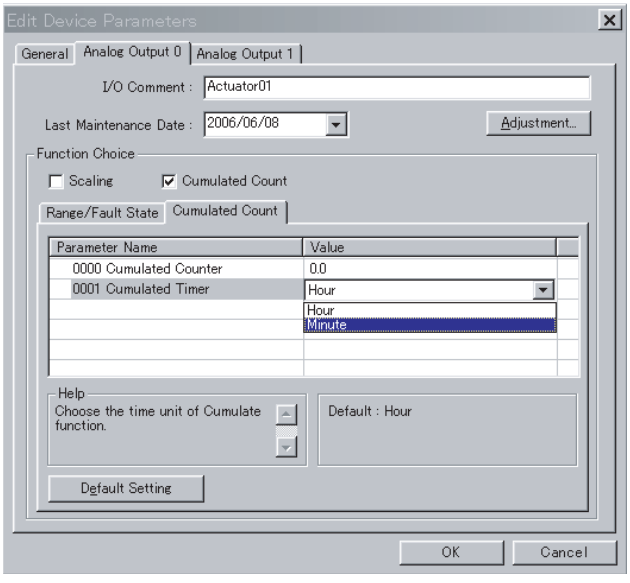
Setting Using the CompoNet Support Software

1,2,3...

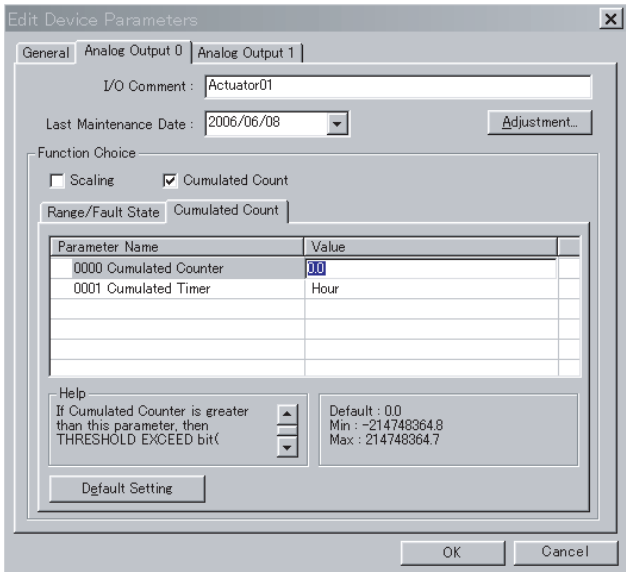
1. Double-click the icon of the Analog I/O Slave Unit to be set in the Main Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)
2. Select the Tab Page for the output where the cumulated counter is to be set, and select ***Cumulated Count*** under the *Function Choice* heading.



3. To set the counter unit, click the **Cumulated Count** Tab and select ***Hour*** or ***Minute*** from the pull-down menu in the *Cumulated Timer* field.



4. To set the monitor value, click the **Cumulated Count** Tab, and input the desired value in the *Threshold Cumulated Counter* field.



5. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button and exit the window.

Setting Output Value for Errors

The value that is output when communications errors (time-out and BusOff errors) occur can be set for each output. The four output settings are set using the CompoNet Support Software.

Setting Patterns

Low limit	Outputs the values in the following table according to the output range.
High limit	Outputs the values in the following table according to the output range.
Hold last state	Holds and outputs the value from immediately before the error occurred.
Zero count	Outputs the value when 0 is written from the Host. This setting will be affected by scaling settings that are used.

Output Ranges and Values

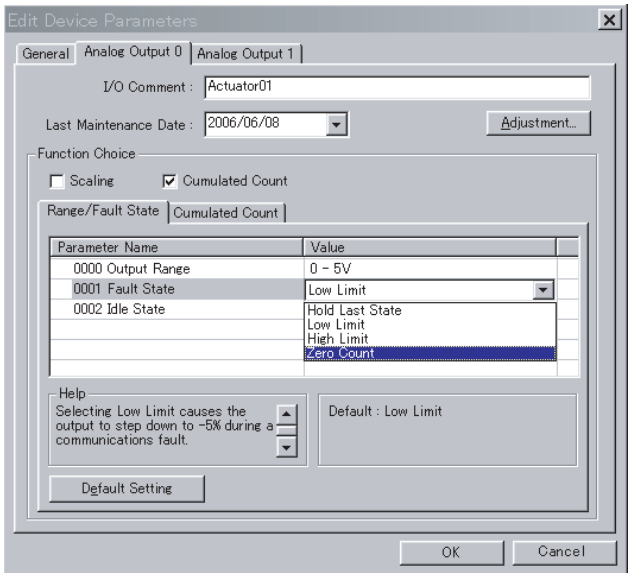
Output range	Low limit	High limit	Hold last state
0 to 5 V	–0.25 V	5.25 V	Holds value.
1 to 5 V	0.8 V	5.2 V	Holds value.
0 to 10 V	–0.5 V	10.5 V	Holds value.
–10 to 10 V	–11 V	11 V	Holds value.
4 to 20 mA	3.2 mA	20.8 mA	Holds value.
0 to 20 mA	0 mA	21 mA	Holds value.

Note When a node address has been used more than once or a Unit error has occurred, the current output will be 0 mA and the voltage output will be 0 V, regardless of the setting.

Setting Using the CompoNet Support Software

1,2,3... 1. Double-click the icon of the Analog I/O Slave Unit to be set in the Network Configuration Window and open the Edit Device Parameters Window. (Alternatively, right-click the Slave Unit icon and select ***Parameters - Edit*** from the menus.)

2. Select the Tab Page for the output where the communications error output value is to be set, and select the desired item from the pull-down menu in the *Fault State* field.



3. Return to the **General** Tab, click the **Download** Button, and then click the **Reset** Button to reset the Unit.
4. Click the **OK** Button and exit the window.

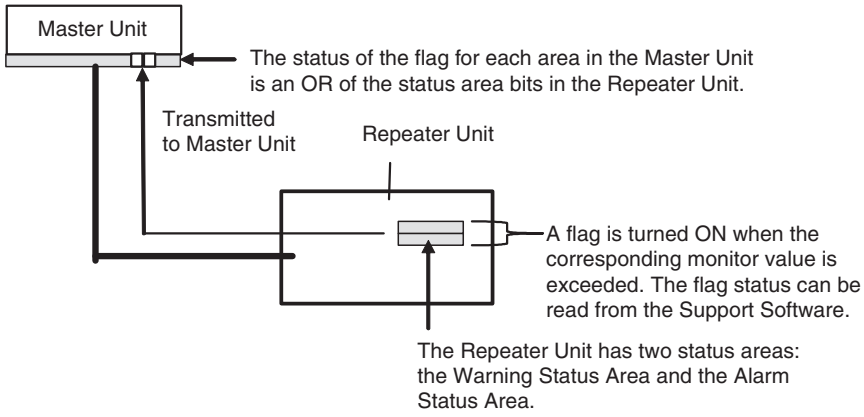
SECTION 8
Repeater Units

This section describes the Repeater Unit.

8-1 Status Areas

An Repeater 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 threshold/monitor values set for each function in that Unit. For each area, a corresponding status flag in the Master Unit will be turned ON if any flag in the status area in the Repeater Unit turns ON. Bit 12 in the Master Unit corresponds to the Warning Status Area and bit 13 corresponds to the Alarm Status Area.

The Repeater Unit's status area information can be read from the CompoNet Support Software.



Warning Status Area

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

Bit	Content	Description
0	Reserved	---
1	Reserved	---
2	Network Power Voltage Drop Flag OFF: Normal ON: Error (Voltage dropped below threshold.)	Turns ON when the voltages drops below the voltage set for the network power voltage monitor function.
3	Unit Maintenance Flag OFF: Normal ON: Error (Threshold exceeded.)	Turns ON when the threshold set for the Unit ON Time Monitor function is exceeded.
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Reserved	---
9	Reserved	---
10	Downstream Network Voltage Flag OFF: Normal ON: Error (Power OFF.)	Turns ON when the power supply to the downstream network is OFF.
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

Alarm Status Area

The Repeater Unit's Alarm Status Area contains the following 16 bits. These bits indicate serious errors in the Unit.

Bit	Content	Description
0	Reserved	---
1	EEPROM Data Error Flag OFF: Normal ON: Error	Turns ON then there is an error in the EEPROM data.
2	Reserved	---
3	Reserved	---
4	Reserved	---
5	Reserved	---
6	Reserved	---
7	Reserved	---
8	Reserved	---
9	Reserved	---
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

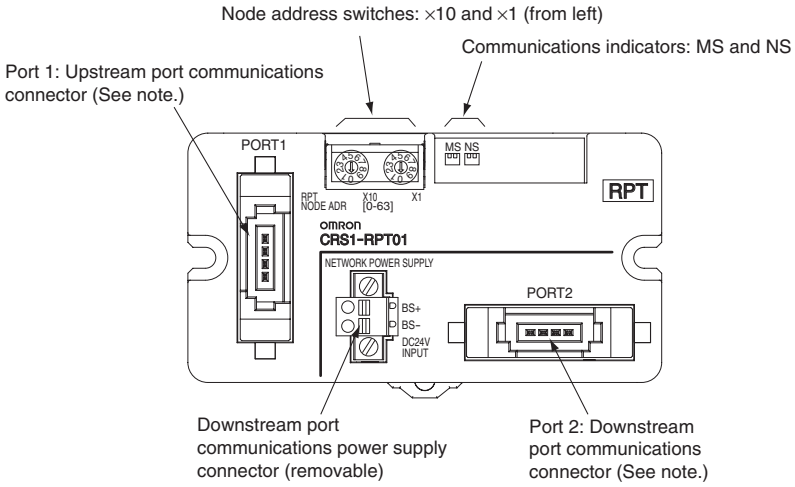
8-2 Repeater Unit

8-2-1 Repeater Unit (CRS1-RPT01)

Specifications

Item	Specification
Model	CRS1-RPT01
Communications ports	Upstream port (port 1):Ttrunk line or sub-trunk line Downstream port (port 2): Sub-trunk line (Can be wired with the same communications specifications as the Master Unit.) Different types of communications cable can be connected to the upstream and downstream ports.
Maximum number of layers	Up to two extra segment layers can be created (i.e., up to 2 Repeater Units are allowed between a Slave Unit and the Master Unit).
Number of nodes per network (per Master Unit)	64 nodes
Number of nodes per trunk line or sub-trunk line	32 nodes
Communications power supply connector	One downstream communications port power supply connector **Note** Communications power for the Repeater Unit is supplied from the BS+ and BS- terminals on the upstream port.
Communications power supply connector allowable current capacity	5 A max.
Noise immunity	Conforms to IEC 61000-4-4 2kV (power line)
Vibration resistance	10 to 150 Hz with double-amplitude of 0.7 mm or 50 m/s^2
Shock resistance	150 m/s^2
Dielectric strength	500 VAC (between isolated circuits)
Insulation resistance	20 MΩ min. (between isolated circuits)
Ambient operating temperature	–10 to 55°C
Ambient operating humidity	25% to 85% (with no condensation)
Ambient operating atmosphere	No corrosive gases
Storage temperature	–25 to 65°C
Storage humidity	25% to 85% (with no condensation)
Installation	35-mm DIN Track or M4 screws
Weight	73 g
Communications power supply voltage	14 to 26.4 VDC
Communications power supply current consumption	95 mA max.

Component Names and Functions



Note A Branch Line Pressure-welded Connector or Terminal Block Adapter (DCN4-TB4) can be connected to the communications connector.

Indicator Section

Communications Indicators

The communications indicators have the following meanings.

MS (Module Status): Indicates the status of the node with a two-color LED (green/red).

MS (Module Status): Indicates the status of communications with a two-color LED (green/red).

Name	Indicator status	Status	Meaning
MS	Lit green.	Normal status	The Unit is operating normally.
	Flashing green.	---	---
	Lit red.	Fatal error	A hardware error has occurred in the Unit. The watchdog timer has timed-out.
	Flashing red.	Non-fatal error	There is an error in the settings.
	Not lit.	Power OFF/Startup	The power supply is OFF, the Unit is being reset, or the Unit is being initialized.
NS	Lit green.	Online and participating	Normal communications are in progress and the node is participating in the network.
	Flashing green.	Online but not participating	Normal communications are in progress but the node is not yet participating in the network.
	Lit red.	Fatal communications error	There is an address setting error. The same address has been set for more than one node.
	Flashing red.	Non-fatal communications error	Polling has timed out. The network has timed out.
	Not lit.	Power OFF/Startup	The power supply is OFF, the Unit is being reset, or the Unit is being initialized.

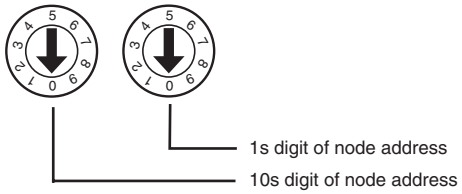
Note When flashing, indicators are lit for 0.5 s and not lit for 0.5 s.

Setting the Node Address

The node address is set as a decimal number with the 10s digit set on the left rotary switch and the 1s digit set on the right rotary switch. (The maximum node address is 63.)

If an illegal address is set, the software setting (default: 0) will be used at startup.

The setting on the rotary switches is read when power is turned ON.



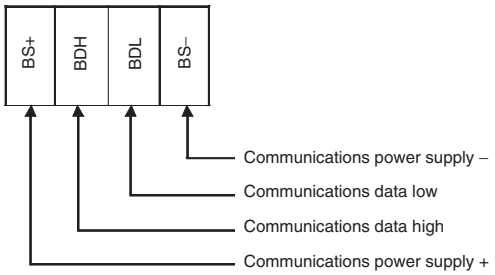
Terminal Arrangement

Upstream Port Communications Connector (Port 1)

BS+	Communications power supply +
BDH	Communications data high
BDL	Communications data low
BS–	Communications power supply –

Note The BS+ and BS– terminals are the communications power for the Repeater Unit.

Downstream Port Communications Connector (Port 2)



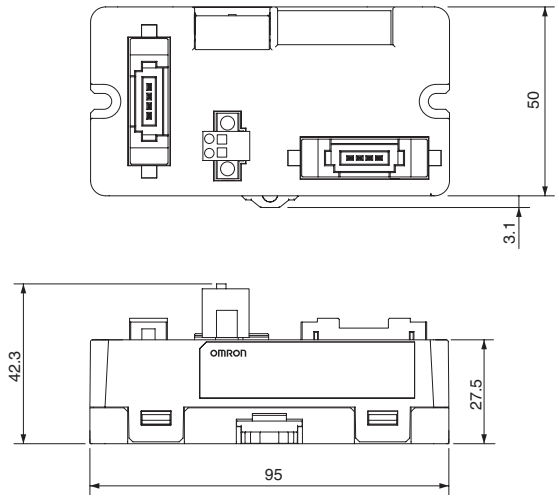
Downstream Port Communications Power Supply Connector

This connector supplies communications power to Slave Units and Repeater Units connected to the downstream communications connector.

BS+	Communications power supply +
BS–	Communications power supply –

Note Communications power for the Repeater Unit is supplied from the BS+ and BS– terminals on the upstream port communications connector (port 1).

Dimensions



SECTION 9
Smart Functions

This section individually describes the functions provided by CompoNet Slave Unit. The functions are divided into those supported by all CompoNet Slave Units and those supported only by specific CompoNet Slave Units.

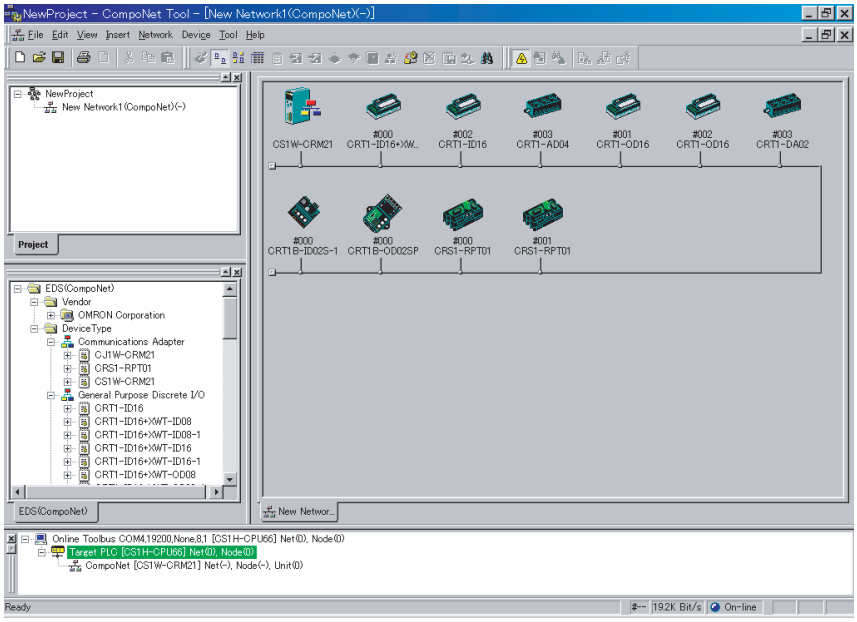
9-1 CompoNet Support Software Windows

There are two main network display windows in the CompoNet Support Software: the Standard Window and the Maintenance Mode Window. These windows can be easily switched between by clicking the icon or selecting ***View*** - ***Large Icons (maintenance mode)***.

9-1-1 Standard Window

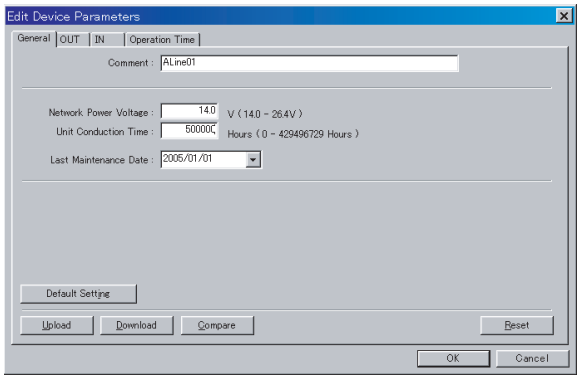
The Standard Window has a white background and is displayed when the CompoNet Support Software is started. Normally, parameters and other settings are made in this window. The devices parameters for any Slave Unit can be set or edited simply by double-clicking on the Slave Unit in the Standard Window. Refer to *9-3 Functions Common to All Slave Units* for details on how to set and edit functions for each Slave Unit. Also refer to the settings methods provided for each Slave Unit.

Standard Window



Edit Device Parameters Windows

The Edit Device Parameters Windows are used to set and edit functions. Double-click any Slave Unit, or right-click the Slave Unit and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window.



9-1-2 Maintenance Mode Window

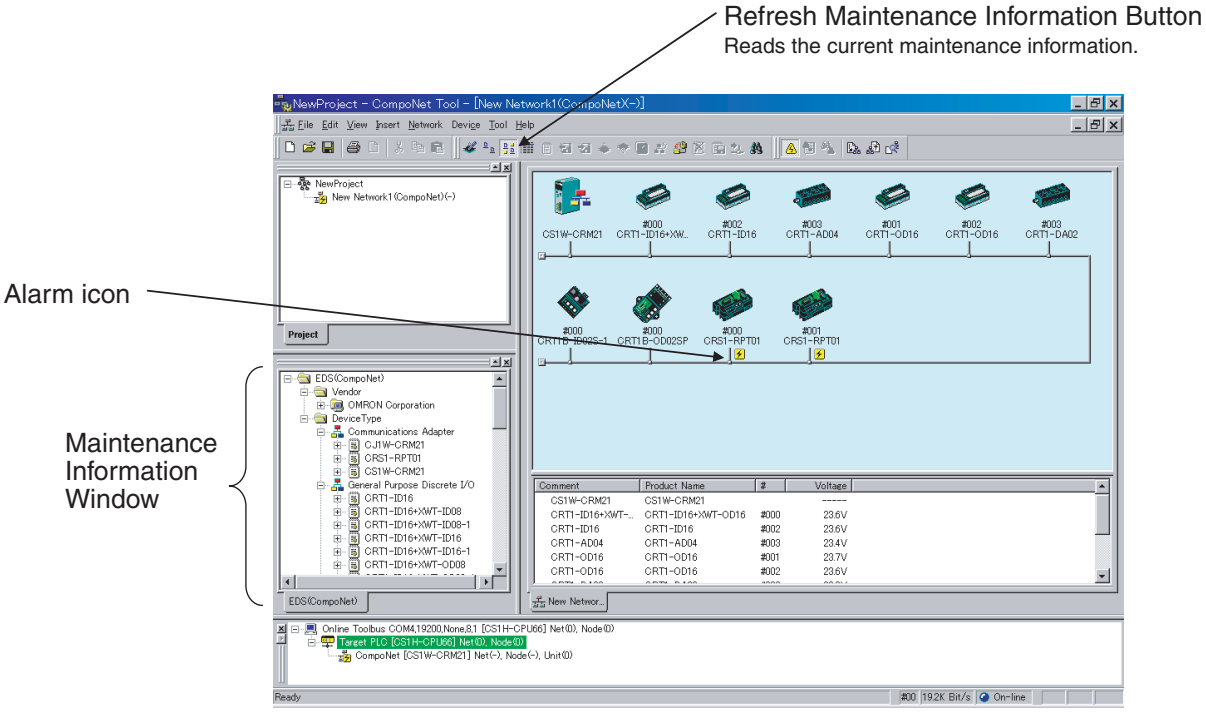
The Maintenance Mode Window is different from the Standard Window because it enables easily monitoring CompoNet Slave Unit data. The Maintenance Mode and Standard Windows can be easily switched between by clicking the icon or selecting ***View*** - ***Large Icons (maintenance mode)***. The background of the Maintenance Mode Window is light blue.

CompoNet Slave Unit data is displayed using the Maintenance Information Window in the Maintenance Mode Window. Open this window to access the status of CompoNet Slave Units.

If an error has been detected in the settings for a Slave Unit, the Network Configuration Window will display a yellow alarm icon that provides information about the error beside the Slave Unit icon. In this way, the Maintenance Mode Window shows the status of each device, the maintenance date, and the location of errors.

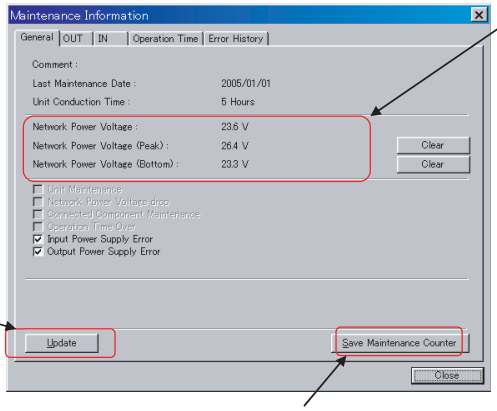
Note The Maintenance Mode Window displays data that is uploaded with the network. The data is not constantly updated through communications. To obtain the latest CompoNet Slave Unit status, click the Refresh Button in the Maintenance Mode Window to read the data from the network. Alternatively, use the Device Monitor Window, which is constantly being refreshed with the latest CompoNet Slave Unit status.

Maintenance Mode Window



Maintenance Information Window

Double-click any CompoNet Slave Unit icon with an alarm icon beside it to display the Maintenance Information Window for that Slave Unit. Refer to the section on the Maintenance Information Window for each Slave Unit for details.



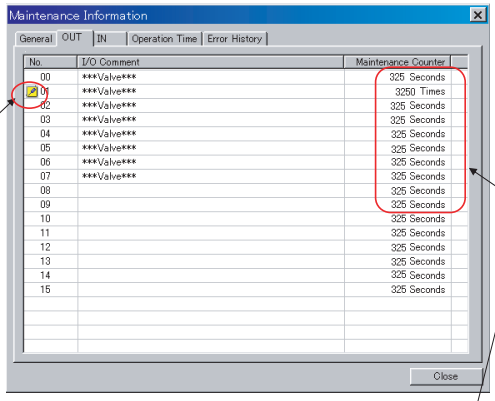
Maintenance information
Displays the generated maintenance information.

Refreshes the current Slave Unit maintenance information.

The maintenance counter value can be saved to flash memory in the Slave Unit.
Normally, the number of contact operations is saved every 12 minutes, which means that the number of operations saved may not be completely accurate, depending on when the power is turned OFF.

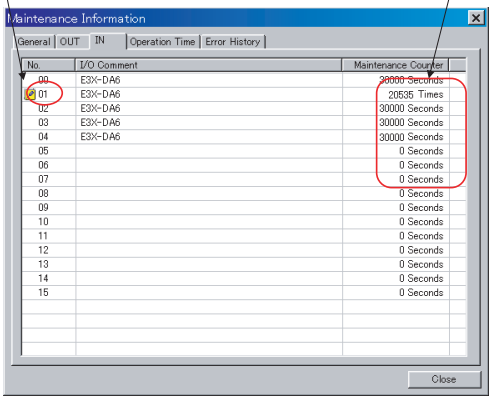
■ OUT and IN Tab Pages

More detailed maintenance information can be found on the OUT and IN Tab Pages.



Nodes that require maintenance can be seen in a glance because an alarm icon is displayed for nodes that exceed monitor values.

The maintenance counter value that was read is displayed.



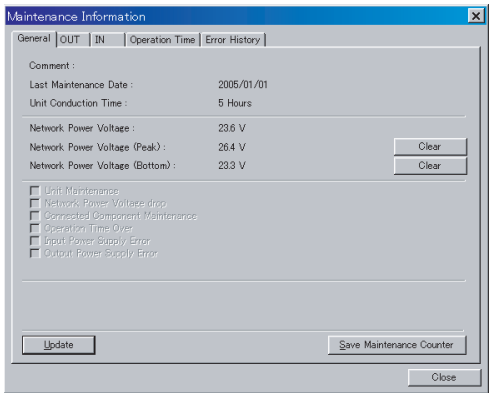
9-1-3 Device Monitor Window

The Device Monitor Window is designed to easily monitor CompoNet Slave Unit data. The displayed data is the same as the Maintenance Mode Window. The Device Monitor Window differs from the Maintenance Mode Window, however, because the data is refreshed online. The data is constantly refreshed by explicit messages between Slave Units and the CompoNet Support Software. Use this Device Monitor Window, therefore, to check the latest CompoNet Slave Unit data.

Right-click in the window and select ***Monitor*** when the CompoNet Support Software is online to display the Device Monitor Window.

Refer to the section on the Maintenance Information Window for each Slave Unit for details.

Device Monitor Window



Note Slave Units and the CompoNet Support Software are constantly exchanging large amounts of the latest data for the Device Monitor Function. This means that each refresh may take a long time if the CompoNet Support Software is connected through a peripheral bus, depending on the Slave Units.

9-2 Function Usage

The functions that can be used with CompoNet Slave Units are listed in the following table.

Yes: Supported, ---: Not supported

Unit / Function	CompoNet Slave Units						
	Digital I/O Slave Units		Bit Slave Units			Analog I/O Slave Units	
	Input Units	Output Units	Input Units	Output Units	I/O Units	Input Units	Output Units
Operation Time Monitor	Yes					---	
Contact Operation Monitor	Yes					---	
Total ON Time Monitor	Yes					---	
Automatic Baud Rate Detection	Yes						
Unit ON Time Monitor	Yes						
Naming Units	Yes						
Naming Connected Devices	Yes						
Network Power Voltage Monitor	Yes						
I/O Power Status Monitor	Yes					---	
Communications Error History Monitor	Yes						
Input Filter	Yes	---	Yes	---	Yes	---	

Unit / Function	CompoNet Slave Units						
	Digital I/O Slave Units		Bit Slave Units			Analog I/O Slave Units	
	Input Units	Output Units	Input Units	Output Units	I/O Units	Input Units	Output Units
Communications Error Output	---	Yes	---	Yes		---	Yes
Preventing Malfunctions Caused by Inrush Current at Startup	Yes	---	Yes	---	Yes	---	---
Sensor Power Short-circuit Detection	---		Yes	---	Yes	---	
External Load Short-circuit Detection	---			Yes		---	
Expansion Using Expansion Units	Yes		---				
Scaling	---					Yes	
Last Maintenance Date	Yes						
Cumulative Counter	---					Yes	
Moving Average	---					Yes	---
Setting the Number of AD Conversion Points	---					Yes	---
Rate of Change	---					Yes	---
Comparator	---					Yes	---
Peak/Bottom Hold	---					Yes	---
Top/Valley Hold	---					Yes	---
Disconnected Line Detection	---					Yes	---
User Adjustment	---					Yes	Yes

9-3 Functions Common to All Slave Units

This section describes the functions common to all CompoNet Slave Units and the procedures for using these functions.

9-3-1 Automatic Baud Rate Detection

The CompoNet Slave Units are automatically set to the same baud rate as the Master Unit. It is not necessary to set the baud rate separately for any Slave Unit.

The baud rate is set when communications is established with the Master Unit after the power is turned ON. The baud rate setting is stored in memory until the power is turned ON again or until the Master Unit baud rate setting is changed.

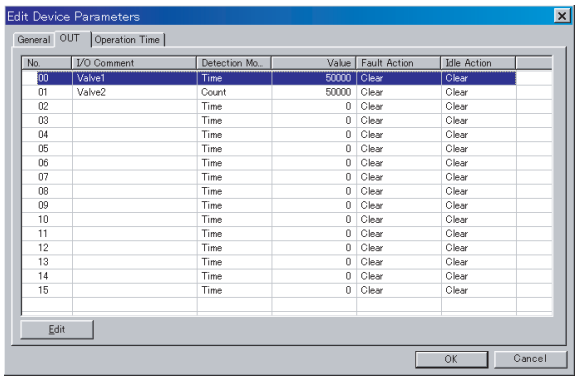
9-3-2 Hold/Clear Outputs

Output Units can be set to hold or clear outputs when an error occurs.

The procedure for setting outputs to be held or cleared using the CompoNet Support Software is outlined below.

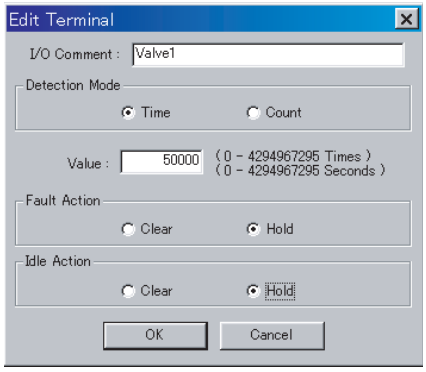
1,2,3... 1. Double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window.

2. Click the **OUT** Tab.



3. Double-click the terminal to be set. The following window will be displayed. Select either ***Clear*** or ***Hold*** to clear or hold outputs when a communications error occurs.

Clear	Clears all output data from the Master Unit to 0 when a communications error occurs.
Hold	Holds all output data from the Master Unit at its current status when a communications error occurs.



4. Confirm that the setting is shown in the Edit Device Parameters Window. Click the **General** Tab, click the **Download** Button, and then click the **Reset** Button.
5. Click the **OK** Button.

9-3-3 Network Power Voltage Monitor

Description

The Network Power Voltage Monitor function stores the present value, minimum value, and maximum value of the network power voltage in the Slave Unit memory. If a monitor voltage is set using the CompoNet Support Software, the monitor voltage is stored in the Slave Unit memory. (The default is 14 V.) If the voltage drops below the monitor voltage, a flag in a status area in the Slave Unit will turn ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

Note

(1) The minimum communications power voltage for the CompoNet network itself is 14 V, so if the network power voltage drops below 14 V, it may not be possible to read a measurement value using the CompoNet Support Software.

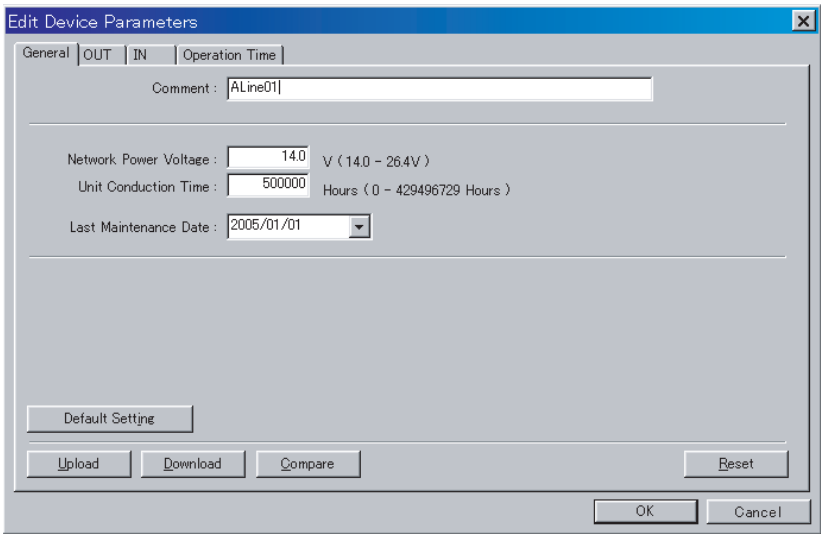
(2) The maximum and minimum values of the network power voltage are cleared when the network power is turned OFF.

Settings Using the CompoNet Support Software

The procedure for making settings using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the **General** Tab.



4. Enter the desired value in the Network Power Voltage Monitor Value field. (The default is 14 V.)
5. Click the **Download** Button, and then click the **OK** Button.

9-3-4 Unit ON Time Monitor

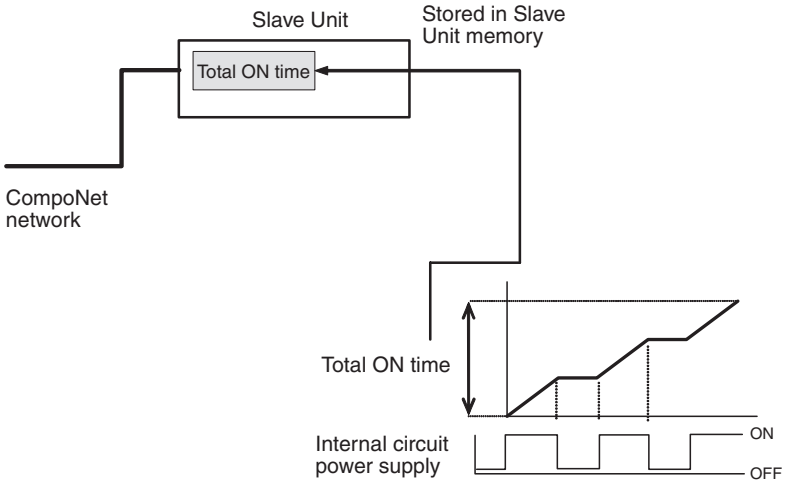
Description

The cumulative time that power is ON to the Slave Unit's internal circuits can be stored in the Slave Unit memory. (This data can be read using the CompoNet Support Software or using explicit messages.)

The monitor value is also stored in the Slave Unit memory so once the total time reaches the monitor value, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

- Measurement time: 0 to 429,496,729 h (Stored data: 0000 0000 to FFFF FFFF hex)
- Measurement unit: 0.1 h

- Storage unit: 0.2 h



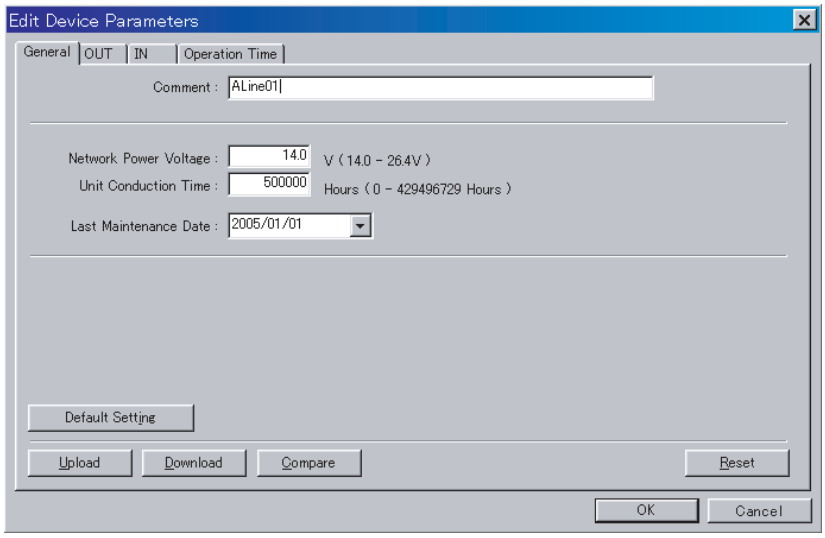
Note The Unit ON Time Monitor Function adds up the time the CompoNet Slave Unit network power supply is ON. The time when the power is OFF is not included.

Settings Using the CompoNet Support Software

The procedure for making settings using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the **General** Tab.

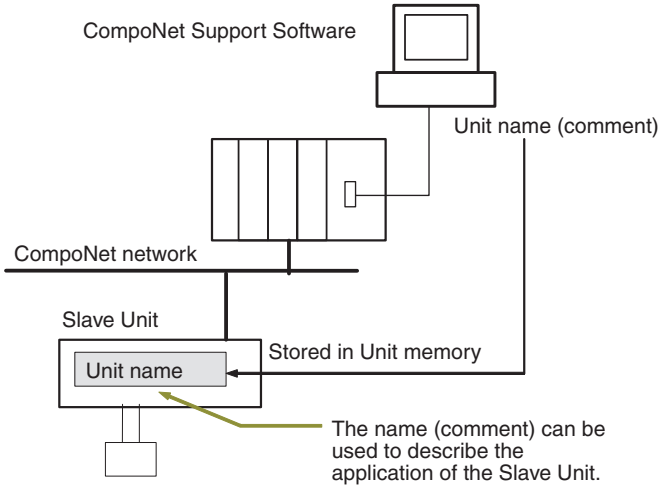


4. Enter the desired value in the Unit ON Time Monitor Value field.
5. Click the **Download** Button, and then click the **OK** Button.

9-3-5 Naming Units

Description

The user can set any name for each Unit (up to 32 characters) as a comment. The name is stored in the Slave Unit memory. The CompoNet Support Software or explicit messages can be used to read/write the name (i.e., the comment).



Settings Using the CompoNet Support Software

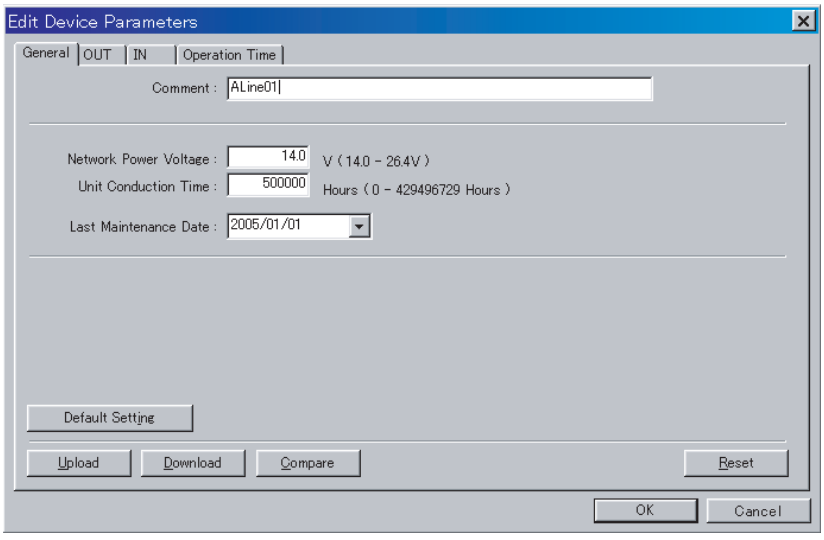
The procedure for making settings using the CompoNet Support Software is outlined below.

There are two setting methods. Either one can be used.

Setting Methods

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the **General** Tab.

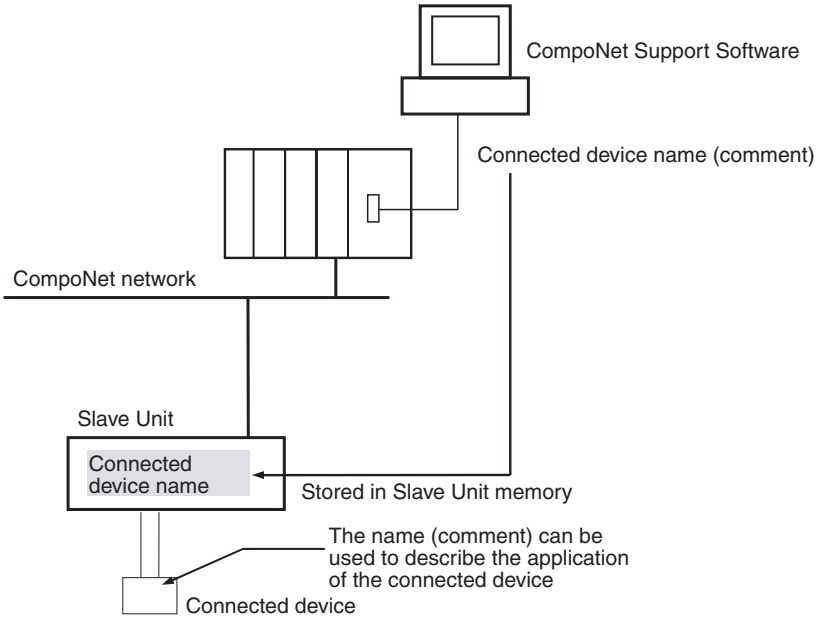


4. Enter the desired name in the *Comment* Field.
5. Click the **Download** Button, and then click the **Reset** Button to reset the Unit.
6. Click the **OK** Button.

9-3-6 Naming Connected Devices

Description

The user can set any name for each I/O contact in the Unit (up to 32 characters). These names are stored in the Slave Unit memory. Connected devices can be checked for each I/O contact, which is useful for remote maintenance and other applications where, for example, devices with errors need to be identified. The CompoNet Support Software or explicit messages can be used to read/write the name (i.e., comment).



Settings Using the CompoNet Support Software

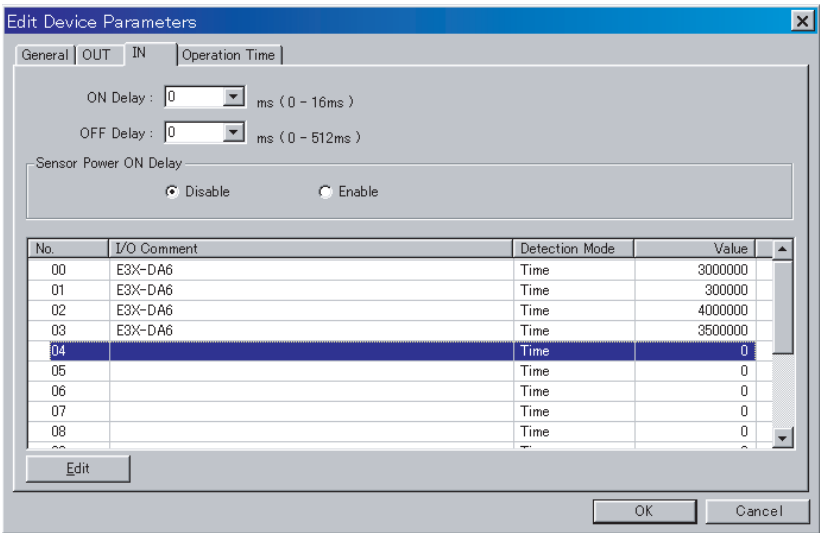
There are two setting methods. Either can be used.

Setting Methods

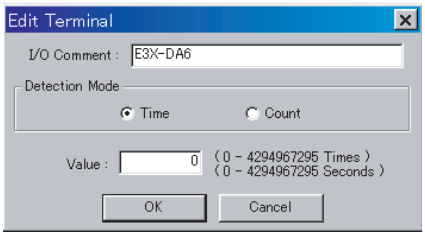
1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.

3. Click the **IN** or **OUT** Tab. The IN Tab Page is shown in the following example.



4. Double-click in the *I/O Comment* Column for the connected device for which a comment is to be added. The following window will be displayed. Enter the desired name and click the **OK** Button.



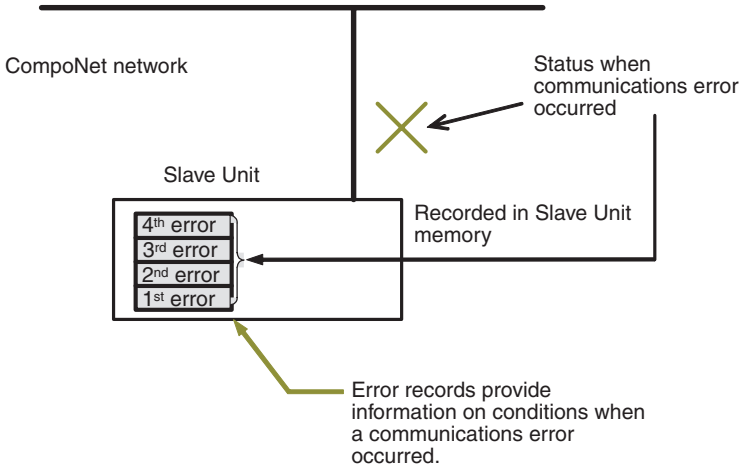
5. Click the **General** Tab, click the **Download** Button, and then click the **OK** Button.

9-3-7 Communications Error History Monitor

Description

The previous four error history records (communications error codes and the power voltage when the error occurred) can be stored in the Slave Unit memory.

The communications error history can be read using the CompoNet Support Software.

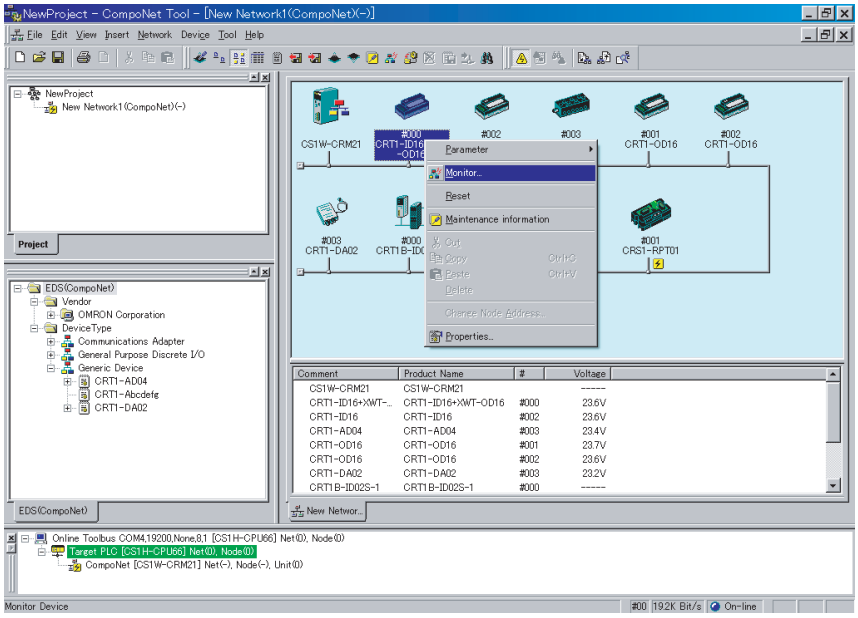


Checking Using the CompoNet Support Software

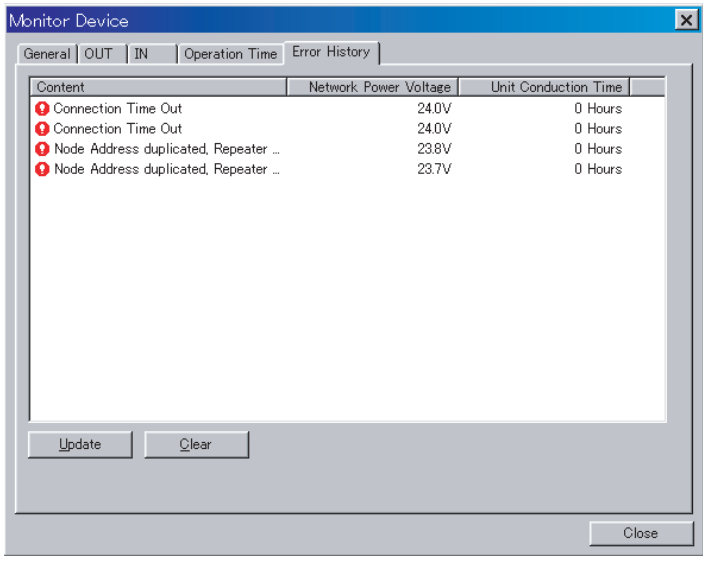
The procedure for checking using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Right-click the icon for the desired CompoNet Slave Unit in the Network Configuration Window and select ***Monitor***.



3. Click the **Error History** Tab in the Device Monitor Window. The communications error history showing the previous 4 errors will be displayed, as shown below. To display the latest error history, click the **Update** Button. To reset the whole error history, click the **Clear** Button.



Note The error history can also be checked by double-clicking the Slave Unit icon in the Maintenance Mode Window and then clicking the Error History Tab in the Maintenance Information Window.

9-3-8 Last Maintenance Date

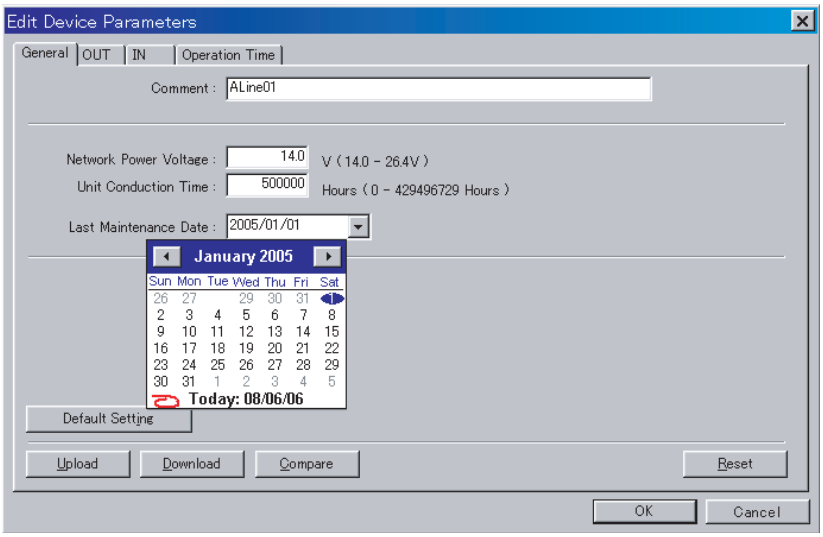
Description

This function can be used to write the date maintenance was last performed in the Slave Unit memory. This makes it easier to decide when maintenance should be performed next. This maintenance date can be written using the CompoNet Support Software.

Settings Using the CompoNet Support Software

1,2,3...

1. Double-click the icon for the target CompoNet Slave Unit in the Standard Window to open the Edit Device Parameters Window. (Right-click in the Maintenance Mode Window and select ***Parameters*** - ***Edit***.)
2. Click the **General** Tab and select a date from the pull-down list for the *Last Maintenance Date* Field. (Select ***Today*** from the bottom of the list to select today's date.)



3. Click the **Download** Button, and then click the **OK** Button.

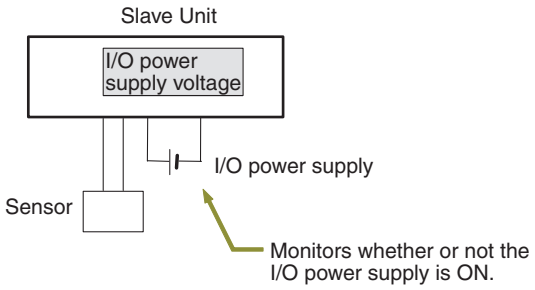
9-4 Word Slave Unit and Bit Slave Unit Functions

9-4-1 I/O Power Status Monitor (Digital I/O Slave Units Only)

Description

The I/O power status monitor function can be used to detect whether the I/O power is ON.

When the I/O power is turned OFF, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.



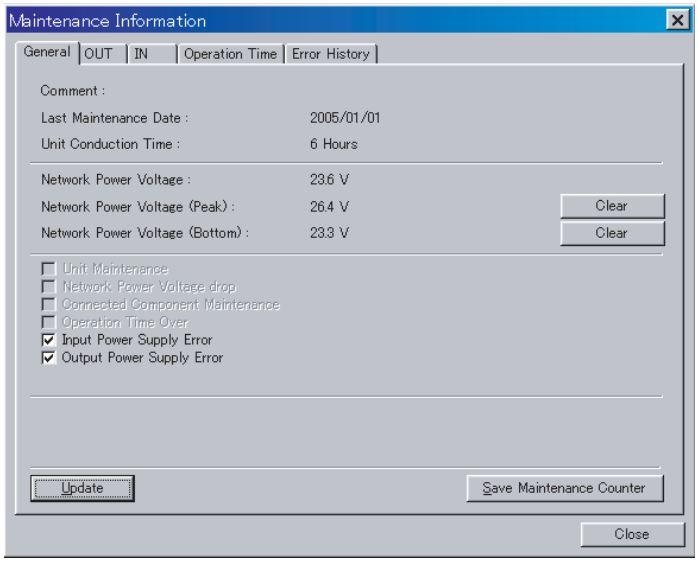
Note A detection voltage cannot be set for the I/O power supply.

Checking Using the CompoNet Support Software

The procedure for checking using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Maintenance Mode Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window to display the Maintenance Information Window. If ***Input Power Supply Error*** and ***Output Power Supply Error*** are selected, it means that the I/O power is not ON.



9-4-2 Input Filter (Input Units Only)

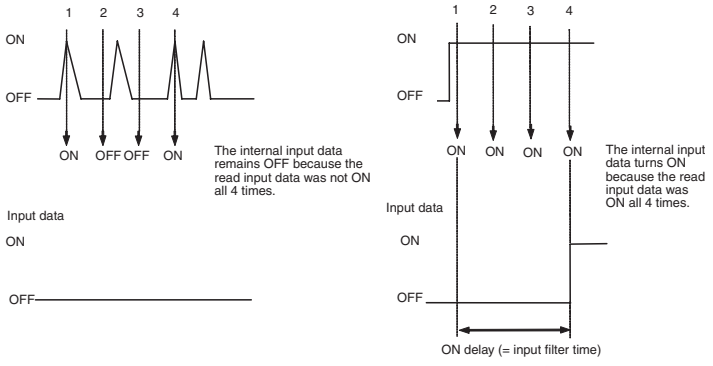
Description

An input value can be read more than once during a set time interval and the input value can be set to be enabled only when all the read values are the same. This function operates for all input points in one Slave Unit.

ON Response Time

When the input data turns ON, the input data is read 4 times at a set interval (1/4 of the ON response time setting) and the internal input data turns ON only when all four values are ON. The ON timing is delayed by the value of the ON response time.

This function can also be used to implement an ON delay (i.e., by utilizing the delay caused by the ON response time when the input filter is enabled).

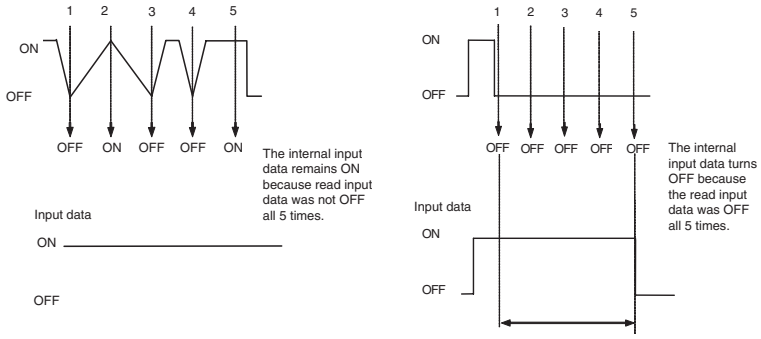


OFF Response Time

When the input data turns OFF, the input data is read 5 times at a set interval (1/5 of the OFF response time setting) and the internal input data turns OFF only when all values are OFF. The OFF timing is delayed by the value of the OFF response time.

This function can also be used to implement an OFF delay.

To enable reading pulses shorter than the communications cycle time, set the OFF response time to a value longer than the communications cycle time. (The input may remain ON if the input pulse interval is too short.)

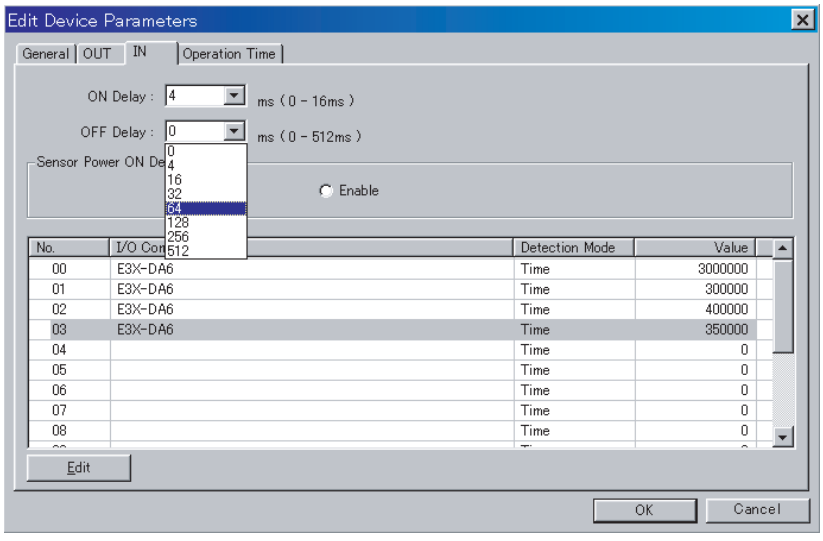


Settings Using the CompoNet Support Software

The procedure for making settings using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the **IN** Tab.
   Select the *ON Response Time* and *OFF Response Time* from the pull-down lists.



4. Click the **General** Tab, click the **Download** Button, and then click the **Reset** Button.
5. Click the **OK** Button.

9-4-3 Error Prevention for Surge Current at Startup (Input Units Only)

Description

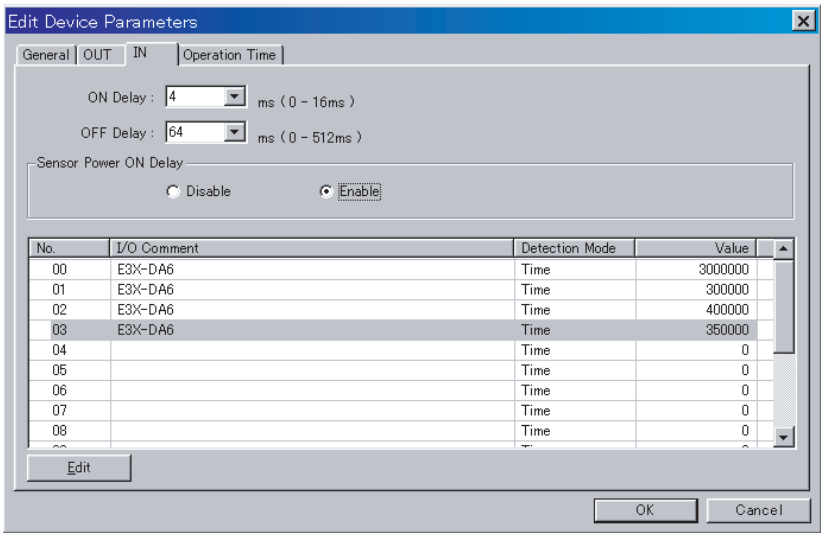
This function can be used to prevent reading inputs while the I/O power is OFF and for 100 ms after the I/O power is turned ON (i.e., until the Slave Unit stabilizes). It helps avoid input errors caused by inrush current from connected devices when the I/O power supply is turned ON.

Settings Using the CompoNet Support Software

The procedure for making settings using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the IN Tab.
   Select the *Enable Option in the Sensor Power ON Delay* Area.



4. Click the **General** Tab, click the **Download** Button, and then click the **Reset** Button.
5. Click the **OK** Button.

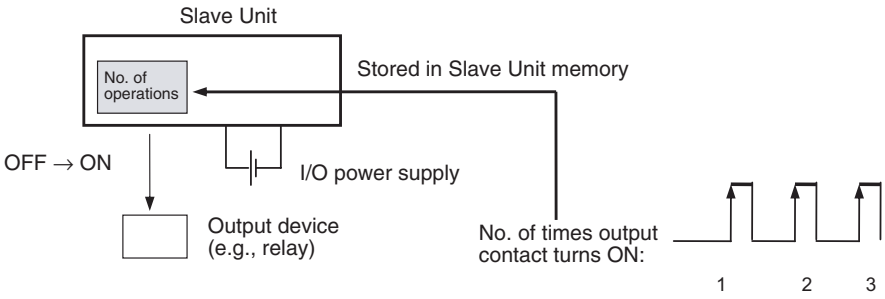
9-4-4 Contact Operation Monitor

Description

The number of times each input contact or output contact is turned ON can be counted (resolution: 50 Hz max.) and stored in Slave Unit memory. (This data can be read using the CompoNet Support Software or using explicit messages.)

A monitor value can also be stored in the Slave Unit memory so once the number of contact operations reaches the monitor value, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

- No. of times measured: 0 to 4,294,967,295 (Stored data: 0000 0000 to FFFF FFFF hex)
- Measurement unit: No. of operations



Note

(1) The contact operation monitor and the total ON time monitor cannot both be used for the same contact at the same time. Select only one of these functions under the *Operation Monitor Mode*.

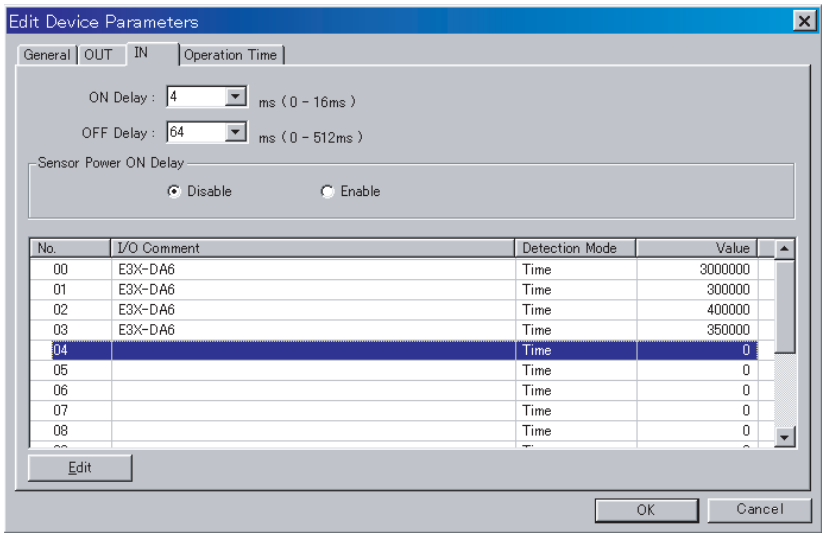
(2) This function does not operate if the I/O power is not turned ON.

Settings Using the CompoNet Support Software

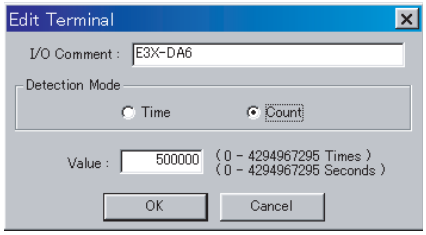
The procedure for making settings using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.
3. Click the **IN** Tab.



4. Double-click the I/O comment of the input to be set. The following window will be displayed. Select the *Count* option in the *Detection Mode* Area, enter the monitor value, and then click the **OK** Button.



5. Check that the set monitor value appears in the Edit Device Parameters Window, click the **General** Tab, and then click the **Download** Button.
6. Click the **OK** Button.

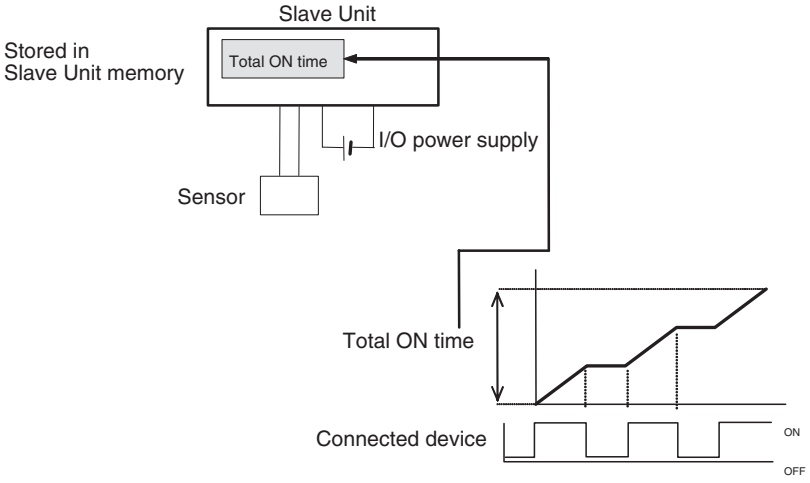
9-4-5 Total ON Time Monitor

Description

This function totals the time that each input and output contact is ON (unit: s) and stores this total time in the Slave Unit memory. (This data can be read using the CompoNet Support Software or using explicit messages.)

A monitor value can also be stored in the Slave Unit memory so once the set total time has been reached, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

- Measurement time: 0 to 4,294,967,295 s (Stored data: 0000 0000 to FFFF FFFF Hex)
- Measurement unit: s



Note

(1) The total ON time monitor and the contact operation monitor cannot both be used for the same contact at the same time. Select only one of these functions under the *Operation Monitor Mode*.

(2) This function does not operate if the I/O power is not turned ON.

(3) The Total ON Time Monitor Function checks at 1 second intervals whether or not the connected device is turned ON.
Keep this in mind when measuring total ON times for inputs of less than 1 s.

■ **Measuring an ON Time of 0.5 s**

As shown in *Figure A*, the actual ON time is 1.5 s (3 × 0.5 s) but the total ON time is measured only as 1 s because the input is ON only once when a measurement is taken.

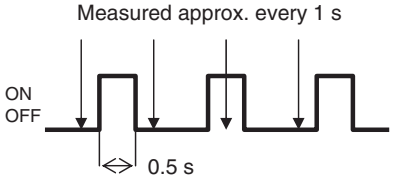


Figure A

In *Figure B*, the actual ON time is 1.5 s (3 × 0.5 s) but the total ON time is measured as 2 s because the input is ON twice when a measurement is taken.

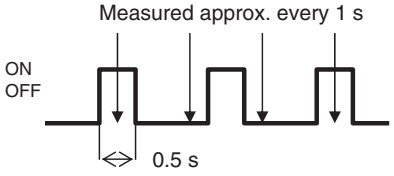


Figure B

■ **Measuring an ON Time of 1.5 s**

In *Figure C*, the actual ON time is 3 s (2 × 1.5 s) but the total ON time is measured as 4 s because the input is ON 4 times when a measurement is taken.

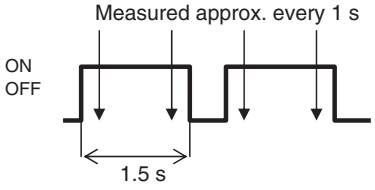


Figure C

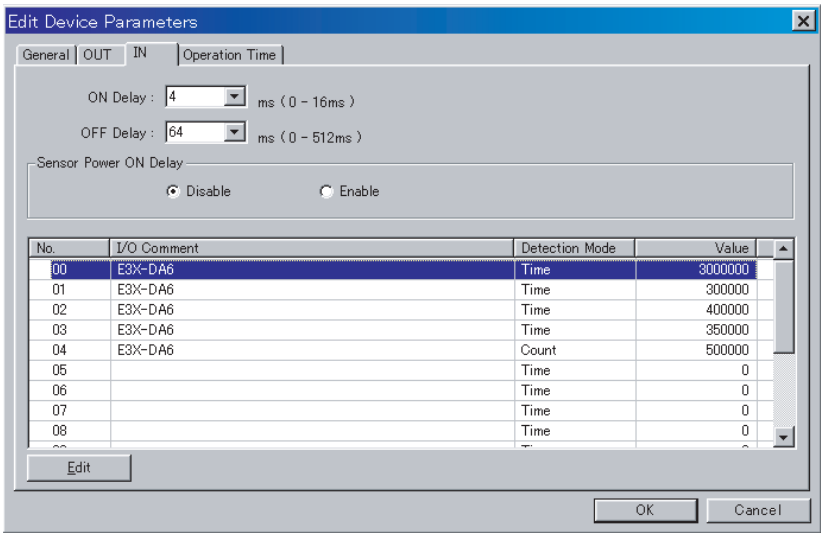
Settings Using the CompoNet Support Software

The procedure for making settings using the CompoNet Support Software is outlined below.

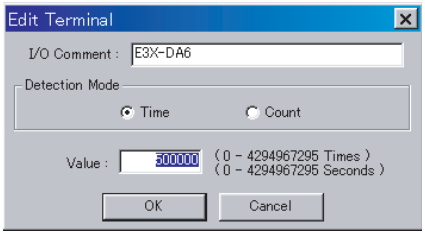
1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window. In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.

3. Click the **IN** Tab.



4. Double-click the I/O comment of the input to be set. The following window will be displayed. Select the *Time* option in the *Detection Mode* Area, enter the monitor value, and then click the **OK** Button.



5. Check that the set monitor value appears in the Edit Device Parameters Window, click the **General** Tab, and then click the **Download** Button.
6. Click the **OK** Button.

9-4-6 Operation Time Monitor

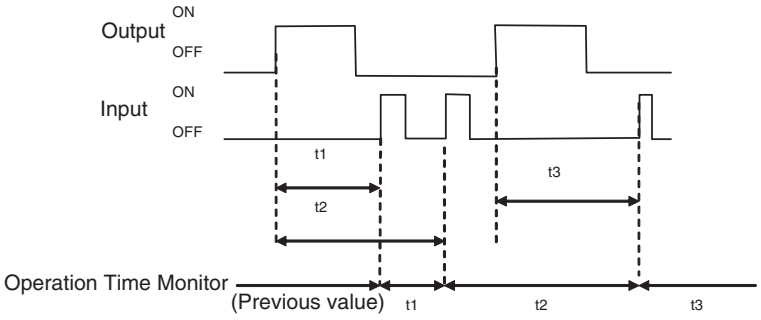
Description

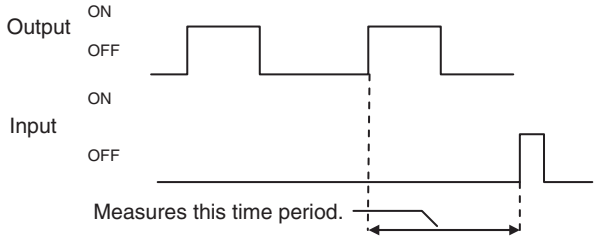
This function can be used to measure the contact I/O timing (ON/OFF) in the Slave Unit (measurement unit: ms) and store the measurement in the Slave Unit memory. (This data can be read using the CompoNet Support Software or using explicit messages.)

The operation time of various combinations of contacts can be monitoring in the Slave Unit (e.g., input-output, input-input, and output-output). In addition, the trigger edge pattern can be set to ON→OFF, ON→ON, OFF→OFF, or OFF→ON. Any input number and output number combination can also be set. (The number of contact points that can be set depends on the Unit.)

This function allows high-precision measurement of the operation time without being affected by the communications cycle. A monitor value can also be stored in the Slave Unit memory so once the set monitor time has been exceeded, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

- The operation time is stored when the time from the output turning ON to the input turning ON is measured. The operation time continues to be measured internally until the next time the output turns ON, and the measurement value is refreshed if the input turns ON again before the next time the output turns ON. For cylinders and other applications with reciprocating operation that receive inputs during the operating time, the measurement taken during operation (outward motion) may be refreshed during the release (return motion).
  Alternatively, if the output turns ON twice before the input turns ON, the time measured is from when the second time the output turns ON to when the input turns ON.



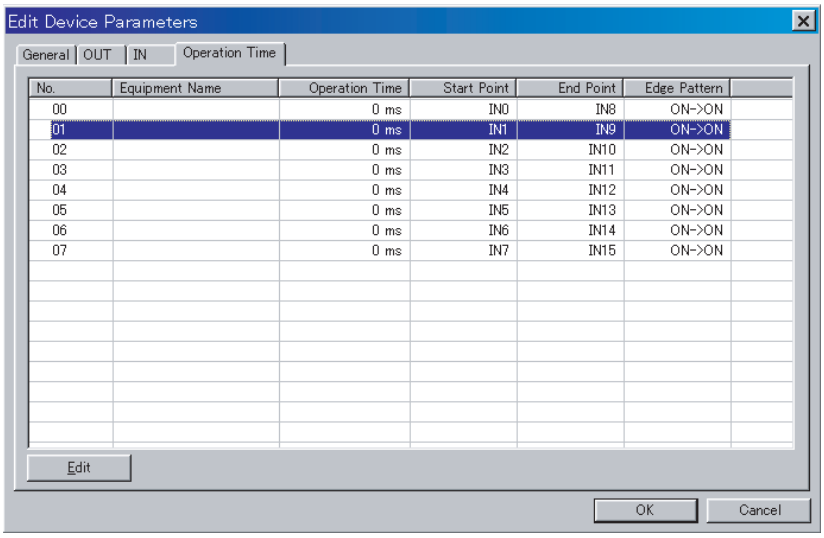


Settings Using the CompoNet Support Software

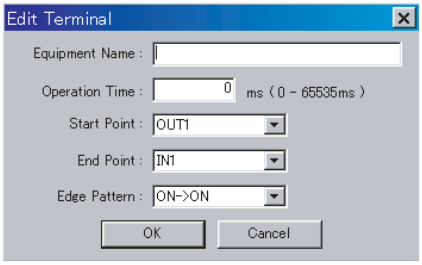
1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. In the Standard Window, double-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window, or right-click the icon and select ***Parameters*** - ***Edit***, to display the Edit Device Parameters Window.
   In the Maintenance Mode Window, right-click the icon for the CompoNet Slave Unit to be set in the Network Configuration Window and select ***Parameters*** - ***Edit*** to display the Edit Device Parameters Window.

3. Click the **Operation Time** Tab.



4. Double-click the target device under *Equipment Name*. The following window will be displayed.
   Enter the desired value in the *Operation Time* Field and select the points to be monitored from the pull-down lists of the *Start Point* and *End Point* Fields. Then select the ON edge or OFF edge monitoring in the *Edge Pattern* Field. Click the **OK** Button.



5. Check that the operation time monitor setting appears in the Edit Device Parameters Window.
   Click the **General** Tab, click the **Download** Button, and then click the **Reset** Button.
6. Click the **OK** Button.

9-5 Functions Unique to Bit Slave Units

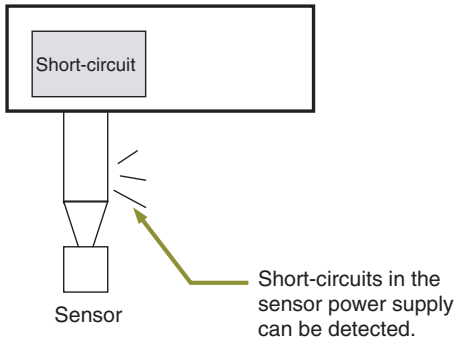
9-5-1 Sensor Power Short-circuit Detection (Input Units and Input Section of I/O Units)

Description

This function monitors the sensor power supply current. If the current is 100 mA or higher per input contact, a sensor power short-circuit is detected.

The I/O power for the Slave Unit turns OFF if a short-circuit is detected for even just one of the contacts being used.

The Slave Unit SHT0 indicator can be used to check whether a sensor power short-circuit has been detected. When a sensor power short-circuit is detected, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages. When the cause of the short-circuit is removed, the Slave Unit is automatically reset, and the power output to the connector that had the short-circuit is turned ON again.



Note Use a power supply rated 100 W or higher as the communications power supply. A short-circuit is detected if a current of 100 mA or more flows two inputs in the Unit's sensor power output. The communications power supply may be temporarily cut if a short-circuit occurs. The Slave Unit is automatically restored after the cause of the short-circuit has been removed but external circuits must also be created to ensure safe system operation while the power is disconnected. Use the following formulas as a guide for calculating the sensor current consumption.

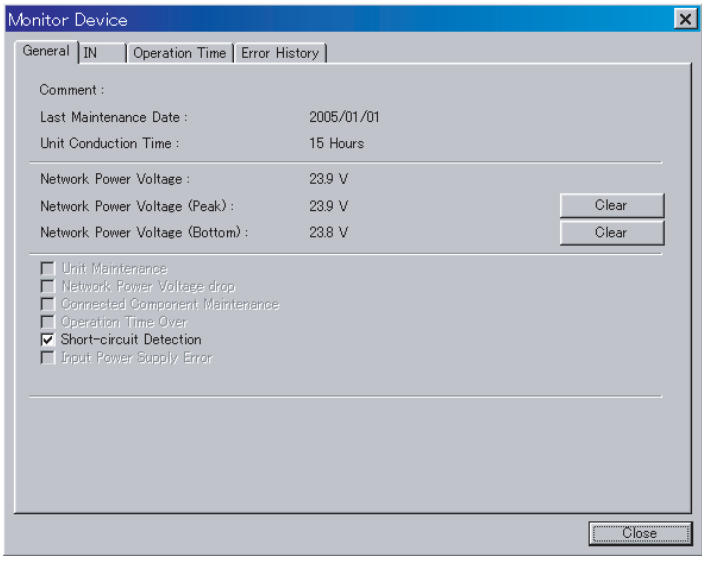
- Total network current = Total Sensor Unit current consumption + total sensor current consumption
- Communications power capacity used ≥ {total network current + (short-circuit detection current = 100 mA)} × (CompoNet network voltage)

Checking Using the CompoNet Support Software

The procedure for checking using the CompoNet Support Software is outlined below.

1,2,3... 1. Turn ON the power supply to the CompoNet Slave Unit.

2. Right-click the icon for the desired CompoNet Slave Unit in the Network Configuration Window and select ***Monitor***.
   Make sure the Short-circuit Detection option is selected.



9-5-2 External Load Short-circuit Detection (Output Units and Output Section of I/O Units)

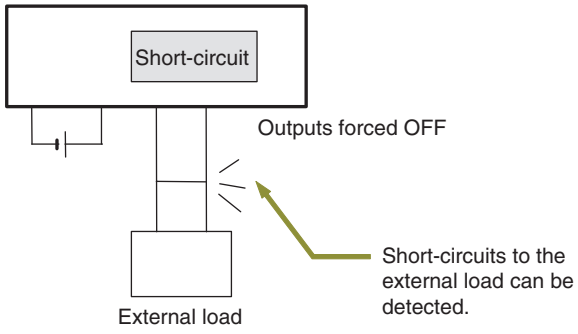
Description

This function monitors the load current for the output section and detects an external load short-circuit if the current per contact (or common) exceeds a specific value. When an external load short-circuit is detected, all Unit outputs are turned OFF to prevent damage to the Unit's output circuits.

The I/O power for the Unit turns OFF if a short-circuit is detected for even just one of the contacts being used.

The Slave Unit's SHT0 or SHT1 indicators can be used to check whether an external load short-circuit has been detected. When an external load short-circuit is detected, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. The notification details can be read using the CompoNet Support Software or using explicit messages.

When the cause of the short-circuit is removed, the Slave Unit is automatically reset, and the power output to the connector for which the short-circuit was detected is turned ON again.



Note The OMRON S8□□ Power Supply Unit is recommended as the I/O power supply. Load short-circuits may not be detected for power supplies with an inverted L overcurrent protection characteristic. If using a power supply with

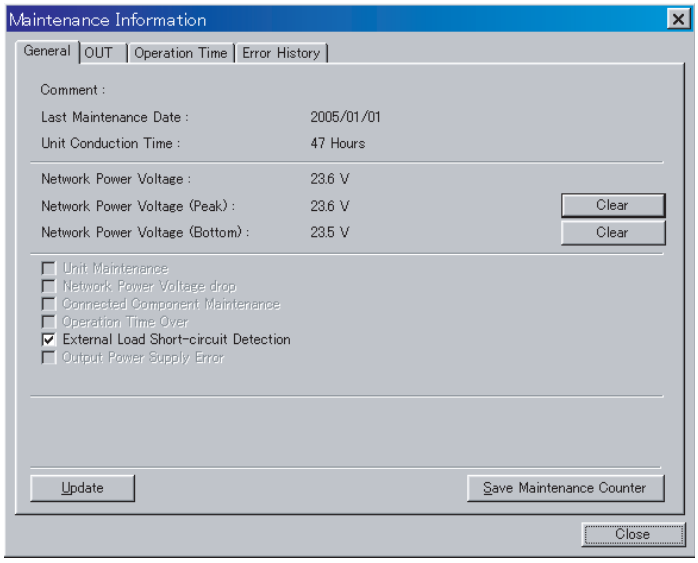
an inverted L overcurrent protection characteristic, use one rated 100 W or higher.

Checking Using the CompoNet Support Software

The procedure for checking using the CompoNet Support Software is outlined below.

1,2,3...

1. Turn ON the power supply to the CompoNet Slave Unit.
2. Right-click the icon for the target CompoNet Slave Unit in the Network Configuration Window and select ***Monitor***.
   Make sure the External Local Short-circuit Detection option is selected.



SECTION 10
Troubleshooting and Maintenance

This section provides troubleshooting information that can be used in the event a problem occurs in CompoNet Slave Unit operation. It also provides information on maintenance that should be performed to ensure optimum application of the CompoNet Slave Units.

10-1 Indicator Meanings and Troubleshooting

MS and NS indicators	Meaning		Remarks
MS: Lit green NS: Lit green	Remote I/O communications or message communications are in progress.	Remote I/O communications are being executed.	Either remote I/O communications, message communications, or both are being executed. Status is normal.
MS: Lit green NS: Not lit	Synchronizing speed.	Waiting for connection with Master Unit.	If only certain Slave Units show this status, check that the baud rate is the same and then restart the Slave Units.
MS: Lit green NS: Flashing green	Waiting for a connection.	Waiting for a connection with the Master Unit to be established.	
MS: Lit red NS: Not lit	Watchdog timer error	A watchdog timer error has occurred in the Slave Unit.	Replace the Slave Unit. Alternatively, check the Expansion Unit connection.
NS: Flashing red NS: Not lit	Illegal switch setting	A DIP switch or other switch setting is illegal.	Check the switch settings then restart the Slave Units.
MS: Lit green NS: Lit red	Configuration error	• The same node address has been used more than once. • Repeater Unit configuration error	Check that the node address is used only once, check the Repeater Unit configuration, and then restart the Slave Units.
MS: Lit green NS: Flashing red	Communications time-out	---	Check the following items then restart the Slave Units: Is the baud rate the same for the Master Unit and Slave Units? Is the cable length (trunk line/branch lines) OK? Is the cable disconnected or loose? Is there terminating resistance on both ends of the trunk line? Is there too much noise?

10-2 Troubleshooting

10-2-1 Troubleshooting for Errors Shown by Indicators

Indicators Are Lit or Flashing Red

Problem	Cause and possible corrections
MS indicator is lit red.	• The Slave Unit is malfunctioning. Replace the Slave Unit. • The Expansion Unit is disconnected. Check the Expansion Unit connection.
MS indicator is flashing 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 non-volatile memory data. Double-click the icon for the Slave Unit in the CompoNet Support Software. The Edit Device Parameters Window will open. Click the **Default Setting** Button and then click the **Reset** Button. Replace the Slave Unit if the MS indicator keeps flashing red even after the data has been returned to the default settings.
The NS indicator lights red without flashing green after the MS indicator lights green.	Check the following items, and then restart the Slave Unit with the error: • Check for node address duplication or Repeater Unit configuration errors. Check all node addresses and check the Repeater Unit configuration and change the settings if required. • Refer to the next item “The NS indicator lights green momentarily and then changes to red”. • Replace the Slave Unit if its NS indicator is always lit red.
The NS indicator lights green momentarily and then changes to red. The NS indicator lights green momentarily and then changes to flashing red.	Check the following items then restart the Slave Unit with the error: • Check that terminating resistance (121 Ω) is connected to both ends of the network's trunk line. If the correct terminating resistance is not set, connect terminating resistance 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 wiring for all nodes to make sure that the communications cable and power supply cables are not disconnected. • Check that the communications power is supplied correctly. • If there are devices in the vicinity that generate noise, implement noise countermeasures for the Master Unit and Slave Units and the communications cable. • If using an OMRON Master Unit, refer to the manual for that Master Unit if an error has occurred in the Master Unit. If using a Master from another manufacturer, refer to the user's manual for that product if an error has occurred in the Master. • Replace the Slave Unit if its NS indicator is always lit red.

Cannot Participate in Network

Problem	Cause and possible corrections
NS indicator remains not lit and status does not change.	Check that all Slave Unit connectors are connected correctly. Check that the Master Unit is operating correctly. If using an OMRON Master Unit, check the Master Unit mode and the Slave Unit node addresses. If using a Master from another manufacturer, refer to the user's manual for that Master. 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 wiring to make sure that the communications cable and power supply cables are not disconnected.

Problem	Cause and possible corrections
NS indicator remains lit green and status does not change.	Check that the Master Unit is operating correctly. Refer to the manual for the Master Unit. Check that the Slave Unit is registered in the Master Unit registration table.
The NS indicator alternates between flashing green and being lit green. Alternatively, the NS indicator alternates between flashing red and flashing green.	Check the following items and take corrective measures based on the Master Unit indicator display. • Re-register the registration table. • Check that the Slave Unit I/O area is not duplicated with the I/O area of another Slave Unit. If the I/O area is duplicated, change the node address so that it is no longer duplicated. • Check that the Slave Unit I/O area is not outside the area permitted by the Master Unit. Change the node address if the I/O area is outside the permitted area.

10-2-2 Troubleshooting by Slave Unit Type

Model	Problem	Cause	Possible correction
All Slave Units	The MS and NS indicators are not lit green.	Refer to *8-2-1 Repeater Unit (CRS1-RPT01)*.	---
	The Network Power Voltage Drop Flag does not turn ON even if the network power supply voltage drops.	The monitor value for the network power supply voltage is set too low. **Note** The default setting is 14 V or less.	Increase the network power voltage monitor value.
	The Network Power Voltage Drop Status is ON even though the network power supply voltage should be appropriate.	The monitor value for the network power supply voltage is set too high.	Decrease the network power voltage monitor value.
	Cannot set the network power voltage monitor value.	The attempted setting is outside the setting range (14 to 26.4 V).	Set the voltage inside the 14 to 26.4-V range.
	Cannot set the connected device or Unit name.	The name (comment) exceeds 32 characters.	Set a name within 32 characters.
	The status for Unit Maintenance Date and Connected Device Maintenance Date do not turn ON.	The status flag will be OFF regardless if the monitor value is set to 0 (function not executed).	Set the monitor value to a value other than 0.
	When the Unit power was turned ON again, the following values did not change to the values from immediately after the power was turned OFF. Word Slave Units: Unit ON Time and Maintenance Counter	The Maintenance Counter value is stored in internal nonvolatile memory once every 6 minutes while the power is ON. Execute ***Save Maintenance Counter*** to save the value. If the power is turned OFF without executing saving the maintenance counter, the value saved previously (from up to 12 minutes earlier) will be read.	Execute ***Save Maintenance Counter*** in the Maintenance Information Window of the CompoNet Support Software before turning OFF the power.

Model	Problem	Cause	Possible correction
All models other than Analog I/O Slave Units	The Maintenance Counter returned to 0.	• The Maintenance Counter will return to 0 if the Unit is reset. • The Maintenance Counter will always return to 0 when the setting is switched between the Total ON Time Monitor Function and the Contact Operation Monitor Function.	---
	Some functions do not change even after parameters have been edited or set.	The functions that have been changed are enabled only after the power is cycled.	Cycle the power or reset the CompoNet Support Software.
	The Maintenance Counter is not counting even though outputs are turned ON.	The I/O power supply is OFF.	Check that the I/O power supply is turned ON.
CRT1-ID16 (-1) and CRT1-OD16 (-1) Slave Units to which Expansion Units can be mounted	I/O communications stopped after mounting or removing an Expansion Unit and turning ON the power.	The number of I/O points increase or decrease when Expansion Units are mounted or removed. The number of I/O points may not match the I/O table registered in the Master Unit.	Change the Master Unit I/O table settings.
	The MS indicator is lit red after mounting or removing an Expansion Unit online.	Expansion Units cannot be mounted or removed online.	Turn OFF the power before mounting or removing Expansion Units.
Slave Units with Operation Time Monitor Function **CRT1-ID16 (-1) (See note.)** **CRT1-OD16 (-1) (See note.)** **CRT1B-ID02S (-1)** **CRT1B-OD02S (-1)** **CRT1B-ID02SP (-1)** **CRT1B-OD02SP (-1)** **CRT1B-ID04SP (-1)** **CRT1B-MD04SLP (-1)** **Note** An Expansion Unit is mounted enabling use as an I/O Unit.	The Operation Time Monitor does not show the expected values.	• If the input filter is set, there is a delay with the ON or OFF time. • The operation time ON or OFF edge selection may not be on the intended setting. • The selected operation time combination is not supported. If the operation time monitor does not show the expected values, the settings may be different from the intended settings. The accuracy is ±6 ms.	• Use the Operation Time Monitor function considering the filter setting or set the filter constant to 0 ms. • Check the operation time combination set for Slave Units for which the operation time edge can be set.
	The status flag for the Operation Time Monitor value has been turns ON and OFF.	The Operation Time Flag is refreshed each measurement cycle, when the operation time is compared with the monitor value. If the Operation Time Flag turns ON for one cycle it will turn OFF when refreshed if the operation time has dropped below the monitor value. There is another flag that holds the contents of monitor value exceeded flags.	---
Slave Units with outputs **CRT1-OD16 (-1)** **CRT1B-OD02S (-1)** **CRT1B-OD02SP (-1)** **CRT1B-MD04SLP (-1)**	Cannot hold outputs when communication errors occur.	The Unit is set to clear outputs for communications errors.	Change the setting to hold outputs for communications errors.
	Cannot clear outputs when communication errors occur.	The Unit is set to hold outputs for communications errors.	Change the setting to clear outputs for communications errors.

Model	Problem	Cause	Possible correction
Slave Units with inputs **CRT1-ID16 (-1)** **CRT1B-ID02S (-1)** **CRT1B-ID02SP (-1)** **CRT1B-MD04SLP (-1)**	There is a delay with the ON and OFF timing for input values.	An input filter may be set.	Set the input filter value to 0. Alternatively, change the input filter to an appropriate value.
Slave Units with External Load Short-circuit Detection Function **CRT1B-OD02S (-1)** **CRT1B-OD02SP (-1)** **CRT1B-MD04SLP (-1)**	The short-circuit detection status does not turn OFF after an external load short-circuit has been detected, even though the error has been fixed.	The status will not turn OFF until the power for the node where the error was detected is reset.	Cycle the communications power after fixing the error.
All Analog I/O Slave Units	The status does not turn ON even if the monitor value is exceeded.	The required Analog Smart Function is not enabled. The status will be OFF regardless if the monitor value is set to 0.	Enable the required function. Set the monitor value setting to a value other than 0. Check the decimal point position then set the monitor value again.
	• The expected analog input value is not received or the expected analog output is not output after changing the input type, display mode, or unit. • The Unit does not operate as expected after changing the allocated I/O data or a function enable bit.	• The changes will not be enabled until the power is cycled or the CompoNet Software Support is used to reset the Unit.	• Cycle the Unit power or reset using the CompoNet Support Software.
All Analog I/O Slave Units	• The analog data values are different from expected or the analog data error is too large. • A disconnection is detected even though it is not disconnected.	• The I/O data function allocations are not correct. • The scaling function is operating. • The connected Sensor is different from the set input type. • The user adjustment error is too large.	• Check again that the analog data type to be set is correctly allocated for the I/O data. • If using the Scaling function, check again that the scaling value is correct. • Remove the Scaling function if it has been allocated by mistake. • Check the input type again. • Execute user adjustment again.
	Cannot set using external switches.	• SW8 is turned OFF (default).	• Turn ON SW 8.
	User adjustment is not accepted.	• Attempted to calibrate with inputs outside the setting range.	• Calibrate again with the correct input voltage (current). • Change the adjustment system if necessary.

Model	Problem	Cause	Possible correction
Analog I/O Slave Units (Inputs) **CRT1-AD04**	The disconnection display does not clear.	• The Sensor is disconnected.	• Restore the Sensor connection. • Check the connected Sensor and input type again.
	No disconnection display.	• Disconnection is not displayed for Analog Input Slave Units for ranges other than 1 to 5 V and 4 to 20 mA.	---
	The conversion cycle is too long.	• The setting of the number of AD conversion points is on the maximum (4 points). • The processing time gets longer each time a function is added.	• Reduce the number of points if some inputs are unnecessary and execute conversion again. • Delete any unused functions and execute conversion again.
Analog I/O Slave Units (Outputs) **CRT1-DA02**	The expected value is not held when communications errors occur.	• The output value that is set for communications errors is incorrect.	• Check the output setting for communications errors.

10-3 Device Maintenance

This section describes everyday device maintenance, in particular cleaning methods, inspection methods, and how to replace Units.

10-3-1 Cleaning

Perform the following cleaning regularly to ensure the network is kept in the best condition possible.

- Wipe the network over with a soft, dry cloth when doing daily cleaning.
- If dirt remains even after wiping with a soft, dry cloth, wipe over with a cloth that has been wet with a sufficiently diluted detergent (2%) and wrung dry.
- Units will become stained if items such as rubber or vinyl products or tape are left on the Unit for long periods. Remove such items during regular cleaning.

Note Never use benzine, thinners, or other volatile solvents, or chemical cloths. The Unit coating may change if these products are used.

10-3-2 Inspections

Always perform periodic inspections to ensure the network is kept in the best possible condition.

Periodic inspections should occur every 6 months to a year. Periodic inspections should occur more frequently, however, for Units in environments subject to high temperatures, high humidity, or a lot of dust.

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 Sometimes Required

Synchroscope

Pen oscilloscope

Thermometer and hygrometer

Inspection Items

Periodically inspect the following items to ensure that they do not deviate from the criteria. If the items deviate from the criteria, adjust the environment so the criteria are met or adjust the Unit itself.

Inspection item	Inspection details	Criteria	Inspection method
Environment	Are the ambient and in-panel temperatures appropriate?	Refer to the specifications for each Slave Unit.	Thermometer
	Is the ambient and in-panel humidity appropriate?	Refer to the specifications for each Slave Unit.	Hygrometer
	Has dust collected?	No dust	Visual inspection

Inspection item	Inspection details	Criteria	Inspection method
Installation	Has the Unit been secured?	No looseness	Phillips screwdriver
	Are the communications cable connectors inserted properly?	No looseness	Phillips screwdriver
	Are the external wiring screws loose?	No looseness	Phillips screwdriver
	Are the connection cables damaged?	No visible damage	Visual inspection

10-3-3 Handling Units When Replacing

Networks are constructed from a Master Unit and Slave Units. If a node is malfunctioning, this affects the entire network, and the node should be replaced quickly. To restore network functions as quickly as possible, it is recommended that spare Units are kept on hand ready to replace malfunctioning Units immediately.

Precautions When Replacing Nodes

Heed the following precautions when replacing nodes after periodic inspection has revealed a problem.

Check that the new Unit does have errors after replacement.

If returning malfunctioning devices for repair, attach a detailed description of the malfunction to the device and send the device to the OMRON representative listed at the end of this manual or to your OMRON representative.

If contacts are defective, wipe them with a clean pure cotton cloth that has been soaked in industrial alcohol.

Settings after Node Replacement

After replacing a node, make the switch and other settings the same as before the node was replaced.

Appendix A
CompoNet Explicit Messages

CompoNet explicit messages sent from the CompoNet Master Unit to a CompoNet Slave Unit can be used to read or write any parameter of the specified Slave Unit.

The CompoNet Slave Units process the commands sent from the Master Unit and then return responses.

Basic Format of Explicit Messages

The basic format of each command and response is shown below.

Command Block

Size	Reserved	Service code	Class ID	Instance ID	Attribute ID	Data

Single Frame or Start of Fragment

Item	Size	Description
Size	2 bytes	The byte size of the data: 0 to 65,535 Single frames: 0 to 30
Reserved	1 byte	Reserved
Service code	1 byte	The explicit message service code
Class ID	1 byte	The explicit message class ID
Instance ID	1 byte	The explicit message instance ID
Attribute ID	1 byte	The explicit message attribute ID
Data	0 to 29 bytes	The explicit message data

Response Block

Normal Response Block

Size	Reserved	Service code	Data

Single Frame or Start of Fragment

Item	Size	Description
Size	2 bytes	The byte size of the data: 0 to 65,535 Single frames: 0 to 30
Reserved	1 byte	Reserved
Service code	1 byte	The explicit message service code
Data	0 to 32 bytes	The explicit message data

Service Code

For normal completion, the value when the leftmost bit of the service code specified in the command turns ON is stored as shown in the following table.

Function	Command service code	Response service code
Write data	10 hex	90 hex
Read data	0E hex	8E hex
Reset	05 hex	85 hex
Save	16 hex	96 hex

When an error response is returned for an explicit message, the value is always 94 hex.

Data

Read data is included only when a read command is executed.

Error Codes

The explicit message error code. For details, refer to the list of error codes in the following table.

List of Error Codes

Response code	Error name	Cause
08FF	Service not supported	The Service code is incorrect.
09FF	Invalid attribute value	The specified Attribute value is not supported. The data written was outside 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 error.
20FF	Invalid parameter	The specified operation command data is not supported.
0EFF	Attribute not settable	An Attribute ID supported only for reading has been executed for a write service code.
10FF	Device state conflict	The specified command cannot be executed due to an internal error.
14FF	Attribute not supported	The specified Attribute is not supported.
19FF	Store operation failure	The data cannot be stored in memory.

Explicit Messages Common to All Slave Units

Reading General Status

Explicit message	Read/write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
General Status Read	Read	Reads the specified Slave Unit's status flags (8 bits).	0E hex	95 hex	01 hex	65 hex	-	1 byte

Note For information on individual bits in the status areas of a Slave Unit, refer to the *Status Areas* section for the Slave Unit.

Setting and Monitoring the Unit Conduction Time

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Unit Maintenance Set Value	Read	Reads the set value for Unit Conduction Time (unit: 0.1 hr)	0E hex	95 hex	01 hex	73 hex	-	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
	Write	Writes the set value for Unit Conduction Time (unit: 0.1 hr)	10 hex	95 hex	01 hex	73 hex	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)	
Unit Maintenance Present Value	Read	Reads the present value for Unit Conduction Time (unit: 0.1 hr)	0E hex	95 hex	01 hex	71 hex		4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
Unit Maintenance Flag	Read	Reads the monitor status of Unit Conduction Time	0E hex	95 hex	01 hex	72 hex		1 byte 00 hex: Within range 01 hex: Out of range (over the monitor value)

Reading Warning Status and Alarm Status

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Warning Status Read	Read	Reads the Slave Unit's warning status area.	0E hex	95 hex	01 hex	C5 hex	-	2 bytes
Alarm Status Read	Read	Reads the Slave Unit's alarm status area.	0E hex	95 hex	01 hex	C6 hex	-	2 bytes

Explicit Messages for Digital I/O Slave Units

Setting and Monitoring Inputs

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Terminal Maintenance Information Monitor Mode	Read	Reads the monitor mode for maintenance information of the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	65 hex		1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode for maintenance information of the input (No. 1 to 32) specified by the Instance ID.	10 hex	08 hex	01 to 20 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	
Set Value for Input Total ON Time or Contact Operation Counter	Read	Reads the set value for the total ON time (unit: s) or number of contact operations (unit: operations) of the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	68 hex		4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
	Write	Writes the set value for the total ON time (unit: s) or number of contact operations (unit: operations) of the input (No. 1 to 32) specified by the Instance ID.	10 hex	08 hex	01 to 20 hex	68 hex	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)	
Input Total ON Time or Contact Operation Counter Read	Read	Reads the total ON time (unit: s) or number of contact operations (unit: operations) for the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	66 hex		4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
Input Total ON Time or Contact Operation Counter Reset	Reset	Resets the total ON time (unit: s) or number of contact operations (unit: operations) for the input (No. 1 to 32) specified by the Instance ID.	05 hex	08 hex	01 to 20 hex	66 hex		
Monitor Status for Input Total ON Time or Contact Operation Counter Read	Read	Reads the monitor status for total ON time or number of contact operations for the input (No. 1 to 32) specified by the Instance ID.	0E hex	08 hex	01 to 20 hex	67 hex		1 byte 00 hex: Within range 01 hex: Out of range (over the monitor value)

Setting and Monitoring the Outputs

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Terminal Maintenance Information Monitor Mode	Read	Reads the monitor mode for maintenance information of the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	65 hex	-	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode
	Write	Writes the monitor mode for maintenance information of the output (No. 1 to 32) specified by the Instance ID.	10 hex	09 hex	01 to 20 hex	65 hex	1 byte 00 hex: Total ON time mode 01 hex: Contact operation counter mode	-
Set Value for Output Total ON Time or Contact Operation Counter	Read	Reads the set value for the total ON time (unit: s) or number of contact operations (unit: operation) for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	68 hex	-	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
	Write	Writes the set value for the total ON time (unit: s) or number of contact operations (unit: operation) for the output (No. 1 to 32) specified by the Instance ID.	10 hex	09 hex	01 to 20 hex	68 hex	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)	-
Output Total ON Time or Contact Operation Counter Read	Read	Reads the total ON time (unit: s) or number of contact operations (unit: operation) for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	66 hex	-	4 bytes 00000000 to FFFFFFFF hex (0 to 4294967295)
Reset for Output Total ON Time or Contact Operation Counter Reset	Reset	Resets the total ON time (unit: s) or number of contact operations (unit: operation) for the output (No. 1 to 32) specified by the Instance ID to 0.	05 hex	09 hex	01 to 20 hex	66 hex	-	-
Monitor Status for Output Total ON Time or Contact Operation Counter Read	Read	Reads the monitor status for total ON time or contact operation counter for the output (No. 1 to 32) specified by the Instance ID.	0E hex	09 hex	01 to 20 hex	67 hex	-	1 byte 00 hex: Within range 01 hex: Out of range (over the monitor value)

Setting and Monitoring Operation Time

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Operation Time Monitor Peak Value Read	Read	Reads the peak value for the time (unit: ms) from the start point trigger until the end point trigger specified by the Instance ID (No. 1 to 8).	0E hex	97 hex	01 to 08 hex	68 hex	-	2 bytes 0000 to FFFF hex (0 to 65535)
Operation Time Monitor Peak Value Reset	Reset	Resets to the present value the peak value for the time (unit: ms) from the start point trigger until the end point trigger specified by the Instance ID (No. 1 to 8)	05 hex	97 hex	01 to 08 hex	68 hex	-	-
Operation Time Monitor History	Read	Reads the monitor history for the time (unit: ms) from the start point trigger until the end point trigger specified by the Instance ID (No. 1 to 8).	0E hex	97 hex	01 to 08 hex	6D hex	-	1 byte 00 hex: Value not exceeded 01 hex: Value exceeded
Operation Time Monitor History Reset	Read	Resets the monitor history for the time (unit: ms) from the start point trigger until the end point trigger specified by the Instance ID (No. 1 to 8) to 0.	05 hex	97 hex	01 to 08 hex	6D hex	-	-

Setting Hold/Clear for Communications Errors for Outputs

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Setting for Output Status (Hold or Clear) after Communications Error	Read	Reads whether hold or clear is set as the output status after a communications error for an output (No. 1 to 32) specified by the Instance ID. The setting can be read for a specified number of points.	0E hex	09 hex	01 to 20 hex	05 hex	-	1 byte 00 hex: Clear 01 hex: Hold
Setting for Output Status (Hold or Clear) after Communications Error	Write	Sets whether hold or clear is set as the output status after a communications error for an output (No. 1 to 32) specified by the Instance ID. The setting can be set for a specified number of points.	10 hex	09 hex	01 to 20 hex	05 hex	1 byte 00 hex: Clear 01 hex: Hold	-

Note The default setting is for all outputs to be cleared (0).

Writing Maintenance Information

Explicit message	Read/ write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Maintenance Counter Save	Save	Stores the maintenance counter in the Slave Unit's memory.	16 hex	95 hex	01 hex	75 hex	-	-

Reading Operation Time Monitor and Total ON Time/Contact Operation Counter for All Slave Units at Once

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Monitor Status for Operation Time Monitor for All Slave Units Read at Once	Read	Reads the monitor status for total operation time monitor for all Slave Units.	0E hex	95 hex	01 hex	7E hex	-	+00: Response size +01: 02 hex (fixed) +02: Response area 1 +03: Response area 2 (See note 1.)
Monitor Status for Total ON Time or Contact Operation Counter for All Slave Units Read at Once	Read	Reads the monitor status for total ON time or contact operation counter for all Slave Units.	0E hex	95 hex	01 hex	7F hex	-	+00: Response size +01: 08 hex (fixed) +02: Response area 1 +03: Response area 2 +04: Response area 3 +05: Response area 4 +06: Response area 5 +07: Response area 6 +08: Response area 7 +09: Response area 8 (See note 2.)

Note 1. The Attribute (7E hex) is bit 6 of the Generic Status and so the size is fixed at 4 bytes and has the following format.

+00	Size, 0002	Fixed
+01		
+02	IN+OUT combined, terminals 0 to 7	The bit turns ON when the set value is exceeded.
+03	IN+OUT combined, terminals 8 to 15	

Note • Depending on the Unit size, not all bits are used.
• 14FF is returned for all Units except mixed I/O Units.

2. The Attribute (7F hex) is bit 7 of the Generic Status and so the size is fixed at 10 bytes and has the following format.

+00	Size, 0008	Fixed
+01		
+02	IN Area, terminals 0 to 7	The bit turns ON when the set value is exceeded.
+03	IN Area, terminals 8 to 15	
+04	IN Area, terminals 16 to 24	
+05	IN Area, terminals 25 to 31	
+06	OUT Area, terminals 0 to 7	
+07	OUT Area, terminals 8 to 15	
+08	OUT Area, terminals 16 to 24	
+09	OUT Area, terminals 25 to 31	

Note Depending on the Unit size, not all bits are used.

Explicit Messages for Analog I/O Slave Units

Reading DIP Switch Settings

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
DIP Switch Status Read	Read	Reads the status of the Input/Output Terminals DIP switch.	0E hex	94 hex	01 hex	68 hex		1 byte

Setting and Reading for Analog Input Terminals

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Analog Data 1 Value	Read	Reads the value for Analog Data 1.	0E hex	0A hex	01 to 04 hex	03 hex	2 bytes	2 byte
Analog Data 2 Value	Read	Reads the value for Analog Data 2.	0E hex	0A hex	01 to 04 hex	65 hex	2 bytes	2 bytes
Setting the Number of AD Conversion Points	Write/ Read	Sets the number of AD conversion points.	Write: 10 hex Read: 0E hex	0A hex	00 hex	64 hex	2 bytes	1 byte
Input Range Setting	Write/ Read	Sets the input range. −10 to 10 V: 0 0 to 5 V: 1 0 to 10 V: 2 4 to 20 mA: 3 1 to 5 V: 7 0 to 20 mA: 8	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	07 hex	1 byte	1 byte
Analog Status Flag Read	Read	Reads the status of the Analog Status Flags. LL = 0; L = 1; Pass signal = 2; H = 3; HH = 4; Valley shot = 5; Top shot = 6; Disconnected line detection = 7	0E hex	0A hex	01 to 04 hex	66 hex		1 byte
Analog Data 1 Allocation Selection	Write/ Read	Selects the data allocated to Analog Data 1. Analog input value: 0; Peak value: 1; Bottom value: 2; Top value: 3; Valley value: 4; Rate of change value: 5	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	68 hex	1 byte	1 byte
Analog Data 2 Allocation Selection	Write/ Read	Selects the data allocated to Analog Data 2. Analog input value: 0; Peak value: 1; Bottom value: 2; Top value: 3; Valley value: 4; Rate of change value: 5	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	69 hex	1 byte	1 byte

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Function Setting	Write/ Read	Sets each function. Bit status: ON: Enabled, OFF: Disabled Moving average: 0; Scaling: 1; Peak/bottom hold: 2; Top/valley hold: 3; Comparator: 4; Cumulative counter: 5; Rate of change: 6	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	6E hex	1 byte	1 byte
Scaling Type Setting	Write/ Read	Default scaling: 0: User scaling: 1	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	6F hex	1 byte	1 byte
Scaling Point 1 Setting	Write/ Read	Sets an analog value as the 0% value for user scaling.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	70 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Scaling Point 2 Setting	Write/ Read	Sets an analog value as the 100% value for user scaling.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	71 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Offset Compensation after Scaling	Write/ Read	Compensates for scaling errors with an offset value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	72 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Maximum Value Read	Read/ Reset	Reads the maximum value after power is turned ON.	Read: 0E hex Reset: 35 hex	0A hex	01 to 04 hex	73 hex		2 bytes
Minimum Value Read	Read/ Reset	Reads the minimum value after power is turned ON.	Read: 0E hex Reset: 35 hex	0A hex	01 to 04 hex	74 hex		2 bytes
Peak Value Read	Read	The peak value is held while the hold function is enabled. The held value is read by this message.	0E hex	0A hex	01 to 04 hex	75 hex		2 bytes
Bottom Value Read	Read	The bottom value is held while the hold function is enabled. The held value is read by this message.	0E hex	0A hex	01 to 04 hex	76 hex		2 bytes
Top Value Read	Read	The top value is held while the hold function is enabled. The held value is read by this message.	0E hex	0A hex	01 to 04 hex	77 hex		2 bytes
Top Detection Timing Flag Read	Read	Reads the timing for detecting top values.	0E hex	0A hex	01 to 04 hex	78 hex		1 byte
Valley Value Read	Read	The valley value is held and read.	0E hex	0A hex	01 to 04 hex	79 hex		2 bytes

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Valley Detection Timing Flag Read	Read	Reads the timing for detecting valley values.	0E hex	0A hex	01 to 04 hex	7A hex		1 byte
HH Value Setting	Write/ Read	Sets the HH value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	7D hex	2 bytes (–32768 to 32767)	2 bytes (–32768 to 32767)
LL Value Setting	Write/ Read	Sets the LL value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	7E hex	2 bytes (–32768 to 32767)	2 bytes (–32768 to 32767)
H Value Setting	Write/ Read	Sets the H value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	7F hex	2 bytes (–32768 to 32767)	2 bytes (–32768 to 32767)
L Value Setting	Write/ Read	Sets the L value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	80 hex	2 bytes (–32768 to 32767)	2 bytes (–32768 to 32767)
Scaled Analog Input Value Read	Read	Reads analog input values for which have only been scaled.	0E hex	0A hex	01 to 04 hex	8D hex		2 bytes
Rate of Change Value Read	Read	Reads the rate of change for each sampling cycle.	0E hex	0A hex	01 to 04 hex	8E hex		2 bytes
Sampling Cycle Setting	Write/ Read	Sets the sampling cycle for obtaining the rate of change based on the previous value.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	90 hex	2 bytes (10 to 65535)	2 bytes (10 to 65535)
Cumulated Value Read	Read/ Reset	Reads the cumulated analog input value.	Read: 0E hex Reset: 35 hex	0A hex	01 to 04 hex	91 hex		4 bytes (–214748364.8 to 214748364.8)
Cumulative Counter Flag Read	Read	Reads the cumulative count status in the Cumulative Counter Flag in the area for Generic Status Flags. 0: Counter overflow 1: Counter underflow 7: Set value overflow	Read: 0E hex	0A hex	01 to 04 hex	92 hex		1 byte
Cumulative Counter Monitor Value Setting	Write/ Read	Writes/reads the set monitor value for the cumulative counter.	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	93 hex	4 bytes	4 bytes
Cumulative Counter Unit Setting	Write/ Read	Sets the unit for the cumulative counter. 0: Hour (count hours); 1: Minute (count minutes)	Write: 10 hex Read: 0E hex	0A hex	01 to 04 hex	94 hex	1 byte	1 byte

Setting and Reading for Analog Output Terminals

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Analog Output Value Read	Read	Reads analog output values.	0E hex	0B hex	01 to 02 hex	03 hex		2 bytes
Output Range Setting	Write/ Read	Sets the output range. 4 to 20 mA: 0; 0 to 10 V: 1; 0 to 20 mA: 2; –10 to 10 V: 3; 0 to 5 V: 4; 1 to 5 V: 6	0E hex	0B hex	01 to 02 hex	07 hex		1 byte
Communications Error Output Setting	Write/ Read	Sets the communications error output value for each output. 0: Hold last state 1: Low limit 2: High limit 3: Zero count	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	09 hex	1 byte	1 byte
Function Setting	Write/ Read	Sets the function. Scaling: 0; Cumulative counter: 1	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	6E hex	1 byte	1 byte
Scaling Type Setting	Write/ Read	Default scaling: 0: User scaling: 1	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	6F hex	1 byte	
Scaling Point 1 Setting	Write/ Read	Sets a conversion value as the 0% value for user scaling.	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	70 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Scaling Point 2 Setting	Write/ Read	Sets a conversion value as the 100% value for user scaling.	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	71 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Offset Compensation after Scaling	Write/ Read	Compensates for scaling errors with an offset value.	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	72 hex	2 bytes (–28000 to 28000)	2 bytes (–28000 to 28000)
Cumulated Value Read	Read/ Reset	Reads the cumulated analog output value.	Read: 0E hex Reset: 35 hex	0B hex	01 to 02 hex	91 hex		4 bytes (–214748364.8 to 214748364.8)
Cumulative Counter Flag Read	Read	Reads the cumulative count status in the Cumulative Counter Flag in the area for Generic Status Flags. 0: Counter overflow 1: Counter underflow 7: Set value overflow	Read: 0E hex	0B hex	01 to 02 hex	92 hex		1 byte

Explicit message	Read /write	Function	Command					Response
			Service code	Class ID	Instance ID	Command data		
						Attribute ID	Data	
Cumulative Counter Monitor Value Setting	Write/ Read	Writes/reads the set monitor value for the cumulative counter.	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	93 hex	4 bytes	4 bytes
Cumulative Counter Unit Setting	Write/ Read	Sets the unit for the cumulative counter. 0: Hour (count hours); 1: Minute (count minutes)	Write: 10 hex Read: 0E hex	0B hex	01 to 02 hex	94 hex	1 byte	

Example of Using Explicit Messages

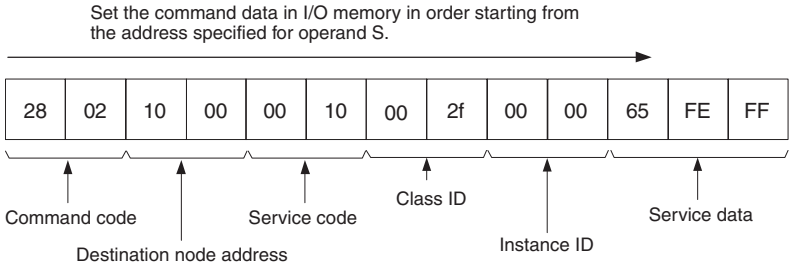
The CMND (SEND COMMAND) instruction in a CS/CJ-series CPU Unit can be used in the ladder program to send explicit messages for CS/CJ-series CompoNet Master Units. The explicit message command data is sent prefixed by the FINS command code 2802 hex. The explicit message response is received after the FINS command code 2802 hex and the FINS end code.

The CMND instructions is as follows:

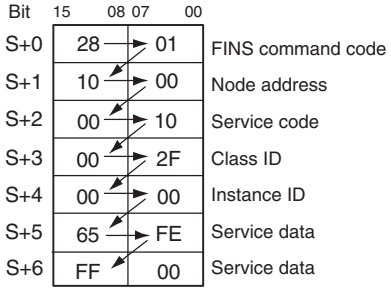
[CMND S D C]
S: First word containing the command data
D: First word in which to store the response
C: First control data word

Set the command data in memory in order from the address specified for S.

Command Format Example: Writing the Error Clear Code to CPU Unit Memory

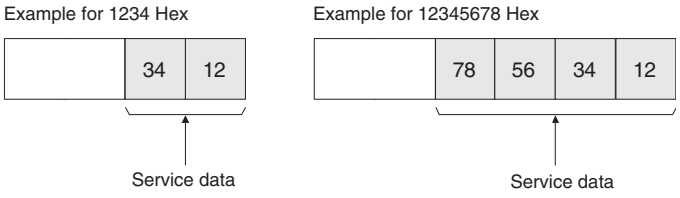


Setting Data Starting from the Address of Operand S of CMND

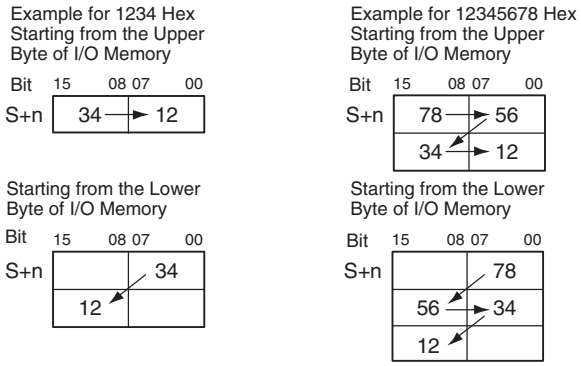


The response is stored in order in I/O memory in the same fashion starting from the address specified for operand D of the CMND instruction.

Note 1. The service data is stored for the command format with the lower byte stored first followed by the upper byte for word (2-byte) or double-word (4-byte) data. For example, with word data, 1234 hex would be specified by setting 34 hex first followed by 12 hex. With double-word data, 12345678 hex would be specified by setting 78 hex first followed by 56 hex, 34 hex, and then 12 hex. This is illustrated below.

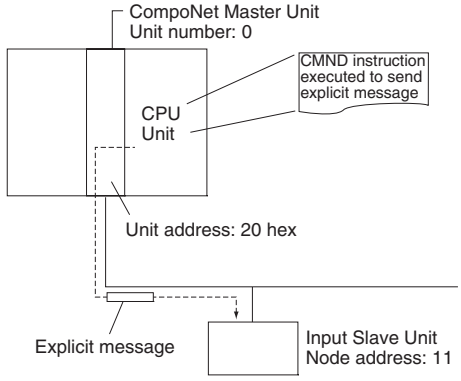


Data is thus set in I/O memory starting from the address specified for operand S of the CMND instruction as follows:



The service data is stored in the same way for the response format, i.e., when word (2-byte) or double-word (4-byte) data is received, the lower byte is stored first.

Example of Sending an Explicit Message with the CMND Instruction



Operation

The header code is read from the Slave Unit. OMRON's header code is 002F hex.

The data is read using the EXPLICIT MESSAGE SEND command (28 02).

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.

If the command does not end normally, the end code is stored in D00006 and the send command is re-executed.

Command Details

[CMND S D C]

Contents of S

Address	Contents (hex)	Meaning
D01000	28 02	Command code
D01001	10 0B	Input Slave Unit node address: 11
D01002	00 0E	Service code: 0E hex
D01003	00 01	Class ID: 0001 hex
D01004	00 01	Instance ID: 0001 hex
D01005	01 00	Attribute ID: 01 hex

D: First Response Storage Word

Contents of C

Address	Contents (hex)	Meaning
D00000	00 0B	Number of bytes of command data: 11 bytes
D00001	00 0C	Number of bytes of response data: 12 bytes
D00002	00 00	Destination Master Unit network address: 0
D00003	00 20	Destination Master Unit node address: 0 Destination Master Unit unit address: 20 hex
D00004	00 00	Response required Communications port number: 0 Number of retries: 0
D00005	00 64	Response monitoring time

Response

Contents of D

Address	Contents (hex)	Meaning
D02000	28 02	---
D02001	00 00	---
D02002	00 04	---
D02003	10 0B	Response source node address: 11 (0B hex)
D02004	00 8E	Normal completion: 8E hex
D02005	2F 00	Vendor code (upper byte followed by lower byte)

Appendix B
Object Mounting

Identity Object (0x01)

Object class	**Attribute**	Not supported
	Service	Not supported

Object instance	**Attribute**	**ID**	**Contents**	**Get (read)**	**Set (write)**	**Value**
		1	Vendor	Yes	No	47
		2	Device type	Yes	No	See note.
		3	Product code	Yes	No	See note.
		4	Revision	Yes	No	1.1
		5	Status (bits supported)	Yes	No	Bit 0 only
		6	Serial number	Yes	No	Unique for each Unit
		7	Product name	Yes	No	See note.
		8	State	No	No	
	Service	**Code**	**Description**	**Parameter option**		
		05	Reset	No		
		0E	Get_Attribute_Single	No		

Note The product code and product name depend on the type of Slave Unit being used, as shown in the following table.

Model		**Device type**	**Product code**	**Product name**
Basic Unit	**Expansion Unit**			
CRT1-ID16	None	7	1327	CRT1-ID16
	XWT-ID08	7	1328	CRT1-ID16
	XWT-ID16	7	1329	CRT1-ID16
	XWT-OD08	7	1330	CRT1-ID16
	XWT-OD16	7	1331	CRT1-ID16
	XWT-ID08-1	7	1332	CRT1-ID16
	XWT-ID16-1	7	1333	CRT1-ID16
	XWT-OD08-1	7	1334	CRT1-ID16
	XWT-OD16-1	7	1335	CRT1-ID16
CRT1-OD16	None	7	1336	CRT1-OD16
	XWT-ID08	7	1337	CRT1-OD16
	XWT-ID16	7	1338	CRT1-OD16
	XWT-OD08	7	1339	CRT1-OD16
	XWT-OD16	7	1340	CRT1-OD16
	XWT-ID08-1	7	1341	CRT1-OD16
	XWT-ID16-1	7	1342	CRT1-OD16
	XWT-OD08-1	7	1343	CRT1-OD16
	XWT-OD16-1	7	1344	CRT1-OD16

Model		Device type	Product code	Product name
Basic Unit	**Expansion Unit**			
CRT1-ID16-1	None	7	1345	CRT1-ID16-1
	XWT-ID08	7	1346	CRT1-ID16-1
	XWT-ID16	7	1347	CRT1-ID16-1
	XWT-OD08	7	1348	CRT1-ID16-1
	XWT-OD16	7	1349	CRT1-ID16-1
	XWT-ID08-1	7	1350	CRT1-ID16-1
	XWT-ID16-1	7	1351	CRT1-ID16-1
	XWT-OD08-1	7	1352	CRT1-ID16-1
	XWT-OD16-1	7	1353	CRT1-ID16-1
CRT1-OD16-1	None	7	1354	CRT1-OD16-1
	XWT-ID08	7	1355	CRT1-OD16-1
	XWT-ID16	7	1356	CRT1-OD16-1
	XWT-OD08	7	1357	CRT1-OD16-1
	XWT-OD16	7	1358	CRT1-OD16-1
	XWT-ID08-1	7	1359	CRT1-OD16-1
	XWT-ID16-1	7	1360	CRT1-OD16-1
	XWT-OD08-1	7	1361	CRT1-OD16-1
	XWT-OD16-1	7	1362	CRT1-OD16-1
CRS1-RPT01	None	26	1363	CRT1-RPT01
CRT1B-ID02S		7	1364	CRT1B-ID02S
CRT1B-ID02S-1		7	1365	CRT1B-ID02S-1
CRT1B-OD02S		7	1366	CRT1B-OD02S
CRT1B-OD02S-1		7	1367	CRT1B-OD02S-1
CRT1B-ID02SP		7	1368	CRT1B-ID02SP
CRT1B-ID02SP-1		7	1369	CRT1B-ID02SP-1
CRT1B-OD02SP		7	1370	CRT1B-OD02SP
CRT1B-OD02SP-1		7	1371	CRT1B-OD02SP-1
CRT1B-ID04SP		7	1372	CRT1B-ID04SP
CRT1B-ID04SP-1		7	1373	CRT1B-ID04SP-1
CRT1B-MD04SLP		7	1374	CRT1B-MD04SLP
CRT1B-MD04SLP-1		7	1375	CRT1B-MD04SLP-1
CRT1-AD04		0	65	CRT1-AD04
CRT1-DA02		0	66	CRT1-DA02

Message Router Object (0x02)

Object class	**Attribute**	Not supported
	Service	Not supported
Object instance	**Attribute**	Not supported
	Service	Not supported
Vendor specification addition		None

Assembly Object (0x04)

Object class	**Attribute**	Not supported
	Service	Not supported

Object instance	Attribute	ID	Contents	Get	Set	Value
		1	Number of members in list	No	No	
		2	Member list	No	No	
		3	Data	Yes	No	
	Service	**Code**	**Description**	**Parameter option**		
		0E	Get_Attribute_Single	None		

The assembly instances for DRT2 Slave Units are given below.

Digital Input Slave Units

Instance number	Type	Bit allocation								Supported model
Assembly instance 2 2 inputs	Input	-	-	-	-	-	-	1	0	CRT1B-ID02S(-1) CRT1B-ID02SP(-1) CRT1B-MD04SLP(-1)
Assembly instance 3 4 inputs	Input	-	-	-	-	3	2	1	0	CRT1B-ID04SP(-1)
Assembly instance 4 8 inputs	Input	7	6	5	4	3	2	1	0	CRT1-OD16(-1) + XWT-ID08(-1)
Assembly instance 5 16 inputs	Input	7	6	5	4	3	2	1	0	CRT1-ID16(-1)
		15	14	13	12	11	10	9	8	CRT1-ID16(-1) + XWT-OD08(-1) CRT1-ID16(-1) + XWT-OD16(-1) CRT1-OD16(-1) + XWT-ID16(-1)
Assembly instance 6 32 inputs	Input	7	6	5	4	3	2	1	0	CRT1-ID16(-1) + XWT-ID16(-1)
		15	14	13	12	11	10	9	8	
		23	22	21	20	19	18	17	16	
		31	30	29	28	27	26	25	24	
Assembly instance 7 24 inputs	Input	7	6	5	4	3	2	1	0	CRT1-ID16(-1) + XWT-ID08(-1)
		15	14	13	12	11	10	9	8	
		23	22	21	20	19	18	17	16	

Digital Output Slave Units

Instance number	Type	Bit allocation								Supported model
Assembly instance 32 2 outputs	Output	-	-	-	-	-	-	1	0	CRT1B-OD02S(-1) CRT1B-OD02SP(-1) CRT1B-MD04SLP(-1)
Assembly instance 34 8 outputs	Output	7	6	5	4	3	2	1	0	CRT1-ID16(-1) + XWT-OD08(-1)
Assembly instance 35 16 outputs	Output	7	6	5	4	3	2	1	0	CRT1-OD16(-1)
		15	14	13	12	11	10	9	8	CRT1-ID16(-1) + XWT-OD16(-1) CRT1-OD16(-1) + XWT-ID08(-1) CRT1-OD16(-1) + XWT-ID16(-1)
Assembly instance 36 32 outputs	Output	7	6	5	4	3	2	1	0	CRT1-OD16(-1) + XWT-OD16(-1)
		15	14	13	12	11	10	9	8	
		23	22	21	20	19	18	17	16	
		31	30	29	28	27	26	25	24	
Assembly instance 37 24 outputs	Output	7	6	5	4	3	2	1	0	CRT1-OD16(-1) + XWT-OD08(-1)
		15	14	13	12	11	10	9	8	
		23	22	21	20	19	18	17	16	

Analog Input Slave Units

Instance number	Byte	Bit allocation								Supported model
Instance 104 Analog Data (input)	+0	Input 0, Analog Data 1								CRT1-AD04
	+1									
	+2	Input 1, Analog Data 1								
	+3									
	+4	Input 2, Analog Data 1								
	+5									
	+6	Input 3, Analog Data 1								
	+7									
Instance 122 Top/Valley Detection Timing Flags	+1	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	CRT1-AD04
Instance 134 Analog Status Flags	+0	BW0	T_ST0	V_ST0	HH0	H0	PS0	L0	LL0	CRT1-AD04
	+1	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	
	+2	BW2	T_ST2	V_ST2	HH2	H2	PS2	L2	LL2	
	+3	BW3	T_ST3	V_ST3	HH3	H3	PS3	L3	LL3	
	+0	BW1	T_ST1	V_ST1	HH1	H1	PS1	L1	LL1	
	+1	BW2	T_ST2	V_ST2	HH2	H2	PS2	L2	LL2	
	+2	BW3	T_ST3	V_ST3	HH3	H3	PS3	L3	LL3	
	+3	0	0	MRF	CCW	RHW	NPW	0	0	
Instance 174 Analog Data 1 + Top/Valley Detection Timing Flags	+0	Input 0, Analog Data 1								CRT1-AD04
	+1									
	+2	Input 1, Analog Data 1								
	+3									
	+4	Input 2, Analog Data 1								
	+5									
	+6	Input 3, Analog Data 1								
	+7									
	+8	0	0	0	0	V_ST3	V_ST2	V_ST1	V_ST0	
	+9	0	0	0	0	T_ST3	T_ST2	T_ST1	T_ST0	

Analog Output Slave Units

Instance number	Byte	Bit allocation								Supported model
Instance 190 Hold Flags	+0					HD3	HD1	HD1	HD0	CRT1-AD04
Instance 192 Analog output data	+0	Input 0, Analog Data								CRT1-DA02
	+1									
	+2	Input 1, Analog Data								
	+3									

Connection Object (0x05)

Object class	**Attribute**	Not supported
	Service	Not supported
	Maximum number of active connections	1

Object instance 1	**Section**	**Information**		**Maximum number of instances**		
	Instance type	Polled I/O		1		
	Production trigger	Cyclic				
	Transport type	Server				
	Transport class	3				
	Attribute	**ID**	**Contents**	**Get (read)**	**Set (write)**	**Value**
		1	State	Yes	No	
		2	Instance type	Yes	No	01 (hexadecimal)
		3	Transport class trigger	Yes	No	82H (Input and Mixed I/O Slave Units) 80H (Output Slave Units and Repeater Units)
		4	Produced connection ID	Yes	No	
		5	Consumed connection ID	Yes	No	
		6	Initial comm. characteristics	Yes	No	01 (hexadecimal)
		7	Produced connection size	Yes	No	See note.
		8	Consumed connection size	Yes	No	See note.
		9	Expected packet rate	Yes	Yes	
		12	Watchdog timeout action	Yes	No	00 (hexadecimal)
		13	Produced connection path length	Yes	No	See note.
		14	Produced connection path	Yes	No	See note.
		15	Consumed connection path length	Yes	No	See note.
		16	Consumed connection path	Yes	No	See note.
		17	Production inhibit time	Yes	No	0000 (hexadecimal)
	Service	**Code**	**Description**	**Parameter option**		
		05	Reset	None		
		0E	Get_Attribute_Single	None		
		10	Set_Attribute_Single	None		

Note The data depends on the type of Slave Unit being used, as shown in the following table.

Model		Name	Produced connection size	Produced connection path length	Produced connection path	Consumed connection size	Consumed connection path length	Consumed connection path
Basic Unit	**Expansion Unit**							
CRT1-ID02S (-1)		Input Data	0001	0006	20_04_24_02_30_03	-	0000	
CRT1-OD02S (-1)		Output Data	-	0000	-	0001	0006	20_04_24_02_30_03
CRT1-ID02SP (-1)		Input Data	0001	0006	20_04_24_02_30_03	-	0000	
CRT1-OD02SP (-1)		Output Data	-	0000	-	0001	0006	20_04_24_02_30_03
CRT1-ID04SP (-1)		Input Data	0001	0006	20_04_24_03_30_03	-	0000	
CRT1-MD04SLP (-1)		Input Data	0001	0006	20_04_24_02_30_03	-	0000	
		Output Data	-	0000	-	0001	0006	20_04_24_02_30_03
CRT1-ID16 (-1)	NA	Input Data	0002	0006	20_04_24_05_30_03		0000	
CRT1-ID16 (-1)	XWT-ID08 (-1)	Input Data	0003	0006	20_04_24_07_30_03		0000	
CRT1-ID16 (-1)	XWT-ID16 (-1)	Input Data	0004	0006	20_04_24_06_30_03		0000	
CRT1-ID16 (-1)	XWT-OD08 (-1)	Input Data	0002	0006	20_04_24_05_30_03		0000	
		Output Data		0000	-	0001	0006	20_04_24_22_30_03
CRT1-ID16 (-1)	XWT-OD16 (-1)	Input Data	0002	0006	20_04_24_05_30_03		0000	
		Output Data	-	0000	-	0002	0006	20_04_24_23_30_03
CRT1-OD16 (-1)	XWT-ID08 (-1)	Output Data		0000	-	0002	0006	20_04_24_23_30_03
		Input Data	0001	0006	20_04_24_04_30_03		0000	
CRT1-OD16 (-1)	XWT-ID16 (-1)	Output Data	-	0000	-	0002	0006	20_04_24_23_30_03
		Input Data	0002	0006	20_04_24_05_30_03		0000	
CRT1-OD16 (-1)	XWT-OD08 (-1)	Output Data	-	0000	-	0003	0006	20_04_24_25_30_03
CRT1-OD16 (-1)	XWT-OD16 (-1)	Output Data	-	0000	-	0004	0006	20_04_24_24_30_03

Model		Name	Produced connection size	Produced connection path length	Produced connection path	Consumed connection size	Consumed connection path length	Consumed connection path
Basic Unit	Expansion Unit							
CRT1-AD04		Analog Data 1	0008	0006	20_04_24_68_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	0004	0006	20_04_24_86_30_03	0000	0000	-
		Top and Valley shot + Generic status	0003	0006	20_04_24_97_30_03	0000	0000	-
		Analog Status + Generic status	0005	0006	20_04_24_A4_30_03	0000	0000	-
		Analog data 1 + Top and valley shot	000A	0006	20_04_24_AE_30_03	0000H	0000	-
		Analog data + Top and valley shot + generic status	000B	0006	20_04_24_B8_30_03	0000	0000	-
		Hold control	0000	0000	-	0001	0006	20_04_24_BE_30_03
CRT1-DA02		Generic Status	0001	0006	20_04_24_79_30_03			-
		Analog Data				0004	0006	20_04_24_C0_30_03

Appendix C
Connectable Devices

Digital I/O Slave Units and Expansion Units

Model	Specifications	Manufacturer
CRT1-ID16	CompoNet Slave Unit with 16 DC inputs (NPN)	OMRON
CRT1-ID16-1	CompoNet Slave Unit with 16 DC inputs (PNP)	OMRON
CRT1-OD16	CompoNet Slave Unit with 16 transistor outputs (NPN)	OMRON
CRT12-OD16-1	CompoNet Slave Unit with 16 transistor outputs (PNP)	OMRON
XWT-ID16	Expansion Unit with 16 DC inputs (NPN)	OMRON
XWT-ID16-1	Expansion Unit with 16 DC inputs (PNP)	OMRON
XWT-OD16	Expansion Unit with 16 transistor outputs (NPN)	OMRON
XWT-OD16-1	Expansion Unit with 16 transistor outputs (PNP)	OMRON
XWT-ID08	Expansion Unit with 8 DC inputs (NPN)	OMRON
XWT-ID08-1	Expansion Unit with 8 DC inputs (PNP)	OMRON
XWT-OD08	Expansion Unit with 8 transistor outputs (NPN)	OMRON
XWT-OD08-1	Expansion Unit with 8 transistor outputs (PNP)	OMRON

Bit Slave Units

Model	Specifications	Manufacturer
CRT1B-ID02S	CompoNet Slave Unit with IP20 protection and 2 DC inputs (NPN)	OMRON
CRT1B-ID02S-1	CompoNet Slave Unit with IP20 protection and 2 DC inputs (PNP)	OMRON
CRT1B-OD02S	CompoNet Slave Unit with IP20 protection and 2 transistor inputs (NPN)	OMRON
CRT1B-OD02S-1	CompoNet Slave Unit with IP20 protection and 2 transistor inputs (PNP)	OMRON
CRT1B-ID02SP	CompoNet Slave Unit with IP54 protection and 2 DC inputs (NPN)	OMRON
CRT1B-ID02SP-1	CompoNet Slave Unit with IP54 protection and 2 DC inputs (PNP)	OMRON
CRT1B-OD02SP	CompoNet Slave Unit with IP54 protection and 2 transistor inputs (NPN)	OMRON
CRT1B-OD02SP-1	CompoNet Slave Unit with IP54 protection and 2 transistor inputs (PNP)	OMRON
CRT1B-ID04SP	CompoNet Slave Unit with IP54 protection and 4 DC inputs (NPN)	OMRON
CRT1B-ID04SP-1	CompoNet Slave Unit with IP54 protection and 4 DC inputs (PNP)	OMRON
CRT1B-MD04SLP	CompoNet Slave Unit with IP54 protection and 2 DC inputs (NPN) and 2 transistor outputs (NPN)	OMRON
CRT1B-MD04SLP-1	CompoNet Slave Unit with IP54 protection and 2 DC inputs (PNP) and 2 transistor outputs (PNP)	OMRON

Analog I/O Slave Units

Model	Specifications	Manufacturer
CRT1-AD04	Analog Input Slave Unit with 4 analog data inputs (4 words)	OMRON
CRT1-DA02	Analog Output Slave Unit with 2 analog data inputs (2 words)	OMRON

Repeater Unit

Model	Specifications	Manufacturer
CRS1-RPT01	2 communications connectors (upstream and downstream ports) 1 upstream port communications power supply connector Up to 64 Repeater Units can be connected for 1 Master Unit.	OMRON

Communications Cables

Model	Specifications	Manufacturer
---	VCTF 2-conductor cable JIS C 3306, nominal cross-section of conductor: 0.75 mm^2, finished cable diameter: 2.3 mm	---
DCA4-4F10	Standard Flat Cable (4-conductor, UL certified) Length: 100 m, conductor cross-sections: 0.75 $mm^2 \times 2$, 0.5 $mm^2 \times 2$	OMRON
DAC5-4F10	Sheathed Flat Cable (4-conductor, UL certified) Length: 100 m, conductor cross-sections: 0.75 $mm^2 \times 2$, 0.5 $mm^2 \times 2$, degree of protection: IP54s	OMRON

Connectors

Model	Specifications	Manufacturer
DCN4-TR4	Standard Flat Cable Trunk Line Pressure-welded Connector	OMRON
DCN5-TR4	Sheathed Flat Cable Trunk Line Pressure-welded Connector	
DCN4-BR4	Standard Flat Cable Branch Line Pressure-welded Connector	
DCN5-B4	Sheathed Flat Cable Branch Line Pressure-welded Connector	
DCN4-MD4	Multi-wiring Connector (for multidrop connections)	
DCN4-TB4	Terminal Block Adapter (to convert communications connector on Master Unit, Slave Unit, or Repeater Unit to a terminal block) Terminal block size: M3.	OMRON

Terminating Resistors

Model	Specifications	Manufacturer
DRS1-T	Terminal Block-type Terminating Resistor, 121 Ω	OMRON
DCN4-TM4	Standard Flat Cable Connector-type Terminating Resistor	
DCN5-TM4	Sheathed Flat Cable Connector-type Terminating Resistor	

Appendix D
Current Consumption Summary

Digital I/O Slave Units

Model	Communications current consumption
CRT1-ID16	85 mA max.
CRT-ID16-1	85 mA max.
CRT-OD16	85 mA max.
CRT-OD16-1	85 mA max.
XWT-ID08 (See note.)	5 mA max.
XWT-ID08-1 (See note.)	5 mA max.
XWT-OD08 (See note.)	5 mA max.
XWT-OD08-1 (See note.)	5 mA max.
XWT-ID16 (See note.)	10 mA max.
XWT-ID16-1 (See note.)	10 mA max.
XWT-OD16 (See note.)	10 mA max.
XWT-OD16-1 (See note.)	10 mA max.

Note The communications current consumption indicated for Expansion Units is the additional current consumed when the Expansion Unit is connected to a Basic Unit.
For example, the current consumption for a combination of a CRT1-ID16 Basic Unit and an XWT-OD16 Expansion Unit is 80 + 10 = 90 mA.

Bit Slave Units

Model	Communications current consumption
CRT1B-ID02S	80 mA max.
CRT1B-ID02S-1	75 mA max.
CRT1B-OD02S	75 mA max.
CRT1B-OD02S-1	70 mA max.
CRT1B-ID02SP	80 mA max.
CRT1B-ID02SP-1	80 mA max.
CRT1B-OD02SP	75 mA max.
CRT1B-OD02SP-1	75 mA max.
CRT1B-ID04SP	90 mA max.
CRT1B-ID04SP-1	90 mA max.
CRT1B-MD04SLP	90 mA max.
CRT1B-MD04SLP-1	85 mA max.

Analog I/O Slave Units

Model	Communications current consumption
CRT1-AD04	175 mA max.
CRT1-DA02	205 mA max.

Repeater Unit

Model	Communications current consumption
CRS1-RPT01	95 mA max.

Appendix E
Precautions with Connecting Two-wire DC Sensors

When using a two-wire sensor with a Slave Unit with DC inputs, check that the following conditions have been met. Failure to meet these conditions may result in operating errors.

Relation between ON Voltage of Slave Unit with DC Inputs and Sensor Residual Voltage

$V_{ON} \leq V_{CC} - V_R$

V_{CC}: I/O power supply voltage (The allowable power supply voltage range is 20.4 to 26.4 V, so 20.4 V will be used here to allow for the worst possible conditions.)

V_{ON}–: ON voltage for a Slave Unit with DC Inputs

V_R: Sensor's output residual voltage

It is sometimes possible to satisfy the above equation by adjusting the I/O power supply voltage (V_{CC}) to 26.4 V.

Relation between ON Current of Slave Unit with DC Inputs and Sensor Control Output (Load Current)

I_{OUT} (min) $\leq I_{ON} \leq I_{OUT}$ (max.)

I_{OUT}: Sensor control output (load current)

I_{ON}: ON current of Input Slave Unit with DC inputs

I_{ON} is calculated as follows:

$I_{ON} = (V_{CC} - V_R - V_F)/R_{IN}$

V_F: Internal residual voltage of a Slave Unit with DC Inputs

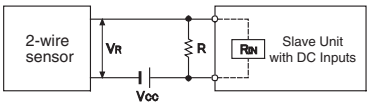
R_{IN}: Input impedance of a Slave Unit with DC Inputs

When I_{ON} is smaller than I_{OUT} (min), connect a bleeder resistor R.

The bleeder resistor constant can be calculated using the following equation.

$R \leq (V_{CC} - V_R)/(I_{OUT}\text{ (min.)} - I_{ON})$

Power $W \geq (V_{CC} - V_R)^2/R \times 4$ [allowable margin]



Relation between OFF Current of Slave Unit with DC Inputs and Sensor Leakage Current

$I_{OFF} \geq I_{leak}$

I_{OUT}: OFF current of a Slave Unit with DC Inputs

I_{leak}: Sensor's leakage current

Connect a bleeder resistor if the Sensor's leakage current is greater than the OFF current of a Slave Unit with DC Inputs.

The bleeder resistor constant can be calculated using the following equation.

$R \leq (I_{OFF} \times R_{IN} + V_F)/(I_{leak} - V_{OFF})$

Power $W \geq (V_{CC} - V_R)^2/R \times 4$ [allowable margin]

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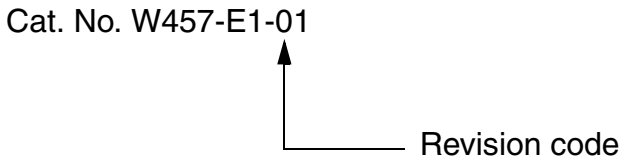
Revision History

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



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

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